KAVITY
For Construction Solutions & Materials.

MECHANICAL
CLADDING FIXATION

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SCAN ME

ABOUT KABRI

KABRI International Contracting Co. L.L.C , Since its founding in UAE in 2012 has become one of the leading contracting companies in the market , via its team experience that is linked to many prestigious projects in the country .A smart – brave decision was taken to expand kabri activities to include a trading division under its umbrella through a partnership with Kavity for construction solutions in Jordan that is dedicated and experienced in the construction .materials supplying field

ABOUT KAVITY

Is a leading specialized construction solutions and Building Materials supplier, primarily offers the Design & Supply for the Façade Mechanical Fixation Systems. via its well-educated highly experienced team along with the extensive accumulated knowledge for over than 15 years in supply execute and consultation services providing across all construction markets; these services expanded to include the supply of very specialized diversified products and fields such as; Expansion &movement joint , Firestop, Impact protection , Vinyl guards, Raised Access Flooring , Entrance Mats , Block works Accessories, Garbage & Linen Chute , Cable Management, Supports and Steel Structure , Water proofing and many other systems .

MISSION & VISION & VALUES

MISSION

We have the conviction to be the leader in building & construction industry through:
Design, manufacture, application and assembly of fastening systems for facades and for any type of cladding at the national and international level.

VISION

To be a worldwide engineering benchmark for fixing systems for facades.

VALUES

Professionalism, security, commitment, quality, reliability and guarantee. Our strengths are a complete technical service based on assistance from the preliminary study to the completion of the project.

OUR OBJECTIVE

The company's fundamental objective is to assist and advise its clients in choosing the most suitable fixing systems for their requirements and to provide them with quality production and supply with timely deliveries.

We have the qualified employees, the know-how and the products to service major construction projects, medium sized to mega projects taking in care our positive contribution to our societies.

WE THRIVE TOWARDS EXCELLENCE BY ACKNOWLEDGING:

Passion, competence and the highest standards in technology, quality and safety constantly drive us to improve, and provide impetus for innovation.

Customer Satisfaction

Employee Retention

Positive Influence on Society and Environment

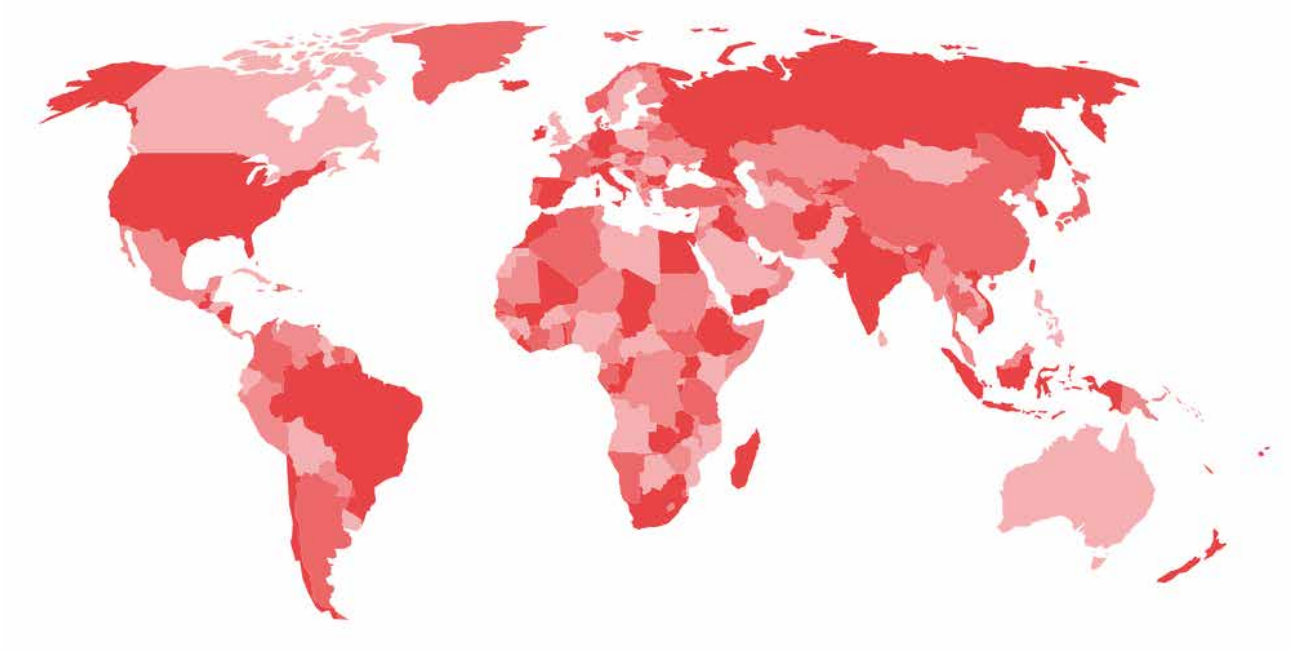
Partner and Supplier Relations

2014 .EST

Start Up

THE BEGINNING

KAVITY was established in UNITED ARAB EMIRATES as a contracting company.
During the same year, another branch was established in the Jordan and USA



ENGINEERING
SPECIALTY

In this catalogue, we present our extensive range for you – with the most important facts about our products. Please do not hesitate to contact us if you have any questions.

The products development department maintains highly skilled calibers with a dedication towards efficient and reliable solutions even in the most complicated cases where delicacy and skillful approaches are indispensable.

DESIGN AND PRODUCT SAFETY

Our design services provide highly flexible design with the ultimate aim to obtain the optimum level of structural performance to meet the safety standards of the project by taking into consideration the economic viability.

SUSTAINABILITY AND RESPONSIBILITY

KAVITY is dedicated to achieving the highest level of customer satisfaction and is committed to being constantly in contact with its clients to better understand their requirements and to offer the services required for the design and production of fixing systems.

OUR DESIGN
OFFICE

KAVITY We provide design, engineering and manufacturing services for high integrity fixing systems used for various types of facade cladding.

Our design services provide highly flexible design with the ultimate aim to obtain the optimum level of structural performance to meet the safety standards of the project by taking into consideration the economic viability. With our in the house design department and testing laboratory, we provide full technical support both for standard and custom-designed fixing systems to suit project requirements.

OUR GOAL IS TO SERVE OUR CLIENTS THROUGH THESE ELEMENTS:

- Excellent in engineering ideas and solutions
- High quality in performance
- Firmness on meeting deadlines

MARBLE & GRANITE FIXINGS

KAVITY Natural stone façade structures create a refined image and stand for value retention and quality. With KAVITY natural stone systems even most superior design can be realized.KAVITY guarantees highest quality materials, high grade manufacture and products with the proven reliability of a global brand , throught
several types of mechanical fixings and accessories used for cladding purposes. Stainless and galvanized steel are among the various materials used in the fabrication.

INTERNATIONAL STANDARDS FOR CLADDING DESIGN

Design & Calculation Standards

Reference is made to the following standards for the design and
structural calculations of Natural Stone Fixing Systems.

American Standards:

- Uniform Building Code 1997-Volume 2
- ASTM A 276 Standard specification for stainless steel bars and
shapes.
- ASTM 666 Standard specification for annealed or cold-worked
austenitic stainless steel sheets.
- ASTM C1354 / C1354M - 09 Standard Test Method for Strength of
Individual Stone Anchorages in Dimension Stone

British Standards:

- BS 8298 Design and installation of natural stone cladding.
- BS 1449 Part 2 Steel plates, sheets and strips stainless and heat
resisting.
- BS 6105 Corrosion resistant stainless steel fasteners.
- BS 5950 Structural use of steel work in building.
- CP3, Chapter 5, Part 2 Wind loads.
- BS 970 Part 3 1991, Mechanical properties for stainless steel.

German Standards:

- DIN 1045 Concrete and reinforced concrete, design and
dimensioning.
- DIN 1053 Masonry, design and dimensioning.
- DIN 1055 Design loads for buildings.
- DIN 18 516 Cladding for external walls.
- DIN 18 800 Steel structures, design and dimensioning.
- DIN 18 801 Steel framed structures

LOADS

- Self load = (Dead Load)
- Wind load - Seismic load
- Temperature variation load

TYPES OF FIXINGS

Principles for the Fixing of Building Cladding

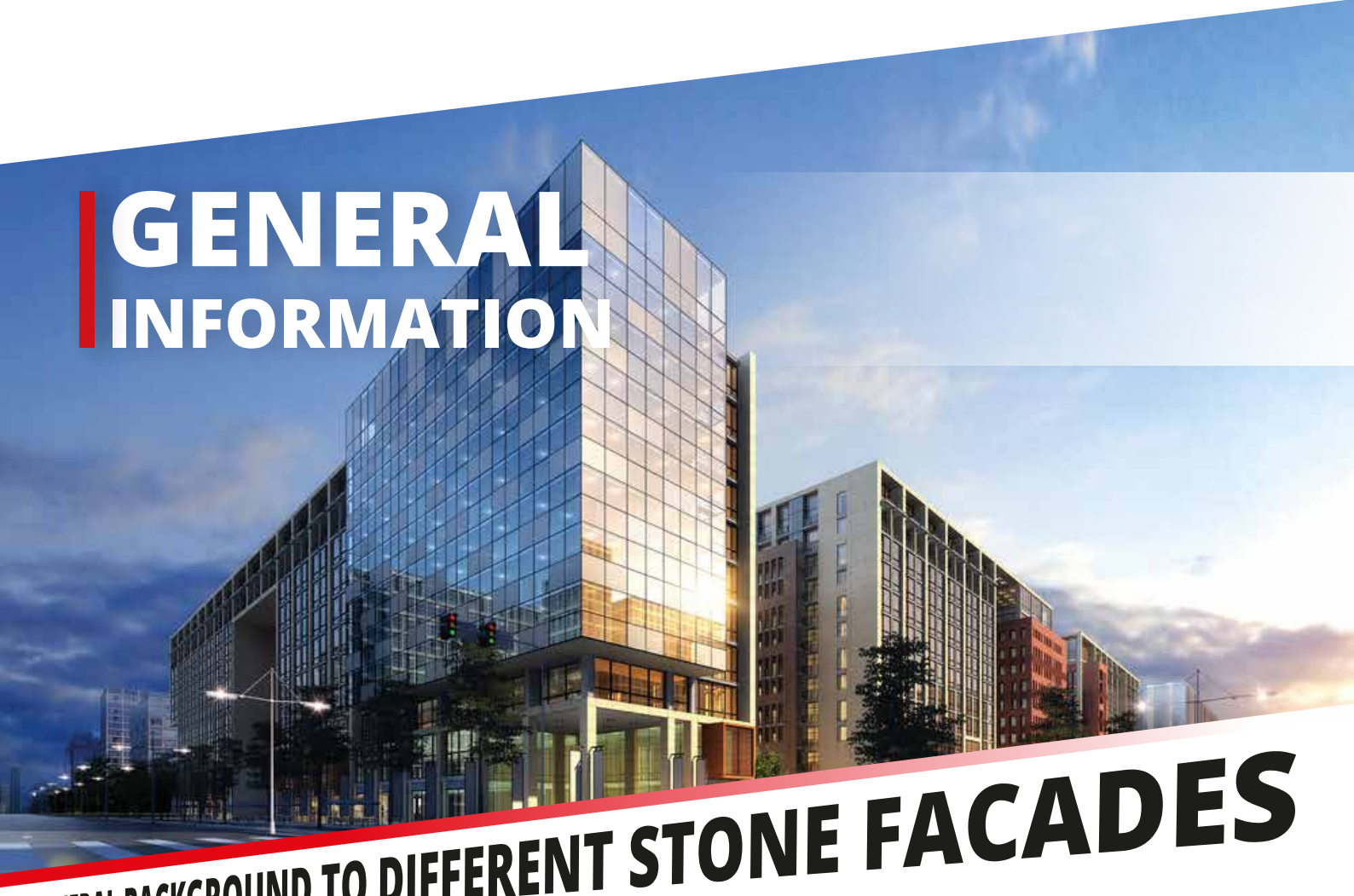
The fixing systems for building cladding are composed of several
elements (angles, expansion bolts, screws, nuts, washers, etc),
each of which shall present the appropriate mechanical features in
respect to the requirements posed by the specific project. Any type
of cladding, once fixed, is subject to two primary types of load:
- Permanent load (the dead load), due to the weight of the cladding
itself;
- Variable load (applied loads), due to the wind, thermal expansions,
seismic motions, etc.structural calculations of Natural Stone Fixing Systems.

Two fundamental types of fixing systems result:

- Load-bearing fixing: to support the permanent load and the
vertical components of the variable loads.
- Restraining fixing: to support the horizontal components of
the loads. Restraining fixings instead, serve to maintain the
slabs in the positions specified by the project design. Thanks to
the systems of adjustment with which they are equipped, the
absence of perfect verticality in the external surfaces may be
easily overcome.

TYPES OF FACADE BUILDING SUBSTRUCTURE

1- Stone fixed to concrete wall
2- Stone fixed to hollow block wall
3- Stone fixed to solid block
4- Stone fixed to composite substructure



GENERAL INFORMATION

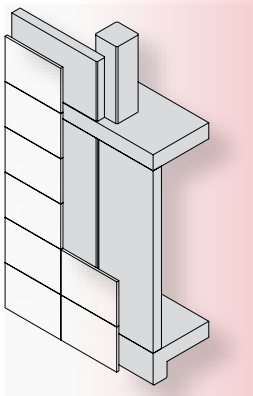
GENERAL BACKGROUND TO DIFFERENT STONE FACADES

When natural or reconstituted stone has been chosen as a cladding material it is necessary to give consideration to the following key areas for the purposes of choosing the most appropriate connection system:

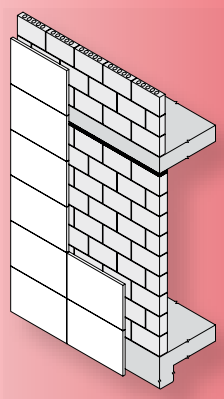
- Stone type and dimensions
- Wall structure: projection size, wall cavity and insulation thickness
- Application type: horizontal or vertical joint installation
- Joint size and the requirement of expansion and compressing joints
- Structural wall backing type
- Height of facade
- Relevant loads such as dead loads, wind loads and seismic loads
- Design criteria of the project and safety factors to be used in calculations

Once these considerations have been made KAVITY can advise on the most suitable anchoring method. Included in this catalog are typical examples of substrates that can be anchored using KAVITY systems, some of which are illustrated opposite

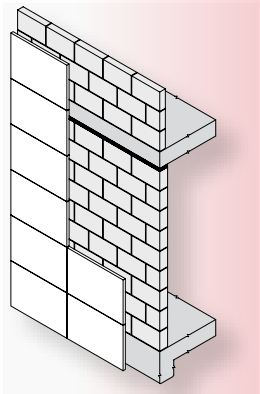
Types of Facade Building Sub-Structure



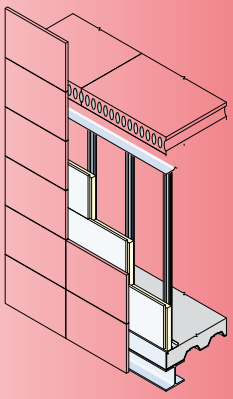
Stone fixed to concrete Structures



Stone fixed to hollow block wall



Stone fixed to solid block wall

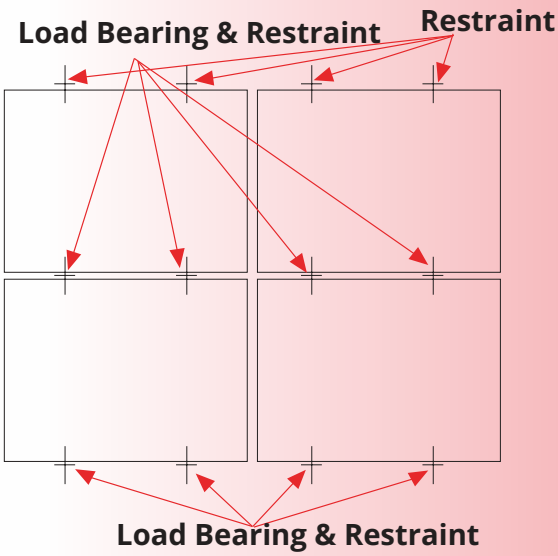


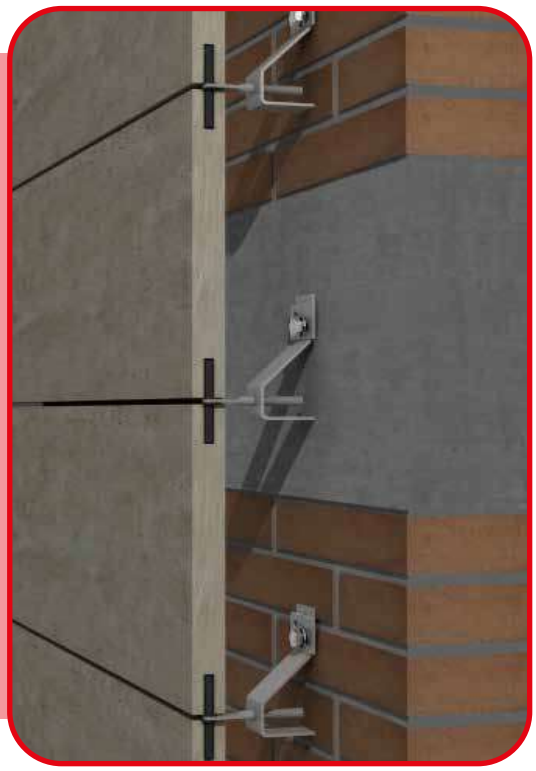
Stone fixed to metal studs substructure

FIXINGS IN **HORIZONTAL** OR **VERTICAL** JOINTS

FIXATION IN THE HORIZONTAL JOINT

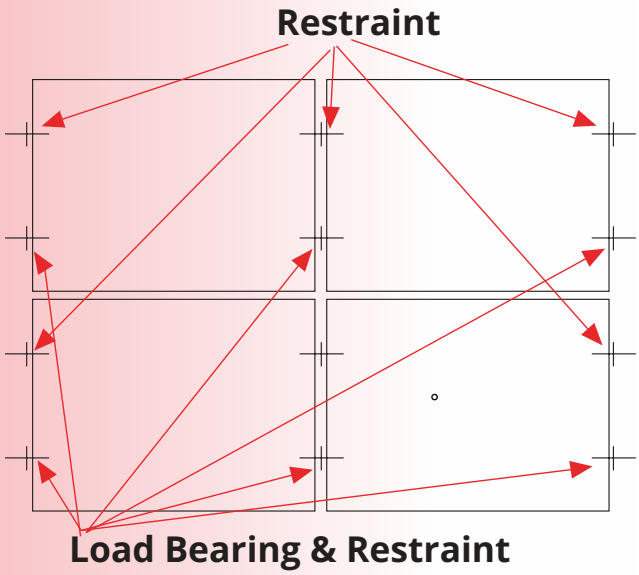
The Z-brackets carry half the weight of the natural stone slabs in horizontal installation. Z-Brackets bear half the weight of the slab
above and also act as restraint, holding the slabs below and restraining them against wind pressure and suction.





FIXATION IN THE VERTICAL JOINT

The load bearing carry the full weight of the natural stone slab in vertical installation. Each Z-bracket bears half the weight of the slab on the right and half the weight of the slab on the left. Restraint Z-brackets hold the slabs below and restrain them against wind
pressure and suction.



KAVITY NATURAL STONE SUPPORT SYSTEMS

DESIGN FUNDAMENTALS

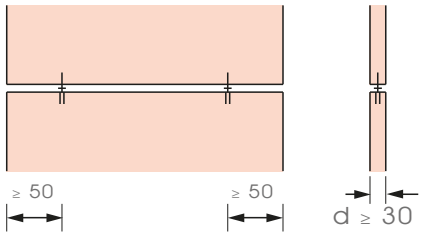
Construction details from DIN 18 516, section 3

Anchor pins
The anchor pins extend into the holes drilled for the pins in the edges of the slabs. The holes are approximately 3 mm larger than the diameter of the pins.

Anchor material
Anchors and pins must be of stainless steel corrosion resistant class III material, according to EN 1993-1-4: 2015

Edge distances
The standard distance from the corner of the panel to the centre of the hole is 50 mm.

The thickness of the panel from the hole to the panel face must not be less than 10 mm. Minimum thickness of panel ≥ 30



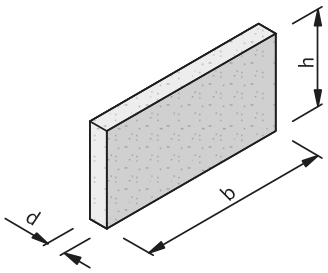
Concrete anchoring substrate Where the load-bearing structures are heavily reinforced and highly stressed, for example reinforced concrete columns or lintels, the type and location of the anchors should be specified in cooperation with the structural engineer.

Anchors connected to KAVITY must be installed in accordance with the approval for KAVITY Channels

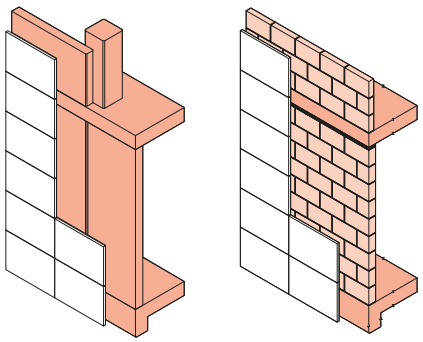
Design and calculation

The planning of natural stone anchor fixings is based on the details shown in figures a) to e). This allows fast and accurate installation to ensure cost effective fixing of natural stone panels.

a) Weights of natural stone panels

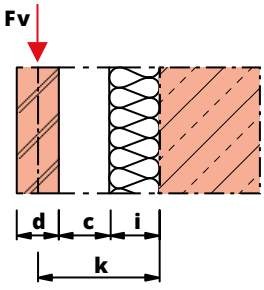


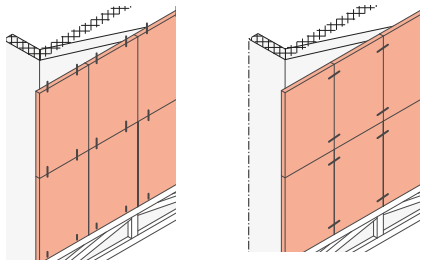
b) Dimensions of natural stone
width b
height h
thickness d



b) Dimensions of natural stone
width b
height h
thickness d

c) Wall section
d = thickness of natural stone panels
c = size of ventilation gap
i = thickness of thermal insulation
k = stand-off installation distance of natural stone anchor





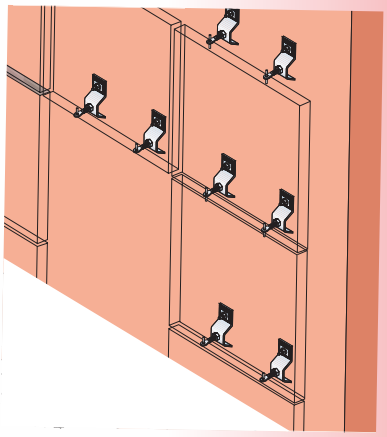
d) Anchoring in concrete or masonry structures

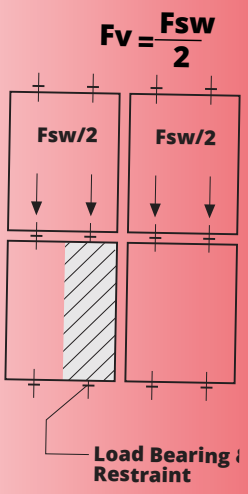
e) Installation of natural stone anchors in vertical or horizontal joints

Material	g [kN/m3]
Ceramic, volcanic ston	20
Limestone compositions, Travertine	24
Sandstone, ophiolite, greywacke	26
Limestone, dolomite, shell marl, marble	27
Granite, porphyry, syenite, slate	28
Basalt, diorite, gabbro, gneiss	30

Calculating the panel weight:
Panel weight:
FV = b [m] × h [m] × d [m] × g [kN/m3]

Installation At Horizontal Joints





Determining Anchor Loading Fv

Fsw : self weight of natural stone panel
a) Support anchor in vertical joint One support anchor carries the dead load (Fv) of one natural-stone panel

Example :

Natural-stone panel b/h/s
(width/ height/ thickness) = 0.6/1.00/0.04m
Density (Design weight) = 27 kN /m^3
Anchor loading Fv = 0.6 * 1.00 * 0.04 * 27 = 0.65kN = 65 kg.
Self weight per panel: Fsw = Fv = 65kg

b) Support anchor in horizontal joint One support anchor carries the dead load (Fv) of half natural-stone panel.

Example :

Natural-stone panel b/h/s = 0.6/1.00/0.04/m
Density= 27 kN/m^3
Anchor loading Fv = Fsw/2 = 0.32kN
Fv = 32kg
The shape and the material of the facing to be anchored

Installation at vertical joints Fsw

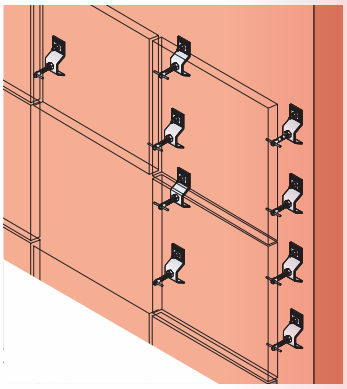
Determining Anchor Loading FH (Wind loading):

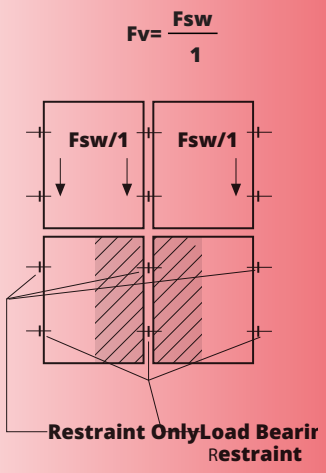
Example :

Natural-stone panel = 0.6/1.00/0.04m
Wind load W = 1.1 kN/m^2 (Wind pressure) for building
height 20-100m

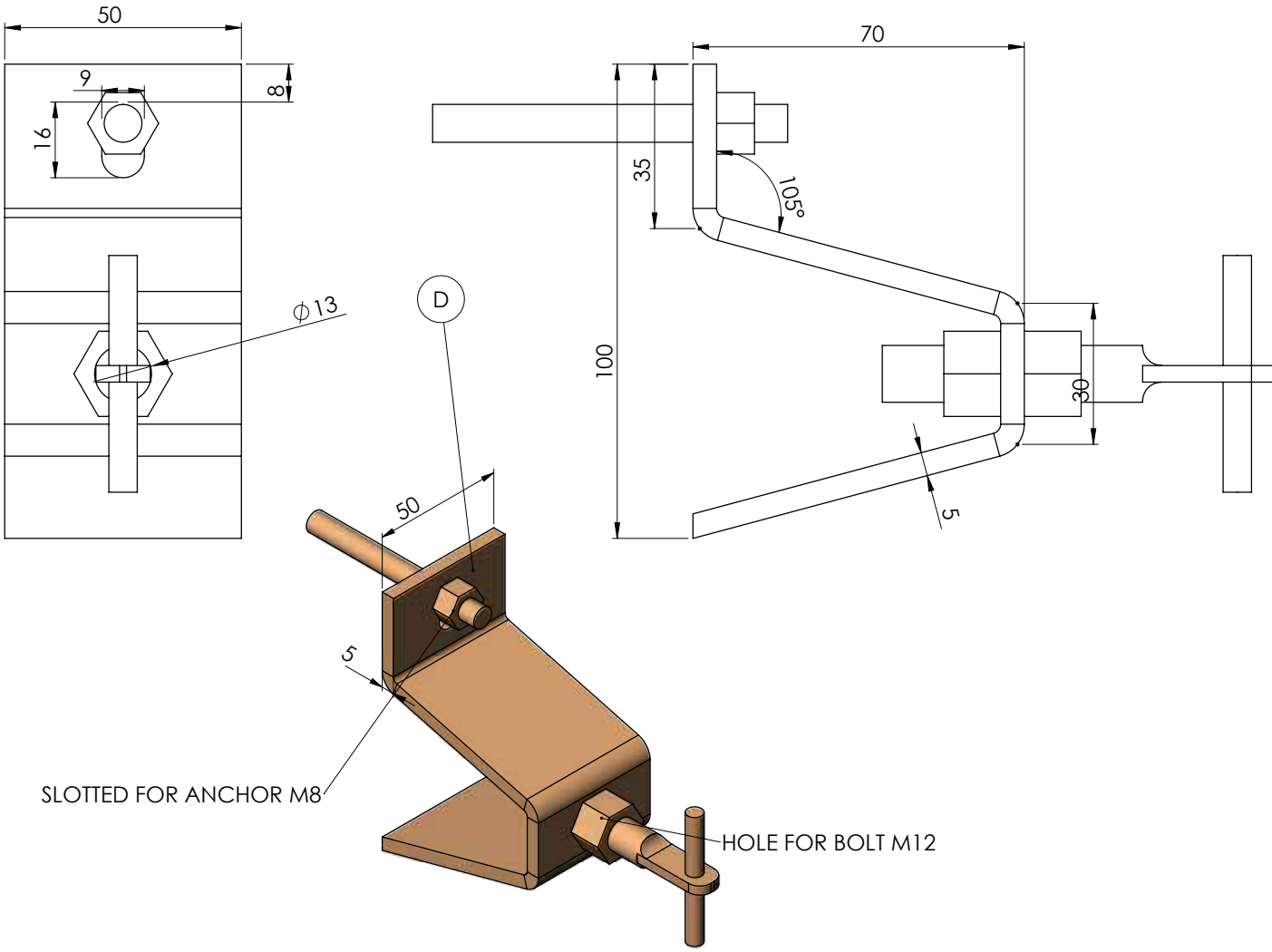
Wind load/ panel = 0.6 * 1.00 * 1.1 = 0.66 kN
Anchor load FH = 2 * 0.25 * 0.66 = 0.5 * 0.66 kN = 0.33kN

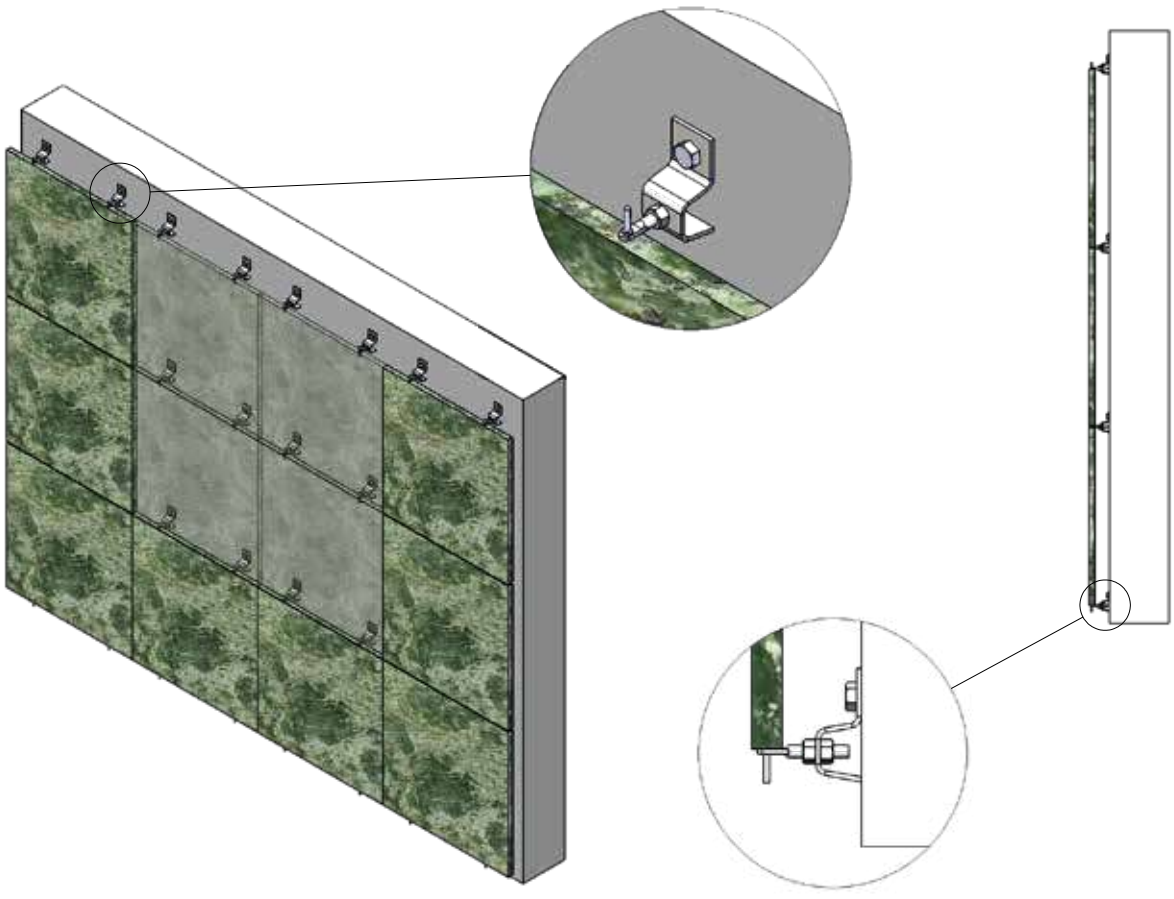
One anchor carries the wind loading of halph Naturalstone
half-panel.

