Technical Manual

Part 5: Proprietary Fixing & Brackets and Surface Finishes

hebel®

The better way to build

8.1 CSR Hebel Fixing Guide

Introduction

CSR Hebel produces lightweight products manufactured from CSR Hebel autoclaved aerated concrete (AAC). AAC has a cellular structure of extremely small, well dispersed air pockets, formed from a liberated gas during the manufacturing process.

This guide has been produce to assist in the selection of the appropriate fixing for use with CSR Hebel AAC. The choice of fixing is dependent upon the application, loading requirements and finish. The fixings detailed in this guide are available through a CSR Hebel distributor, some major hardware outlets, or the manufacturer of the particular fixing. A list of contact details is provided.

The CSR Hebel building systems and products, as well as proprietary products by other manufacturers, are continuously being developed. This on-going development may result in changes to product specifications, range and performance characteristics from time to time. **Therefore, it is important that the user of this guide ensure that they are in possession of the latest information by:**

- **For CSR Hebel fixings and brackets, visiting the CSR Hebel website; or**
- **For proprietary fixings by others, contact the manufacturer or visit the appropriate website.**

Fixing selector

Determine the grade of fixing (Selection table) to suit your application and select a fixing (Types of Fixing Table). Use 'Design Tables' to check the adequacy of the fixing and contact the manufacturer for confirmation.

Note: 1kN is slightly less than 100kg.

Selection of Grade of Fixing

Grade of Fixing	Application	Working (Permissible) Loads	
		Load (kN)	Approx. Load (kg)
Light Duty	Skirtings, coat hooks, small light fittings, towel rails, mirrors, picture & painting hangings, pipe brackets, carpet smooth edge.	< 0.2	~ 20
Medium Duty	Mirrors, large light fittings, door & window framing, plasterboard, shelving, lightweight cupboards & fittings, meter box, tool rack, curtain tracks & rods, towel rails.	0.2 - 0.5	20 - 50
Heavy Duty	Grab rails, hand rails, cisterns, clothes dryers, hand basin, sinks, heavy cupboards.	0.5 - 2.0	50 - 200

Types of Fixings and Supplier

Table/Fastener	Supplier	Page Number
	Light Duty Fixings	
Galvanised Clasp Nail	Hardware Store	8.4
Coarse Thread Screw	Hardware Store / Screw Manufacturer – Distributor	8.4
Helifix TurboFast	Helifix	8.5
Hilti HGN gas concrete anchor	Hilti	8.6
Hilti HPS-1 impact anchor	Hilti	8.13
Mungo Multi Plug Nylon MU	Powers Fasteners	8.20
Mungo Nylon Plug MN	Powers Fasteners	8.19
Mungo Nylon Plug Long MNL	Powers Fasteners	8.19
Powers Rubber Nut	Powers Fasteners	8.18
Powers Zip It®	Powers Fasteners	8.18
Ramset Easy Drive Masonry Anchor	Ramset Fasteners	8.21
Ramset Ramplug Masonry Anchor	Ramset Fasteners	8.22
Ramset Long Ramplug Masonry Anchor	Ramset Fasteners	8.22
Ramset Ultra Long Ramplug Masonry Anchor	Ramset Fasteners	8.23
TOX-TFS-L Long Plug	TOX Fasteners	8.24
TOX-VLF Framing Fixings	TOX Fasteners	8.24
Fischer Nylon Twist Lock Anchor Type-GB	Southern Cross Fasteners	8.26
	Medium Duty Fixings	
Galvanised Clasp Nail	Hardware Store	8.4
Helifix TurboFast	Helifix	8.5
Hilti HRD-U frame anchor	Hilti	8.15
Hilti HGN gas concrete anchor	Hilti	8.6
Mungo Multi Plug Nylon MU	Powers Fasteners	8.20
Mungo Nylon Frame Plug MB-S	Powers Fasteners	8.20
Ramset Ramplug Masonry Anchor	Ramset Fasteners	8.22
Ramset Long Ramplug Masonry Anchor	Ramset Fasteners	8.22
Ramset Ultra Long Ramplug Masonry Anchor	Ramset Fasteners	8.23
TOX-TFS-L Long Plug	TOX Fasteners	8.24
TOX-VLF Framing Fixings	TOX Fasteners	8.24
TOX-MKD Metal Claw Plug	TOX Fasteners	8.25
Fischer Nylon Twist Lock Anchor Type-GB	Southern Cross Fasteners	8.26
	Heavy Duty Fixings	
Hilti HIT-RE 500 injection adhesive	Hilti	8.10
Hilti HIT-HY 150 injection mortar	Hilti	8.7
Mungo Multi Plug Nylon MU	Powers Fasteners	8.20
Mungo Nylon Frame Plug MB-S	Powers Fasteners	8.20
Power-Fast Plus® epoxy injection gel	Powers Fasteners	8.17
KF2 Polyester injection gel	Powers Fasteners	8.17
Ramset Chemical Injection System	Ramset Fasteners	8.21
TOX-KD-DV Heavy Load Toggle	TOX Fasteners	8.25
Fischer Nylon Twist Lock Anchor Type-GB	Southern Cross Fasteners	8.26

8.2 Fixing Suppliers

CSR Hebel recommends contacting the manufacturer of proprietary fixings for the local outlet.

Manufacturer Contact Details
New South Wales

Hilti
Ph: 131 292
Fax: 1300 135 042
23 Egerton Street
Silverwater NSW 2128
www.hilti.com

Ramset
Ph: 1300 780 063
Fax: 1300 556 676
71 Carnarvon Street
Silverwater NSW 2128
Email: enquiry@ramset.com.au
www.ramset.com.au

Fischer Fasteners
c/o Southern Cross Fasteners
Ph: (07) 5524 3919
Fax: (07) 5524 9230
1/35 Machinery Drive
South Tweed Heads NSW 2485
Email: sxf@iinet.net.au

Helifix (Aust.) P/L
Ph: (02) 9368 7707
Fax: (02) 9368 7714
Level 7,100 William Street
East Sydney NSW 2011
www.helifix.com.au

Macsim Fastenings P/L
Ph: 1800 022 019
Fax: (02) 9881 2444
10 Wonderland Drive
Eastern Creek NSW 2766
www.macsim.com.au

ITW Buildex
Ph: 1300 368 101
Fax: 1800 456 448
4 Ash Road
Hoxton Park NSW 2171
www.buildex.com.au

Victoria

Powers Fasteners
Ph: (03) 8787 5888
Fax: (03) 8787 5899
Factory 3 /205 Abbott Road
Dandenong South VIC 3175
www.powers.com.au

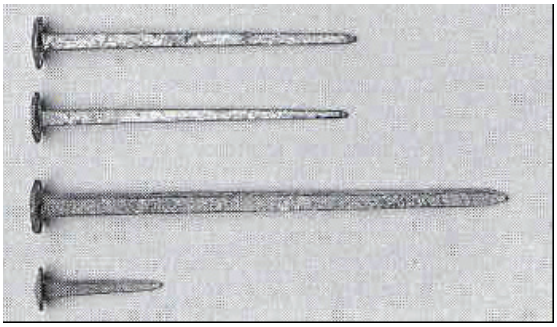
TOX Fasteners
Ph: (03) 9338 3996
Fax: (03) 9338 8366
47 Allied Drive
Tullamarine VIC 3043

CSR Hebel Distributors Contact Details

The 'Contact Details' of the 'Distributors' can be obtained by visiting the CSR Hebel website www.hebelaustralia.com.au or contacting CSR Hebel on 1300 369 448.

8.3 Galvanised Clasp Nail

Galvanised clasp nails can be used to fasten many items to CSR Hebel. The galvanised clasp nail shall have a minimum penetration depth of 50mm. This will give a working pullout load of 0.1kN with a factor of safety of 5. Nails are hammered directly into CSR Hebel and should not be pre-drilled.



Allowable Capacity of Galvanised Clasp Nails

Nail Length (mm)	Penetration Depth (mm)	Allowable Pullout (kN)			Recommended Applications
		AAC-2.5	AAC-3.5	AAC-5.0	
100	88	0.12	0.17	0.29	Light Door Frames, Pictures
125	110	0.16	0.23	0.39	Window Frames
150	138	0.26	0.37	0.64	Gypsum Board

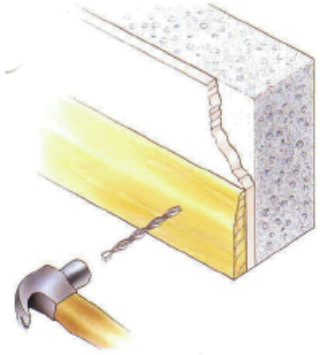
8.4 Coarse Thread Screws

CSR Hebel recommends using a 50mm long x 10 gauge coarse thread screw, with applicable type head, to secure plasterboard sheeting or fixing metal door frames.

Pullout Capacity of Coarse Thread Screw (Tested by CSR Hebel)

Screw Type	Minimum Embedment(mm)	Pullout Working Load (kN)Factor of Safety = 3
Macsim : 10G x 60mm coarse thread	52 +/- 2	0.27
Buildex : 10-12 x 50mm coarse thread	40 +/- 1	0.17
14-10 x 50mm large head	35 (assumed)	0.06
14-10 x 65mm Type 17 - 20mm edge dist.	50 (assumed)	0.24
14-10 x 65mm Type 17 - 40mm edge dist.	50 (assumed)	0.38
14-10 x 65mm Type 17 - 50mm edge dist.	50 (assumed)	0.31
14-10 x 150mm Type 17	75	0.28
100mm HAPES	45	0.29

8.5 HELIFIX TurboFast



TurboFast fixings offer a fast, reliable and economical method for securing timber to low density blocks.

Principle benefits of TurboFast fixings are:

- Manufactured from stainless steel, therefore resist corrosion.
- No pre-drilling required.
- No plugs or screws.
- No problems with splitting of blocks or timber.
- Not loosened by over hammering.
- Straight fixing recommended – skew nailing not required.
- Reduced installation cost.
- Power installer available for rapid fixing.

• For fixing timber door and window frames, skirtings, architraves, battens and trims. Also decorative AAC facings and trims to Hebel.

TurboFast Strength Capacities

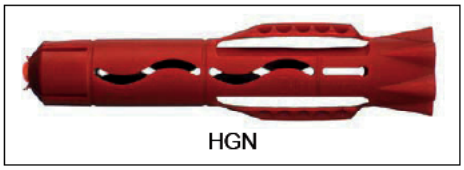
TurboFast Diameter (mm)	Embedment (mm)	Working Load (kN) (Factor of Safety = 3)	
		Pullout	Shear
6	50	0.28	-
6	80	-	0.24
6	90	0.35	0.26
6	120	0.46	-
8	50	0.29	-
8	80	-	0.28
8	90	0.47	0.31
8	120	0.56	-

8.6 HILTI Product Specifications

HILTI

HGN gas concrete anchor

Features:	
	- base material: aerated lightweight concrete, gypsum panel, and other lightweight building materials
	- through-fastening possible
	- universal in application
	- good keying thanks to large fins
Material:	
	- PA 6 polyamide, containing no heavy metals
	- containing no cadmium or lead, halogens, or silicones
	- temperature when setting: from –10 °C to +40 °C


HGN

Basic loading data: HGN

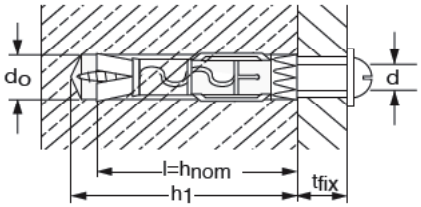
*** Working Loads; N_{rec} & V_{rec} [kN]:**

Base material	HGN 12 + 8mm x 100 coach screw		HGN 14 + 10mm x 110 coach screw	
	Nrec (kN)	Vrec (kN)	Nrec (kN)	Vrec (kN)
Aerated lightweight concrete panel (1) Characteristic compressive strength, f'_c = 4.5MPa	0.5	0.3	0.9	0.3
Aerated lightweight concrete block (2) Characteristic compressive strength, f'_c = 2.25MPa	0.5	0.3	0.7	0.3

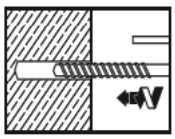
* The working load is calculated from the characteristic ultimate load divided by a factor of safety = 4.
* The working load is calculated with no edge distance or spacing influence.
* N_{rec} = recommended working load in tension, V_{rec} = recommended working load in shear.
* Holes produced by rotary drilling only.
* At temperatures above 40 °C, the recommended figure should be reduced if there is a sustained tensile load.
* NB: 1kN is approximately 100kg.
(1) Tests were carried out on 150mm thick CSR Hebel wall panels and are valid for all similar materials (nominal dry density 550kg/m3).
(2) Tests were carried out on 175mm thick CSR Hebel blocks and are valid for all similar materials (nominal dry density 470kg/m3).

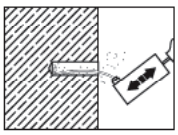
Setting details

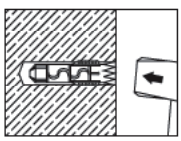
Setting details / Anchor size			HGN 12	HGN 14
d_0	[mm]	Drill bit and anchor diameter	12	14
	[mm]	Min. hole depth	95	110
l	[mm]	Anchor length	75	85
l_s	[mm]	Required screw length	$l + t_{fix} + 5$	$l + t_{fix} + 5$
d	[mm]	Required screw shank diameter	8-10	10-12
Drill bit			TE-CX-12/22	TE-CX-14/22

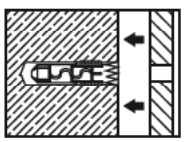


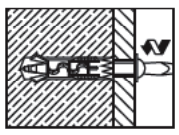
Setting operations


Drill hole with drill bit.


Blow out dust and fragments.


Install / tap in anchor


Part fastened


Drive screw into anchor.

Section 8

HILTI

HIT-HY 150 injection mortar with HAS rod

Features:	
	- base material: concrete, aerated lightweight concrete
	- two-component hybrid adhesive
	- rapid curing
	- no expansion forces in base material
	- high loading capacity
	- small edge distance and anchor spacing possible
	- clean and simple application
	- fastening through in-place parts
	- special lengths available on request
Material:	
Mortar:	- Hilti HIT-HY 150, standard size 330 ml - Hilti HIT-HY 150, Jumbo size 1100 ml
HAS-E:	- grade 5.8 , ISO 898 T1, zinc plated to min 5 µm
HAS-EF:	- grade 5.8 hot dip galvanised
HAS-ER:	- stainless steel, A4-70
Dispenser:	- MD2000, BD2000, P3000 F, P5000 HY

HIT-HY 150 foil pack, mixer

HAS-E, HAS-EF, HAS-ER rods

Basic loading data HIT-HY 150 with HAS-E, HAS-EF, HAS-ER

*** Working Loads; N_{rec} & V_{rec} [kN]:**

Base material \ Anchor Size		M8	M10	M12
Aerated Lightweight Concrete Characteristic Compressive Strength, f'_c = 4.5MPa	N_{rec}	1.8kN	2.3kN	2.9kN
	V_{rec}	0.5kN	0.7kN	0.9kN

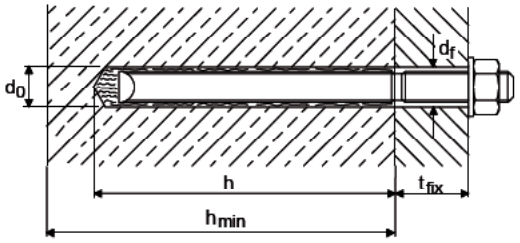
* The working load is calculated from the characteristic ultimate load divided by a factor of safety = 3
* N_{rec} = recommended working load in tension, V_{rec} = recommended working load in shear
* Holes produced by rotary drilling only, then cleaned as per *setting operations* to remove all dust in hole.
* Dry density of aerated lightweight concrete > 550kg/m^3
* NB: 1kN is approximately 100kg

Thread size (mm)	Hole dia. (mm)	Hole depth (mm)	Edge dist. min. (mm)	Spacing min. (mm)	Rod length (mm)	Max. thickness Fastened (mm)	Rod designation
M8	10	80	80	160	110	14	HAS-E M8x80/14
M10	12	90	90	180	130	21	HAS-E M10x90/21
M12	14	110	110	220	160	28	HAS-E M12x110/28

* Edge distance min. and spacing min. refer to the minimum edge distance and spacing to retain full load capacity in tension and shear.

HIT-HY 150 injection mortar with HAS rod

Setting details



Anchor size			M8	M10	M12
Anchor rod[1]	HAS-E/-EF/-ER		(M8x110/14)	(M10x130/21)	(M12x160/28)
			M8x80/14	M10x90/21	M12x110/28
d_0	[mm]	Drill bit diameter	10	12	14
h	[mm]	Hole depth	80	90	110
h_{min}	[mm]	Min. base material thickness	100	120	140
t_{fix}	[mm]	Max. fixture (fastenable) thickness	14	21	28
d_f	[mm]	Clearance hole rec.	9	12	14
		Clearance hole max.	11	13	15
Injected volume (guide)[2),3)]		ml	5	8	12
			The hole must be at least 2/3rds full.		
Drill bit			TE-CX-10/22	TE-CX-12/22	TE-CX-14/22

[1)] The values in the first line describe the old specification for the anchor rod.