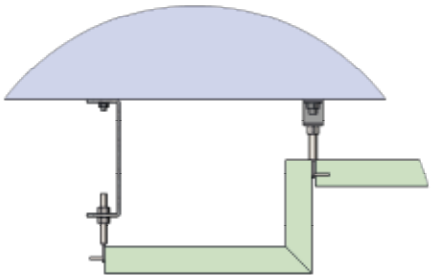




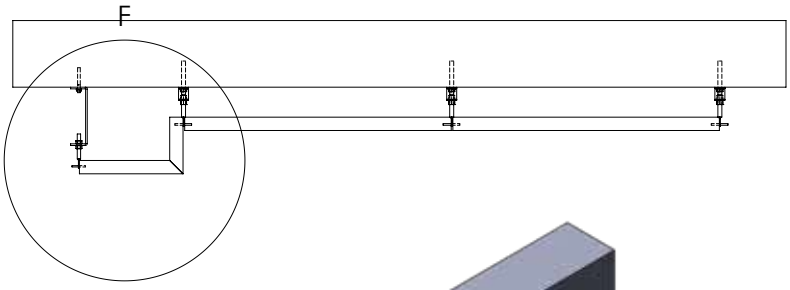
MOULDING 2,3,5,7 Z BRACKET

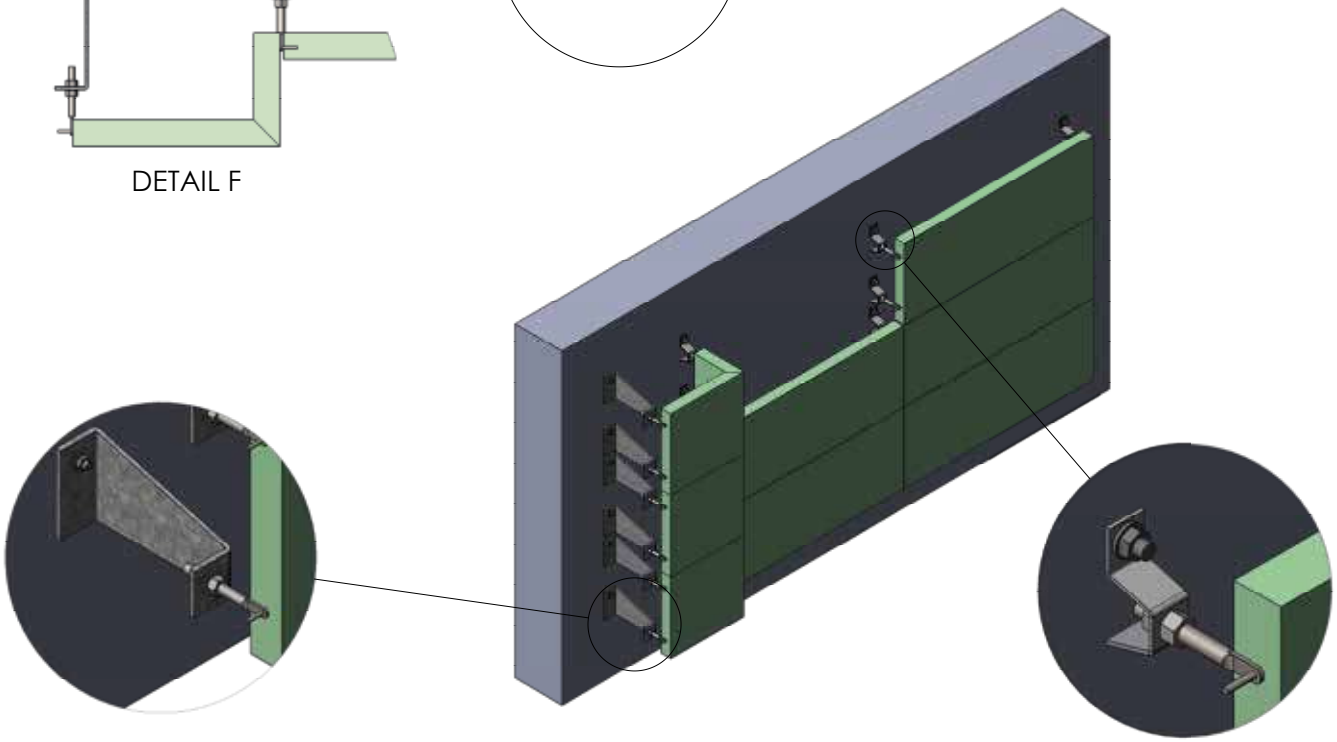


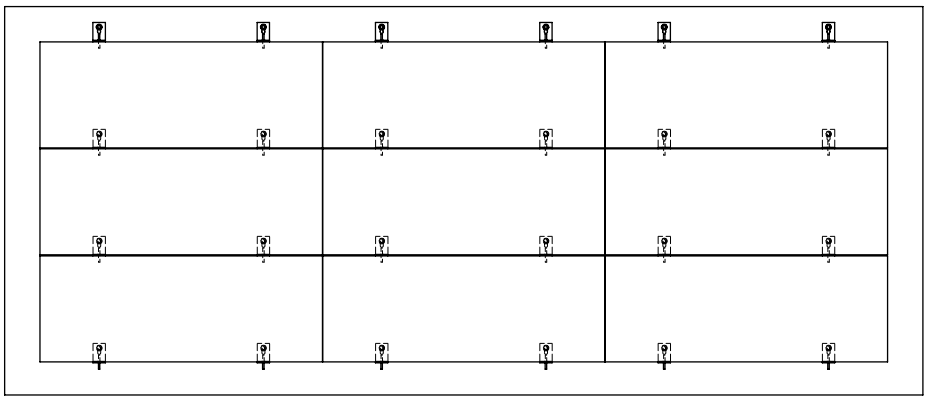


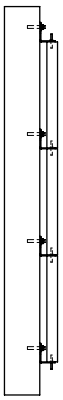


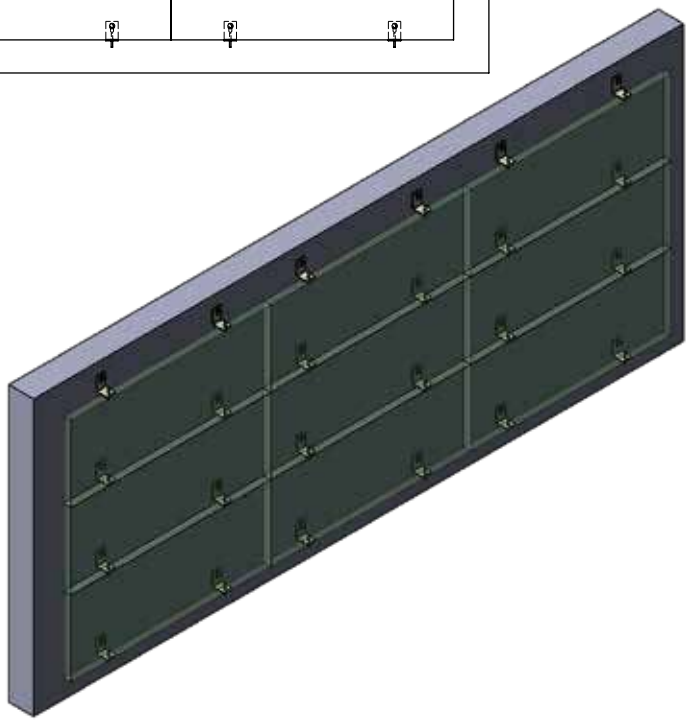
DETAIL F

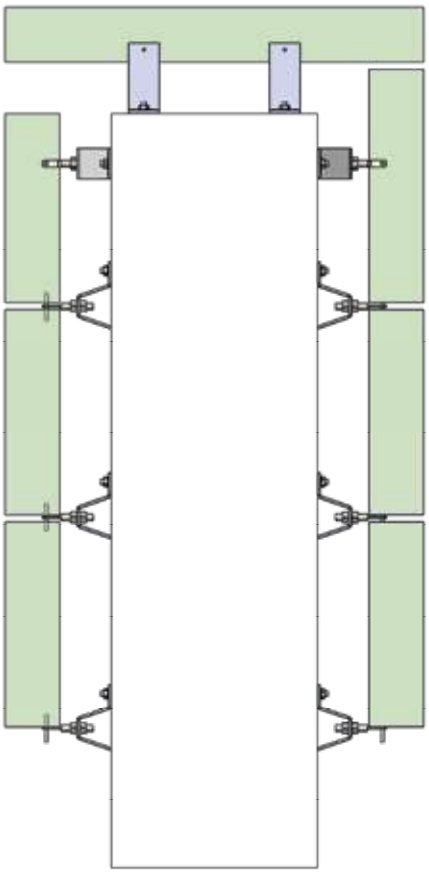


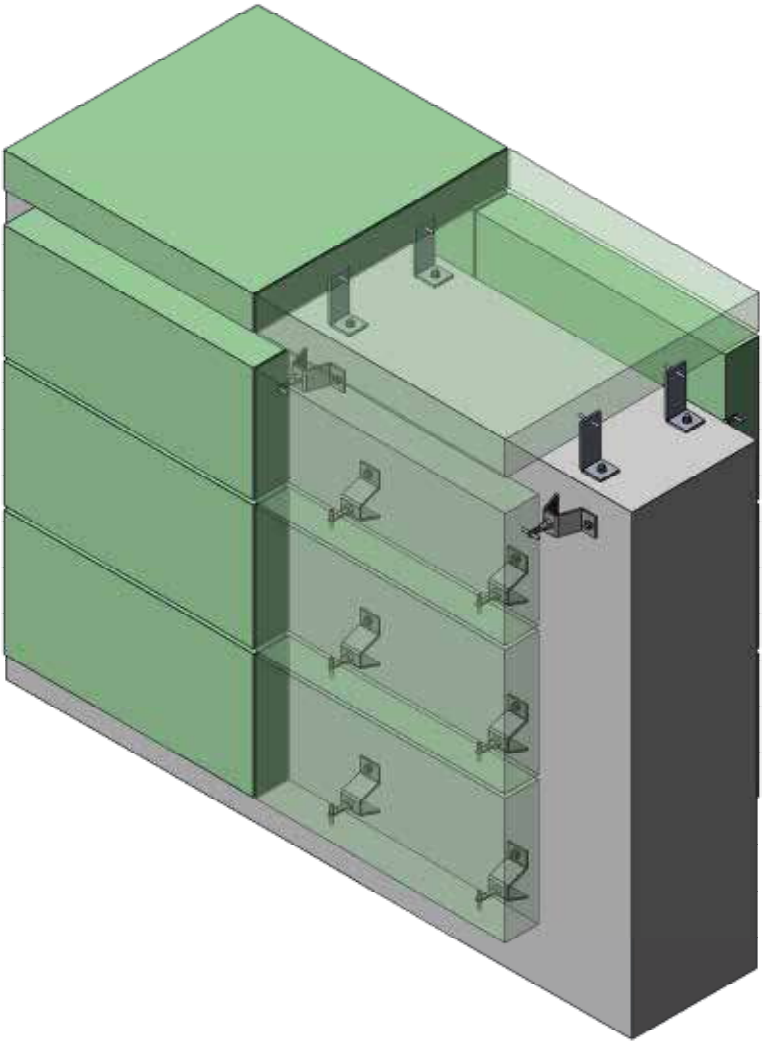


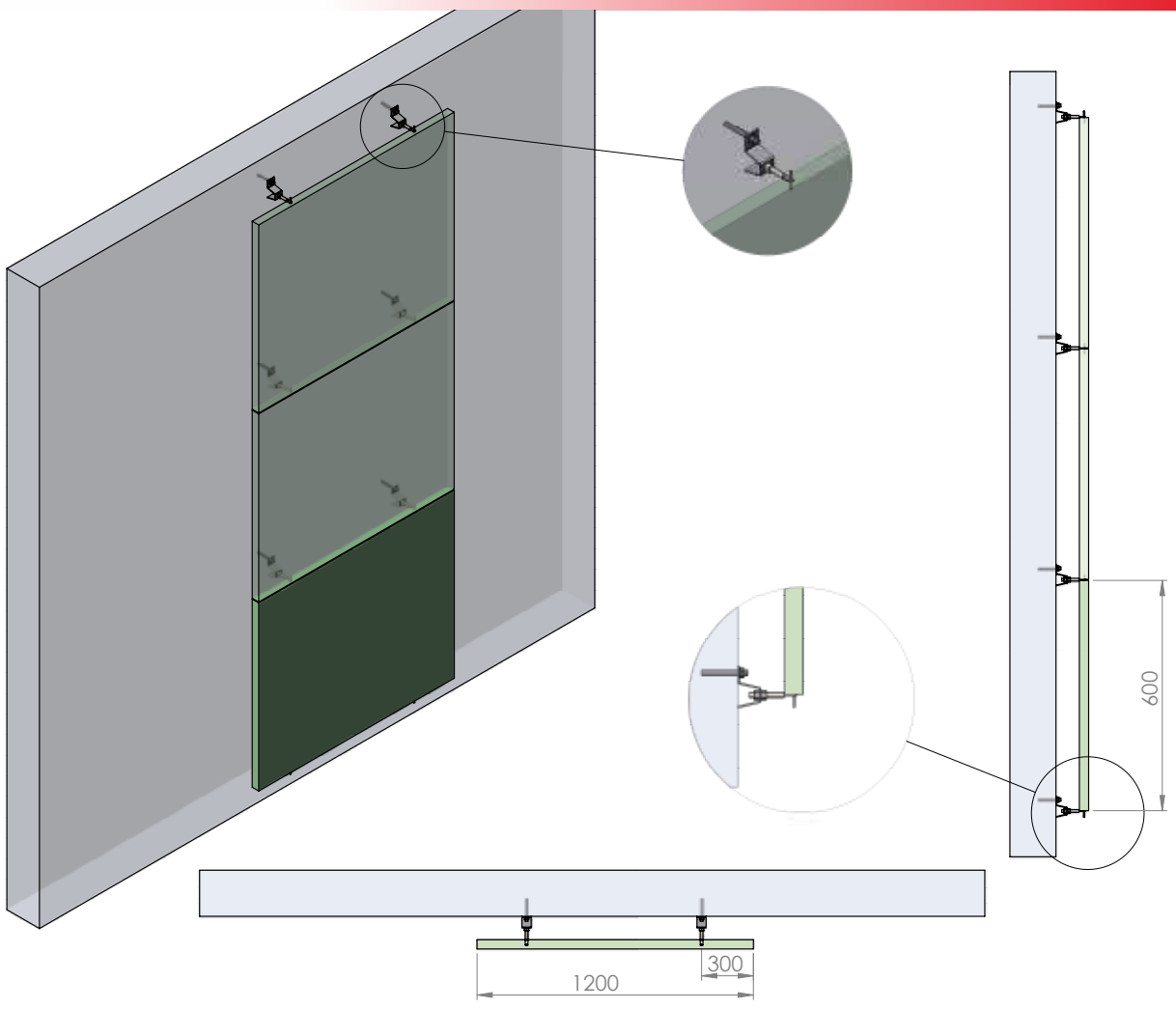








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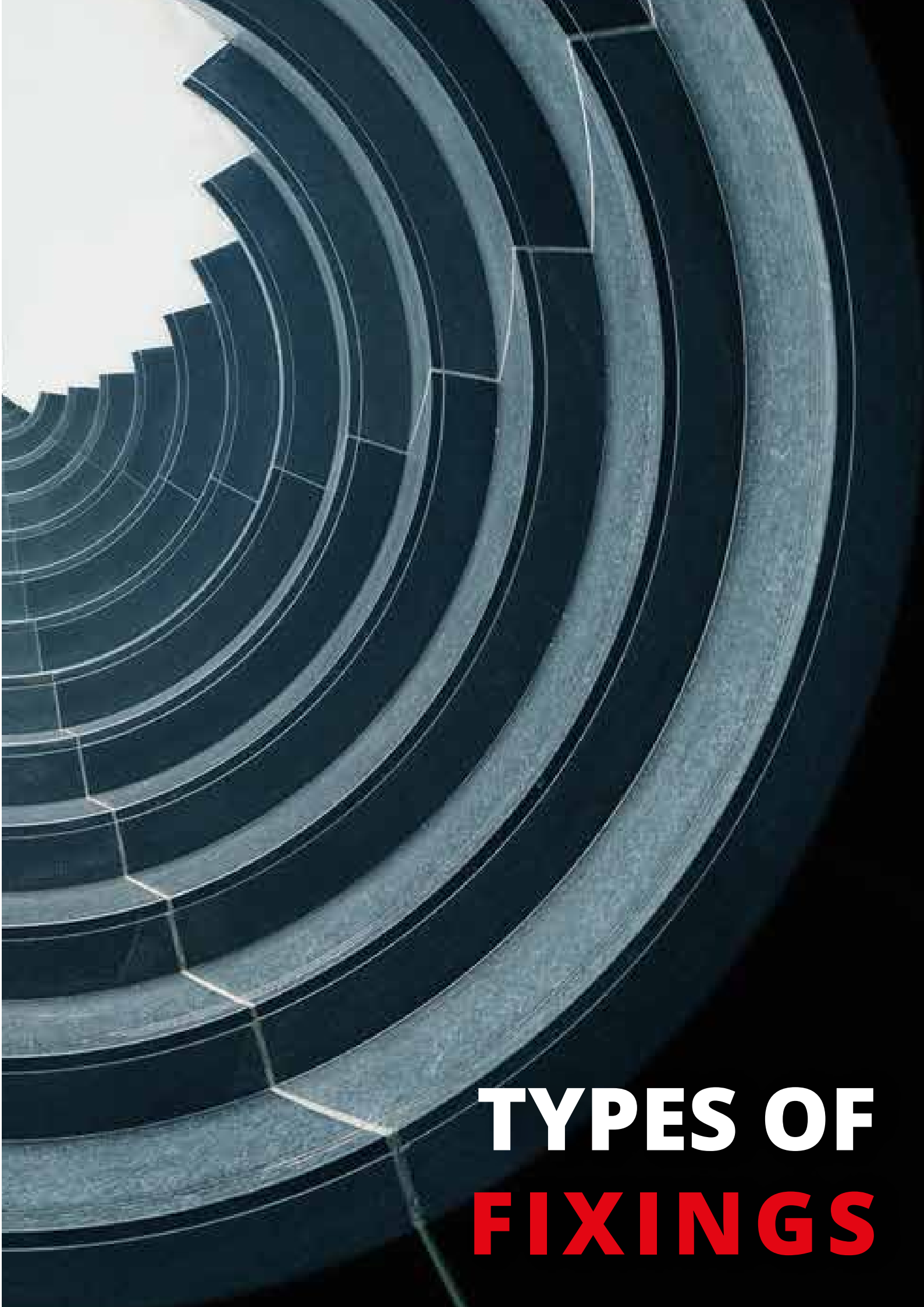


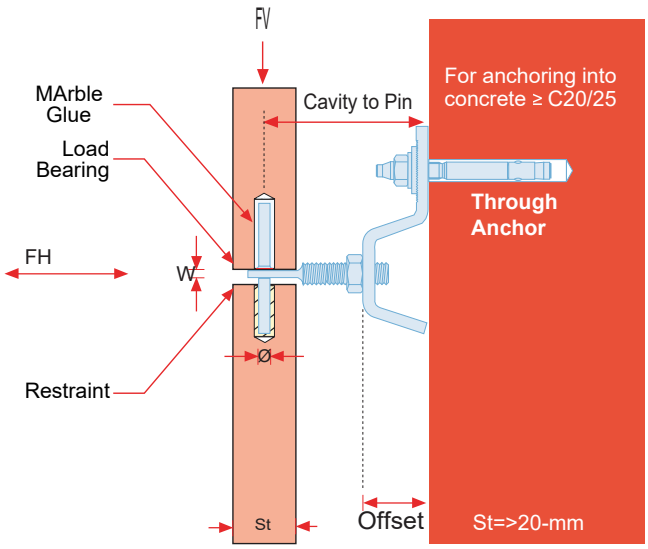
TYPES OF FIXINGS

PRINCIPLES FOR THE FIXING OF BUILDING CLADDING

The fixing systems for building claddings are composed of several elements (angles, expansion bolts, screws, nuts, washers, etc),
each of which shall present the appropriate mechanical features in respect to the requirements posed by the specific project.

Any type of cladding, once fixed, is subject to two primary types of load:

1: The permanent load (the dead load), due to the weight of the cladding itself;
2: The variable load (applied loads), due to the wind, thermal expansions, seismic motions, etc.



Two fundamental types of fixing systems result:

1: Load-bearing fixing: to support the permanent load and the vertical components of the variable loads.

2: Restraining fixing: to support the horizontal components of the loads.

Load-bearing fixing are usually composed by angles (of adequate dimensions), firmly fixed to the building by the opportunely selected anchoring element complete with expansion anchors and bolts.

Restraining fixings instead, serve to maintain the slabs in the positions specified by the project design .Thanks to the system of adjustment with which they are equipped, the absence of perfect verticality in the external surfaces may
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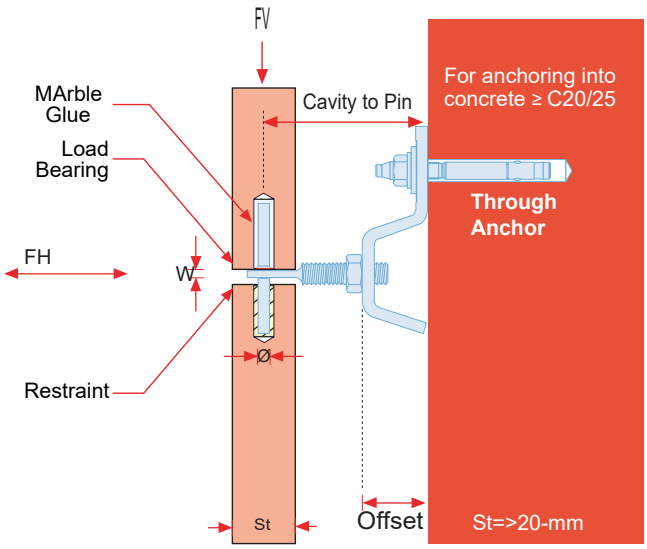

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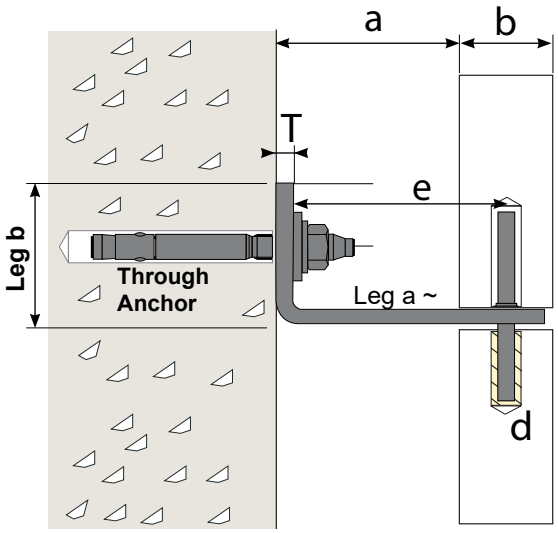
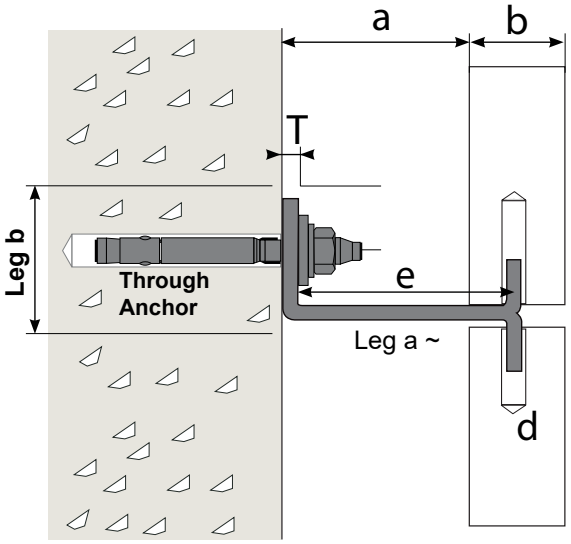
L-BRACKET (STANDARD & SERRATED) | TYPE KAV LS

L-Bracket with pin	
a	Cavity to back side panel
b	Panel thickness
T	Bracket thickness
d	Diameter of pin
e	Cavity to pin

Economic for 20 < a ≤ 80mm



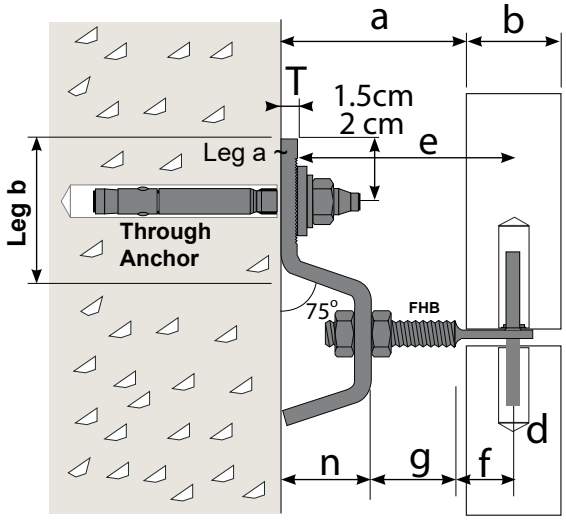
L-BRACKET (STANDARD & SERRATED) | TYPE KAV LSU



L-Bracket up and down	
a	Cavity to back side panel
b	Panel thickness
T	Bracket thickness
e	Cavity to pin

Economic for 20 < a ≤ 80mm

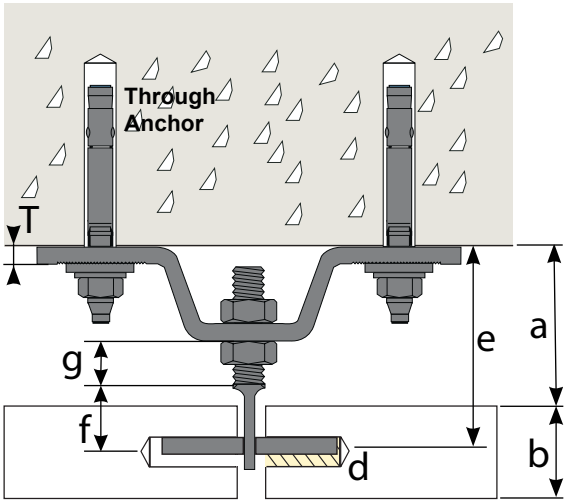
Z-BRACKET WITH RETURNED LEG (SERRATED) | TYPE KAV Z



Z-returned bracket	
a	Cavity to back side panel
b	Panel thickness
T	Bracket thickness
d	Diameter of pin
e	Cavity to pin
f	Flat head parts
g	Threaded part

Economic for 50 < a ≤ 120mm

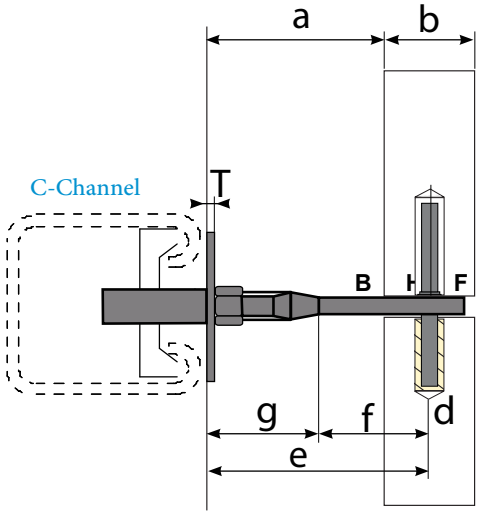
OMEGA BRACKET (STANDARD & SERRATED) | TYPE KAV OM



Z-returned bracket	
a	Cavity to back side panel
b	Panel thickness
T	Bracket thickness
d	Diameter of pin
e	Cavity to pin
f	Flat head parts
g	Threaded part

Economic for 50 < a ≤ 120mm

FLAT-HEAD-BOLT IN CHANNEL (SPRING NUT SET)



Flat-Head-Bolt in Channel	
a	Cavity to back side panel
b	Panel thickness
t	Bracket thickness
d	Diameter of pin
e	Cavity to pin
f	Flat head parts
g	Rounded part

economic for 10 < a ≤ 60mm

THE RANGE OF PRODUCTION

We provide design, engineering and manufacturing services for high integrity fixing systems used for various types of facade cladding

A product range is available that comprehensively covers all facade applications. Apart from
standard products that are shown in our catalogues, the design and engineering of customized systems are made to full fil the requirements of the project.

For which KAVITY has organized a staff of specialized technicians, in grade to provide a series of services at the complete disposal of
the client. For greater detail, we shall illustrate these additional services to which our clients may avail themselves, as follows:

CONSULTANT SERVICE **DESIGNING SERVICE** **INSTALLATION SERVICE**

QUALITY CONTROL SERVICE **TRAINING SERVICE**

CONSULTANT SERVICE

The company's fundamental objective is to assist and advise its clients in choosing the most suitable fixing systems for their
requirements and to provide them with quality production and supply with timely deliveries

DESIGNING SERVICE

Our design services provide highly flexible design with the ultimate aim to obtain the optimum level of structural
performance to meet the safety standards of the project by taking into considera-tion the economic viability.

QUALITY CONTROL SERVICE

KAVITY guarantees highest quality materials, high grade manufacture and products with the proven reliability of a reputable
brand.

INSTALLATION SERVICE

KAVITY is also ready to provide assistance service and to carry out the laying of the building cladding with specialized personnel. Our
technical staff is at your complete disposal in order to supply any further clarifica-tion you should desire.

PRODUCT RANGE

KAVITY cladding systems cover a wide variety of cavity, widths and load capacity. The steel angle consists of two main components,
a bracket with a vertical slot, and a threaded flat head bolt with dowel pin. The vertical slot allows for up and down adjustment for connecting to the structure. The threaded flat head bolt allows in and out adjustment to accommodate variations in cavity wide steel angle can be bolted to C-Channel for maximum adjustment, or installed using drilled bolts. Steel angles are available in several configurations with a choice of either full or half dowel pins. Full dowel pins have a nurled zone to pre-vent the pin dropping through the
hole in the flat head bolt.

INTERNATIONAL STANDARDS FOR CLADDING DESIGN

Design & Calculation Standards

Reference is made to the following standards for the design and structural calculations of Natural Stone Fixing Systems.

British Standards:

BS 8298 Design and installation of natural stone cladding.
BS 1449 Part 2 Steel plates, sheets and strips stainless and heat resisting.
BS 6105 Corrosion resistant stainless steel fasteners.
BS 5950 Structural use of steel work in building.
CP3, Chapter 5, Part 2 Wind loads.
BS 970 Part 3 1991, M Mechanical properties for stainless steel.

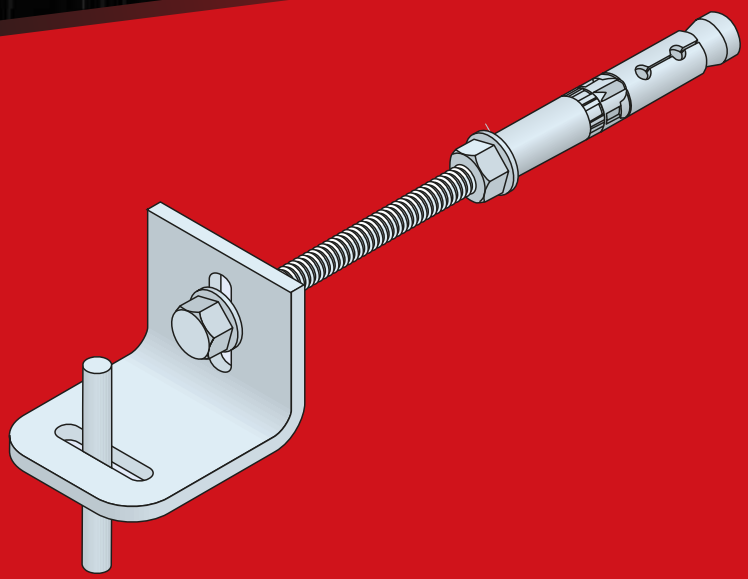
German Standards:

DIN 1045 Concrete and reinforced concrete, design and dimensioning.
DIN 1053 Masonry, design and dimensioning.
DIN 1055 Design loads for buildings.
DIN 18 516 Cladding for external walls.
DIN 18 800 Steel structures, design and dimensioning.
DIN 18 801 Steel framed structures.

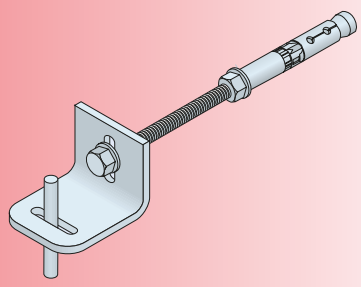
American Standards:

ASTM A 276 Standard specification for stainless steel bars and shapes.
ASTM 666 Standard specification for annealed or cold-worked austenitic stainless steel sheets.
Uniform Building Code 1997-Volume 2

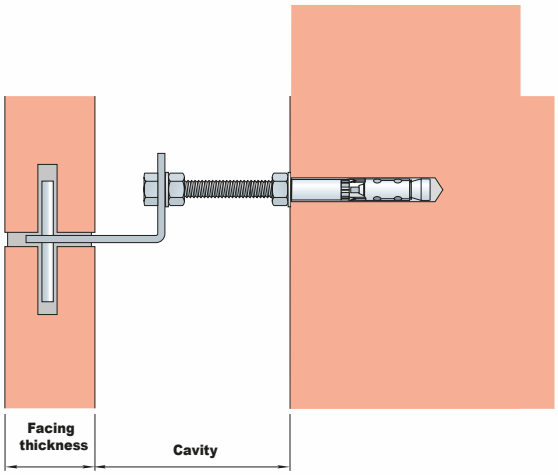
L- BRACKETS



STANDARD TYPES
L- BRACKETS



KAVL-Bracket



Support Bracket

The structural analysis fully considers the dead load of panel, imposed wind loads and thermal stresses, in accordance with relevant DIN standards.

Loads caused by earthquakes can be transferred into the anchoring base.

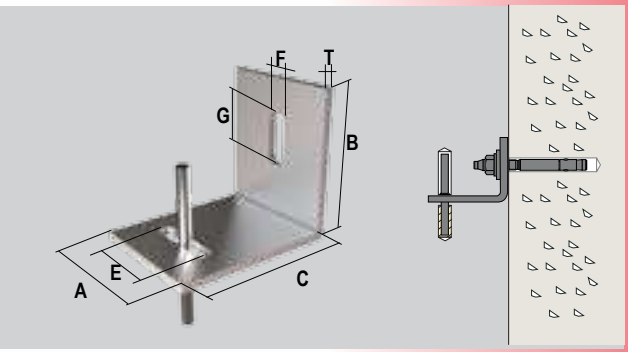
The support and restraint brackets are Fixed using expansion anchors, chemical anchors, etc.

Using expansion bolts, an installation of the facade is also possible during the winter months

Due to the small drill hole dimensions of the expansion bolts, the facade can be installed very quickly.

KAV L- BRACKETS

L - Brackets



KAV-L With Pin Bracket

KAV-U Up&Down Bracket

Materials SS304, SS316, SS316L, SS316TI, S235JR-MG, S235JR-HDG ≤ 50°C 24h average temperature

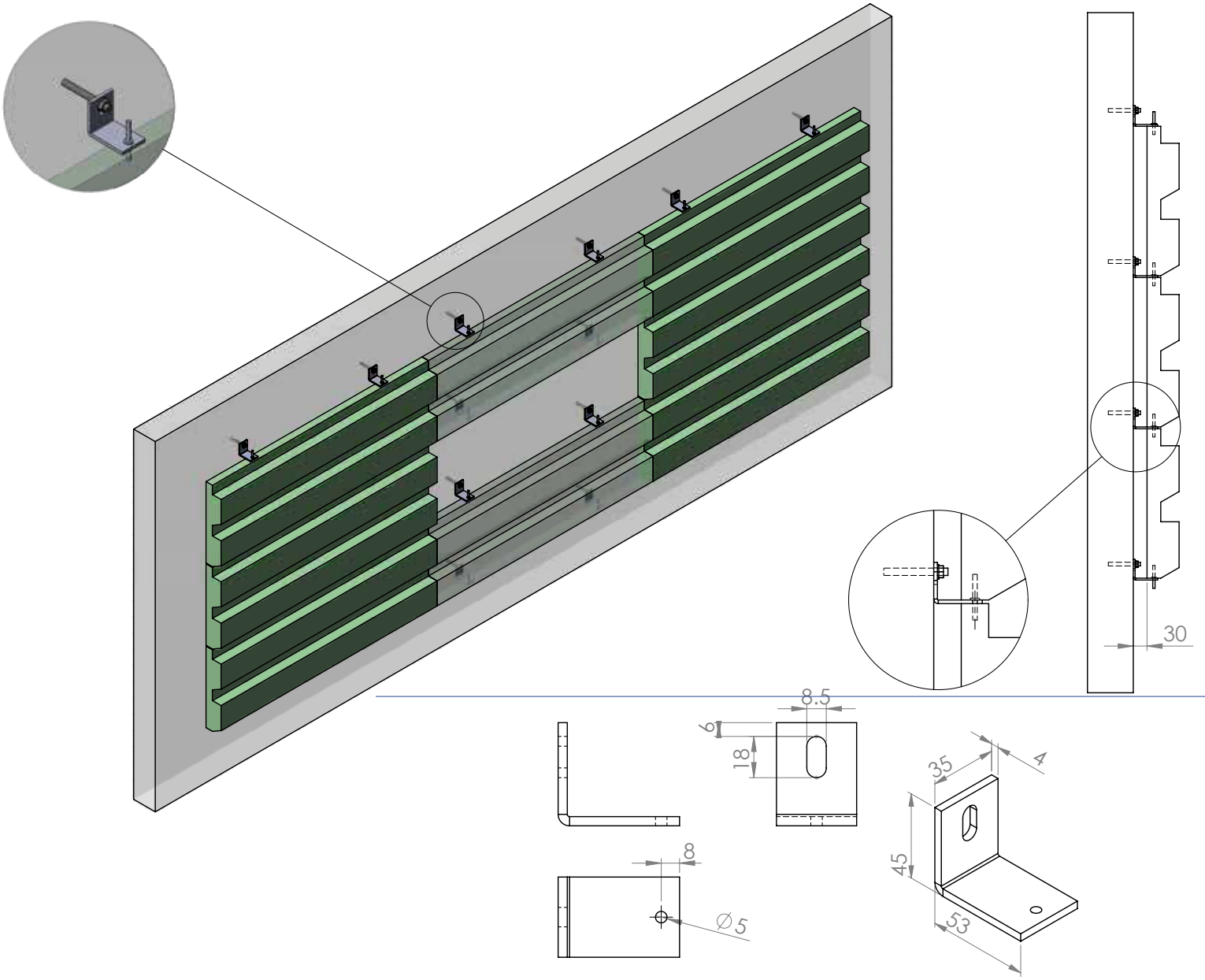
Load Table for KAV L- Brackets.

Materials: SS304, SS316, SS316L, SS316TI, S235JR-MG, S235JR-HDG ≤ 50oc 24h average temperature

Leg B B mm	Cavity to Pin C mm	Deadload max DL kN	Windload max WL ± kN	Bracket Width A mm	Bracket Thickness T mm	Ø Pin mm	Anchor comb. Force kN*
45	30	0.06	0.11	35	2	4	1.40
45	35			40	2	4	1.60
45	40			35	3	4	1.70
45	45			35	3	4	1.90
45	50			35	3	4	2.00
45	30	0.09	0.17	35	3	4	2.30
45	35			35	3	4	2.60
45	40			35	3	4	2.80
45	45			35	3	4	3.10
45	50			40	3	4	3.30
45	30	0.15	0.28	40	3	4	3.60
45	35			40	3	4	4.00
45	40			35	4	4	4.40
50	45			35	4	4	3.40
50	50			35	4	4	3.70
45	30	0.20	0.33	35	4	4	4.60
45	35			35	4	4	5.10
45	40			35	4	4	5.60
50	45			40	4	4	4.40
50	50			40	4	4	4.70

Loads per 1 bracket
If loads are bigger or dimensions are different, an individual calculation is necessary
* with safety 3.0

KAV L- BRACKETS

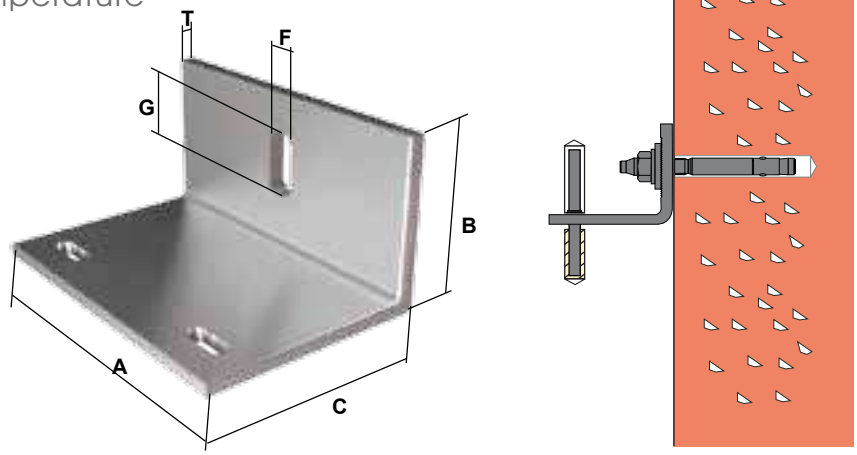


SYSTEM TYPE KAV SHELF ANGLES (SA)

Shelf Angle With Two Pins

Materials SS304, SS316, SS316L, SS316TI, S235JR-MG, S235JR-HDG ≤ 50°C 24h average temperature

Standard Items:



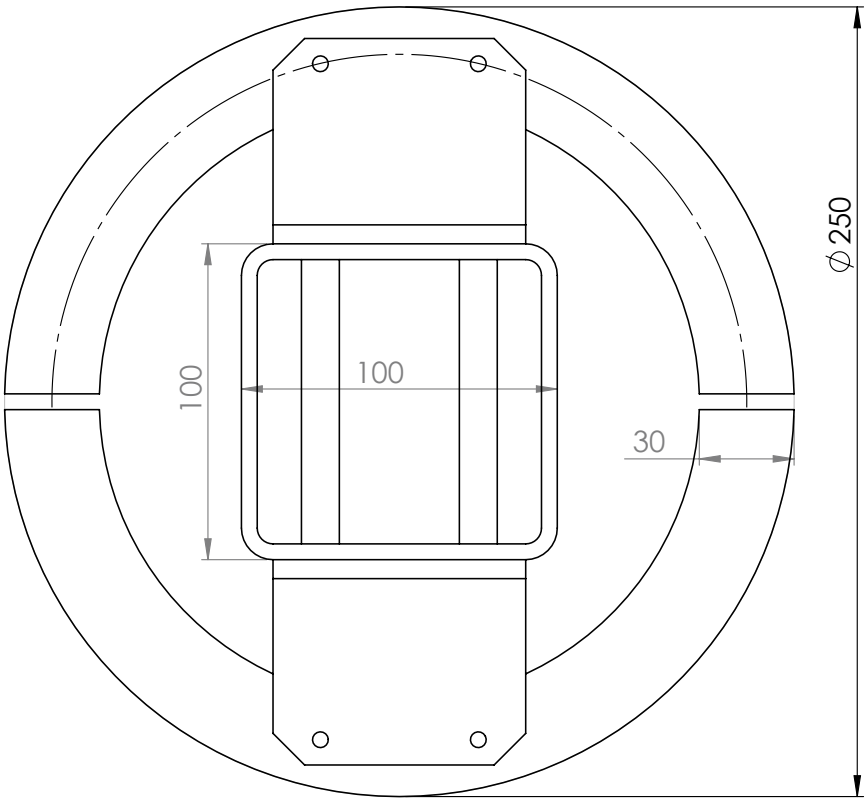
Load Table for KAV L- Brackets.

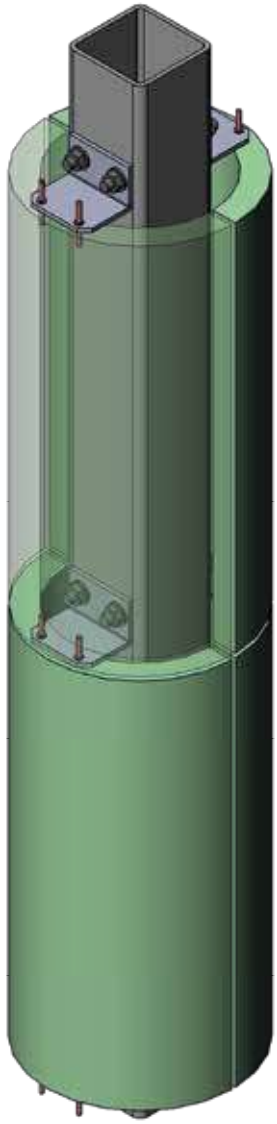
Materials: SS304, SS316, SS316L, SS316TI, S235JR-MG, S235JR-HDG ≤ 50oc 24h average temperature

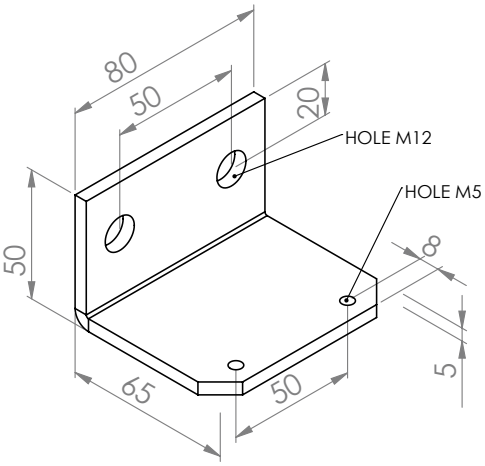
Leg B B mm	Cavity to Pin C mm	Deadload max DL kN	Windload max WL ± kN	Bracket Width A mm	Bracket Thickness S mm	Ø Pin mm	Anchor comb. Force kN*
50	30	0,40	0,56	120	3	2x 4	5,80
50	35			120	3	2x4	6,30
50	40			120	3	2x4	6,80
50	45			140	3	2x4	7,30
50	50			120	4	2x4	8,90
50	30	0,50	0,70	120	3	2x 4	8,10
50	35			130	3	2x4	8,90
50	40			120	4	2x4	9,60
50	45			120	4	2x4	10,40
50	50			120	4	2x4	11,10
60	30	0,60	0,84	140	3	2x 4	7,00
60	35			120	4	2x4	7,90
60	40			120	4	2x4	8,40
60	45			120	4	2x4	8,90
60	50			120	4	2x4	9,40
60	30	0,70	0,98	120	4	2x 4	8,60
60	35			120	4	2x4	9,20
60	40			120	4	2x4	9,80
60	45			130	4	2x4	10,40
60	50			140	4	2x4	11,00

Loads per 1 bracket
If loads are bigger or dimensions are different, an individual calculation is necessary
* with safety 3,0

SYSTEM TYPE KAV SHELF ANGLES (SA)



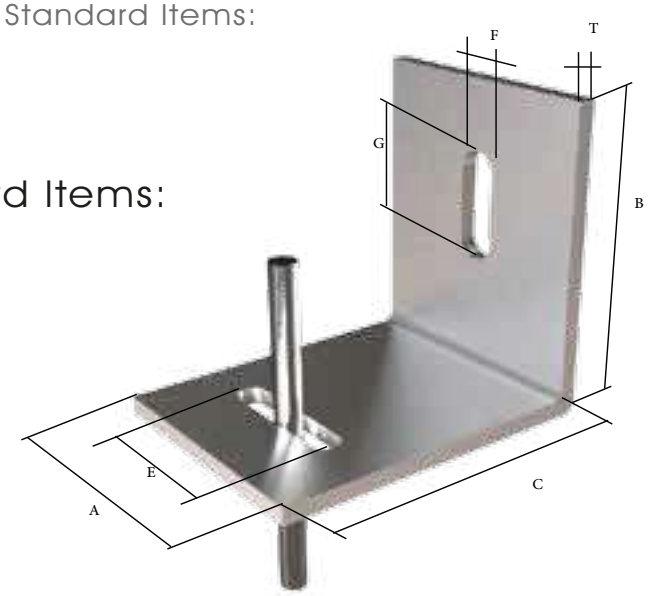


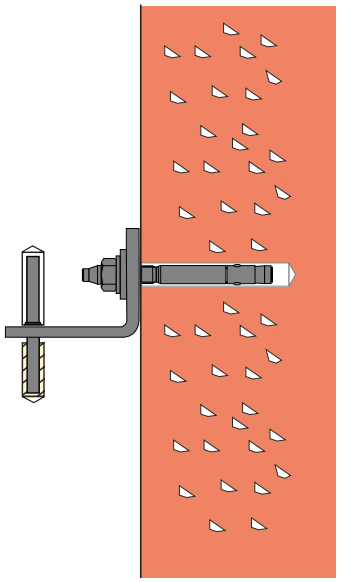


L-BRACKET (STANDARD) | TYPE KAV-L

Materials SS304, SS316, SS316L, SS316TI, S235JR-MG, S235JR-HDG ≤ 50°C 24h average temperature Standard Items:

Standard Items:

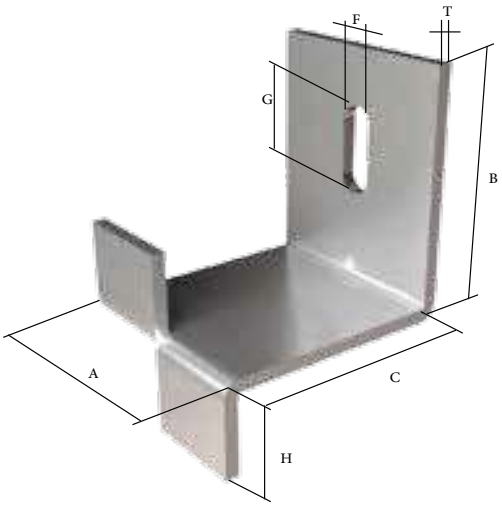


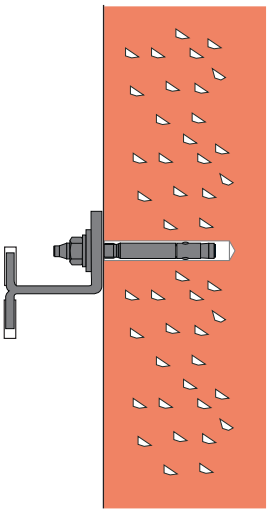


SYSTEM TYPE KAV-U UP & DOWN Bracket

L-Bracket | Type KAV-U Up and Down
Materials SS304, SS316, SS316L, SS316TI, S235JR-MG, S235JR-HDG ≤ 50°C 24h average temperature

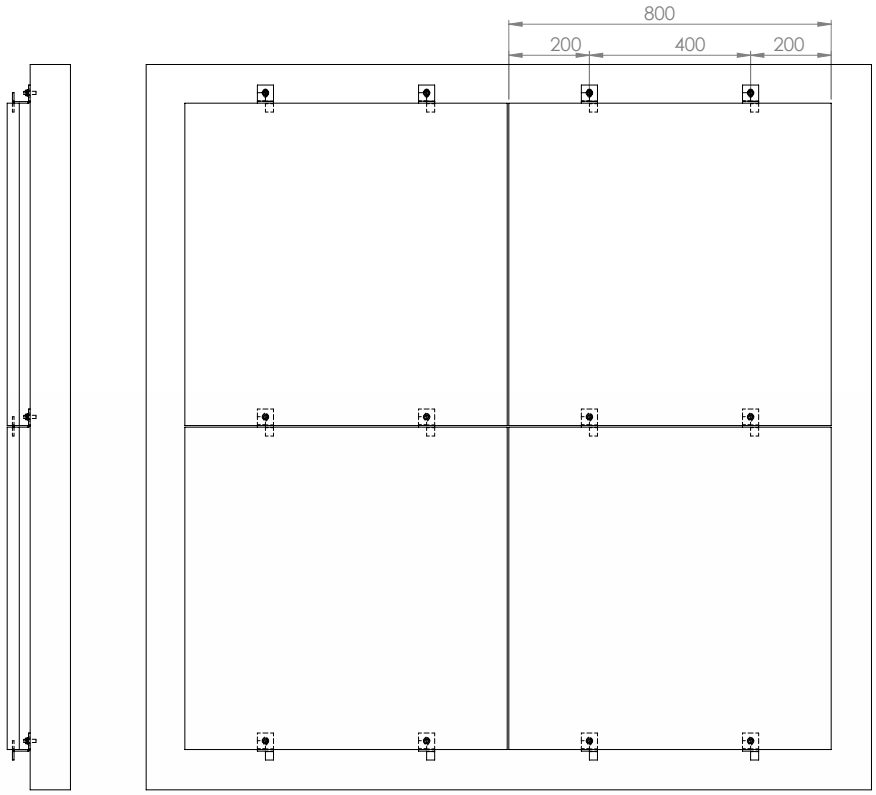
Standard Items:

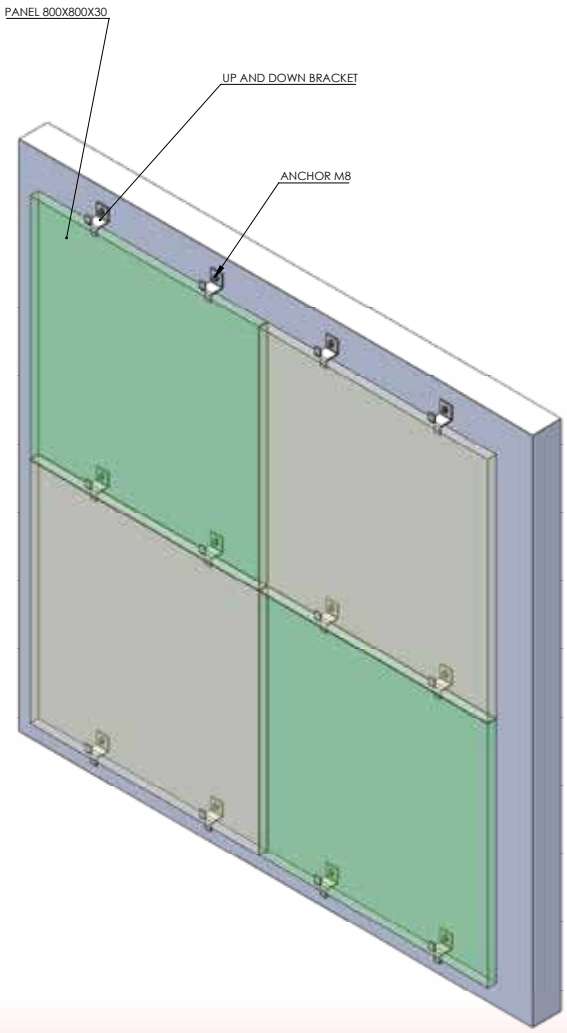




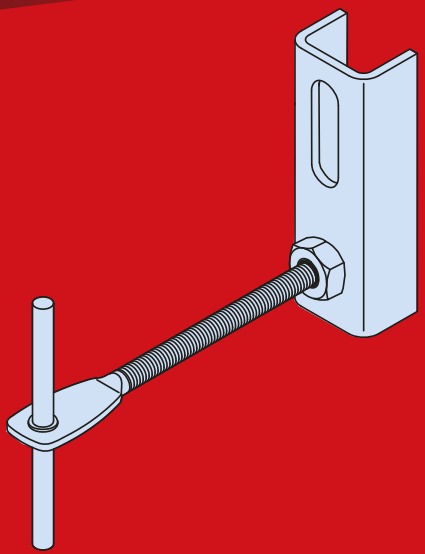
Item No.	T	A	B	C	H	sl hole
1200-35.45.30.2	2	35	45	30	15	6,5 x 22
1200-40.45.35.2	2	40	45	35	15	6,5 x 22
1200-35.45.30.3	3	35	45	30	15	6,5 x 22
1200-40.45.30.3	3	40	45	30	15	8,5 x 22
1200-35.45.35.3	3	35	45	35	15	6,5 x 22
1200-40.45.35.3	3	40	45	35	15	8,5 x 22
1200-35.45.40.3	3	35	45	40	15	6,5 x 22
1200-35.45.30.4	4	35	45	30	15	8,5 x 22
1200-35.45.35.4	4	35	45	35	15	8,5 x 22
1200-35.45.40.4	4	35	45	40	15	8,5 x 22
1200-35.50.45.4	4	35	50	45	15	8,5 x 22
1200-40.50.45.4	4	40	50	45	15	8,5 x 22

L-BRACKET (STANDARD) | TYPE KAV-L





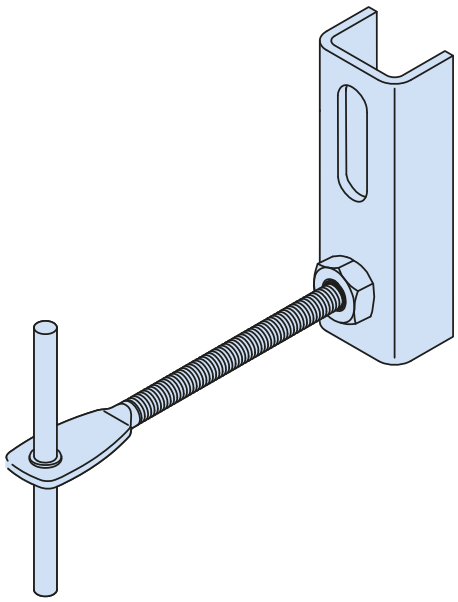
BODYANCHOR

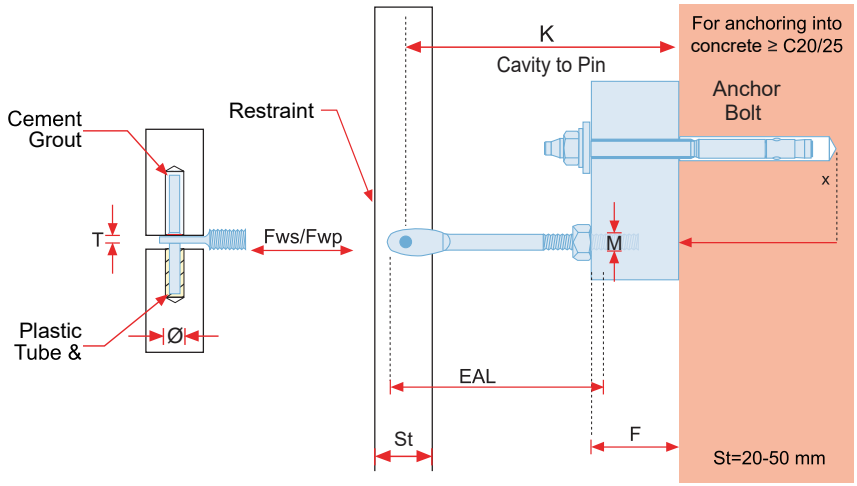


KAV BA RESTRAINT ANCHOR - PRODUCT DETAILS

KAV BA is a restraint anchor; only suitable for wind loads

For projections between 60 mm and 320 mm
Load capacity from 850 N to 1,300



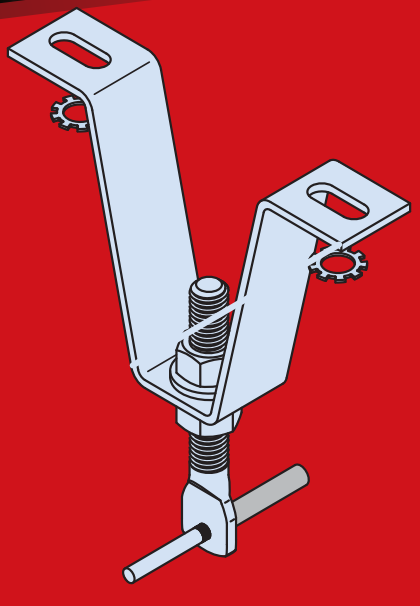


• Available in sizes to fit the projection range of all AXO anchors.