[2)] **Note:** To ensure that optimal holding power is obtained, the first two trigger pulls of adhesive after opening a foil pack of Hilti HIT-HY 150 must be thrown away.

[3)] One trigger pull is approx. 8 ml mortar when using the MD 2000.

Base Material temperature, °C	Working time in which rod can be inserted and adjusted, t_{gel}	Curing time before anchor can be fully loaded, t_{cure}
-5	90 min.	6 hours
0	45 min.	3 hours
5	25 min.	1.5 hours
20	6 min.	50 min.
30	4 min.	40 min.
40	2 min.	30 min.

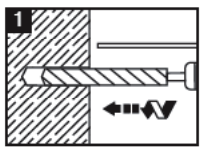
The foil pack temperature must be at least +5°C.

Installation equipment

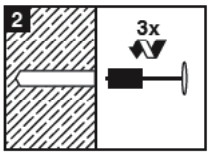
Rotary hammer (TE1, TE 2, TE5, TE6A, TE15, TE15-C,), a drill bit, the dispensing gun (MD 2000, BD 2000 P3000 F, P5000 HY), blow-out pump, a brush & a wrench.

HIT-HY 150 injection mortar with HAS rod

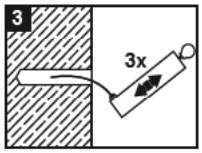
Setting operations

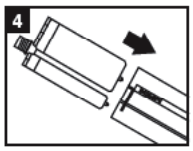


Drill hole.

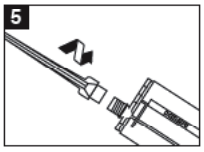


Clean hole.

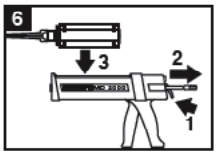




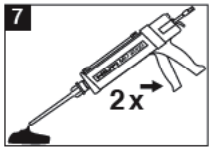
Insert foil pack into holder.



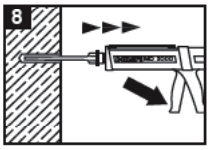
Screw in mixer.



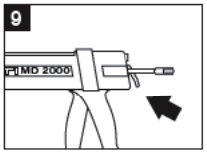
Put cartridge into dispenser.



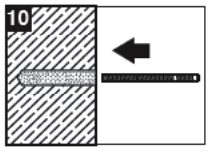
Throw away (must) first two trigger pulls.



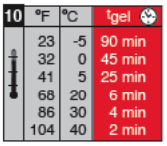
Inject adhesive.

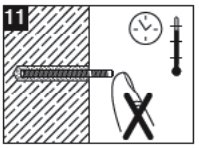


Release dispenser.

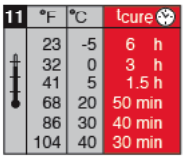


Insert rod before gel time.

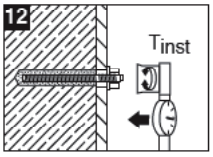




Wait for curing.



t_{cure} time



Apply tightening torque.

Anchor geometry and mechanical properties

Anchor size			M8	M10	M12
A_s [mm²]	Stressed cross-section		32.8	52.3	76.2
f_{uk} [N/mm²]	Nominal tensile strength	HAS-E, HAS-EF HAS-ER	500 700	500 700	500 700
f_{yk} [N/mm²]	Nominal yield strength	HAS-E, HAS-EF HAS-ER	400 450	400 450	400 450
W [mm³]	Section modulus		26.5	53.3	93.9
$M_{Rd,s}$ [Nm]	Design bending resistance [1]	HAS-E , HAS-EF HAS-ER	12.7 14.3	25.6 28.7	45.1 50.6
S_w [mm]	Width across flats		13	17	19
d_w [mm]	Washer diameter		16	20	24

[1] The design bending resistance of the anchor rod was calculated from $M_{Rd,s} = (1.2*W* f_{uk})/\gamma_{Ms,b}$, where the partial safety factor for steel of grade 5.8 is $\gamma_{Ms,b} = 1.25$, for A4-70 and HCR $\gamma_{Ms,b} = 1.56$. Verification of the safety level is then $M_{Sk}*\gamma_F \leq M_{Rd,s}$.

Section 8

HIT-RE 500 injection adhesive with HAS rod

Features:	
	- base material: concrete, aerated lightweight concrete
	- two-component adhesive
	- long working time at elevated temperatures
	- no expansion forces in base material
	- high loading capacity
	- small edge distance and anchor spacing possible
	- clean and simple application
	- fastening through in-place parts
	- special lengths available on request
Material:	
Mortar:	- Hilti HIT-RE 500, standard size 330 ml - Hilti HIT-RE 500, Jumbo size 1100 ml
HAS-E:	- grade 5.8 , ISO 898 T1, zinc plated to min.5 µm
HAS-EF:	- grade 5.8 hot dip galvanised
HAS-ER:	- stainless steel; A4-70
Dispenser:	- MD2000, BD2000, P3000 F, P5000 HY

HIT-RE500 foil pack, mixer

HAS-E, HAS-EF, HAS-ER rods

Basic loading data HIT-RE 500 with HAS-E, HAS-EF, HAS-ER

*** Working Loads; N_{rec} & V_{rec} [kN]:**

Base material \ Anchor Size		M8	M10	M12
Aerated Lightweight Concrete Characteristic Compressive Strength, f'_c = 4.5MPa	N_{rec}	2.1kN	2.7kN	3.0kN
	V_{rec}	0.5kN	0.7kN	0.9kN

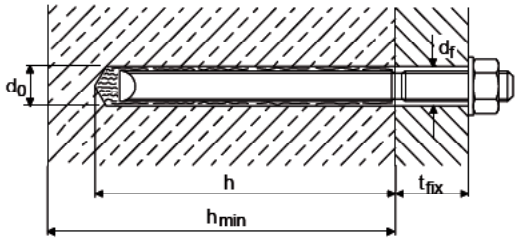
* The working load is calculated from the characteristic ultimate load divided by a factor of safety = 3
* N_{rec} = recommended working load in tension, V_{rec} = recommended working load in shear
* Holes produced by rotary drilling only, then cleaned as per *setting operations* to remove all dust in hole.
* Dry density of aerated lightweight concrete > 550kg/m^3
* NB: 1kN is approximately 100kg

Thread size (mm)	Hole dia. (mm)	Hole depth (mm)	Edge dist. min. (mm)	Spacing min. (mm)	Rod length (mm)	Max. thickness Fastened (mm)	Rod designation
M8	10	80	80	160	110	14	HAS-E M8x80/14
M10	12	90	90	180	130	21	HAS-E M10x90/21
M12	14	110	110	220	160	28	HAS-E M12x110/28

* Edge distance min. and spacing min. refer to the minimum edge distance and spacing to retain full load capacity in tension and shear.

HIT-RE 500 injection adhesive with HAS rod

Setting details



Anchor size			M8	M10	M12
Anchor rod[1]		HAS-E/-EF/-ER	(M8x110/14)	(M10x130/21)	(M12x160/28)
			M8x80/14	M10x90/21	M12x110/28
d_0	[mm]	Drill bit diameter	10	12	14
h	[mm]	Hole depth	80	90	110
h_{min}	[mm]	Min. base material thickness	100	120	140
t_{fix}	[mm]	Max. fixture (fastenable) thickness	14	21	28
d_f	[mm]	Clearance hole rec.	9	12	14
		Clearance hole max.	11	13	15
Injected volume (guide)[2),3)]		ml	5	8	12
			The hole must be at least 2/3rds full.		
Drill bit			TE-CX-10/22	TE-CX-12/22	TE-CX-14/22

[1)] The values in the first line describe the old specification for the anchor rod.
[2)] **Note:** To ensure that optimal holding power is obtained, the first three trigger pulls of adhesive after opening a foil pack of Hilti HIT-RE 500 must be thrown away.
[3)] One trigger pull is approx. 8 ml mortar when using the MD 2000.

Base Material temperature, °C	Working time in which rod can be inserted and adjusted, t_{gel}	Curing time before anchor can be fully loaded, t_{cure}
40°C	12 min	4 hours
30°C	20 min	8 hours
20°C	30 min	12 hours
10°C	2 hours	24 hours
0°C	3 hours	50 hours
-5°C	4 hours	72 hours

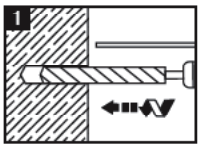
The foil pack temperature must be at least +5°C.

Installation equipment

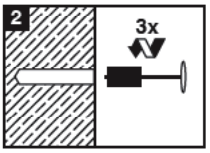
Rotary hammer (TE1, TE 2, TE5, TE6A, TE15, TE15-C,), a drill bit, the dispensing gun (MD 2000, BD 2000 P3000 F, P5000 HY), blow-out pump, a brush & a wrench.

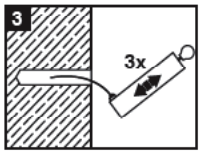
HIT-RE 500 injection adhesive with HAS rod

Setting operations

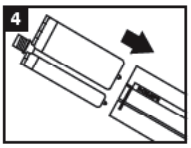


Drill hole.

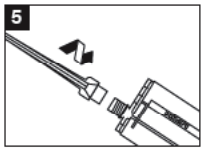




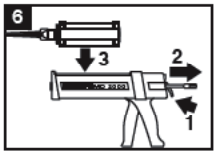
Clean hole.



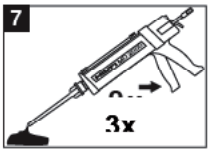
Insert foil pack into holder.



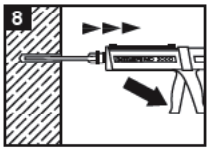
Screw in mixer.



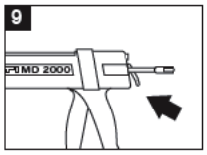
Put cartridge into dispenser.



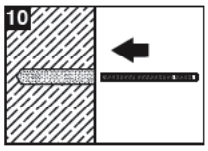
Throw away (must) first three trigger pulls.



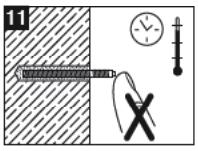
Inject adhesive.



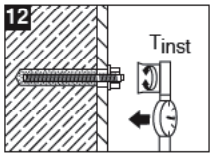
Release dispenser



Insert rod before gel time



Wait for curing.



Apply tightening torque.

Anchor geometry and mechanical properties

Anchor size			M8	M10	M12
A_s [mm²]	Stressed cross-section		32.8	52.3	76.2
f_{uk} [N/mm²]	Nominal tensile strength	HAS-E, HAS-EF HAS-ER	500 700	500 700	500 700
f_{yk} [N/mm²]	Nominal yield strength	HAS-E, HAS-EF HAS-ER	400 450	400 450	400 450
W [mm³]	Section modulus		26.5	53.3	93.9
$M_{Rd,s}$ [Nm]	Design bending resistance [1]	HAS-E , HAS-EF HAS-ER	12.7 14.3	25.6 28.7	45.1 50.6
S_w [mm]	Width across flats		13	17	19
d_w [mm]	Washer diameter		16	20	24

[1] The design bending resistance of the anchor rod was calculated from $M_{Rd,s} = (1.2*W* f_{uk})/\gamma_{Ms,b}$, where the partial safety factor for steel of grade 5.8 is $\gamma_{Ms,b} = 1.25$, for A4-70 and HCR $\gamma_{Ms,b} = 1.56$. Verification of the safety level is then $M_{Sk}*\gamma_F \leq M_{Rd,s}$.

HILTI

HPS-1 impact anchor

Features:	
	- base material: concrete and solid or hollow brick, aerated lightweight concrete
	- ready-to-use anchor for through-fastening
	- impact expansion by hammer or screwdriver
	- removable and adjustable with a screwdriver
Material:	
	- PA 6.6 polyamide, contains no heavy metals
	- contains no cadmium, lead, halogens, or silicones
	- temperature when setting: from –10 °C to +40 °C
Drive screw:	- steel zinc plated to 5 microns
	- stainless steel, A2 grade

HPS-1 (zinc plated)
HPS-1 S (counter sunk head)
HPS-1 R (stainless steel)

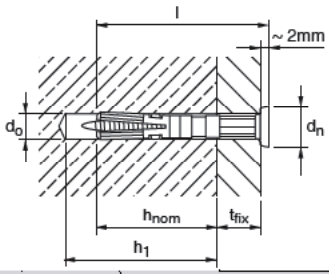
Basic loading data: HPS-1

*** Working Loads; N_{rec} [kN]:**

Base material / Anchor size		HPS-1 5/5 - 5/15	HPS-1 6/5 - 6/40	HPS-1 8/10 - 8/80
Aerated Lightweight Concrete Characteristic Compressive Strength, f'_c = 4.5MPa	N_{rec}	0.03kN	0.04kN	0.06kN

* The working load is calculated from the characteristic ultimate load divided by a factor of safety = 5.
* The working load is calculated with no edge distance or spacing influence.
* N_{rec} = recommended working load in tension.
* Holes produced by rotary drilling only.
* At temperatures above 40 °C, the recommended figure should be reduced if there is a sustained tensile load.
* Dry density of aerated lightweight concrete > 550kg/m^3
* NB: 1kN is approximately 100kg

Setting details

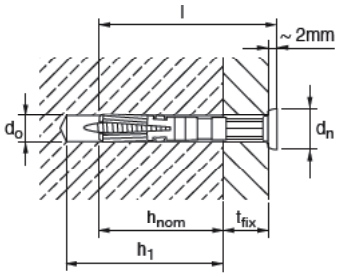


Setting details / Anchor size HPS-1			5/5	5/15	6/5	6/10	6/15	6/25	6/40
d_0	[mm]	Drill bit diameter	5	5	6	6	6	6	6
h_0	[mm]	Hole depth	30	30	40	40	40	40	40
h_{nom}	[mm]	Anchorage depth	20	20	25	25	25	25	25
t_{fix}	[mm]	Fixture (fastenable) thickness	5	15	5	10	15	25	40
l	[mm]	Anchor length	27	37	32	37	42	52	67
d_n	[mm]	Head diameter	9.5	9.5	11	11	11	11	11
Drill bit			TE-CX-5/12		TE-CX-6/12				

Section 8

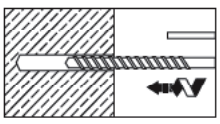
HILTI

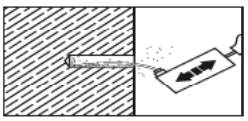
HPS-1 impact anchor

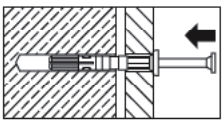


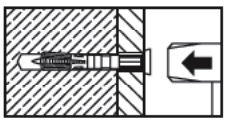
Setting details	Anchor size HPS-1 8/10	8/20	8/30	8/40	8/60	8/80
d_0 [mm] Drill bit diameter	8	8	8	8	8	8
h_0 [mm] Hole depth	50	50	50	50	50	50
h_{nom} [mm] Anchorage depth	30	30	30	30	30	30
t_{fix} [mm] Fixture (fastenable) thickness	10	20	30	40	60	80
l [mm] Anchor length	42.5	52.5	62.5	72.5	92.5	112.5
d_n [mm] Head diameter	13	13	13	13	13	13
Drill bit	TE-CX-8/17					

Setting operations


Drill hole with drill bit


Blow out dust


Install anchor.


Hammer in anchor.

Section 8

HILTI

HRD-U frame anchor

Features:	
	- base material: concrete, solid brick, hollow brick, aerated lightweight concrete
	- ready-to-use anchor (anchor body and matching screw)
	- suitable for through-fastening
	- tap-in stops eliminate premature expansion
	- low tightening torque
Material:	
	- PA 6 / 6.6 Polyamide, contains no heavy metals
	- contains no cadmium or lead
	- contains no halogens or silicones
	- temperature when setting: from –10 °C to +40 °C
Screw:	
Zinc plated:	- with hexagon, hex + integrated washer and countersunk head
	- 5 microns, yellow chromated, 6.8, ISO 898 T1
Hot-dip galvanised:	- with hexagon and hex + integrated washer, 45 microns, grey
Stainless steel:	- with hexagon, countersunk head, A4

HRD-UGT 10 (counter sunk screw, zinc plated)
HRD-URT 10 (counter sunk screw, stainless steel)

HRD-UGS 10 (hex head screw, zinc plated)
HRD-UFS 10 (hex head screw, hot dip galvanised)
HRD-URS 10 (hex head screw, stainless steel)

Basic loading data: HRD-U 10

* Working Loads; N_{rec} & V_{rec} [kN]:

Base material	HRD-U 10		Anchor Spacing Min. (mm)	Edge Distance Min. (mm)	Min. Base Material Thickness (mm)
	Nrec (kN)	Vrec (kN)			
Aerated lightweight concrete panel (1) Characteristic compressive strength, f'_c = 4.5MPa	0.7	0.3	150	150	115
Aerated lightweight concrete block (2) Characteristic compressive strength, f'_c = 2.25MPa	0.6	0.3	150	150	115

* The working load is calculated from the characteristic ultimate load divided by a factor of safety = 4.
* N_{rec} = recommended working load in tension, V_{rec} = recommended working load in shear.
* Holes produced by rotary drilling only.
* At temperatures above 40 °C, the recommended figure should be reduced if there is a sustained tensile load.
* NB: 1kN is approximately 100kg.
(1) Tests were carried out on 150mm thick CSR Hebel wall panels and are valid for all similar materials (nominal dry density 550kg/m3).
(2) Tests were carried out on 175mm thick CSR Hebel blocks and are valid for all similar materials (nominal dry density 470kg/m3).