Product Code	Technical Details											
	Projec-tion	Min. Projec-tion	Max. Projec-tion	Forming Size	Wind-Pressure	Wind-Suction	Anchor Bolt Size	Pin Size	Adj. Arm Metric Size	Adj. Arm Flat Thickness	Adj. Arm Length	X Size
	K (mm)	K - (mm)	K + (mm)	F (mm)	Fwp (N)	Fws (N)	A.B. (mm)	Ø (mm)	M (mm)	T (mm)	EAL (mm)	x (mm)
KAV03-60	60	40	80	25	2028	1419	M8X80	5	M8	3	70	30
KAV03-80	80	60	100								90	
KAV03-100	100	80	120	32							100	
KAV03-120	120	100	140								120	
KAV03-140	140	120	160								140	
KAV03-160	160	140	180								160	
KAV03-180	180	160	200	40							170	
KAV03-200	200	180	220								190	
KAV03-220	220	200	240								210	
KAV03-240	240	220	260	50							220	
KAV03-260	260	240	280								240	

• Material: Stainless Steel 1.4301 (A2) & 1.4401 (A4)
• Table above is prepared according to Eurocode standard
• Loads stated are working resistance loads
• Other sizes are available for production upon request
• Bolts are provided separately
• Structural calculation reports are available upon order

OMEGABRACKET

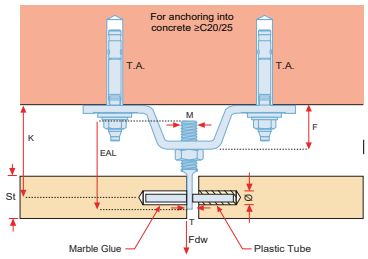


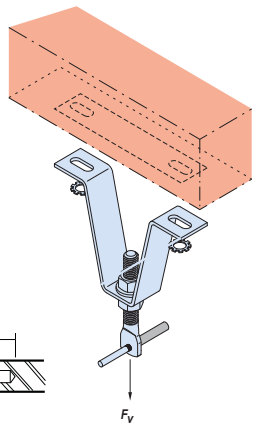
200 OMEGA BRACKET (STANDARD & SERRATED) | KAV-OM

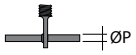
It is is designed for fastening the natural stone panel beneath a concrete floor slab.

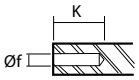
Anchoring base: acc. to the licence of the anchor bolt chosen.

Adjustibility: x = ± 05 mm
in 2 directions Z = ± 10 mm







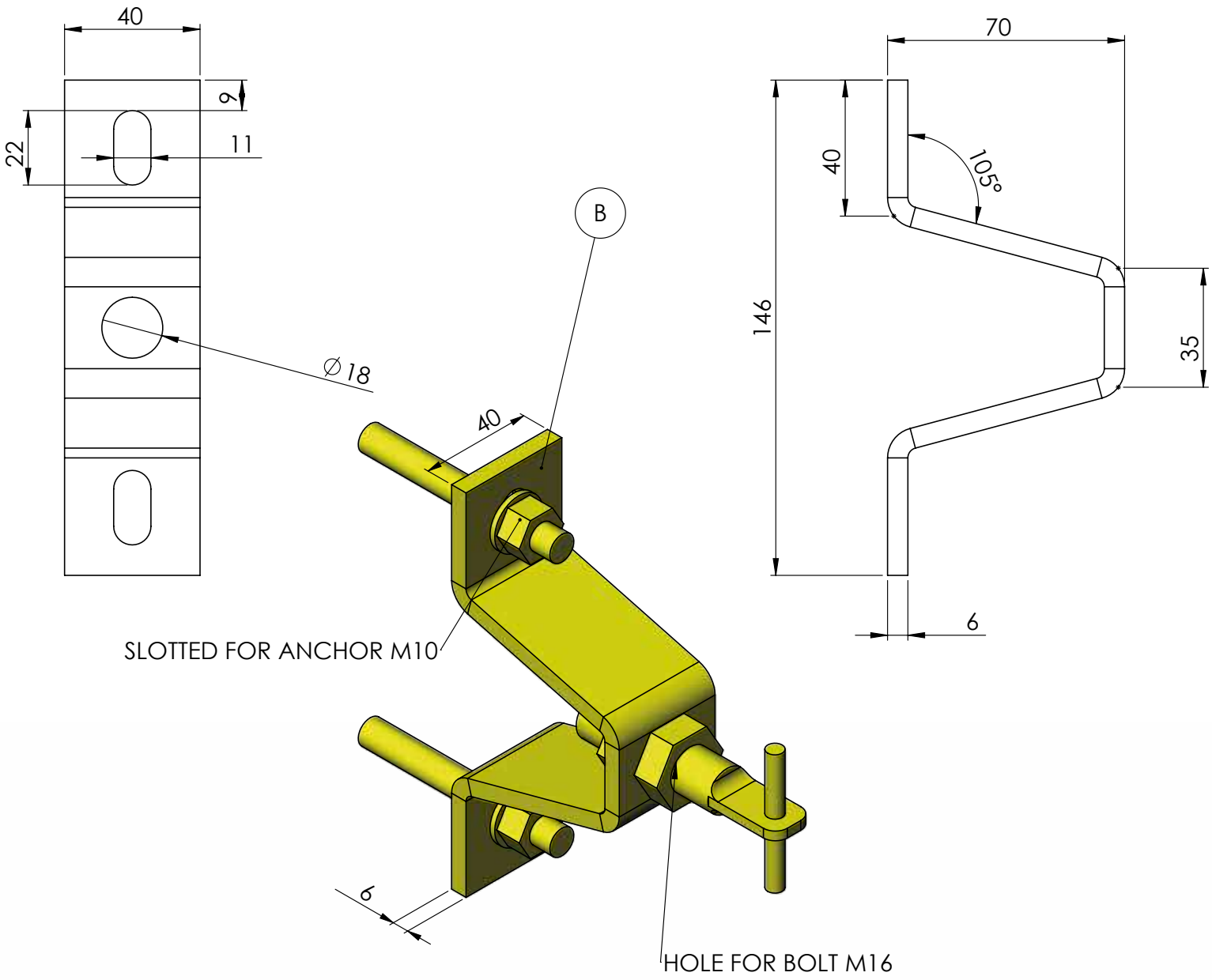


FVperm = permissible vertical loading capacity
FHperm.= permissible horizontal tensile load or pressure load
FR= existing load on the anchor with maximum load of the bracket

Codes	Width (W) mm	Bracket mm	Offset (N)	FHB A2-70 A4-70	Ø Pin mm	sl hole
200-35.3.70	35	3	70	M8	4	6,5 x 22
2100-35.3.80	35	3	80	M8	4	6,5 x 22
200-40.3.110	40	3	10	M8	4	6,5 x 22
200-40.3.120	40	3	20	M8	4	6,5 x 22
200-55. 4110	55	4	10	M10	5	8,5 x 22
200-55.4.120	55	4	20	M10	5	8,5 x 22
200-55.5.90	55	5	90	M12	6	10,5 x 22
200-55.5.100	55	5	0	M12	6	10,5 x 22
200-60.5.110	60	5	10	M12	6	10,5 x 22
200-60.5.120	60	5	20	M12	6	10,5 x 22

Bracket Offset mm	Cavity to Pin min - max mm	Deadload max DL kN	Windload max WL ± kN	Bracket Width mm	Bracket Thickness (T) mm	Ø Pin mm	FHB A2-70 A4-70	Anchor comb. Force kN *
70	100-110	0.16	0.22	30	3	4	M8	2.30
80	110-120			30	3	4	M8	2.40
90	120-130			35	3	4	M8	2.50
100	130-140			35	3	4	M8	2.50
110	140-150			40	3	4	M8	2.50
120	150-160			40	3	4	M8	2.60
70	100-110	0.28	0.39	55	3	5	M10	4.10
80	110-120			55	3	5	M10	4.20
90	120-130			50	4	5	M10	4.30
100	130-140			50	4	5	M10	4.40
110	140-150			55	4	5	M10	4.50
120	150-160			55	4	5	M10	4.60
70	100-120	0.55	0.77	50	5	6	M12	8.80
80	110-130			50	5	6	M12	9.00
90	120-140			55	5	6	M12	9.20
100	130-150			55	5	6	M12	9.40
110	140-160			60	5	6	M12	9.60
120	150-170			60	5	6	M12	9.80

MOULDING 4 OMEGA BRACKET



FLAT HEAD BOLT (FHB) TECHNICAL DETAILS

Flat Head Bolt

Materials A2-70, A4-70 ≤ 50°C 24h average temperature Fixing in reinforced concrete vertical wall, or steel substructure

Cavity to Pin min - max mm	Deadload max DL kN	Windload max WL ± kN	FHB A2-70 A4-70	Ø Pin mm
20-30	0.08	0.11	M6	4
30-40			M6	4
40-50			M8	4
50-60			M8	4
30-40	0.16	0.22	M8	4
40-50			M8	4
50-60			M10	4
60-70			M10	4
30-40	0.23	0.32	M10	5
40-50			M10	5
50-60			M10	5
60-70			M10	5
30-40	0.45	0.63	M12	6
40-50			M12	6
50-60			M12	6
60-70			M12	6

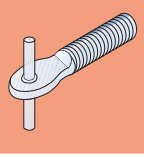
Kav B-Z Anchor - Soffit Anchor

- Load bearing & restraint
- Three dimensional adjustability
- Fastened on to load bearing walls with expansion bolts and on to channels with set screws
- Projection sizes between 45 and 130 mm
- Suitable for horizontal & vertical joints
- Loads up to 400 N
- Stone thicknesses 20-50 mm

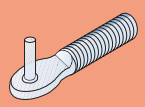
Product Code Description

Kav - 45 2 A
- A — Type
- 2 — Projection (mm)
- 45 — Dead Load (x10 Kg)
- A — Shape

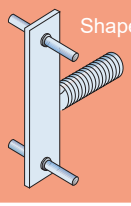
Shape A



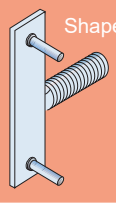
Shape B



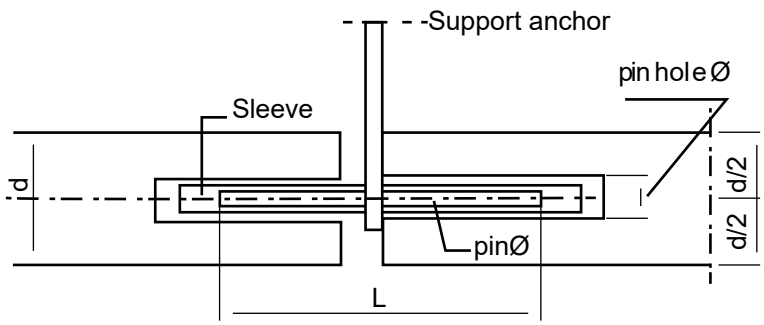
Shape C

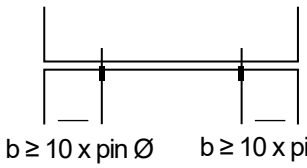


Shape D



According to DIN 18515 part 3 Pins: pin hole shall be 3mm bigger than pin diameter. Pin distances (d<30): Distance between pannel corner and middle pinhole is min 2.5 the pannel thickness





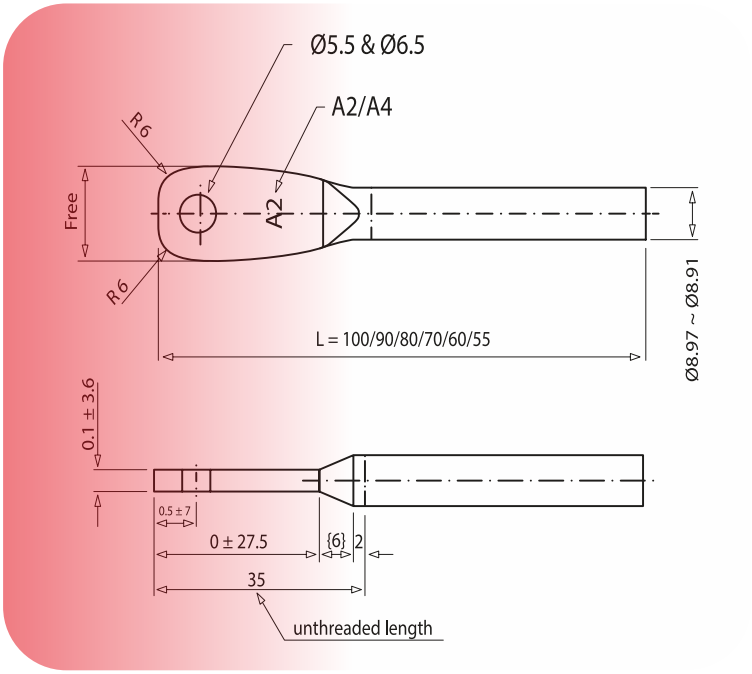
HIGH PERFORMANCE STAINLESS STEEL ANCHORS

FHB M10

Stainless steel 304 and 316 manufactured as per ASTM A593 Alloy Group 2

Dimensions:

Code	Length (mm)
FHB- M10/50	50
FHB- M10/60	60
FHB- M10/70	70
FHB- M10/80	80
FHB- M10/90	90
FHB- M10/100	100
FHB- M10/110	110
FHB- M10/120	120



Pin With Ring

Stainless steel 304 and 316 manufactured as per ASTM A276

Diameter D1 (mm)	Length L1(mm)
M4	40/50/60/70/75
M5	40/50/60/70/75
M6	40/50/60/70/75

Stainless Steel 316/A4

Mechanical Properties:

Ultimate Tensile Strength MPa (N/mm²)	0.2 % Proof Stress MPa (N/mm²)	% Elongation	Hardness HRB	Property Class
600	310	54	82	A4

KAV-SM Shim Plate

KAV-W Serrated Washer

Stainless Steel 304/A2

Mechanical Properties:

Ultimate Tensile Strength MPa (N/mm²)	0.2 % Proof Stress MPa (N/mm²)	1 % Proof Stress MPa (N/mm²)	% Elongation	Hardness HRB	Property Class
636	310	364	52	82	A4

C-CHANNELSYSTEM

THE MOST IMPORTANT FEATURES AND BENEFI TS AT A GLANCE

- The entire sub-structure assembly can be completed prior to the installation of any stone
- Spans non load-bearing sections of the main structure
- Adaptable and easy to install
- Large projections possible
- Minimises thermal bridges
- Further variations possible with special designs and using other from our Installation accessories

STEEL SUB-CHANNEL FIXING SYSTEMS

Together with the corresponding Kavity bolts or threaded plates, Kavity framing channels offer all the advantages of adjustable bolt connections and framing construction.

Systems are used for stone cladding on to non-load bearing walls or on to walls structures where there are high projection sizes. By using specially designed channel supports and restraints, channels are spanned between floor levels, creating a sub frame on to which installation is enabled by using set screws and nuts.

- Channels are fixed on to channel supports that are fastened to load bearing beams, spanning between floor levels overlaying in front of the thermal insulation
- Stone fixing is done with anchors that are fixed on to channels either with set screws or lock nut sets
- High load bearing capacity to fit projection sizes up to 360 mm
- Greater projection sizes are achieved with special design
- Fully adjustable and allows quick and easy installation
- Lower drilling points increases production rate and reduces cold bridging
- Channel systems available in stainless steel type 1.4301 (AISI 304) & 1.4401 (AISI 316) and hot dip galvanized mild steel type 1.0038 (S235JR) Pre-galvanized channels .

EXAMPLES OF STEEL BACKSUPPORT SYSTEMS

- Example -1
  Front To Back Channel with welded back plate and Flat Head Bolt
- Example -2
  Square tube with welded channel & double pin L-bracket
- Example -3
  Single channel with Omega/Holder support and Z-brackets
- Example -4
  BTB/ Single Channel with Omega Sapport and FHB / Z-brackets
- Example -5
  Cantilever Arm / Holder Support with BTB channel and Side Fixed Flat Head Bolt

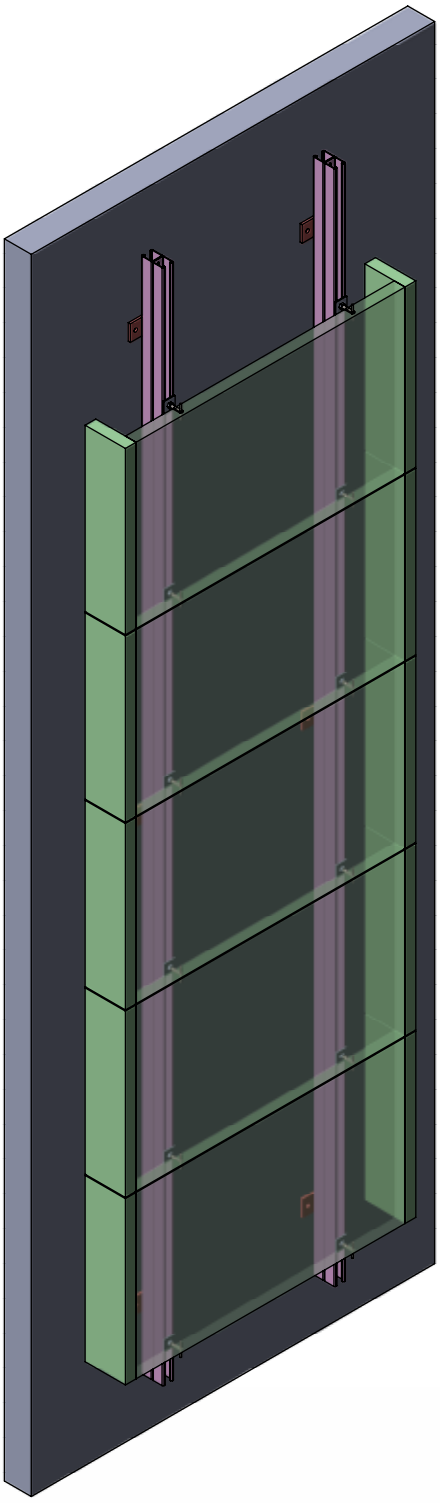
EXAMPLE -1

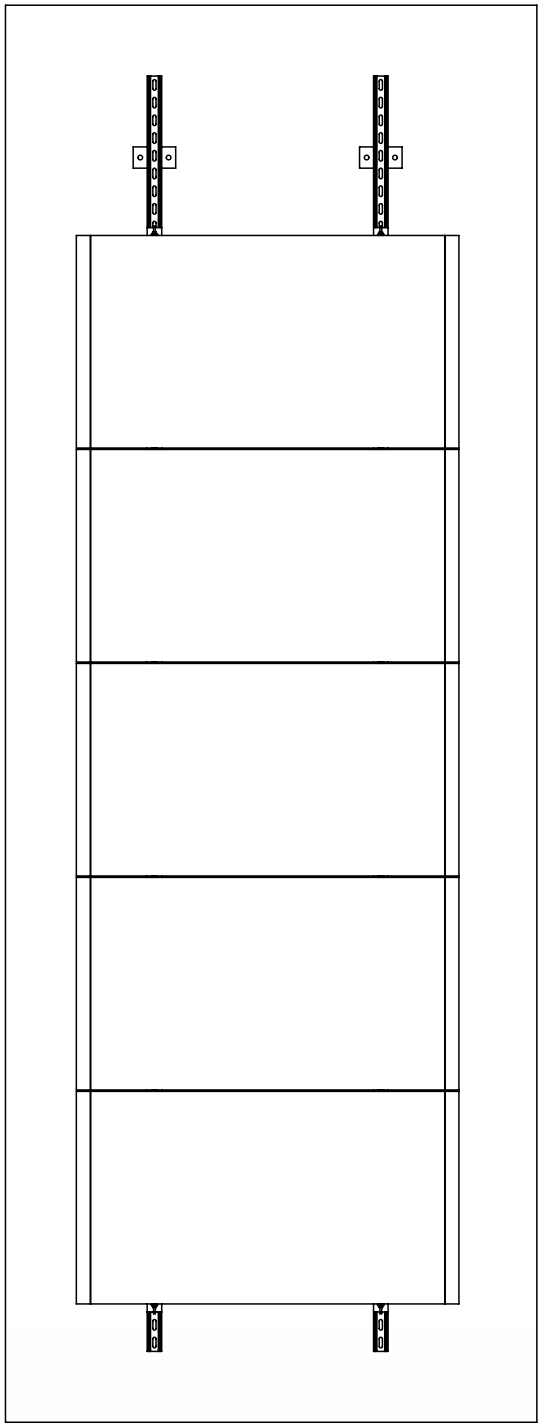
Front To Back Channel with welded back plate and Flat Head Bolt :

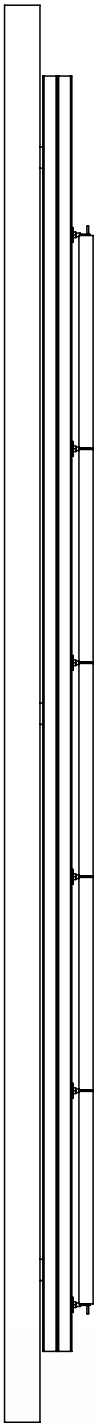
Floor to floor System using front to back channels with support plates and L-Brackets up & down with bolts and spring nuts fixed to the channels

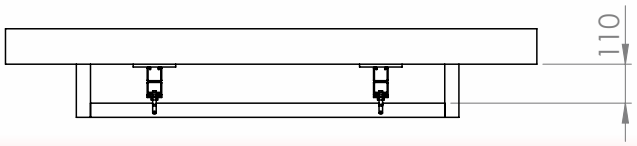
- Min cavity to backside of panel: 100 mm
- Span ≤ 3,0 mm