Permissible bending moments for screw; M_d [Nm]:

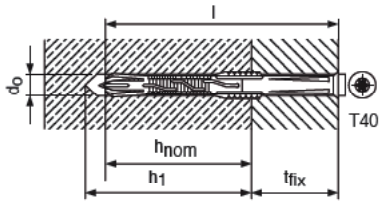
Anchor	HRD-U 10
Tensile load	N_{Rec} = 0 kN
Zinc plated screw	10.1Nm
Stainless-steel screw	9.5Nm

Section 8

HRD-U frame anchor

Setting details

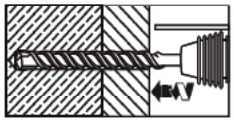
HRD-U 10



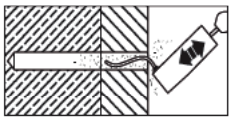
Setting details		Anchor size	HRD-U 10				
			x80/10	x100/30	x120/50	x140/70*	x180/110*
d_0	[mm]	Drill bit and anchor diameter	10				
h_1	[mm]	Min. hole depth	80				
h_{nom}	[mm]	Min. anchorage depth	70				
t_{fix}	[mm]	Max. fixture (fastenable) thickness	10	30	50	70	110
L	[mm]	Anchor length	80	100	120	140	180
Drill bit size			TE-CX-10/17	TE-CX-10/22			TE-CX-10/27

+ subject to lead time for certain material types
* Anchor holes in aerated lightweight concrete may only be drilled with a rotary action (without hammering).
* Holes in the part to be fastened should be max. 0.5 mm larger than the anchor diameter.

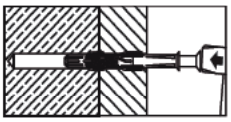
Setting operations



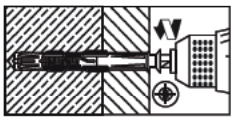
Drill hole with drill bit.



Blow out dust and fragments.



Install anchor.



Drive screw into anchor.

8.7 POWERS Product Specifications

Load performance of Powers Adhesives in CSR HEBEL materials

POWER-FAST PLUS® Epoxy injection gel

KF2 Polyester injection gel

Adhesive type	Bar dia mm	Drill dia mm	Depth mm	Edge distance mm		Spacing mm		Recommended Working Load Safety factor 4:1 kN							
								Floor Panel		Wall Panel		Thermoblok		Sonoblok	
				Tension	Shear	Tension	Shear	Tension	Shear	Tension	Shear	Tension	Shear	Tension	Shear
POWERFAST PLUS®	10	12	90	75	100	75	100	2.29	1.26	2.11	1.16	1.73	0.87	2.54	1.40
	12	14	110					2.88	1.58	2.74	1.50	1.95	0.98	3.23	1.77
KF 2	10	12	90					0.69	0.41	0.78	0.47	1.33	0.73	1.37	0.82
	12	14	110					1.43	0.86	1.13	0.68	1.46	0.80	1.54	0.92

Adhesive type	Bar dia mm	Drill dia mm	Depth mm	Edge distance mm		Spacing mm		Recommended Working Load Safety factor 4:1 kN	
								Power Panel	
				Tension	Shear	Tension	Shear	Tension	Shear
POWERFAST PLUS®	10	12	50	75	100	75	100	0.61	0.34
	12	14						0.68	0.37
KF 2	10	12						0.26	0.14
	12	14						0.41	0.22

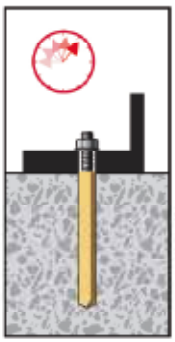
Installation of POWER-FAST PLUS® Epoxy and KF2 polyester injection gels

1 Drill a hole to the size and embedment required.

2 Blow the hole clean with compressed air, brush the hole, and blow it clean again.

3 Fill the hole approximately half way with adhesive mortar starting from the rear of the hole. Slowly withdraw the static mixing nozzle as the hole fills to avoid creating air pockets within the hole.

4 Push the threaded rod or rebar into the hole while turning slightly to insure full distribution of the adhesive. The rod or rebar should be free from dirt, grease, oil, or foreign material.



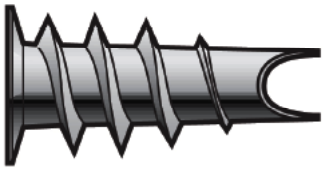
5 Allow the adhesive mortar to cure for the specified time prior to applying any load.

Powers Fasteners Australasia Pty Ltd. PASS Document v1 11/2001

Powers FASTENERS

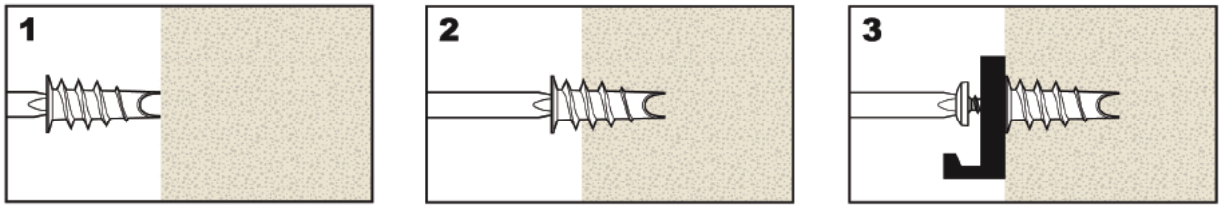
Load performance of Powers anchors in CSR HEBEL material

ZiP-It® Metal Hollow body self drilling metal anchor (For Thermoblok only)



Anchor length mm	Screw size No.	Recommended working load Tension/Shear - kN (kg)
30	#6 - 8	0.28 (28) Incorporated safety factor = 5

Installation of ZiP-It®

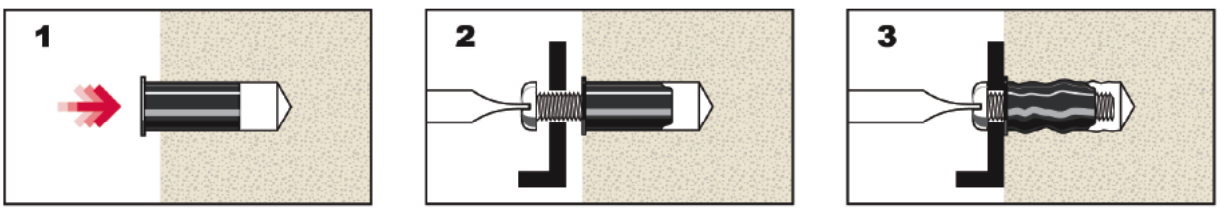


Rubber Nut multi purpose anchor

Description	Anchor length mm	Thread	Screw length mm	Hole Dia. mm	Recommended working load Tension/Shear - kN (kg)
M5 x 38	38	M5	50	10	0.41 (41) Incorporated safety factor = 5

Tested in Thermoblok

Installation of Rubber Nut



Section 8

Powers FASTENERS

Load performance of *mungo*® by Powers anchors in CSR HEBEL material

MUNGO Nylon Plug (MN)

Method of installation

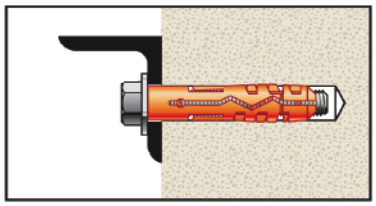
Through and pre-assembly fixing

Applications

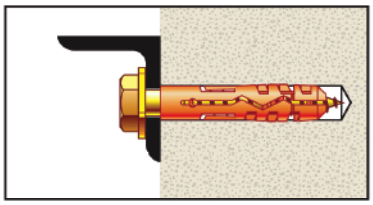
Skirtings, coat hangers, small light fittings, towel rails, mirrors, pictures, pipe brackets, shelves, light cupboards.

Description	Plug and drill Ø mm	Length mm	Screw type Wood/Chipboard - Metric gauge	mm	Recommended working load Tension/Shear kN	(kg)
MN4	4	20	2 - 5	-	0.02	(2)
MN5	5	25	3 - 8	M3	0.04	(4)
MN6	6	30	6 - 10	M4	0.06	(6)
MN7	7	35	9 - 10	M4	0.07	(7)
MN8	8	40	9 - 14	M5	0.09	(9)
MN10	10	50	14 - 20	M6	0.2	(20)
MN12	12	60	20 - 24	M8	0.4	(40)
MN14	14	70	-	M10	0.5	(50)
MN16	16	80	-	M12	0.6	(60)
MN20	20	90	-	M14	1.0	(100)

Tested in Thermoblok. Reached with max. diameter wood screw. Safety factor = 5

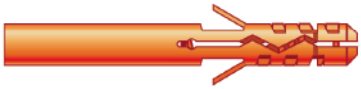


Fixing with MN and metric screw -through fixing



Fixing with MN and wood/chipboard screw - pre-assembly fixing

MUNGO Nylon Plug Long (MNL)



Description	Plug and drill Ø mm	Length mm	Screw size gauge	Recommended working load Tension/Shear kN	(kg)
MNL6	6	50	6 - 10	0.06	(6)
MNL8	8	60	9 - 14	0.09	(9)

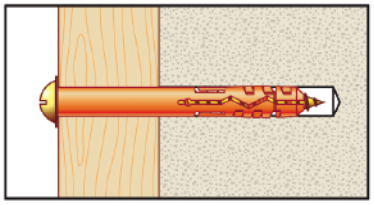
Tested in Thermoblok. Reached with max. diameter wood screw. Safety factor = 5

Method of installation

Through and pre-assembly fixing

Applications

Timber door frames, timber window frames



Suitable for frame fixing

Powers Fasteners Australasia Pty. Ltd. PASS Document v1 01/2002

8.8 Ramset Product Specifications

Ramset Chemical Injection System

CSR Hebel recommends that the preparation and installation of the chemical injection systems are performed in accordance with the manufacturer's specification.

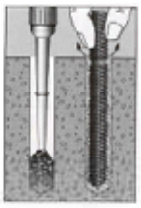
Important: Ensure the drilled hole is completely free of AAC dust prior to installing the bonding agent.

Capacity of Ramset Chemical Injection System

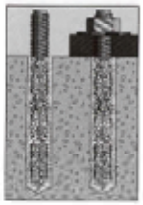
Anchor PartNo.	Anchor Size		Twist Drill		Recommended Working Loads (Safety factor 3:1)				Edge Distance(mm)		Spacing(mm)	
	Dia.(mm)	Length(mm)	Dia.(mm)	Length(mm)	Tensile Load (kN)		Shear Load (kN)					
					AAC Compressive Strength (MPa)		AAC Compressive Strength (MPa)		Tension	Shear	Tension	Shear
					2.5	4.5	2.5	4.5				
M10130	10	130	12	90	2.0	2.4	1.2	1.5	60	100	60	100
M12160	12	160	13	110	2.3	2.9	1.3	1.6	72	100	72	100

Installation Procedure

1. Drill correct diameter hole to recommend depth. Clean hole thoroughly with a nylon brush. Remove debris by way of vacuum pump, compressed air hand pump etc.



2. Insert mixer nozzle and inject mixture into hole. insert the stud into the bottom of the hole using a slow twisting motion.



3. Allowresin to cure as per recommendations. Attach fixture

Ramset Easydrive Masonry Anchor

Capacity of Ramset Easydrive Masonry Anchor – Pre-assembled fixing with screw included

Anchor PartNo.	Anchor Size		Twist Drill		Recommended Working Loads (Safety factor 4:1)				Edge Distance(mm)		Spacing(mm)	
	Dia.(mm)	Length(mm)	Dia.(mm)	Length(mm)	Tensile Load (N)		Shear Load (N)					
					AAC Compressive Strength (MPa)		AAC Compressive Strength (MPa)		Tension	Shear	Tension	Shear
					2.5	4.5	2.5	4.5				
ED533	5	33	5	27	50	60	105	160	35	70	50	50
ED550	5	50	5	27	50	60	105	160	35	70	50	50
ED642	6	42	6	30	60	70	140	200	35	70	50	50
ED655	6	55	6	30	60	70	140	200	35	70	50	50
ED675	6	75	6	30	60	70	90	130	35	70	50	50
ED880	8	80	8	40	125	115	230	330	40	80	60	60
ED8120	8	120	8	40	125	150	140	170	40	80	60	60

Installation Procedure

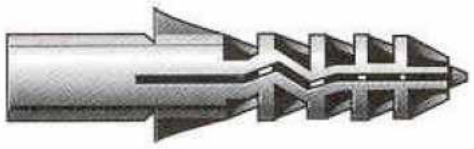
1. Drill hole same diameter as Easydrive anchor

2. Insert the Easydrive anchor through the material being fastened up to the anchor collar

3. Screw or hammer the nail in for positive expansion. Easydrive anchor can be removed if required.

Ramset Ramplug Masonry Anchor

The Ramset Ramplug is a nylon plug for securing screws in lightweight building materials. Major benefits of the Ramplug are quick installation and its special design making it suitable for all types of screws.



Capacity of Ramset Ramplug Masonry Anchor

Anchor PartNo.	Anchor Size		Twist Drill		Screw Dia.(mm)	Recommended Working Loads (Safety factor 4:1)				Edge Distance(mm)		Spacing(mm)	
						Tensile Load (N)		Shear Load (N)					
	Dia.(mm)	Length(mm)	Dia.(mm)	Length(mm)		AAC Compressive Strength (MPa)		AAC Compressive Strength (MPa)		Tension	Shear	Tension	Shear
						2.5	4.5	2.5	4.5				
DNP5	5	25	5	35	3.0 – 4.0	55	85	55	90	35	70	50	50
DNP6	6	30	6	40	4.0 – 5.0	85	135	85	125	35	70	50	50
DNP7	7	35	7	50	4.5 – 5.5	120	170	100	140	40	80	60	60
DNP8	8	40	8	55	5.0 – 6.0	160	215	140	200	40	80	60	60
DNP10	10	50	10	65	6.0 – 8.0	255	370	165	245	75	100	75	75
DNP12	12	60	12	75	8.0 – 10.0	350	520	205	305	75	100	75	75

Ramset Long Ramplug Masonry Anchor

The Ramset Long Ramplug is a nylon plug with an extra long expansion segment, for use in lightweight building materials, such as autoclaved aerated concrete.

Capacity of Ramset Long Ramplug Masonry Anchor

Anchor PartNo.	Anchor Size		Twist Drill		Screw Dia.(mm)	Recommended Working Loads (Safety factor 4:1)				Edge Distance(mm)		Spacing(mm)	
						Tensile Load (N)		Shear Load (N)					
	Dia.(mm)	Length(mm)	Dia.(mm)	Length(mm)		AAC Compressive Strength (MPa)		AAC Compressive Strength (MPa)		Tension	Shear	Tension	Shear
						2.5	4.5	2.5	4.5				
410627	6	55	6	65	4.0 – 5.0	165	200	150	185	35	70	50	50
410658	8	65	8	80	5.0 – 6.0	220	270	210	250	40	80	60	60
410689	10	80	10	95	6.0 – 8.0	275	335	270	330	75	100	75	75
410719	12	95	12	110	8.0 – 10.0	285	470	280	395	75	100	75	75

Ramset Ultra Long Ramplug Masonry Anchor

The Ramset Ultra Long Ramplug is a long shaft nylon plug for fixing wood or metal facades sub-frames. Supplied complete with the compact screw. Available in two head styles Posi and Hex Head.

Capacity of Ramset Ultra Long Ramplug Masonry Anchor

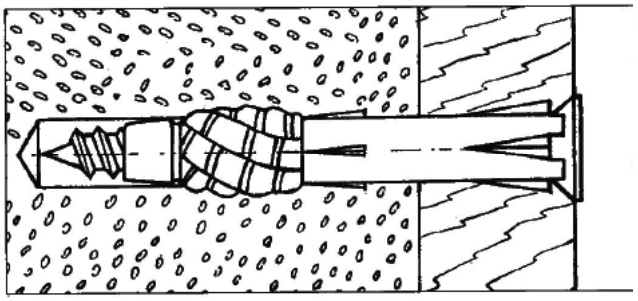
Part No.HexHead	Part No.PoziHead*	Descript	Anchor Size		Twist Drill		Min. Embed Depth(mm)	Recommended Working Loads (Safety factor 4:1)				Edge Distance(mm)		Spacing(mm)	
			Dia.(mm)	Length(mm)	Dia.(mm)	Min.Depth(mm)		Tensile Load (N)		Shear Load (N)					
								AAC Compressive Strength (MPa)		AAC Compressive Strength (MPa)		Tension	Shear	Tension	Shear
								2.5	4.5	2.5	4.5				
410368	410269	10 x 100	10	100	10	100	90	305	375	300	370	75	100	75	100
410382	410283	10 x 135	45	135	10	100	90	305	375	300	370	75	100	75	100
410405	410305	10 x 160	70	160	10	100	90	305	375	300	370	75	100	75	100
410580	410320	10 x 200	110	200	10	100	90	305	375	300	370	75	100	75	100
410603	410344	10 x 280	190	280	10	100	90	305	375	300	370	75	100	75	100

Note: * Accessories: Setting Tool for Pozi Drive Head Screws: Part No. 590329 (No. 4 Pozi Drive)

8.9 TOX Product Specifications

TFS – L : All Purpose Long Plug

The TFS-L All purpose Long Plug is designed to knot up inside CSR Hebel blocks as the screw is tightened, providing a deep seated grip. The appropriate hole size must be drilled first and then use of a screw long enough to protrude through the end of the plug.