EXAMPLES OF STEEL BACKSUPPORT SYSTEMS

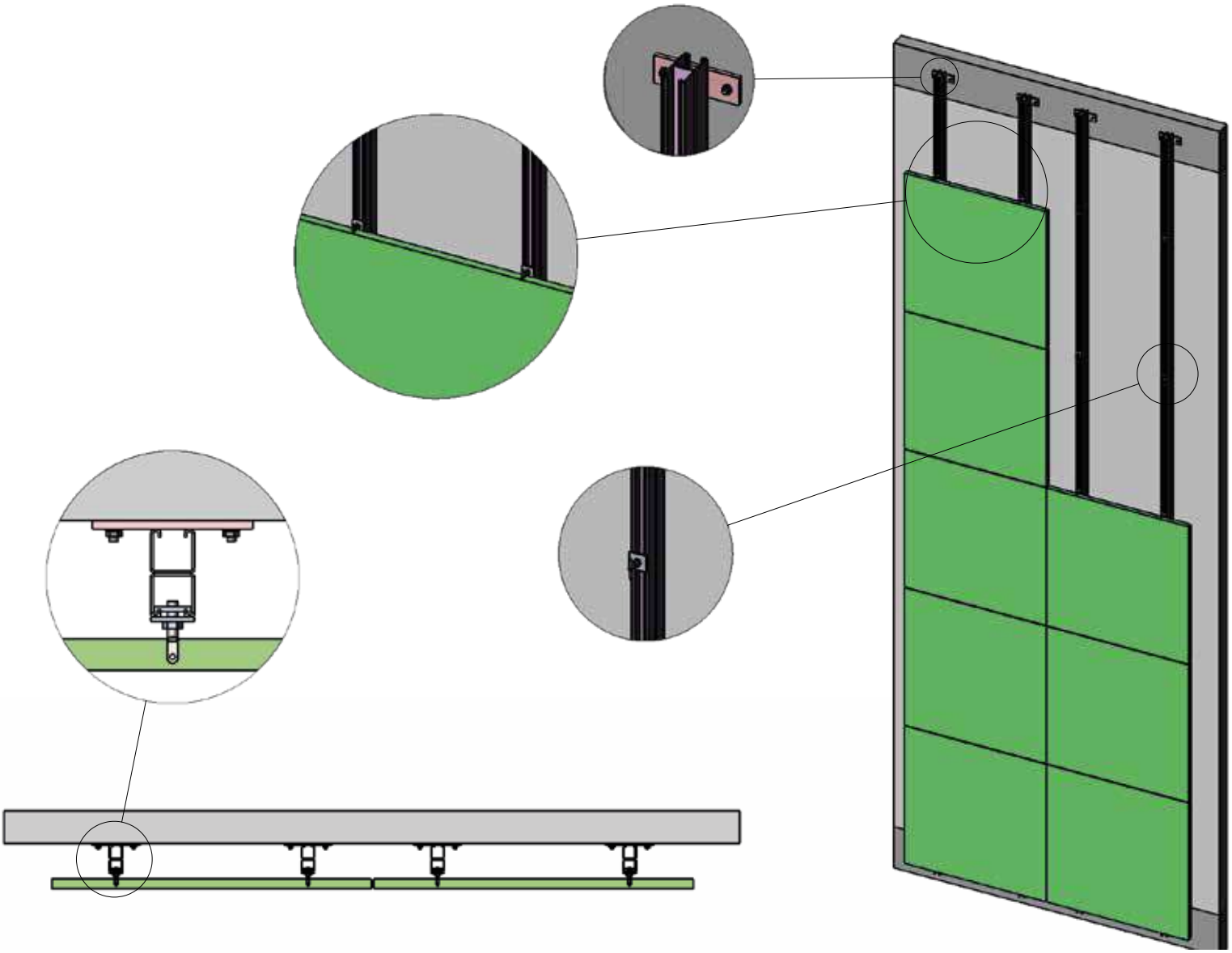








EXAMPLES OF STEEL BACKSUPPORT SYSTEMS

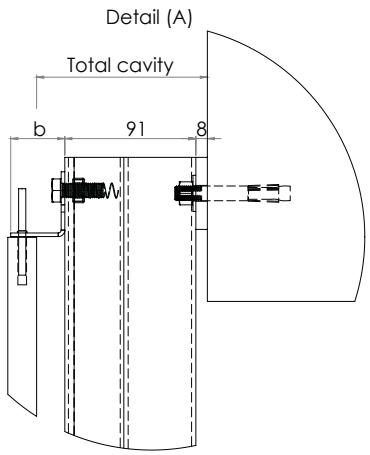


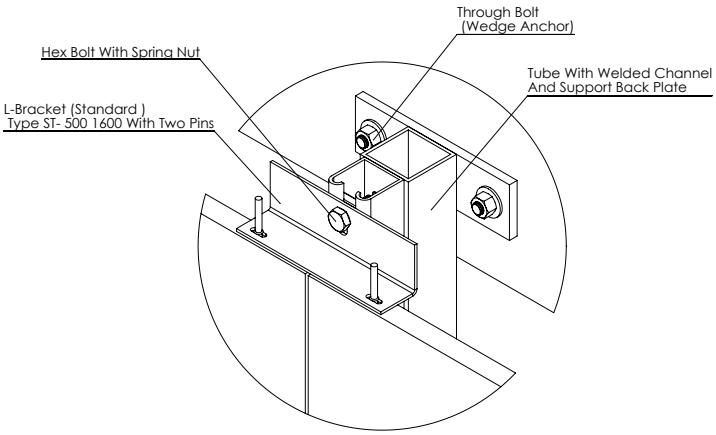
EXAMPLE -2

Square tube with welded channel & double pin L-bracket

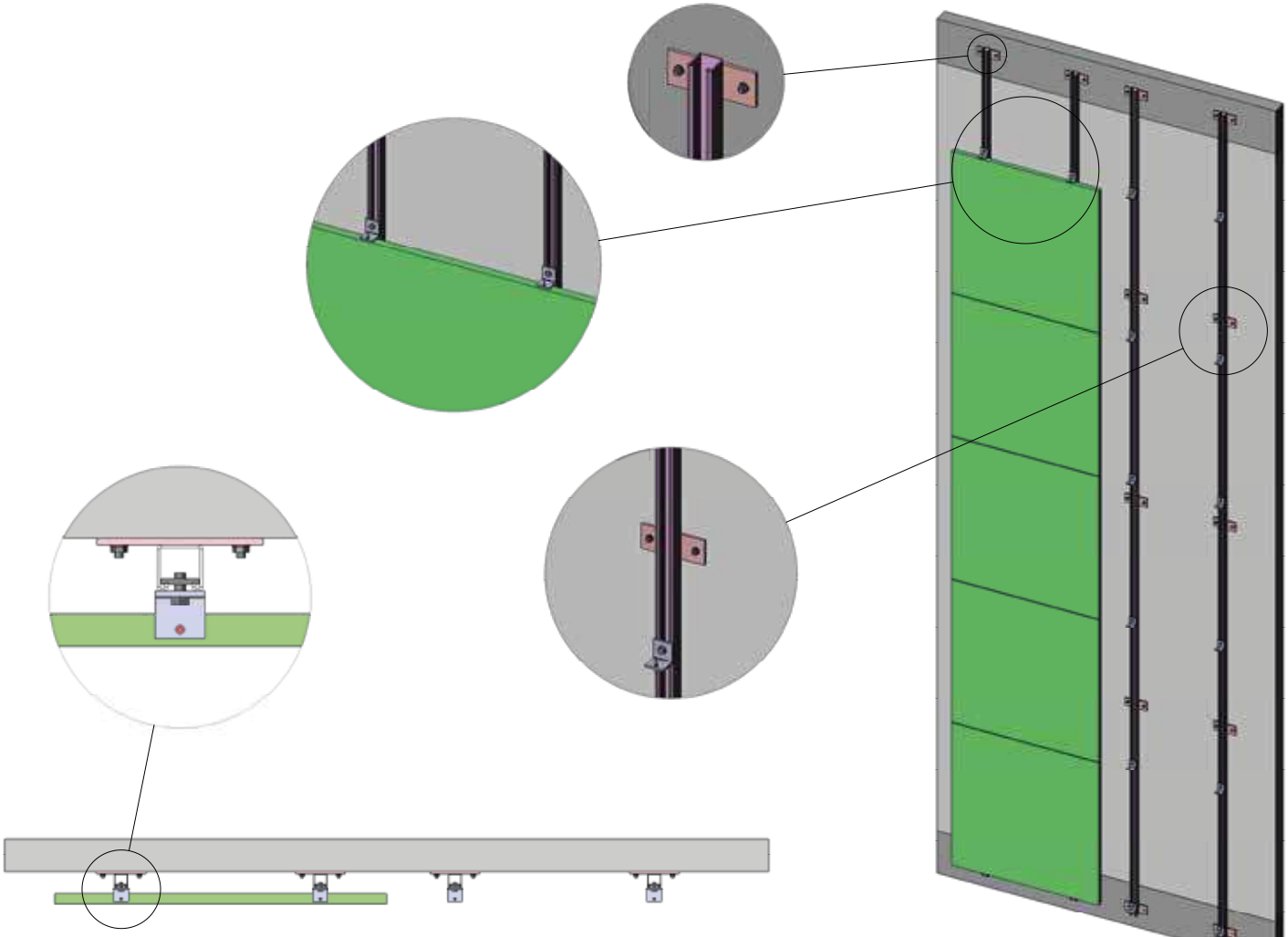
Floor to floor System using square tubes with channels and L-Brackets double pin type with bolts and spring nuts fixed to the channels .

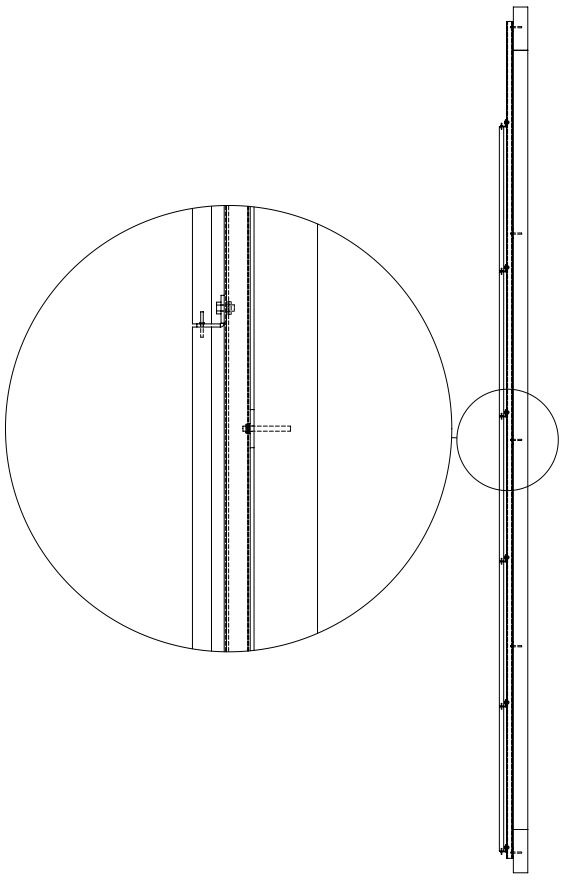
- Min cavity to backside of panel: 120 mm
- Span ≥ 3,0 mm

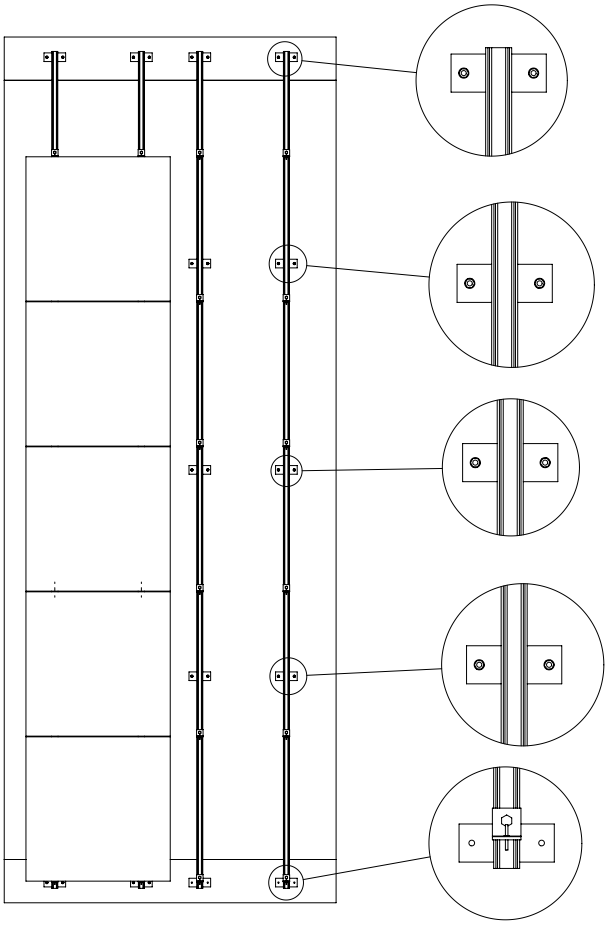




EXAMPLE -2





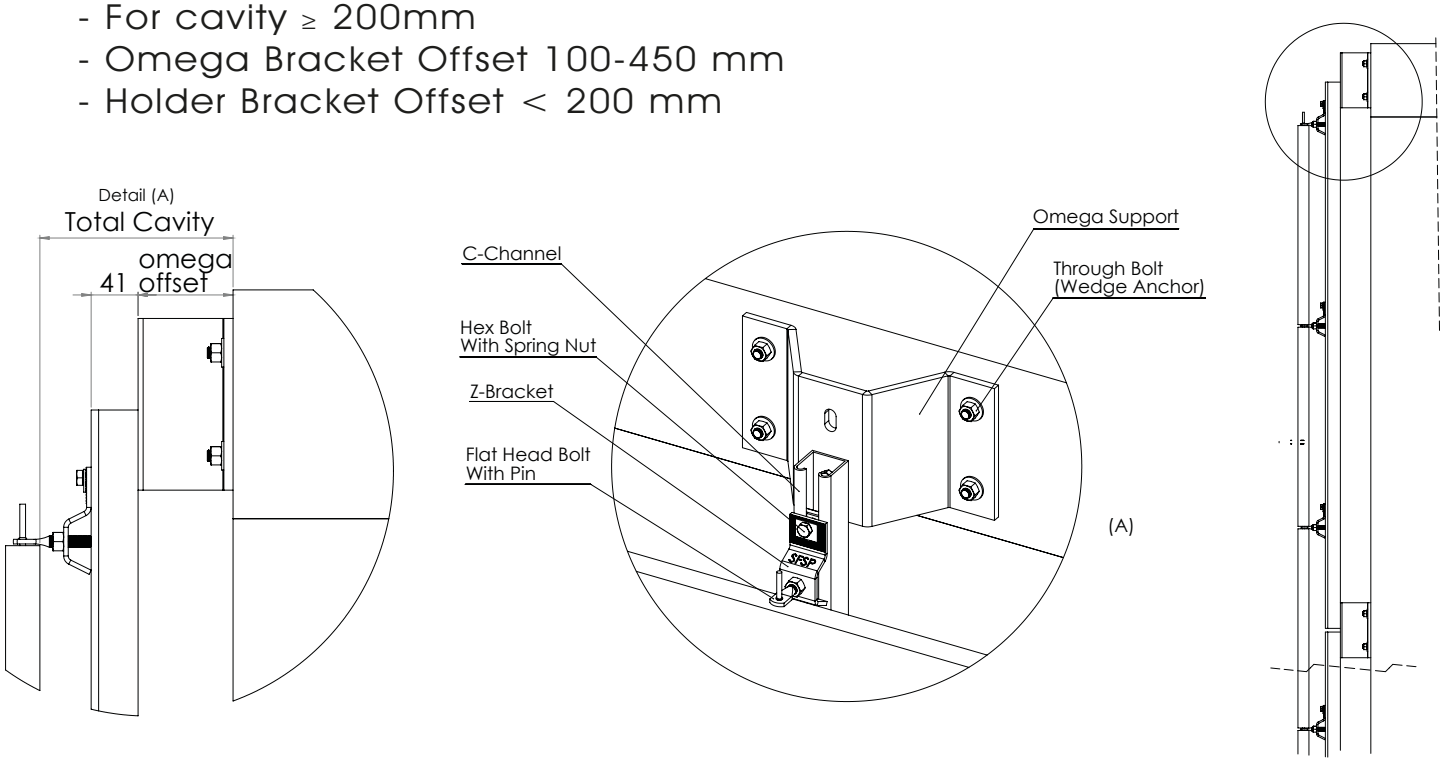


EXAMPLE -3

Single channel with Omega/Holder support and Z-brackets

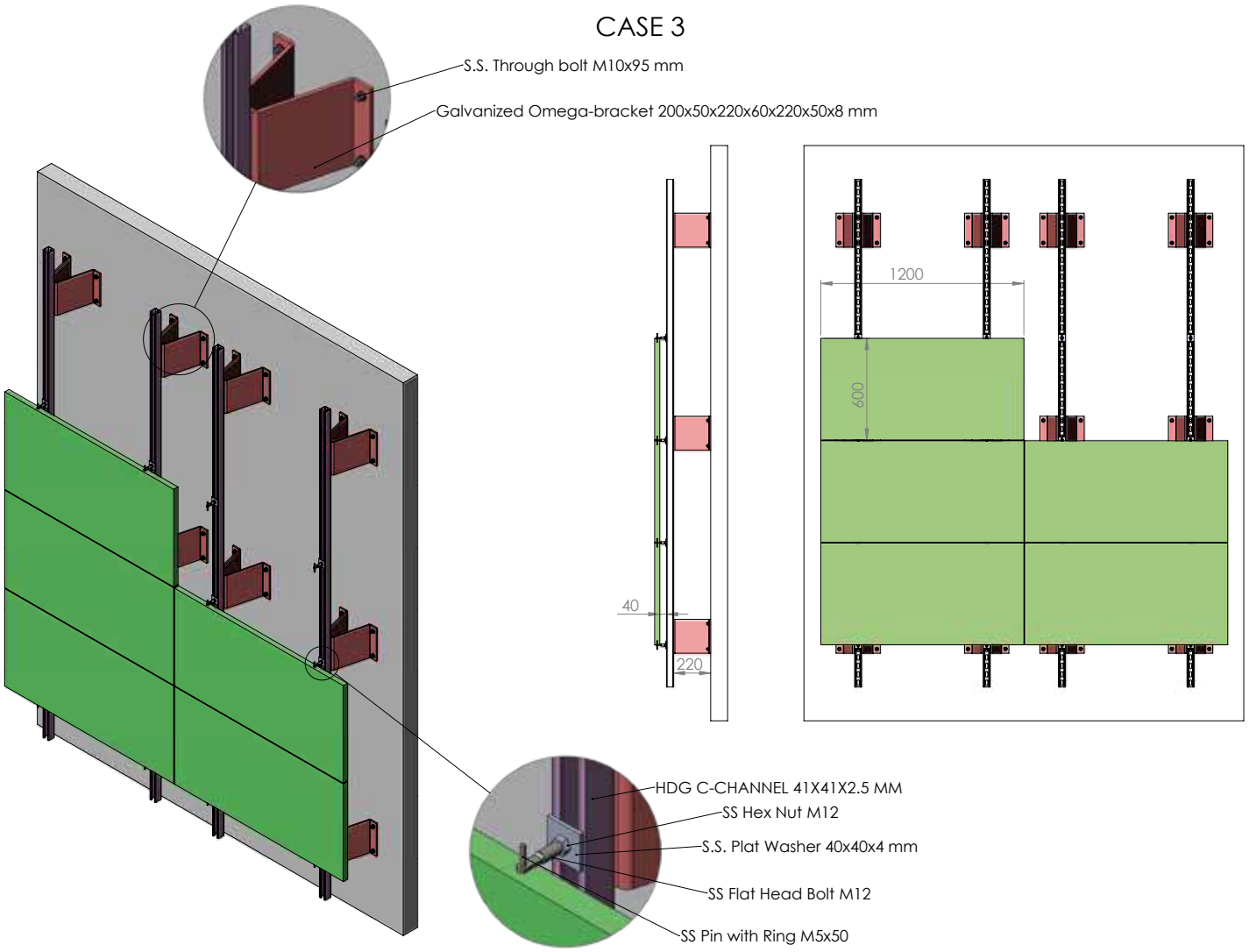
Steel back-support system for large cavity using omega brackets, channels and Z- brackets with bolts and spring nuts fixed to the channels and adjustable flat head bolts .

- For cavity ≥ 200mm
- Omega Bracket Offset 100-450 mm
- Holder Bracket Offset < 200 mm

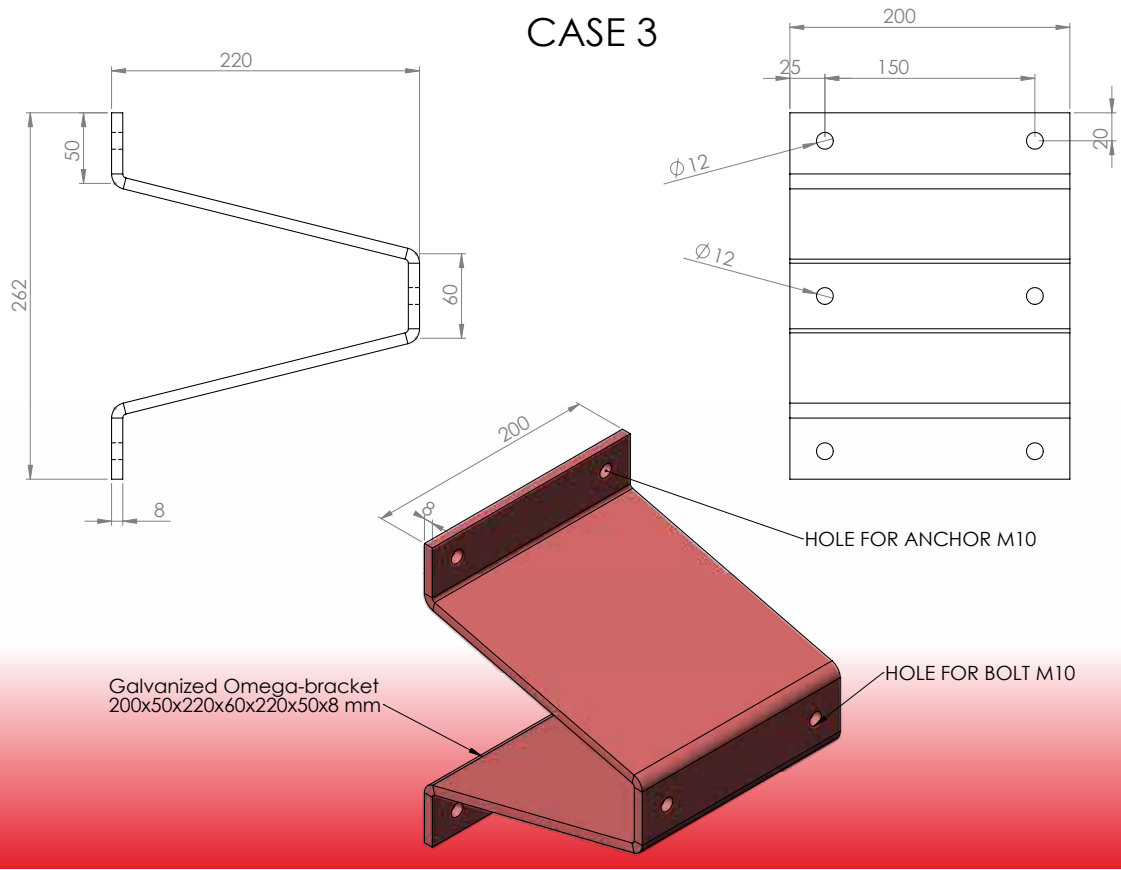


EXAMPLE -3

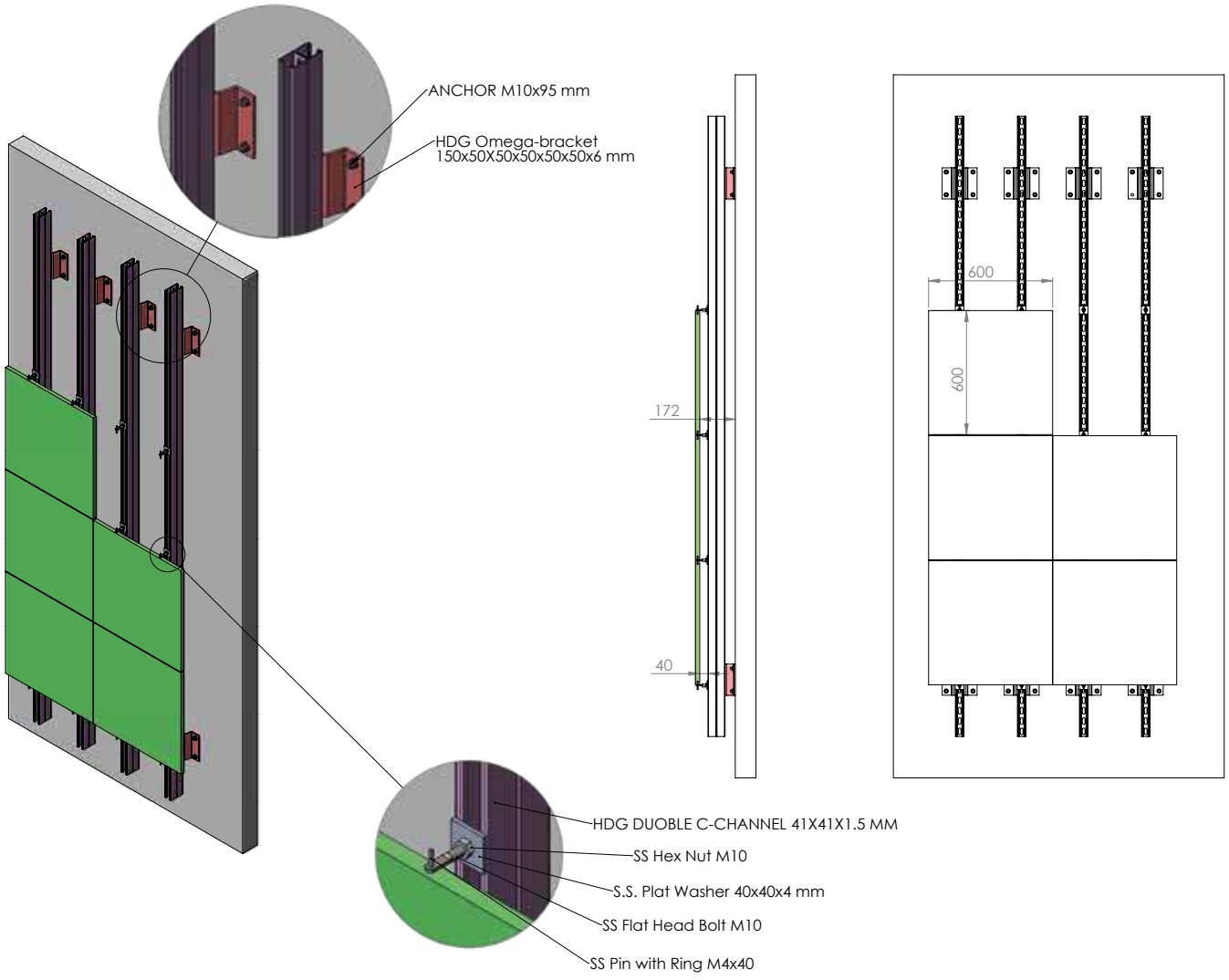
CASE 3

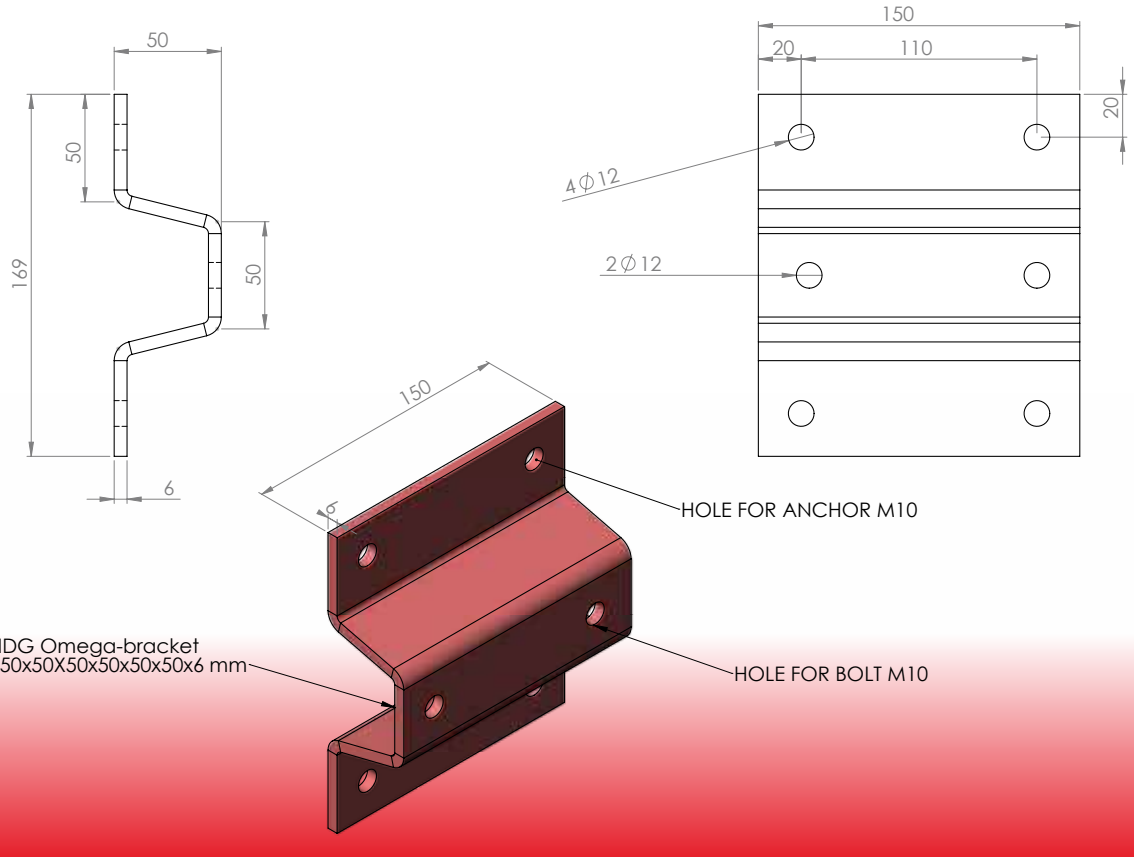


CASE 3



EXAMPLE -3


ANCHOR M10x95 mm
HDG Omega-bracket
150x50X50x50x50x50x6 mm
172
40
600
600
HDG DUOBLE C-CHANNEL 41X41X1.5 MM
SS Hex Nut M10
S.S. Plat Washer 40x40x4 mm
SS Flat Head Bolt M10
SS Pin with Ring M4x40

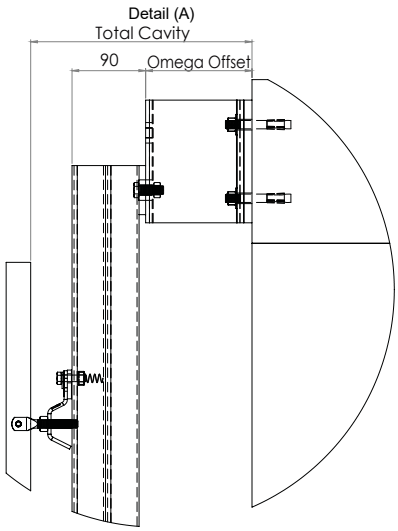

50
50
169
50
6
150
20
110
20
4Ø12
2Ø12
150
6
HOLE FOR ANCHOR M10
HDG Omega-bracket
150x50X50x50x50x50x6 mm
HOLE FOR BOLT M10

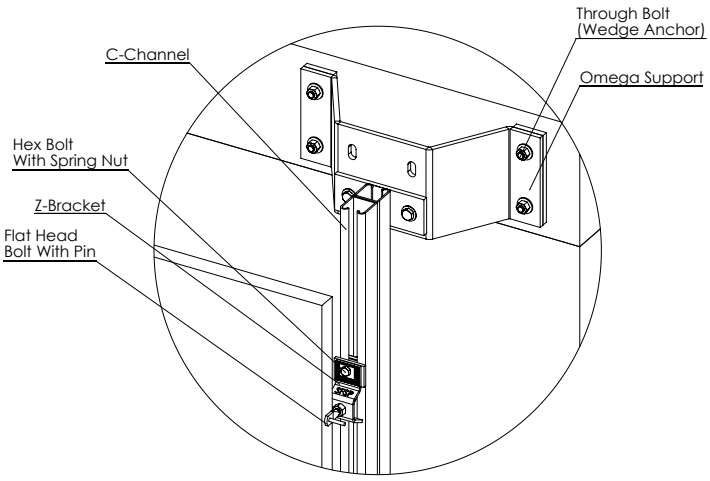
EXAMPLE -4

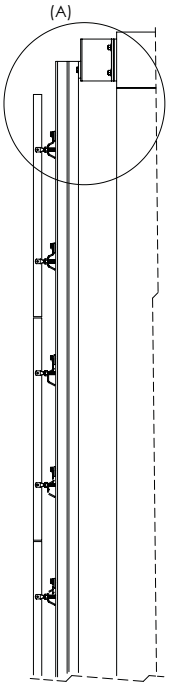
BTB/ Single Channel with Omega Sapport and FHB / Z-brackets

Steel back-support system for large cavity using omega brackets, channels and Z- brackets with bolts and spring nuts fixed to the channels and adjustable flat head bolts.