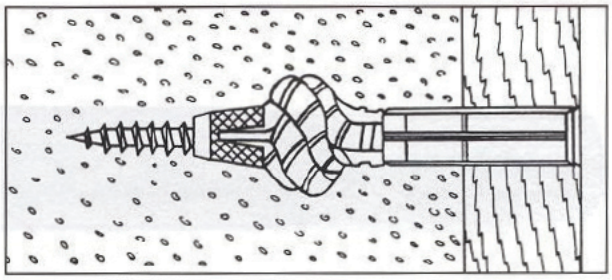
Capacity of TOX-TFS-L All Purpose Long Plug

Anchor Type	Hole Diameter(mm)	Screw Diameter(mm)	Minimum Anchorage(mm)	Working Loads(kN)
TFS-L 6/65	6	4.5	50	0.2
TFS-L 8/80	8	6.0	70	0.3
TFS-L 10/100	10	7.0	70	0.4

Notes: A safety factor of 5 in 500 – 800 kg/m^3 blocks has been used.

TOX – VLF Frame Fixings

The pre-assembled VLF Frame Fixing is used for piercing as a stable item and can be hammered like a nail without pre-drilling into the CSR Hebel AAC. The anchor is set by tightening the screw a maximum of 6 turns, when the expansion section of the plug is drawn axially outwards and knots up deep within the concrete to provide optimum holding strength.



Deep seated retention (knot effect) in cellular concrete (aerated concrete).

Capacity of TOX-VLF Frame Fixings

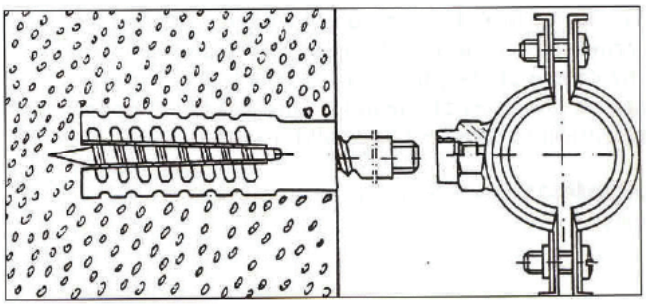
Anchor Type	Hole Diameter(mm)	Anchorage Lengths(mm)	Minimum Anchorage(mm)	Working Loads(kN)
VLF 6 (csk)	6	70	70	0.3
VLF 8 (csk)	8	80, 100, 115, 135	70	0.4
VLF 10 (csk & hex)	10	100, 115, 135, 160	70	0.5

Notes: A safety factor of 5 in 500 – 800 kg/m^3 blocks has been used.

TOX – MKD Metal Claw Plug

The MKD claw anchor is a four part steel expansion plug with up to 22 double sided claws per segment for maximum grip. They are suitable for coach, wood, and chipboard screws and can also be used with headless metric screws for installation of pipe fittings.

The MKD anchors can be hammer driven direct into CSR Hebel blocks without pre-drilling, but a 5mm pilot hole is recommended for accurate placement or near the edges of blocks.



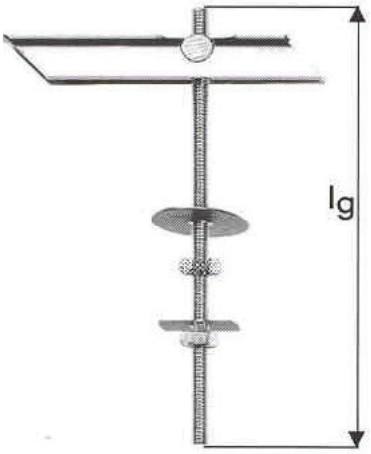
Capacity of TOX-MKD Metal Claw Plug

Anchor Type	Hole Diameter(mm)	Screw Diameter(mm)	Minimum Anchorage(mm)	Working Loads(kN)
MKD 6/32	6	5 – 6	32	0.25
MKD 8/38	8	7 – 8	38	0.35
MKD 8/60	8	7 – 8	60	0.40
MKD 10/60	10	8 – 10	60	0.55

Notes: A safety factor of 3 in 500 – 800 kg/m3 blocks has been used.

TOX – KD – DV Heavy Load Toggle

The KD-DV Heavy Load Gravity Toggle is available in M8 and M10 thread sizes and comes standard in 100mm and 200mm lengths and can also be supplied longer to order. The toggle is used for fixing through CSR Hebel blocks and panels in situations where only a blind fixing can be used and heavy loads are required.



Capacity of TOX-KD-DV Heavy Load Toggle

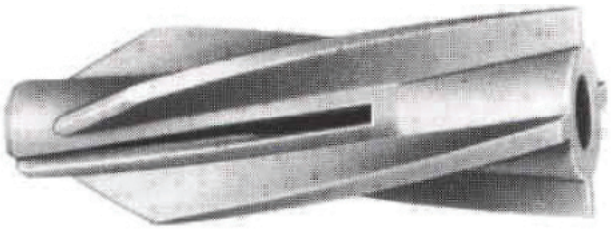
Anchor Type	Hole Diameter(mm)	Anchor Length(mm)	Working Loads(kN)
KD M10	22	100/200 +	1.2
KD M8	22	100/200 +	1.2

Notes: A safety factor of 3 in 75mm thick Hebel Powerpanel™ has been used.

8.10 Fischer Product Specifications

Fischer Nylon Twist Lock Anchor Type - GB

The Fischer Nylon Twist Lock Anchor Type – GB is suitable for use in aerated concrete. The anchor is hammered into a clean hole, formed by drilling or a metal punch. The helical stabilisers rotate into the aerated concrete and effectively distribute the load over their greater surface area. When the screw fastener is installed, the base of the fastener expands. The wide surface area provides excellent support for the screw and assures a high resistance to shear load.



Capacity of Fischer Nylon Lock Anchor Type - GB

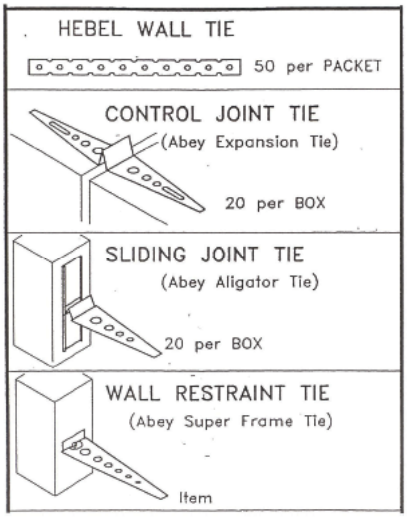
Anchor Type	Hole Diameter(mm)	Plug Length(mm)	Screw Diameter(mm)	Minimum Hole Depth(mm)	Screw Embedment (mm)	Minimum Wall Thickness(mm)	Recommended Tensile Load (kN)	
							Blocks	Panels
GB8	8	50	5	60	55	100	0.2	0.4
GB10	10	55	7	65	62	100	0.3	0.8
GB14	14	75	10	90	85	200	0.5	1.2

Notes: Contact supplier for shear capacities of GB connections or other Fischer Fasteners. Refer to Page 8.3 of this publication.

8.11 CSR Hebel Wall Ties

Similar to conventional brickwork and blockwork construction, CSR Hebel blockwork construction required ties to be installed at control joints, intersections of dissimilar materials and supporting structure, to ensure the block walls are strengthened and supported, as required by the design.

The various types and strengths of wall ties available are summarised in the tables below.