- For cavity ≥ 200mm
- Omega Bracket Offset 100-450 mm

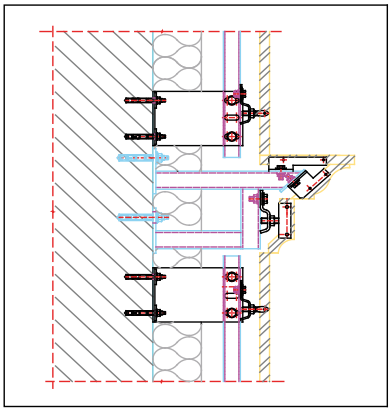




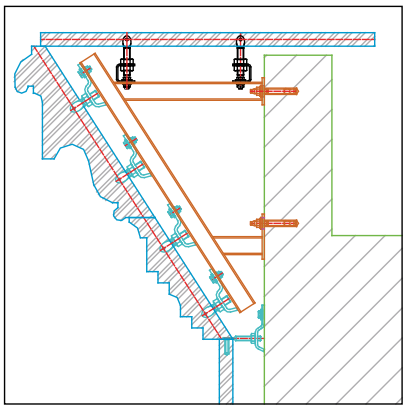


Special Designs

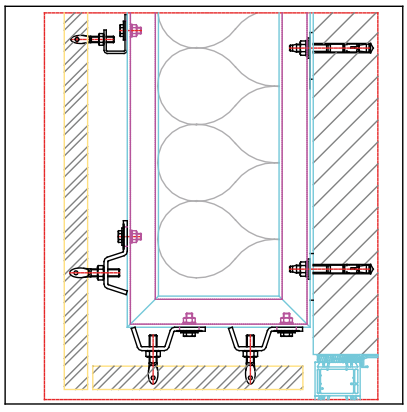
Z Anchors are fixed on sub frame to install cornice lining.



Z Anchors are fixed on to special steel structure for cornice parapet installation.



Z Anchors are fixed on to special steel structure for special area installation.

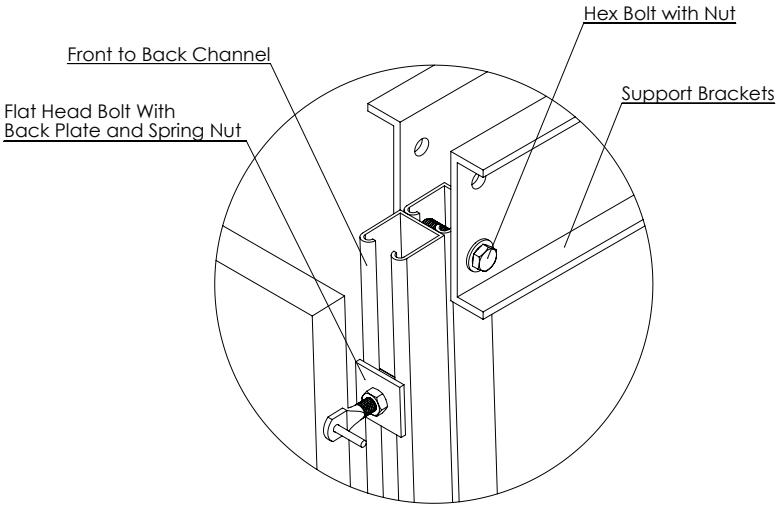


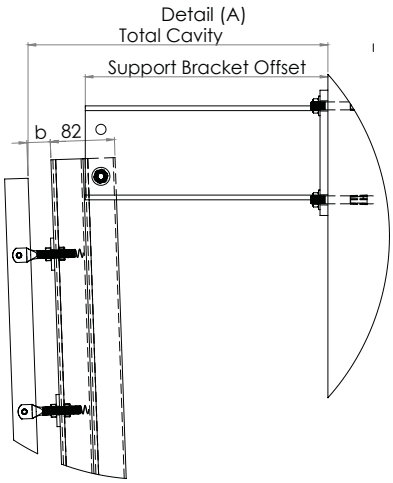
EXAMPLE -5

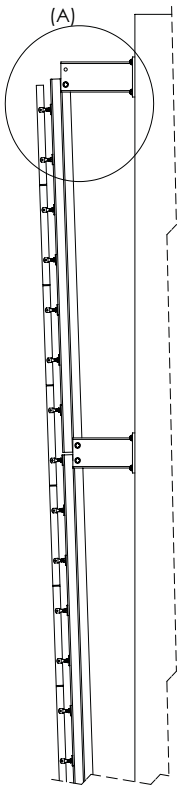
Cantilever Arm / Holder Support with BTB channel and Side Fixed Flate Head Bolt

Steel back-support system for Adjustable large cavities/Holder using support brackets, front to back channels,and adjustable flat head bolts with back plates and spring nuts fixed to channels .

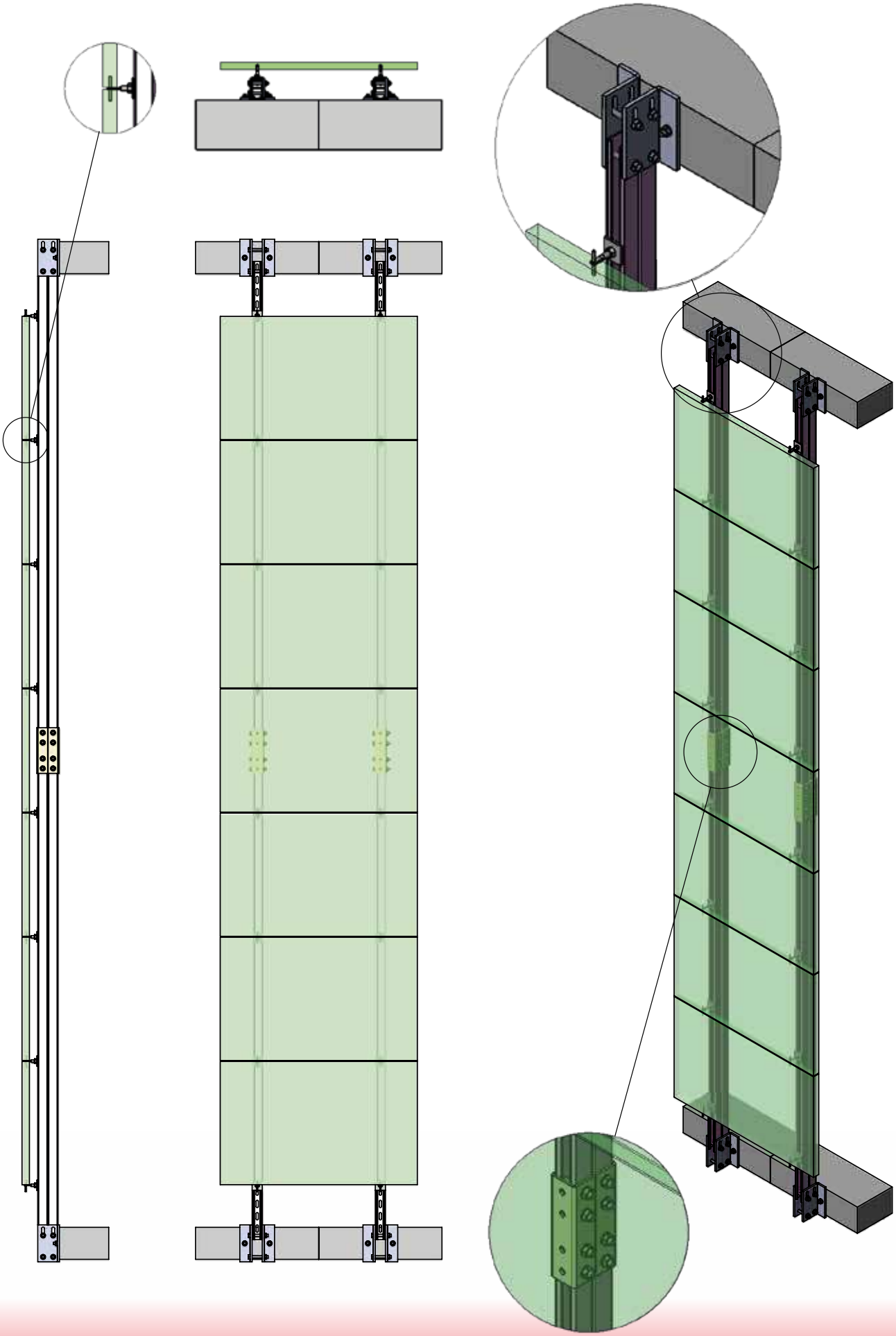
- For cavity ≥ 300 mm
- Distance of Omega brackets ~3 cm (=Span of channels).



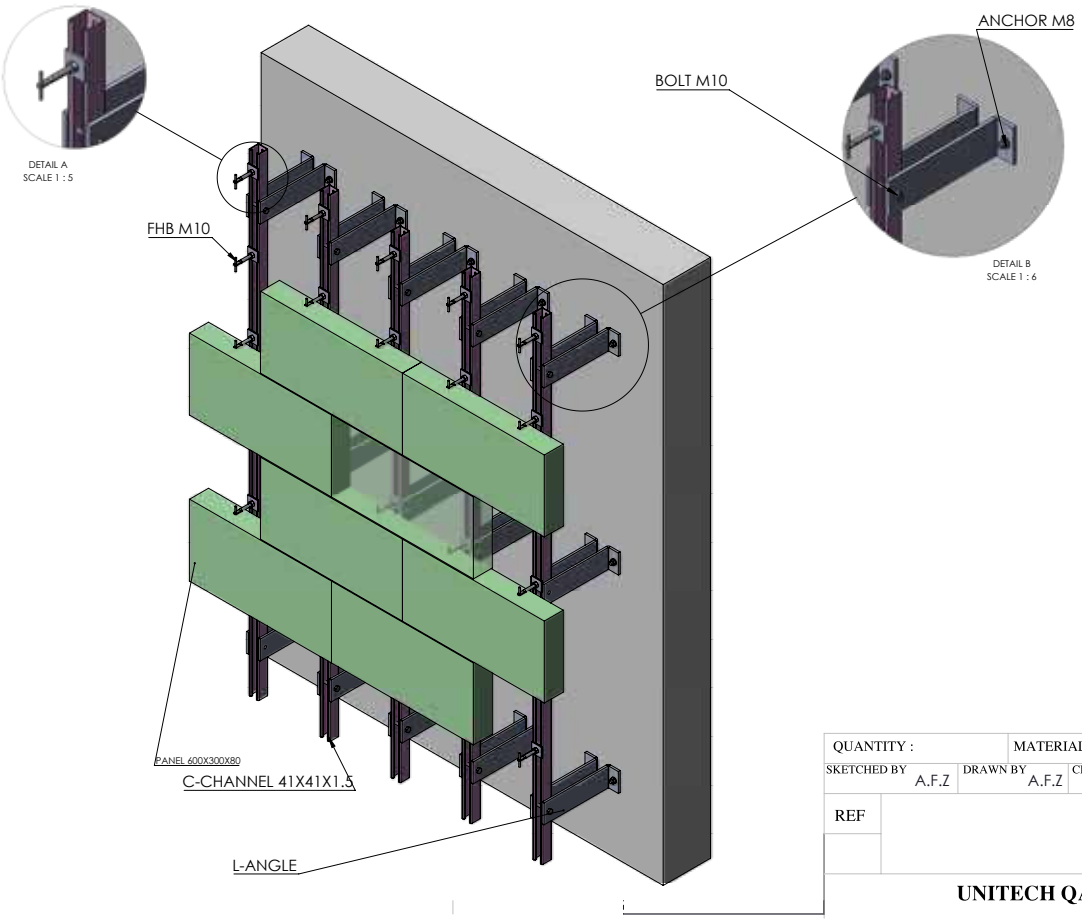




EXAMPLE -5

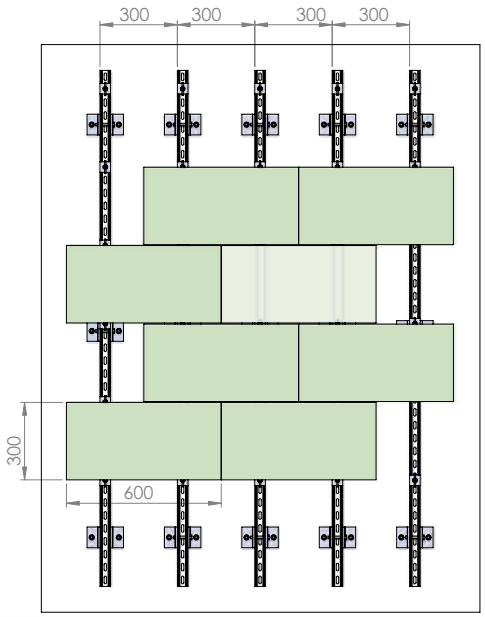


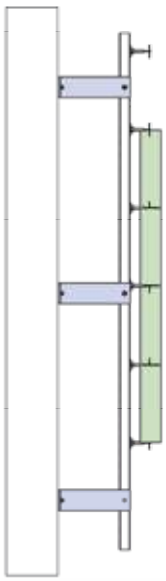
EXAMPLE -5

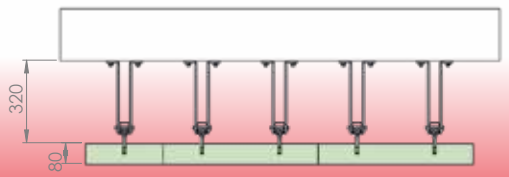


QUANTITY :	MATERIAL :	UNITS :	mm
SKETCHED BY A.F.Z	DRAWN BY A.F.Z	CHECKED BY RTS	DATE : / / 2017
REF		PART NAME :	
		CODE NUMBER:	

UNITECH QATAR







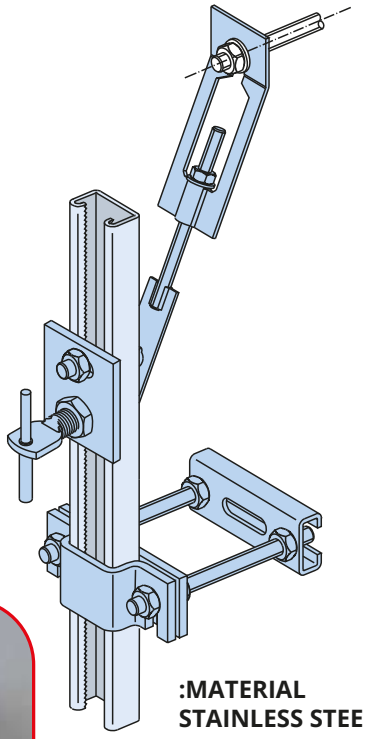
QUANTITY :	MATERIAL :	UNITS :	mm
SKETCHED BY A.F.Z	DRAWN BY A.F.Z	CHECKED BY RTS	DATE : / / 2017
REF		PART NAME :	
		CODE NUMBER:	

UNITECH QATAR

KAVITY NATURAL STONE SUPPORT SYSTEMS

KAVITY STAINLESS STEEL SUPPORT STRUCTURE

THE KAVITY SYSTEM IS AN ADJUST- ABLE SUSPENDED CHANNEL SYSTEM WITH SUPPORT AND RESTRAINT ANCHORS THAT CAN EASILY BE ADJUSTED TO ANY HEIGHT FOR FAÇADE STAND-OFF INSTALLATIONS 160MM



:MATERIAL
STAINLESS STEEL A4

IT IS IDEAL FOR NEW CONSTRUCTIONS AND REMODELLING PROJECTS. THE SYSTEM IS ESPECIALLY SUITED FOR NATURAL STONE FAÇADES WITH LARGE AND VARYING DISTANCES TO THE LOAD-BEARING WALL

THE SYSTEM IS MADE UP OF A SMALL NUMBER OF EASY TO INSTALL COMPONENTS .AND IS THEREFORE INCREASES EASE OF INSTALLATION NON-LOAD-BEARING AREAS AND RECESSES CAN BE SPANNED

THE NECESSITY FOR FEWER ANCHOR POINTS ALLOWS QUICK INSTALLATION OF THE STAINLESS STEEL SUPPORT STRUCTURE AND THEREFORE FASTER FAÇADE ELEMENT INSTALLATION

- **FAÇADE ANCHOR FIXED WITH BOLT**
- **CHANNEL**
- **COMPRESSION-TENSION BRACE**
- **KAVITY DESIGN INCLUDING INSTALLATION PARTS**

TYPES OF LOADS

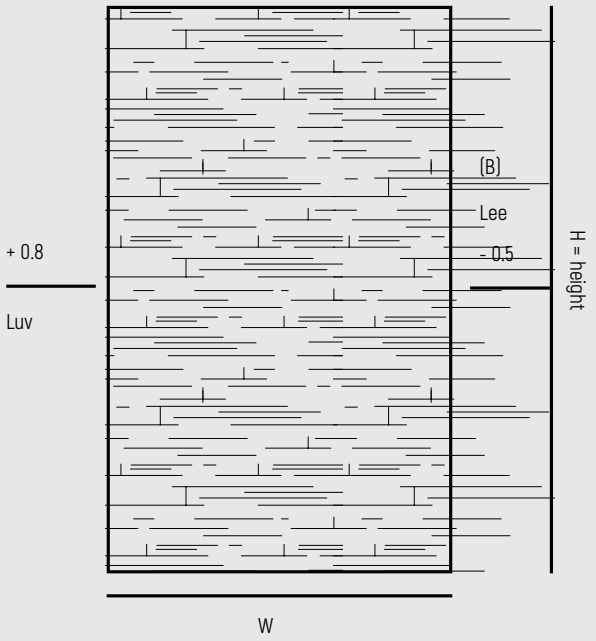
TYPES OF LOADS

Wind Suction
W = C x q
C = Wind Coefficient
q = Velocity Pressure

Suction Coefficient in area of discontinuity		
Increasing Coefficient C_p	**Width of a (m)**	**Width of d (m)**
-2,0	a<8 m	1,0 m
	8 m < a ≤ 16 m	a/8
	a > 16,0 m	2,0 m

Wind Suction				
Height	**0 - 8 m**	**> 8 m - 20 m**	**> 20 m - 100 m**	**> 100 m**
Wind kN/m²	-1,00 (-2 x 0,5)	-1,60 (-2 x 0,8)	-2,20 (-2 x 1,1)	-2,60 (-2 x 1,30)

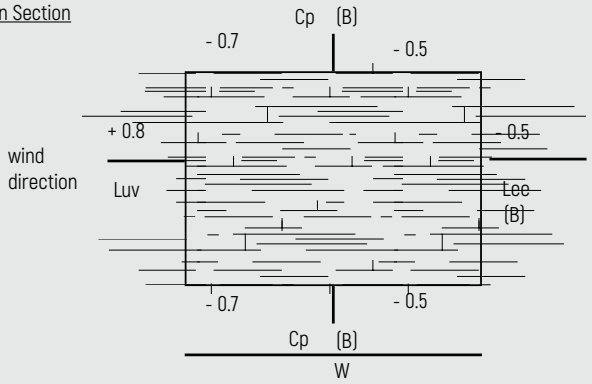
Wind Pressure = w = Cp x q
aerodynamic Pressure Factor CP
Elevation Section



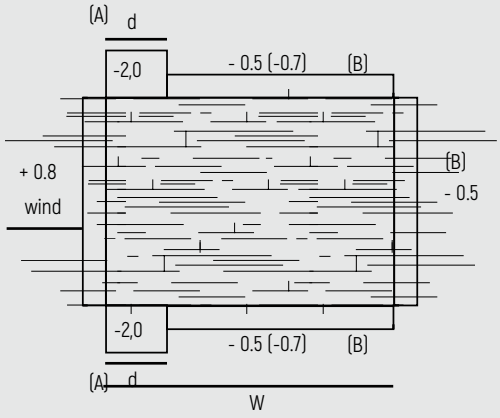
CP = -2,0
d = 1m for A < 8 m
d = W/P for 8m < A < 16 m
d = 2,0 m for W > 16 m

Lateral Walls
CP = -0,5 for H/W ≤ 0,25
CP = -0,7 for H/W ≤ 0,5

Plan Section

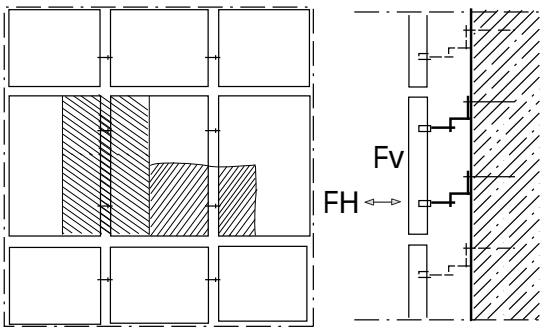


Wind pressure on corners
d = Corner



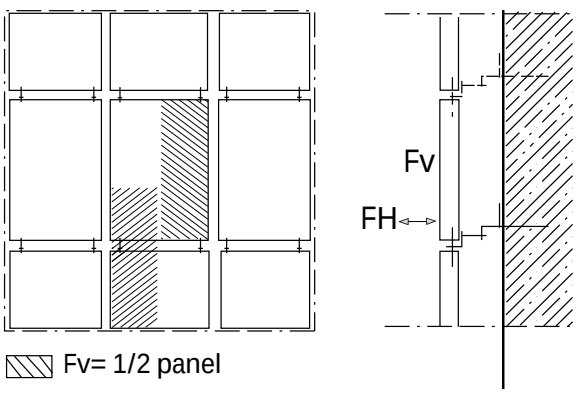
WIND LOAD ACCORDING TO DIN 1055

Vertical Joints



Fv= 1 panel
FH= 1/2 panel

Horizontal Joints



Fv= 1/2 panel
FH= 1/2 panel

TYPES OF LOADS

Loads for Support Anchor

Characteristic weights of natural stone panels [kN/m²]						
Density kN/m³	Plate thickness [cm]					
	2,0	3,0	4,0	5,0	6,0	7,5
20	0,40	0,60	0,80	1,00	1,20	1,50
24	0,48	0,72	0,96	1,20	1,44	1,80
25	0,50	0,75	1,00	1,25	1,50	1,88
26	0,52	0,78	1,04	1,30	1,56	1,95
27	0,54	0,81	1,08	1,35	1,62	2,03
28	0,56	0,84	1,12	1,40	1,68	2,10
30	0,60	0,90	1,20	1,50	1,80	2,25

Characteristic loads per panel [kN] by panel thickness 3cm and stone density 26kN/m² (0,78kN/m²)										
self weight kN	Size m²	Wind pressure FH kN			Wind suction FH (A) kN			Wind suction FH (B) kN		
		0-8m	8-20m	20-100m	0-8m	8-20m	20-100m	0-8m	8-20m	20-100m
0,3	0,38	0,15	0,25	0,34	-0,38	-0,62	-0,85	-0,13	-0,22	-0,30
0,6	0,77	0,31	0,49	0,68	-0,77	-1,23	-1,69	-0,27	-0,43	-0,59
0,9	1,15	0,46	0,74	1,02	-1,15	-1,85	-2,54	-0,40	-0,65	-0,89
1,2	1,54	0,62	0,98	1,35	-1,54	-2,46	-3,38	-0,54	-0,86	-1,18
1,5	1,92	0,77	1,23	1,69	-1,92	-3,08	-4,23	-0,67	-1,08	-1,48
1,8	2,31	0,92	1,48	2,03	-2,31	-3,69	-5,08	-0,81	-1,29	-1,78

Characteristic loads per panel [kN] by panel thickness 4cm and stone density 28kN/m² (1,12kN/m²)										
self weight kN	Size m²	Wind pressure FH kN			Wind suction FH (A) kN			Wind suction FH (B) kN		
		0-8m	8-20m	20-100m	0-8m	8-20m	20-100m	0-8m	8-20m	20-100m
0,4	0,36	0,14	0,23	0,31	-0,36	-0,57	-0,79	-0,13	-0,20	-0,28
0,8	0,71	0,29	0,46	0,63	-0,71	-1,14	-1,57	-0,25	-0,40	-0,55
1,2	1,07	0,43	0,69	0,94	-1,07	-1,71	-2,36	-0,38	-0,60	-0,83
1,6	1,43	0,57	0,91	1,26	-1,43	-2,29	-3,14	-0,50	-0,80	-1,10
2,0	1,79	0,71	1,14	1,57	-1,79	-2,86	-3,93	-0,63	-1,00	-1,38
2,4	2,14	0,86	1,37	1,89	-2,14	-3,43	-4,71	-0,75	-1,20	-1,65

SEISMIC LOAD ACCORDING TO UBC

Seismic Load

Seismic loading is one of the basic concept of earthquake engineering which means application of an earthquake generated agitation to a structure. It happens at contact surface of a structure either with the ground or with adjacent structure:

$$= SL = \frac{(2.5 \times Ca \times I)}{R} \; D, \; SL \geq 0.11 \; Ca \times I \times D$$

SL = Seismic load, Ca = Seismic response spectrum = Lateral force value in 97 UBC table 160
I = Importance factor given in 97 UBC Table 16 K
R = Component response modification factor from 97 UBC Table 16N
D = Dead Load
It is common practice to oxpress the Seismic load as a percentage of dead load calculating only the coefficient term.

Zone	Seismic Load
1	0.06 7x D
2	0.122 x D
3	0.2 x D
4	0.244 x D

Seismic Zone	
Zone	Damage to Structure
0	No Domage
1	Minor
2	Moderate
3	Major
4	Huge

TYPES OF LOADS

Table 16-K - Occupancy Category

Occupancy Category	Occupancy or functions of Structure	Seismic Importance Factor, I	Seismic Importance Factor[1], I_p	Seismic Importance Factor, I_w
1. Essential facilities[2]	Group I, Division 1 Occupancies having surgery and emergency treatment areas Fire and police stations, Garages and shelters for emergency vehicules and emrgency aircraft, Structures and shelters in emergency - preparedness centers Aviation control towers, Structures and equipment in government communication centers and other facilities required for emergency response Standby power - generating equipment for Category 1 facilities Tanks or other structures containing housing or supporting water or other fire - suppression material or equipment required for the protection of Category 1.2 or 3 structures.	1.25	1.50	1.15
2. Hazardous facilities	Group H, Divisions 1, 2, 6 and 7 Occupancies and structures therein housing or supporting toxic or explosive chemicals or substances, Nonbuilding structures housing, supporting or containing quantities for toxic or explosive substances that, if contained within a building, would cause that building to be classified as a Group H, Division 1, 2 or 7 Occupancy	1.25	1.50	1.15
3. Special occupancy structures[3]	Group A, Divisions 1, 2 and 2.1 Occupancies Buildings housing Group E, Divisions 1 and 3 occupancies with a capacity greater than 300 students, Buildings Housing Group B Occupancies used for college or adult education with a capacity greater than 500 students, Group I, Divisions 1 and 2 Occupancies with 50 or more resident incapacitated patients, but not included in Category I, Group I, Division 3 Occupancies All structures with an occupancy greater than 5.000 persons Structures and equipment in power-generating stations, and other public utility facilities not included in Category 1 or Category 2 above, and required for continued operation	1.00	1.00	1.00
4. Standard occupancy structures[3]	All structures housing occupancies or having functions not listed in Category 1, 2 or 3 and Group U Occupancy towers	1.00	1.00	1.00
5. Miscellaneous structure	Group U Occupancies except for towers	1.00	1.00	1.00

SEISMIC LOAD ACCORDING TO UBC

Table 16-N-Structural Systems1

BASIC STRUCTURAL SYSTEM 2	LATERAL-FORCE-RESISTING SYSTEM DESCRIPTION	R	O	HEIGHT LIMIT FOR SEISMIC ZONES 3 AND 4 (feet) x 304.8 for cm
1. Bearing wall system	1. Light-framed walls with shear panels a. Wood structural panel walls for structures three stories or less b. All other light-framed walls	 5.5 4.5	 2.8 2.8	 65 65
	2. Shear walls a. Concrete b. Masonry	 4.5 4.5	 2.8 2.8	 160 160
	3. Light steel-framed bearing walls with tension-only bracing	2.8	2.2	65
	4. Braced frames where bracing carries gravity load a. Steel b. Concrete[3] c. Heavy timber	 4.4 2.8 2.8	 2.2 2.2 2.2	 160 - 65
2. Building frame system	1. Steel eccentrically braced frame (EBF)	7.0	2.8	240t
	2. Light-framed walls with shear panels a. Wood structural panel walls for structures three stories or less b. All other light-framed walls	 6.5 5.0	 2.8 2.8	 65 65
	3. Shear walls a. Concrete b. Masonry	 5.5 5.5	 2.8 2.8	 240 160
	4. Ordinary braced frames a. Steel b. Concrete3 c. Heavy timber	 5.6 5.6 5.6	 2.2 2.2 2.2	 160 -- 65
	5. Special concentrically braced frames a. Steel	 6.4	 2.2	 240
3. Moment-resisting frame system	1. Special moment-resisting frame (SMRF) a. Steel b. Concrete[4]	 8.5 8.5	 2.8 2.8	 N.L. N.L.
	2. Masonry moment-resisting wall frame (MMRWF)	6.5	2.8	160
	3. Concrete intermediate moment-resisting frame (IMRF)[5]	5.5	2.8	--
	4. Ordinary moment-resisting trame (OMRF) a. Steel[6] b. Concrete[7]	 4.5 3.5	 2.8 2.8	 160 --
	5. Special truss moment frames of steel (STMF)	6.5	2.8	240

N.L.--no limit
[1]Sec Section 1630.4 for combination of structural systems.
[2]Basic structural systems are defined in Section 1629.6.
[3]Prohibited in Seismic Zones 3 and 4.
[4]Includes precast concrete conforrning to Section 1921.2.7.
[5]Prohibited in Seismic Zones 3 and 4, except as permitted in Section 1634.2.
[6]Ordinary moment-resisting fi'ames in Seismic Zone 1 meeting the requirements of
Section 2211.6 may use a R value of 8.
[7]Total height of the building including cantilevered columns.
[8]Prohibited in Seismic Zones 2A, 2B, 3 and 4. See Section 1633.2.7.

TYPES OF LOADS

BASIC STRUCTURAL SYSTEM2	LATERAL-FORCE-RESISTING SYSTEM DESCRIPTION	R	O	HEIGHT LIMIT FOR SEISMIC ZONES 3 AND 4 (feet) x 304.8 for cm
4. Dual systems	1. Shear walls	8.5	2.8	N.L.
	a. Concrete with SMRF	4.2	2.8	160
	b. Concrete with steel OMRF	6.5	2.8	160
	c. Concrete with concrete IMRF[5]	5.5	2.8	160
	d. Masonry with SMRF	4.2	2.8	160
	e. Masonry with steel OMRF	4.2	2.8	--
	f. Masomy with concrete IMRF[3]	6.0	2.8	160
	g. Masonry with masonry MMRWF			
	2. Steel EBF			
	a. With steel SMRF	8.5	2.8	N.L.
	b. With steel OMRF	4.2	2.8	160
	3. Ordinary braced frames			
	a. Steel with steel SMRF	6.5	2.8	N.L.
	b. Steel with steel OMRF	4.2	2.8	160
	c. Concrete with concrete SMRF[3]	6.5	2.8	--
	d. Concrete with concrete 1MRF[3]	4.2	2.8	--
	4. Special concentr.ically braced frames	7.5	2.0	N.L.
	a. Steel with steel SMRF	4.2	2.8	160
	b. Steel with steel OMRF			
5. Cantilevered column building systems	1. Cantilevered column elements	2.5	2.0	35[7]
6. Shear \vall-frame interaction systems	1. Concrete[8]	5.5	2.8	160
7. Undetined systems	See Sections 1629.6.7 and 1629.9.2	--	--	--

SEISMIC LOAD ACCORDING TO UBC

Table 16-0-Horizontal Force Factors, $_{Ap}$ and $_{Rp}$

ELEMENTS OF STRUCTURES AND NONSTRUCTURAL COMPONENTS AND EQUIPMENT[1]	ap	R_p	FOOTNOTE
1. Elements of Structures			
A. Walls including the following:			
(1) Unbraced (cantilevered) parapets.	2.5	3.0	
(2) Exterior walls at or above the ground floor and parapets braced above their centers of gravity	1.0	3.0	2
(3) All interior-bearing and nonbearing walls.	1.0	3.0	2
B. Penthouse (except when framed by an extension of the structural trame).	1.5	4.0	
C. Connections for prefabricated structural elements other than walls. See also Section 1632.2.	1.0	3.0	3
2. Nonstructural Components			
A. Exterior and interior Oll1amentations and appendages.	2.5	3.0	
B. Chimneys, stacks and trussed towers supported on or projecting above the roof:			
(I) Laterally braced or anchored to the structural frame at a point below their centers of mass.	2.5	3.0	
(2) Laterally braced or anchored to the structural frame at or above their centers of mass	1.0	3.0	
C. Signs and billboards.	2.5	3.0	
D. Storage racks (include contents) over 6 feet (1829 mm) tall	2.5	4.0	
E. Permanent floor-supported cabinets and book stacks more than 6 feet (1829 mm) in height (include contents).	1.0	3.0	
F. Anchorage and lateral bracing for suspended ceilings and light fixtures.	1.0	3.0	3,6,7,8
G. Access floor systems.	1.0	3.0	4,5,9
H. Masonry or concrete fences over 6 feet (1829 mm) high.	1.0	3.0	
I. Partitions.			
3. Equipment			
A. Tanks and vessels (include contents), including support systems.	1.0	3.0	
B. Electrical. mechanical and plumbing equipment and associated conduit and ductwork and piping.	1.0	3.0	5,10,11,12,13,14,15,16
C. Any flexible equipment laterally braced or anchored to the strue-tural frame at a point below their center of mass.	2.5	3.0	5,10,14,15,16
D. Anchorage of emergency power supply systems and essential communications equipment. Anchorage and support systems for battery racks and fuel tanks necessary for operation of emergency equipment. See also Section 1632.2.	1.0	3.0	17,18
E. Temporary containers with llammable or hazardous materials.	1.0	3.0	19

TYPES OF LOADS

ELEMENTS OF STRUCTURES AND NONSTRUCTURAL COMPONENTS AND EQUIPMENT[1]	ap	R_p	FOOTNOTE
4. Other Components A. Rigid components with ductile material and attachments.	1.0	3.0	1
B. Rigid components with nonduetile material or attachments.	1.0	1.5	1
C. Flexible components with ductile material and attachments.	2.5	3.0	1
D. Flexible components with nonductile material or attachments.	2.5	1.5	1

Table 16-Q-Seismic Coefficient C_a

SOIL PROFILE TYPE	SEISMIC ZONE FACTOR, Z				
	Z= 0.075	Z= 0.15	Z= 0.2	Z= 0.3	Z= 0.4
S_A	0.06	0.12	0.16	0.24	$0.32N_a$
S_B	0.08	0.15	0.20	0.30	$0.40N_a$
S_C	0.09	0.18	0.24	0.33	$0.40N_a$
S_D	0.12	0.22	0.28	0.36	$0.44N_a$
S_E	0.19	0.30	0.34	0.36	$0.36N_a$
S_F	See Footnote I				

[1]Site-specific geotechnical investigation and dynamic site response analysis shall be perfomled to determine seismic coefficients tor Soil Profile Type S_F

[I]See Sectlon 1627 for definitions of flexible components and rigid components.
[2]See Sections 1633.2.4 and 1633.2.8 for concrete and masonry walls and Section 1632.2 for connections for panel connectors for panels.
[3]Applies to Seismic Zones 2,3 and 4 only.
[4]Ground supported steel storage racks may be designed using the provisions of Section 1634. Chapter 22, Division VI, may be used for design, provided seismic design forces are equal to or greater than those specified in Section 1632.2 or 1634.2, as appropriate.
[5]Only attachments, anchorage or restraints need be designed.
[6]Ceiling weight shall include all light fixtures and other equipment or partitions that are laterally supported by the ceiling. For purposes of determining the seismic force, a ceiling weight of not less than 4 psf (0.19 kN/m^2) shall be used.
[7]Ceilings constructed of lath and plaster or gypsum board screw or nail attached to suspended members that support a ceiling at one level extending from wall to wall need not be analyzed, provided the walls are not over 50 feet (15 240mm) apart.
[8]Light fixtures and mechanical services installed in metal suspension systems for accoustical title and lay-in panel ceilings shall be independently supported from the structure above as specified in UBC Standard 25-2, part III.
[9]W^P for access floor systems shall be the dead load of the access floor system plus 25 percent of the floor live load plus a 10-psf (0.48 kN/$m^{2)}$ partition load allowance.
[10]Equipment includes, but is not limited to, boilers, chillers, heat exchangers, pumps, air-handling units, cooling towers, control panels, motors, switchgear, transformers and life-safety equipment. It shall include major conduit, ducting and piping, which services such machinery and equipment and fire sprnkler systems. see section 163.2.2 for additional requirements for determining ap for nonrigid or flexibly mounted equipment.
[11]Seismic restraints may be omitted from piping and duct support if all the following conditions are satisfied:
[11.1] Lateral motion of the piping or duct will not cause damaging impact with other systems.
[11.2] The piping or duct is made of ductile material with ductile connections.
[11.3] Lateral motion of the piping or duct does not cause impact of fragile appurtenances (e.g., sprinkler heads) with any other equipment, piping or structural member.
[11.4] Lateral motion of the piping or duct does not cause loss of system vertical support.
[11.5] Rod-hung supports of less than 12 inches (305mm) in length have top connections that cannot develop moments.
[11.6] Support members cantilevered up from the floor are checked for stability.

THERMAL MOVEMENTS

General

It is essential to take thermal movements into account. These are the relative changes in length and height due to temperature differences between the cladding, and the structure to which the cladding is fixed. The magnitude of the movements is dependent on whether the frame is entirely or partly inside the building envelope, the ambient temperature, the coefficients of the thermal expansion of the various materials (see the table), and the temperature of the various components when the cladding is fixed.

For buildings in the KSA with modern standards of thermal insulation and air conditioning, the temperatures tabulated in table KSA may be used as a guide to the extremes likely
to be experienced

TYPES OF LOADS

Material	Coefficient of linear expansion 10^-6K^-1
(Steel (and any concrete casing to steel members	12
Concrete	
Dense gravel aggregate	to 14 10
(Crushed rock (except limestone	to 13 10
Limestone aggregate	to 8 7
Lightweight aggregate	to 12 8
Masonry	
Concrete brickwork and blockwork	to 12 6
Dense aggregate	to 12 6
(Lightweight aggregate (autoclaved	to 12 8
(Aerated (autoclaved	8
Calcium silicate brickwork	to 14 8
Clay or shale brickwork or blockwork	to 8 5
Natural stones	
Limestone	to 10 3
Sandstone	to 12 7
Granite	to 10 8
Slate	to 12 6
Marble	to 15 3
Quaritzte	to 12 9

Thermal Movements

1- Example of Calculation of thermal movement:

Consider a Building Construction type is an enclosed Concrete frame with Granite cladding (1000x500x30mm)

On a hot summer's day with the building complete and occupied the relative movement (in mm/m) of frame to cladding is given by the equation A =1000 [(tfs.tfe) Xf-(tcs-tce)Xc]

tfs = is temperature (in °C) of frame in Summer

tfe = is temperature (in °C) of frame on erection

Xf = is coefficient of thermal expansion of frame

tcs = is temperature (in °C) of cladding in Summer

tce = is temperature (in °C) of cladding on erection

Xc = is coefficient of thermal expansion of cladding using the following values:

tfs = 30°C, tfe = 40°,Xf = 13x10^-6 per °C,tcs = 80°C, ce= 10°C,Xc =(8 to 10) x 10 ^-6 per °C

If Xc = 8 x 10^-6 per °C, movement = 1000[(30-40) 13-(80-10)^8]

DL= 0,69mm/m, if Xc = 10, Dl = 0,83 mm/m in both cases , the movement shall be less than 1,0mm

Coefficients Of Thermal Expansion	
Material	Linear expansion ' (in/°F)
Aluminium	0.0000133
Brass	0.0000104
Bronze	0.0000101
Bronze	0.0000096
Concrete	0.0000079
Marble	0.0000073
Granite	0.0000078
Lime stone	0.0000060
Masonry	0.0000035
Mild steel	0.0000067

Example Calculation of Deflection

Panel size : 1000mmx500mmx30mm

Granit with a density of 28 kN/m^3

Deflection on the support anchor with a section of (width x height) 35mmx4mm

Existing deflection = f = (Fv.a^3)/3xExI

Fv = Weight of cladding panel = 420 N

a = Cavity to pin in mm = 40mm

E= Modulus of Elasticity of bracket = 170000 N/mm^2

I = Moment of Inertia = 35x4^3/12 = 186,70mm^4

Allowable deflection f = (420Nx40^3 mm^3) / 3x170000 N/mm^2 x186,70mm^4)

f = 0,28 mm < 1.0mm

Thermal Expansion:

The thermal expansion of natural stone is an important consideration where natural stone is used with dissimilar materials to form large units which are rigidly fixed.

The coefficient of thermal expansion varies from one variety of natural stone to another, so theactual thermal characteristics of a specific natural stone should be obtained from the supplier when the final choice of a natural stone is made.

Thermal expansion is calculated as follows: $L = \alpha . h . T \sim 0.5$ mm/m

Where

L Change in height of panel in [mm]

α : Coefficient of thermal expansion in [mm/mm/°C]

h: Height of panel in [mm]

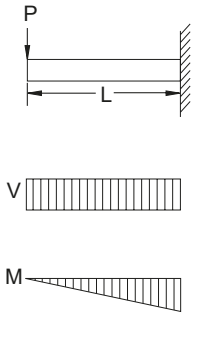
T: Change in temperature in [°C]

We need joints, allowable movement thermal expansion

CHANNELS
LOADS & SUPPORTS

BEAM SUPPORT CONDITIONS

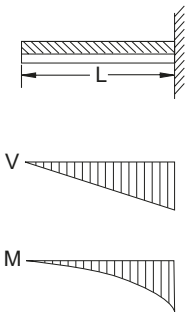
Cantilever Beams



V max. = P

M max. = PL

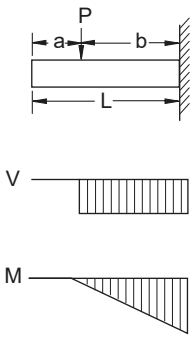
$\Delta max. = \frac{PL^3}{3EI}$



V max. = W

$M max. = \frac{WL}{2}$

$\Delta max. = \frac{WL^3}{8EI}$

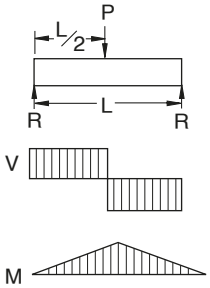


V max. = P

M max. = Pb

$\Delta max. = \frac{Pb^2(3L-b)}{6EI}$

Simple Beams

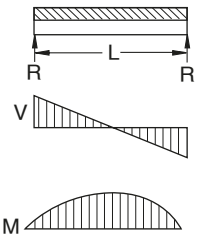


$R = \frac{P}{2}$

V max. = $\frac{P}{2}$

M max. = $\frac{PL}{4}$

$\Delta max. = \frac{PL^3}{48EI}$

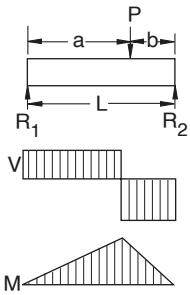


$R = \frac{W}{2}$

V max. = $\frac{W}{2}$

M max. = $\frac{WL}{8}$

$\Delta max. = \frac{5WL^3}{384EI}$



$R_1 = \frac{Pb}{L}$

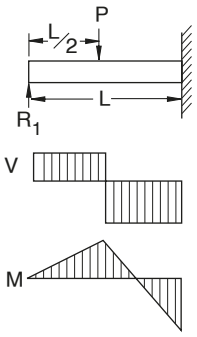
$R_2 = \frac{Pa}{L}$

V max. = $\frac{Pa}{L}$

M max. = $\frac{Pab}{L}$

$\Delta max. = \frac{Pab(a+2b)\sqrt{3a(a+2b)}}{27EIL}$

Beams Fixed At One End & Supported At The Other



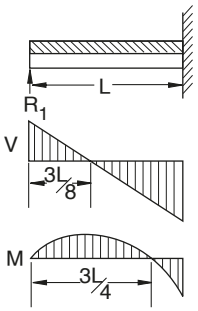
$R_1 = \frac{5P}{16}$

V max. = $\frac{11P}{16}$

M max. = $\frac{3PL}{16}$

$\Delta max.$ at x = 0.447L

$\Delta max. = 0.009317\frac{PL^3}{EI}$



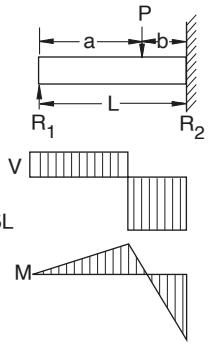
$R_1 = \frac{3W}{8}$

V max. = $\frac{5W}{8}$

M max. = $\frac{WL}{8}$

$\Delta max.$ at x = 0.4215L

$\Delta max. = \frac{WL^3}{185EI}$



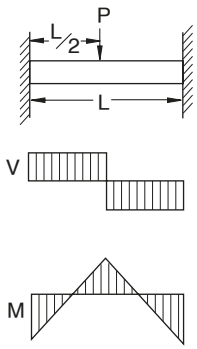
$R_1 = \frac{Pb^2}{2L^3}(a+2L)$

$R_2 = \frac{Pa}{2L^3}(3L^2-a^2)$

M at point of load = $R_1 a$

M at fixed end = $\frac{Pab}{2L^3}(a+L)$

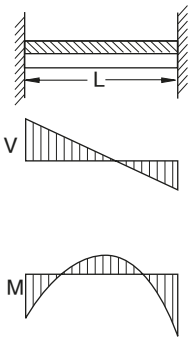
Beams Fixed At Both Ends



V max. = $\frac{P}{2}$

M max. = $\frac{PL}{8}$

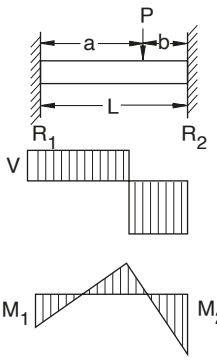
$\Delta max. = \frac{PL^3}{192EI}$



V max. = $\frac{W}{2}$

M max. = $\frac{WL}{12}$

$\Delta max. = \frac{WL^3}{384EI}$



$R_1 = \frac{Pb^2}{L^3}(3a+b)$

$R_2 = \frac{Pa^2}{L^3}(a+3b)$

$M_1 = \frac{Pab^2}{L^2}$

$M_2 = \frac{Pa^2b}{L^2}$

R – Reaction
M – Moment
P – Concentrated Load

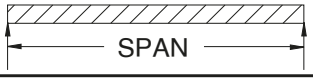
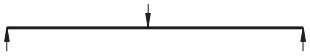
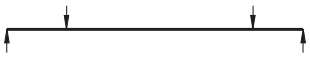
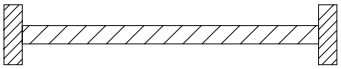
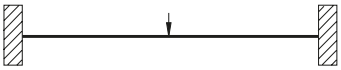
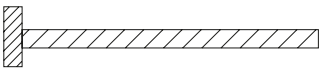
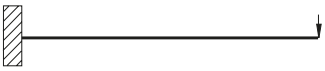
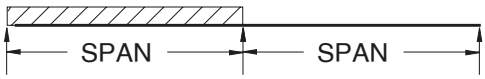
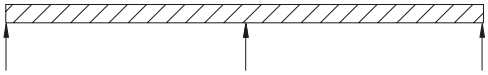
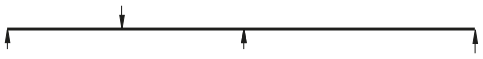
W – Total Uniform Load
V – Shear
L – Length

Δ – Deflection
E – Modulus of Elasticity
I – Moment of Inertia

REFERENCE TABLES AND DATA

CONVERSION FACTORS FOR BEAMS WITH VARIOUS STATIC LOADING CONDITIONS

All Beam Load tables are for single-span (simple) beams supported at the ends. These can be used in the majority of the cases. However, there are times when it is necessary to know what happens with other loading and support conditions. Some common arrangements are shown below. Simply multiply the values from the Beam Load tables by factors given below

Load and Support Condition	Load Factor	Deflection Factor
1. Simple Beam, Uniform Load 	1.00	1.00
2. Simple Beam, Concentrated Load at Center 	.50	.80
3. Simple Beam, Two Equal Concentrated Loadcs at 1/4 pts 	1.00	1.10
4. Beam Fixed at Both Ends, Uniform Load 	1.50	.30
5. Beam Fixed at Both Ends, Concentrated Load at Center 	1.00	.40
6. Cantilever Beam, Uniform Load 	.25	2.40
7. Cantilever Beam, Concentrated Load at End 	.12	3.20
8. Continuous Beam, Two Equal Spans, Uniform Load on One Span 	1.30	.92
9. Continuous Beam, Two Equal Spans, Uniform Load on Both Ends 	1.00	.42
10. Continuous Beam, Two Equal Spans, Concentrated Load at Center of One Span 	.62	.71
11. Continuous Beam, Two Equal Spans, Concentrated Load at Center of Each Span 	.67	.48

REFERENCE TABLES AND DATA

Channel

kavity's metal framing channel is cold formed on modern rolling machines from low carbon steel manufactured according to BS 6946:1988. A continuous slot provides the ability to make attachments at any point.

Lengths

Standard length: 3000mm with ± 3.2mm length tolerance.
Custom lengths vv available upon request.

Finishes

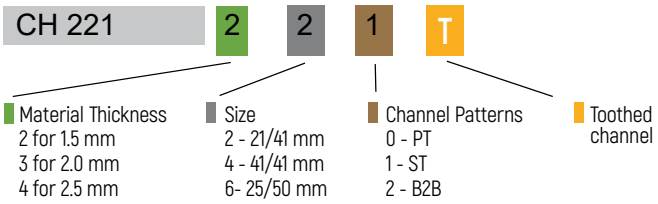
Standard Finishes: Pre-Galvanized finish (ASTM A653M coating G90 and G60). Hot Dip Galvanized after fabrication (ASTM A123 or BS EN ISO1461:2009). Other custom coatings are available upon request.

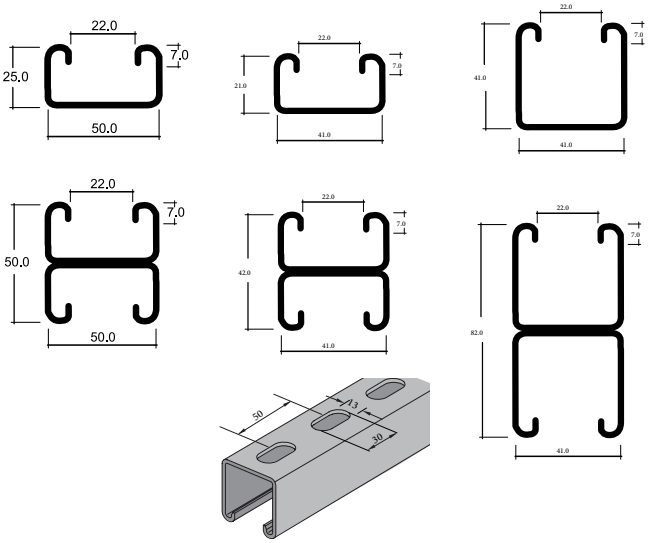
Framing Channels

Selection Chart

Part No	Channel Dimensions		Thickness
	Height "H"	Width "W"	
CH - 220/221	21.0 mm	41.0 mm	1.5 mm
CH - 240/241	41.0 mm	41.0 mm	1.5 mm
CH - 260/261	25.0 mm	50.0 mm	1.5 mm
CH - 320/321	21.0 mm	41.0 mm	2.0 mm
CH - 340/341	41.0 mm	41.0 mm	2.0 mm
CH - 360/361	25.0 mm	50.0 mm	2.0 mm
CH - 420/421	21.0 mm	41.0 mm	2.5 mm
CH - 440/441	41.0 mm	41.0 mm	2.5 mm
CH - 460/461	25.0 mm	50.0 mm	2.5 mm

For Toothed Channel add "T" after the Part no. ex: CH-220T



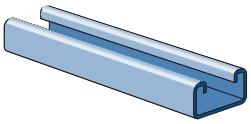


Channel Hole Patterns

PT Type Channel

Part No	Thick. mm.	Height "H"
CH-220	1.5	21.0
CH-240	1.5	41.0
CH-260	1.5	25.0
CH-320	2.0	21.0
CH-340	2.0	41.0
CH-360	2.0	25.0
CH-420	2.5	21.0
CH-440	2.5	41.0
CH-460	2.5	25.0

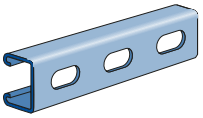
PT Plain Type



ST Type Channel

Part No	Thick. mm.	Height "H"
CH-221	1.5	21.0
CH-241	1.5	41.0
CH-261	1.5	25.0
CH-321	2.0	21.0
CH-341	2.0	41.0
CH-361	2.0	25.0
CH-421	2.5	21.0
CH-441	2.5	41.0
CH-461	2.5	25.0

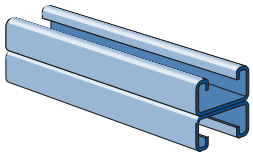
ST Slotted Type



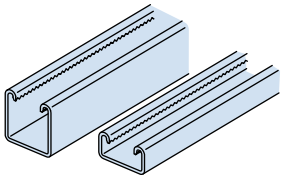
B2B Type Channel

Part No	Thick. mm.	Height "H"
CH-222	1.5	42.0
CH-242	1.5	82.0
CH-262	1.5	50.0
CH-322	2.0	42.0
CH-342	2.0	82.0
CH-362	2.0	50.0
CH-422	2.5	42.0
CH-442	2.5	82.0
CH-462	2.5	50.0

Back to Back Type



Toothed channel type



For Toothed Channel add "T" after the Part no.

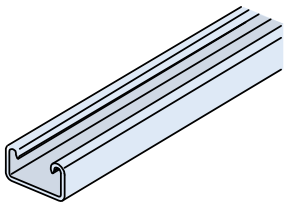
REFERENCE TABLES AND DATA

CH-321-320

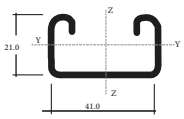
LOAD TABLE FOR SINGLE BEAM WITH UNIFORM (CHARACTERISTIC) LIVE- LOAD

This associated data are considered for perforated and non-perforated c-channel types according to DIN 18.800

Thickness : 2.0 mm
Standard Length : 3.00 m
Finishes : Pre-Galvanized,
Hot-Dip Galvanized.
Stainless Steel.



CH-320

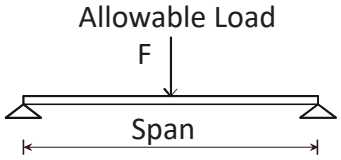


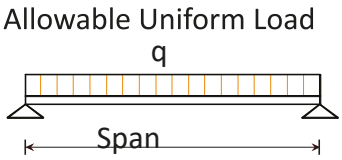
C-Channel:	41 x 21 x 2.0	
Area of Shear (A_z)	0.55	cm^2
Moment of Inertia (I_y)	0.88	cm^4
Moment of Inertia (I_z)	4.25	cm^4
min. Section Modulus (S_y)	0.75	cm^3
Warping Constant (I_w)	21.34	cm^6
Torsional Constant (I_T)	0.02	cm^4
Plastic Moment cap. ($M_{pl,y}$)	0.24	kNm
Self weight (G)	1.27	kg/m

Chosen Material:	40 B = S 235 JRG2	
Allowable Bending Stress	21,82	kN/cm^2
Allowable Shear Stress	12,60	kN/cm^2
Modulus of Elasticity	21.000	kN/cm^2

Beam Load Data

					Uniform Load* @	
Span (L)	Allowable Load*		Deflection		L / 360	L / 180
[cm]	q [kN/m]	F [kN]	U [mm]	[L /X]	q [kN/m]	q [kN/m]
50	2.80	0.70	1.54	320	2.50	2.80
60	1.90	0.60	2.17	280	1.50	1.90
70	1.40	0.50	2.96	240	0.90	1.40
80	1.10	0.40	3.97	200	0.60	1.10
90	0.90	0.41	5.20	170	0.43	0.86
100	0.70	0.35	6.17	160	0.32	0.63
125	0.45	0.28	9.68	130	0.16	0.32
150	0.31	0.23	13.82	110	x	0.19
175	0.23	0.20	19.00	90	x	x
200	0.17	0.17	23.96	80	x	x
225	x	x	x	x	x	x
250	x	x	x	x	x	x
275	x	x	x	x	x	x
300	x	x	x	x	x	x





* Given loads are always “allowable characteristic live load”

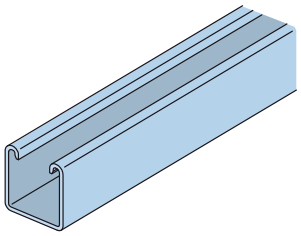
REFERENCE TABLES AND DATA

CH-340-341

LOAD TABLE FOR SINGLE BEAM WITH UNIFORM (CHARACTERISTIC) LIVE- LOAD

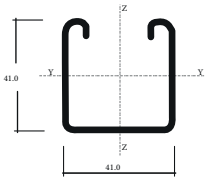
This associated data are considered for perforated and non-perforated c-channel types according to DIN 18.800

Thickness : 2.0 mm
Standard Length : 3.00 m
Finishes : Pre-Galvanized,
Hot-Dip Galvanized.
Stainless Steel



C-Channel:	41x41x2.0	
Area of Shear (A_z)	1.34	cm^2
Moment of Inertia (I_y)	4.59	cm^4
Moment of Inertia (I_z)	6.99	cm^4
min. Section Modulus (S_y)	2.18	cm^3
Warping Constant (I_w)	138.49	cm^6
Torsional Constant (I_T)	0.03	cm^4
Plastic Moment cap. ($M_{pl,y}$)	0.64	kNm
Self weight (G)	1.83	kg/m

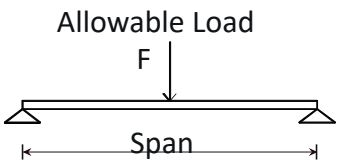
CH-340

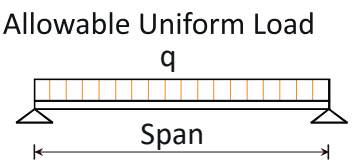


Chosen Material:	40 B = S 235 JRG2	
Allowable Bending Stress	21,82	kN/cm^2
Allowable Shear Stress	12,60	kN/cm^2
Modulus of Elasticity	21.000	kN/cm^2

Beam Load Data

					Uniform Load* @	
Span (L)	Allowable Load*		Deflection		L / 360	L / 180
[cm]	q [kN/m]	F [kN]	U [mm]	[L /X]	q [kN/m]	q [kN/m]
50	8.10	2.00	0.85	580	8.10	8.10
60	5.60	1.70	1.23	490	5.60	5.60
70	4.10	1.40	1.66	420	4.10	4.10
80	3.20	1.30	2.21	360	3.20	3.20
90	2.50	1.10	2.77	320	2.30	2.50
100	2.00	1.00	3.38	300	1.60	2.00
125	1.30	0.80	5.36	230	0.80	1.30
150	0.90	0.70	7.69	190	0.50	0.90
175	0.66	0.60	10.45	170	0.30	0.60
200	0.51	0.50	13.78	150	0.20	0.40
225	0.40	0.50	17.31	130	x	0.30
250	0.32	0.40	21.11	120	x	0.20
275	0.27	0.37	26.07	110	x	x
300	0.23	0.35	31.46	100	x	x





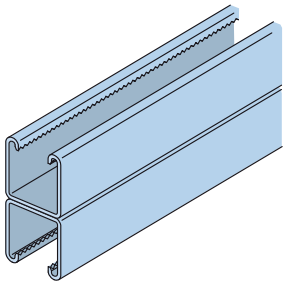
* Given loads are always “allowable characteristic live load”

REFERENCE TABLES AND DATA
CH-342

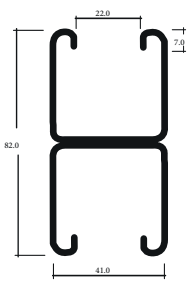
LOAD TABLE FOR SINGLE BEAM WITH UNIFORM (CHARACTERISTIC) LIVE- LOAD

This associated data are considered for perforated and non-perforated c-channel types according to DIN 18.800

Thickness : 2.0 mm
Standard Length : 3.00 m
Finishes : Pre-Galvanized,
Hot-Dip Galvanized.
Stainless Steel



CH-342

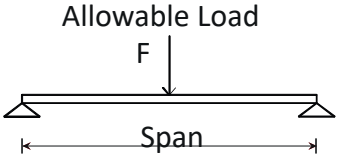


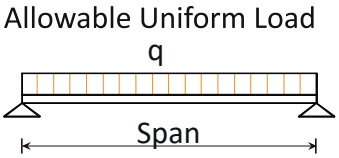
C-Channel:	41x41x2.0 b2b	
Area of Shear (A_z)	1.88	cm^2
Moment of Inertia (I_y)	26.81	cm^4
Moment of Inertia (I_z)	14.04	cm^4
min. Section Modulus (S_y)	6.62	cm^3
Warping Constant (I_w)	113.65	cm^6
Torsional Constant (I_T)	0.08	cm^4
Plastic Moment cap. ($M_{pl,y}$)	1.98	kNm
Self weight (G)	3.76	kg/m

Chosen Material:	40 B = S 235 JRG2	
Allowable Bending Stress	21,82	kN/cm^2
Allowable Shear Stress	12,60	kN/cm^2
Modulus of Elasticity	21.000	kN/cm^2

Beam Load Data

					Uniform Load* @	
Span (L)	Allowable Load*		Deflection		L / 360	L / 180
[cm]	q [kN/m]	F [kN]	U [mm]	[L /X]	q [kN/m]	q [kN/m]
50	24.70	6.20	0.45	1.120	24.70	24.70
60	17.10	5.10	0.64	940	17.10	17.10
70	12.60	4.40	0.87	800	12.60	12.60
80	9.60	3.80	1.14	700	9.60	9.60
90	7.60	3.40	1.44	620	7.60	7.60
100	6.20	3.10	1.79	560	6.20	6.20
125	3.90	2.40	2.75	450	3.90	3.90
150	2.70	2.00	3.9	380	2.70	2.70
175	2.00	1.80	5.42	320	1.80	2.00
200	1.50	1.50	6.4	290	1.20	1.50
225	1.10	1.20	8.15	280	0.80	1.10
250	0.90	1.10	10.16	250	0.60	0.90
275	0.66	0.90	10.91	250	0.50	0.70
300	0.52	0.80	12.18	250	0.40	0.50

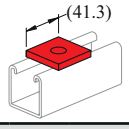




* Given loads are always “allowable characteristic live load”

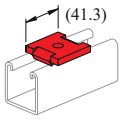
REFERENCE TABLES AND DATA
FLAT PLATE FITTINGS

W102,



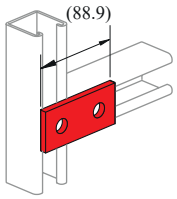
Part No.	Bolt Size	Hole Size	Wt/100 pcs Lbs (kg)
W102	10	11	18 *(8.2)*

W262



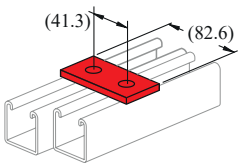
Part Number	Bolt Size	Hole Size	Wt/100 pcs Lbs *(kg)*
W262	10	11	18 *(8.2)*

W165



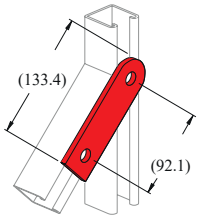
Wt/100 pcs: (17.2 kg)

W124



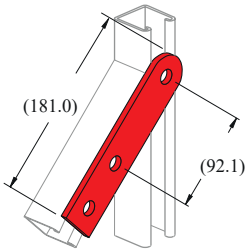
Wt/100 pcs: (15.9 kg)

W225



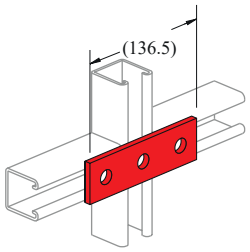
Wt/100 pcs: (24.9 kg)

W224



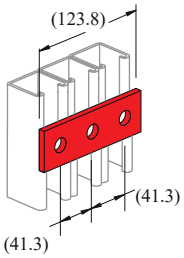
Wt/100 pcs: (34.0 kg)

W166



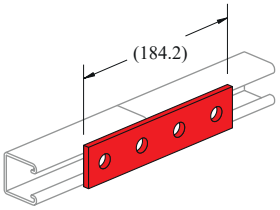
Wt/100 pcs: (25.4 kg)

W125



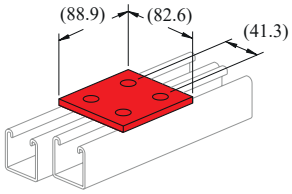
Wt/100 pcs: (22.7 kg)

W167



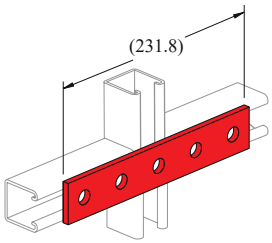
Wt/100 pcs: (35.4 kg)

W279



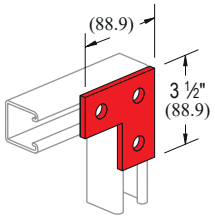
Wt/100 pcs: (33.1 kg)

W141



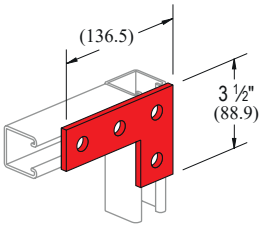
Wt/100 pcs: (42.6 kg)

W136



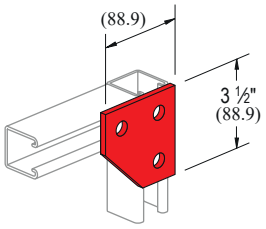
Wt/100 pcs: (26.3 kg)

W138 A



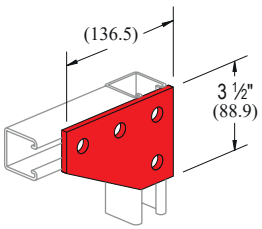
Wt/100 pcs: (36.3 kg)

W134



Wt/100 pcs: (31.8 kg)

W138

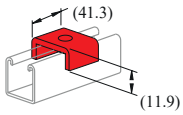


Wt/100 pcs: (47.6 kg)

REFERENCE TABLES AND DATA

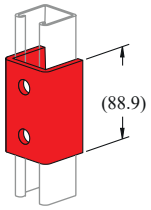
"U" SHAPE FITTINGS

W280



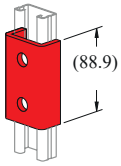
Part Number	Bolt Size (mm)	Hole Size (mm)	Wt/100 pcs Lbs *(kg)*
W280	10	11	14 *6.4*

W136



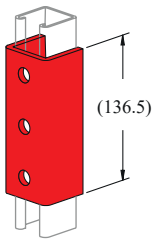
Wt/100 pcs: (58.1 kg)

W436



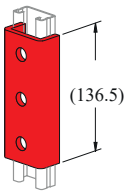
Wt/100 pcs: (38.6 kg)

W136A



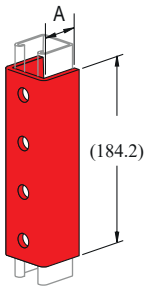
Wt/100 pcs: (89.4 kg)

W436A

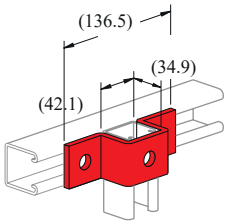


Wt/100 pcs: (59.0 kg)

W137

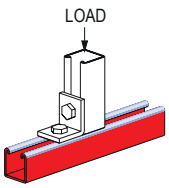
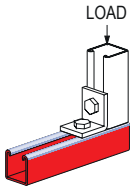
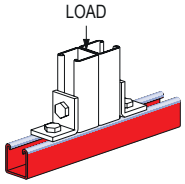


W347

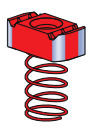


Wt/100 pcs: (38.1 kg)

CHANNEL NUTS AND LOAD DATA, FLAT FITTINGS
BEARING LOADS ON KAVITY CHANNEL

Loads are calculated based on 2001 Specification For The Design Of Cold Formed Steel Structural Members published by AISI			
Channel	**Bearing Length (31.8 mm) Maximum Allowable Loads - Lbs** *(kN)*	**Bearing Length (31.8 mm) Maximum Allowable Loads - Lbs** *(kN)*	**Bearing Length (63.5 mm) Maximum Allowable Loads - Lbs** *(kN)*
A100	3,700 *(16.46)*	1,700 *(7.56)*	4,300 *(19.13)*
A300	3,800 *(16.90)*	1,700 *(7.56)*	4,300 *(19.13)*

CHANNEL NUT WITH SPRING

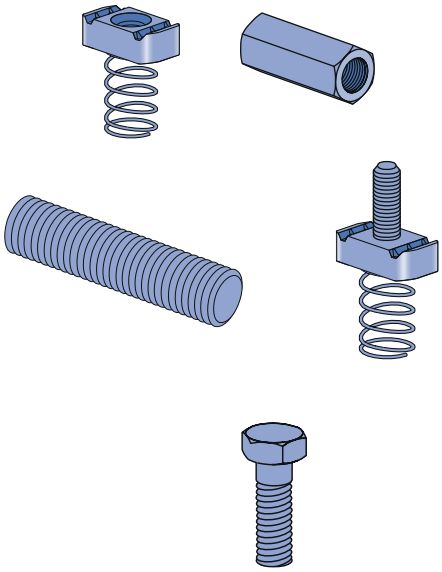


Part Number	Nut Size Thread
S107	M10

CHANNEL NUT WITHOUT SPRINGS

Part Number	Nut Size Thread
S307	M10

NUTS & HARDWARE



MATERIAL

KAVITY channel nuts are manufactured from mild steel cold rolled coil, and after stamping and machining operations are completed, they are case hardened, assuring positive biting action into the inturned edge of the Kavity channel.

Screws conform to SAE J429 GR 2 (exceeds ASTM A307). Proof Load 55KSI, Tensile Load 74 KSI

Bolt Size	Channel Nut ASTM
¼" & 5⁄16"	A1011 SS GR33
3⁄8", 7⁄16" & ½"	A576 GR1015 Modified
5⁄8" & ¾"	A36 or A675 GR60
7⁄8"	A36

FINISHES

All Channel nuts are available in:

Electro-galvanized (EG), conforming to ASTM B633 type III SC1

Hot-dipped galvanized (HG), conforming to ASTM A153

Plain (PL)

Hardware items such as Hex Nuts bolts and washers are Electro-Galvanized (EG), ASTM B633 Type III SC1 finish, unless otherwise noted.

Many hardware items are also available in stainless steel. Consult factory for ordering information.

THREADS

KAVITY nuts and bolts are manufactured to meet the Unified Screw Thread standard, ANSI B1.1, coarse series (UNC) class 2.

DESIGN BOLT TORQUE

BOLT SIZE	¼"-20	5⁄16"-18	3⁄8"-16	½"-13	5⁄8"-11	¾"-10
Rec.Torque Ft/Lbs *(N•m)*	6 *(8)*	11 *(15)*	19 *(26)*	50 *(68)*	100 *(136)*	125 *(170)*
Max Torque Ft/Lbs *(N•m)*	7 *(9)*	15 *(20)*	25 *(34)*	70 *(95)*	125 *(170)*	135 *(183)*

DIMENSIONS

Imperial dimensions are illustrated in inches. Metric dimensions are shown in parenthesis or as noted. Unless noted, all metric dimensions are in millimeters and rounded to one decimal place.

Many KAVITY nuts, bolts and hardware items are also available in standard metric dimensions. Consult factory for ordering information.

FRAMING SYSTEM ACCESSORIES

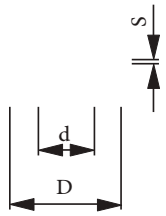
Fully Threaded Rods

Threaded Rod
(STR)

Thread Size	Length (mm)	Load cap. (KN)
M6	2000/3000	2.2
M8	2000/3000	4.0
M10	2000/3000	6.4
M12	2000/3000	12.9
M16	2000/3000	17.3

Round Washers DIN 125

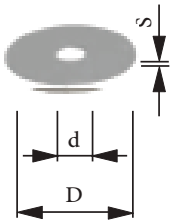
Washers
(SRW)
DIN 125



Round Washer	D (mm)	d (mm)	s (mm)
M6	12	6.4	1.6
M8	16	8.4	1.6
M10	21	10.5	2
M12	24	13	2.5
M16	30	17	3

Round Washers DIN 440,DIN 9021

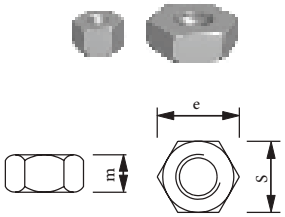
Washers (SRW)
DIN 440,DIN 9021



DIN	Zinc Plated for bolt	D (mm)	d (mm)	s (mm)
440	M6	22	6.6	2
9021	M8	24	8.4	2
9021	M10	30	10.5	2.5
440	M12	45	13.5	4
9021	M12	37	13	3
9021	M16	50	17	3

Hexagon Nuts DIN 934, DIN EN 24032

Hexagon nut (SHN)
DIN 934 or ISO 4032
(= DIN EN 24032)



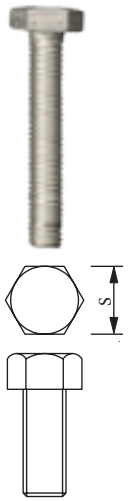
Zinc Plated Thread	S/m DIN (mm)	S/m ISO (mm)	e (mm)
M6	10/5	10/6	11.5
M8	13/6.5	13/7.5	15.0
M10	17/8	16/9.5	19.6
M12	19/10	18/12	21.9
M16	24/13	24/15.5	27.7

Finishing Available : Electroplated, HDG, SS AISI 304 & 316

FRAMING SYSTEM ACCESSORIES

Machine HexHead Bolts DIN 933, DIN 24017

Hex Head Bolt (SHB)
DIN 933 or
EN 24017
(without nut)



Zinc Plated Dimension	S DIN (mm)	S EN (mm)
M 6 x 12	10	10
M 6 x 25		
M 8 x 25	13	13
M 8 x 40		
M 10 x 20	17	16
M 10 x 30		
M 10 x 45		
M 10 x 60		
M 10 x 70		
M 12 x 22	19	18
M 12 x 25		
M 12 x 30		
M 12 x 40		
M 12 x 50		
M 12 x 60		
M 12 x 80		
M 12 x 90		
M 16 x 40	24	24
M 16 x 60		
M 16 x 90		

Coupler Sleeves Rounded

Coupler Sleeves (SCS)

Electroplated Thread	D (mm)	L (mm)	Load .cap (KN)
M6	10/10	15	2.2
M8	12/14	20	4.0
M10	13/16	25	6.4
M12	16/20	30	9.3
M16	21/25	40	17.3
M20	26/32	50	27.0

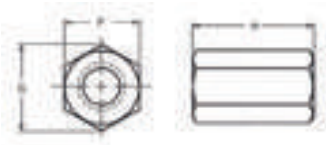
Hexagonal Rod Coupler

Hexagonal
Rod Cou-
pler with
view hole
(SHR)

Electroplated Thread	S (mm)	L (mm)	Load cap. (KN)
M10	13	40	6.4
M12	17	40	9.3
M16	22	50	17.3

Hexagonal Rod Coupler

Hexagonal
Rod Cou-
pler with
view hole
(SHR)



Size	G	F		H	
	Min.	Min.	Max.	Min.	Max.
M6	11.05	9.78	10	17.6	18
M8	14.38	12.73	13	23.5	24
M10	18.9	16.73	17	29.5	30
M12	21.1	18.67	19	35.4	36
M16	26.75	23.67	24	47.0	48
M20	32.95	29.16	30	58.1	60
M24	39.55	35.00	36	70.1	72
M30	50.85	45.00	46	87.8	90

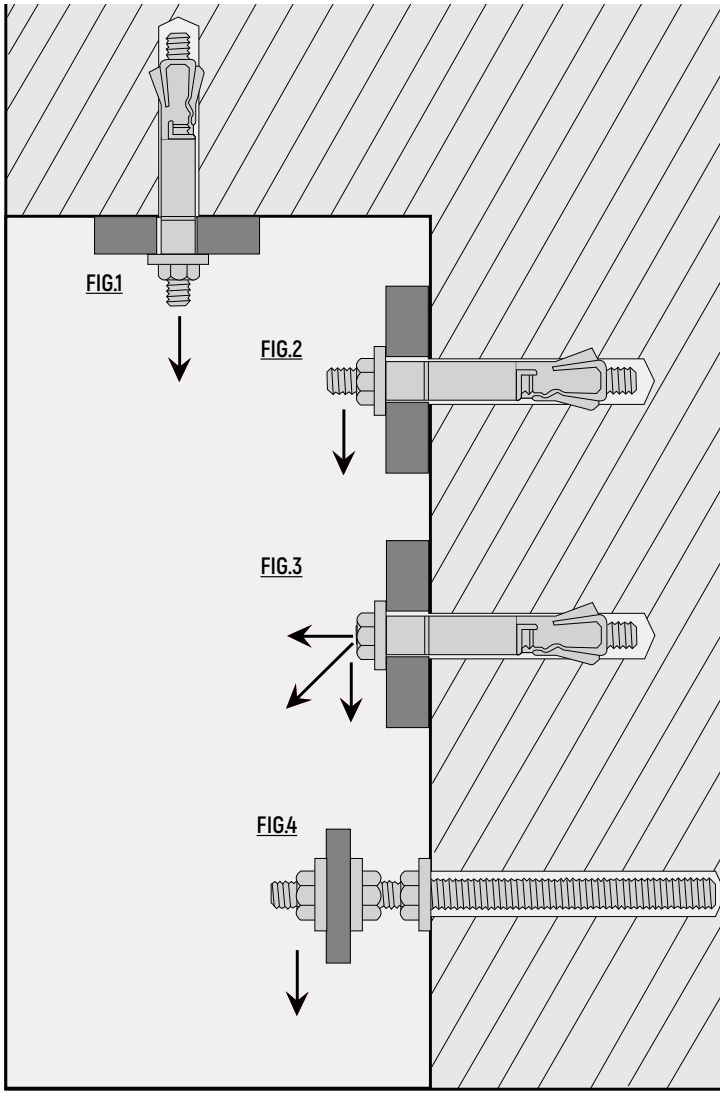
Specification Requirements:
Dimensions: H, F and G - as above
Threads type: 6H
Mechanical Properties: class 6. Proof Load Strength 600MPa
Finish: Electro-plated

Remarks:
1. Above Coupling Nut to be used with Threaded Rod Class 4.6 or less
2. Threaded Rod to be extended inside the Coupler with distance equal or greater than the nominal Threaded diameter which is equal to H/2

Finishing Available : Electroplated, HDG, SS AISI 304 & 316

ANCHORS

HEAVY DUTY ANCHORS
GENERAL INFORMATION



Direction of Loading
The direction of the applied load shall be considered to determine the most appropriate anchor .

The tension and shear components shall be less than the recommended load/design resistance in the direction concerned.

Tensile Loads
Tensile loads are applied along the axis of fixing (see Fig.1).

Common examples include suspended ceiling applications and the suspension of mechanical services, pipework, ductwork, etc.

Shear Loads
Shear loads act at right angles to the axis of fixing and directly against the face of the structural material (see Fig.2).

Shear performance is governed mainly by the shear strength of the bolt material and by the comperssive strength of the supporting substrate.

Oblique / Combined Loads
Oblique loads are a combination of tension and shear components (see Fig.3).

If the angle of the applied oblique load is within 10° of pure tension or pure shear, the safe working load for that direction may be assumed. Otherwise, the applied oblique load shall be resolved into its shear and tensile components.

Offset Loads
Offset loads act at right angles to the fixing axis but are offset from the surface (see Fig.4).

In this situation, the deflection of the bolt due to bending needs to be considered as well as the shear capacity of the anchor.

Slotted Holes in Fixture
When fixing anchors through slotted holes; it is important to ensure that there is an adequate surface contact between the washer and the fixture to guarantee a positive clamping force. If in doubt, a square plate washer with a thickness of 3mm or above would be recommended in place of the standard washer supplied.

Diamond Drilled Holes
When holes are formed in the structure using a diamond drilling system; extra care is required to ensure the holes are thoroughly cleaned by brushing and blowing for at least three times.

Also, to make a key for the anchor (particulary if a bonded anchor is installed) the sides of the hole shall be roughened up by inserting a standard masonry bit into the hole attached to a hammer action drilling machine. A resin with minimal shrinkage shall be selected for diamond drilled holes.

THROUGH ANCHOR - TA
TYPICAL APPLICATIONS

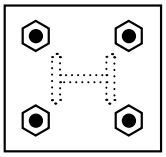
CHANNEL, STEEL CONSTRUCTION, SUPPORTS AND BRACKET

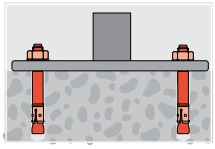
Features:

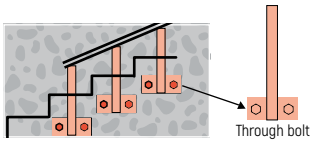
- Suitable for use in cracked concrete or in non-cracked concrete and in natural stone.
- Special design of the clip in stainless steel which ensures a safe hold in the hole.
- Torque controlled expansion.
- Zinc plated > 5µm.
- User friendly, face fixing or through fixing.

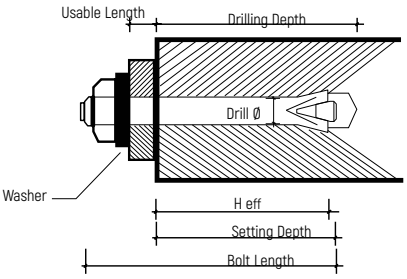
Materials:

- zinc plated steel.
- stainless steel [SS 304 (A2) , SS 316 (A4)].









Technical Data:

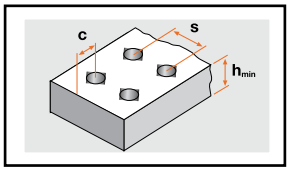
Through bolt zinc plated (non-cracked concrete C20/25).

Bolt Size	Tension Load (KN)	Shear Load (KN)	Torque Moment (Nm)
M6	2.0	1.90	4.0
M8	4.0	4.0	15.0
M10	5.95	5.95	30.0
M12	7.5	10.0	50.0
M16	12.0	16.0	100

*for cracked Concrete we shall use 0,5 x this value (approximately)

Setting Data:

Edge distance > 1,5 H eff. , distance between anchors > 3 x H eff.
Thickness of foundation > 2 x H eff.



Bolt Size	H eff. (mm)	Edge Distance C (mm)	Distance Between Anchors S (mm)	Washer (Ø)	Thickness of Foundation h_{min} (mm)	Tightening Torque (Nm)	Spanner Size
M6	40	60	120	x 1.6 12	100	7	10
M8	50	75	150	x 1.6 16	100	14	13
M10	58	87	174	x 2.0 20	120	30	17
M12	68	102	204	x 2.5 24	140	35	19
M16	80	120	240	x 3.0 30	160	80	24

SLEEVE ANCHOR - SA
TYPICAL APPLICATIONS

CHANNEL, STEEL CONSTRUCTIONS AND MECHANICAL FIXATIONS

Features:

- Suitable for use in concrete, natural stone, brickwork and blockwork- small distance between anchors.
- Optimum performance in most base material types.
- No protruding threads after installation.
- Small distance between anchors and from edge.
- Controlled expansion.
- Zinc plated > 5µm.
- Effective force distribution in the drilled hole.
- Sleeve anchor with hexagon screw or with threaded bolt.

Materials:

- zinc plated steel.
- stainless steel [SS 304 (A2) , SS 316 (A4)].

Technical Data:

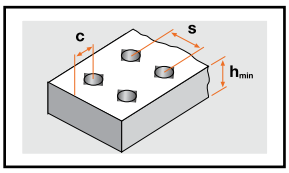
Recommended loads (non-cracked concrete C 20/25).

Bolt Size	Tension Load (KN)	Shear Load (KN)	Torque Moment (Nm)
M6	1.40	2.0	10
M8	2.45	3.3	25.0
M10	3.5	5.0	40.0
M12	....	....	....

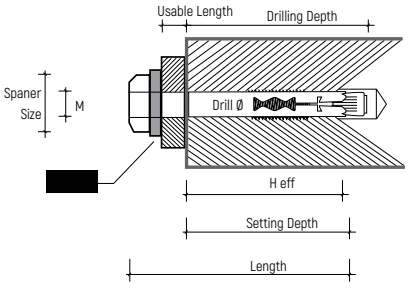
*for cracked Concrete we shall use 0,5 x this value (approximately)

Setting Data:

Edge distance > 1.5 x effective anchorage depth, distance between anchors > 3,0 x effective anchorage depth, min. thickness of foundation > 2,5 x H eff.



Bolt Size	H eff. (mm)	Edge Distance C (mm)	Distance Between Anchors S (mm)	Thickness of Foundation h_{min} (mm)	Washer (Ø) (mm)	Tightening Torque (Nm)	Spanner size
M6	35	52.5	105	70	x 1.6 18	8	10
M8	40	60	120	80	x 1.6 16	25	13
M10	50	75	150	100	x 2.0 20	40	17
M12	75	112.5	225	150	x 2.0 26	50	19



Sleeve Anchor - SAS:

with hexagon screw (non-cracked concrete C20/25).

Size	Length (mm)	Drill (Ø) (mm)	Hole Ø in Fixture (mm)	Drilling Depth (mm)	Setting Depth (Ø)	H eff. (mm)	Min.Usable Length (mm)
M6	45	8	10	55	35	35	5
M6	60	8	10	55	35	35	15
M8	60	10	12	60	40	40	15
M8	80	10	12	60	40	40	25
M10	70	12	14	70	50	50	15
M10	100	12	14	70	60	50	35

*for cracked Concrete we shall use 0,5 x this value (approximately).

EXPANSION ANCHOR XA
TYPICAL APPLICATIONS

CHANNEL, STEEL CONSTRUCTIONS AND MECHANICAL FIXATIONS

Features:

- Suitable for all screws or threaded bolts with metric thread.
- Low energy impact, power-saving assembly.
- Multiple removing and fixing.
- Inside threaded anchor, allows great flexibility.
- Can use variable lengths and art of threaded rods or bolts.
- Small edge distance and small distance between anchors.
- Provide uniform load by tightening the screw or hexagon nut, the cone pulls into the expansion anchor and tightens against the drilled hole.
- Suitable for use in concrete and natural stone.

Materials:

- zinc plated steel.
- stainless steel [SS 304 (A2) , SS 316 (A4)].

Technical Data:

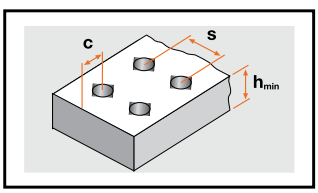
Recommended loads (non-cracked concrete C 20/25).

Type (order No)	Tension Load (KN)	Shear Load (KN)	Torque Moment (Nm)	Screw Grade
M6	2.5	2.3	10	4.6
M8	3.3	4.4	17	4.6
M10	4.7	6.5	34	4.6
M12	6.9	8.5	60	4.6

*for cracked Concrete we shall use 0,5 x this value (approximately)

Setting Data:

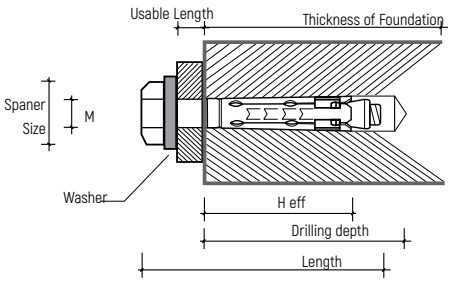
Edge distance > 1,5 x H eff., distance between anchors > 3 x H eff.
Thickness of foundation > 2 x H eff.



Size	H eff. (mm)	Edge Distance C (mm)	Distance Between Anchors S (mm)	Thickness of Foundation h_{min} (mm)	Washer (Ø)	Tightening Torque (Nm)	Spanner size (mm)
M6	40	60	120	100	x 1.6 12	10	10
M8	45	68	135	100	x 1.6 16	20	13
M10	55	83	165	110	x 2.0 20	40	17
M12	70	105	210	140	x 2.5 24	75	19

Installation Parameters:

H eff = Effective anchorage depth.



Bolt Size	Length exp.unit (mm)	Drill (Ø) (mm)	Drilling depth (mm)	H eff. (mm)	Usable Length (mm)	Screw Ø x Length (mm)
M6	45	10	55	40	5	M6 x 50
M8	50	12	60	45	10	M8 x 60
M10	60	15	80	55	20	M10 x 80
M12	75	18	90	70	25	M12 x 90