Pullout Strength of CSR Hebel Blockwork Ties (Internal Testing : 13th of September, 2001)

Tie Type	Working Pullout Load (N per mm embedment)(Factor of Safety = 3)
Hebel Wall Tie	7.18 N/mm

Out-of-Plane Shear Strength of CSR Hebel Blockwork Ties (CSIRO Research Report DTM320)

Tie Type	Characteristic Strength (kN)	
	1.5mm Relative Movement	Ultimate
Hebel Wall Tie	0.74	0.81
Control Joint Tie	0.44	1.01
Sliding Joint Tie	0.38	0.65
Wall Restraint Tie	0.76	0.76
SS Flat Plate 6 'V' slots*	-	0.69**
SS Flat Plate 6 'V' slots*	-	0.62

* CSIRO Test Report DTM253 - 2 off 'V' nails were installed in the end slots of the 3 available slots load was applied to the middle slot of the other end

** one test only - 2 off 'V' nails installed in the end 2 slots of the 3 available slots

Strength of CSR Hebel Frame Ties

As well as full CSR Hebel blockwork construction, CSR Hebel blockwork can be used in conjunction with conventional brickwork (external or internal masonry wall) or timber frame construction (external masonry wall).

The CSR Hebel blockwork is secured to the brickwork/blockwork wall or internal timber/steel frame with frame ties. Strength testing of various ties has been conducted at the CSIRO, and the results of this testing are summarised in the tables below. The various ties tested are shown below.

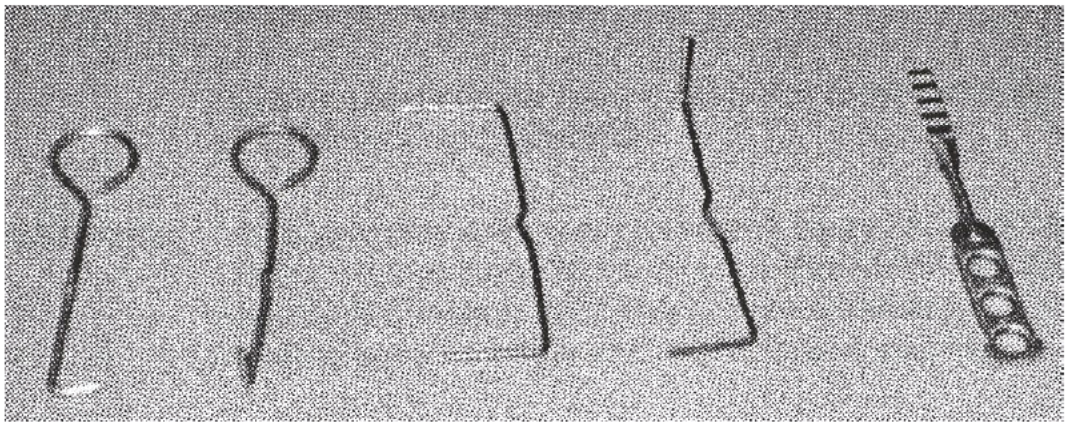
A copy of the CSIRO Report DTM 193 can be obtained by contacting CSR Hebel.

Frame Tie Capacities (CSIRO Research Report DTM193)

Tie Type	Characteristic Strength			
	Out-of-Plane Load (kN)		Stiffness (kN/mm)	
	Tension	Compression	Tension	Compression
Hebel Tie	0.33	0.57	n/a	n/a
Abey Tremor Tie	1.16	1.37	0.80	1.06
Abey Tremor Tie	1.48	0.48	n/a	n/a
Scott Tie	0.42	0.63	n/a	n/a

Note: “n/a” indicates not applicable

Types of Frame Ties Assessed by the CSIRO



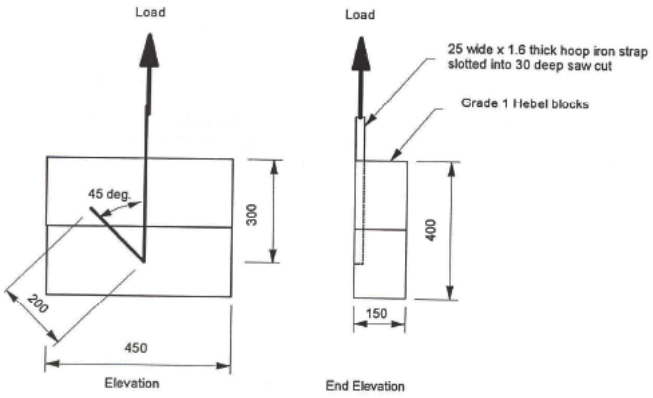
Scott Tie | Modified Scott Tie | Hebel Tie | Modified Hebel Tie | Abey Tremor

8.12 Tie Down Strap

Tie-down Strap Capacity (CSIRO Research Report DTM253)

A tie down strap installed as shown below (with good workmanship) will exhibit a characteristic strength of 0.99kN and a working load (F.O.S. = 3) strength of 0.383kN. Test conducted at the CSIRO – CSIRO Research Report DTM253.

CSIRO Test Configuration for Structural Assessment of Tie Down Strap



9.1 Scope

This section provides practical advice and performance requirements for rendering and coating CSR Hebel autoclaved aerated concrete (AAC) products. CSR Hebel AAC products include; Thermoblok masonry units, Sonoblok masonry units, PowerPanel™ special purpose masonry units, and wall panels.

9.2 General

Rendering over AAC is different from rendering over conventional masonry. Simply, the AAC products have different properties than that of conventional masonry and a suitable renders has to be adopted to accommodate these unique properties. Compatibility is important, as a common mistake is the substitution of AAC products for conventional bricks and blocks with no consideration to the impact of a brick/block styled render used I conjunction with AAC products.

Although AAC products are manufactured to tight tolerances, small surface irregularities due to cutting process in manufacture of CSR Hebel AAC products provide a substrate, which is suitable for a wide range of renders. Rendered CSR Hebel AAC products are suitable for solid walls or external and internal leaves of cavity wall construction to provide thermally efficient buildings in all areas of exposure, except very severe exposure where some form of cladding should be used.

All renders should comply to the requirements outlined in with the Australian Standard AS3700: Masonry Structures and referenced literature.

All rendered surfaces shall be finished with a vapour permeable coating. The performance requirements of the coating system are outlined in this section.

9.3 Surface Preparation of AAC Substrate

Adhesion is provided by key and suction. The natural suction of AAC should be augmented with a mechanical key, such as an initial splatter coat treatment. The AAC surface should be kept clean and free of dust and loose particles, which may have occurred during construction by brushing down the surface with stiff broom. In addition, any contaminants should be removed which may affect the adhesion of the render.

All holes should be filled and damaged areas patched, and all joints shall be filled with Hebel Adhesive. All vertical joints shall be finished flush. The damp proof course (DPC) should protrude the specified distance from the wall beyond the external finish of the render (render should not bridge the DPC).

The wall surface should be neither saturated nor very dry. CSR Hebel products normally provide a ‘medium suction background’. Given certain ambient conditions, or where the AAC product has been allowed to dry out, high rates of initial suction may be experienced. This condition can have an adverse effect on hydration and adhesion and measures should be taken to reduce the suction. This condition should be avoided by rendering and applying external finishes within 12 months of installation of the CSR Hebel product.

Alternatively, should high rates of suction persists a splattered treatment or other recommendation by the product manufacturer may be considered. This will enhance the keying action of the render to the surface.

9.4 External Renders

Pre-mixed Renders

Render can be supplied as a pre-mixed in bags, or prepared on-site. Pre-mixed renders have the advantage of being a consistency quality produced material, unlike on-site mixed renders, which can result in product variations if the raw material quality and preparation processes are not well controlled. The manufacturer of pre-mixed renders shall provide the requirements, instructions and guarantees for the use of their render product on AAC substrates.

Site Mixed Renders

CSR Hebel recommends using Hebel HighBuild™ and Hebel SkimCoat™ render products, which have been specifically developed for the CSR Hebel AAC substrate.

If site batching is unavoidable, more accurate mixing will result from weighed batching. The mix proportions will, however, require adjustment from volume to weight. The constituents of the generic render mixes are described by volume. The render contractor shall provide the requirements, instructions, testing and guarantees for the use of their render product on AAC substrates for the project.

The render should normally be applied with a minimum of two coats. Successive coats should be weaker than the first. Cement rich (strong) mixes must be avoided for rendering, as the amount of water necessary to hydrate the cement gives rise to a higher rate of drying shrinkage occurring within the render than in the AAC product. This differential shrinkage can lead to a shearing action building up between the two materials, resulting in failure which shows itself as cracking and/or delamination (spalling). Such a failure mechanism can be avoided by adopting a recommended compatible render specification.

It is important that the selected render is compatible with the AAC substrate. The render needs to have a similar compressive strength, good adhesion, and good vapour permeability and yet be water-resistant.

9.5 Construction Considerations

Meshing

General

The use of alkali resistant matting (woven fibreglass, expanded stainless or galvanised steel, or plastic) is recommended around areas on walls, such as:

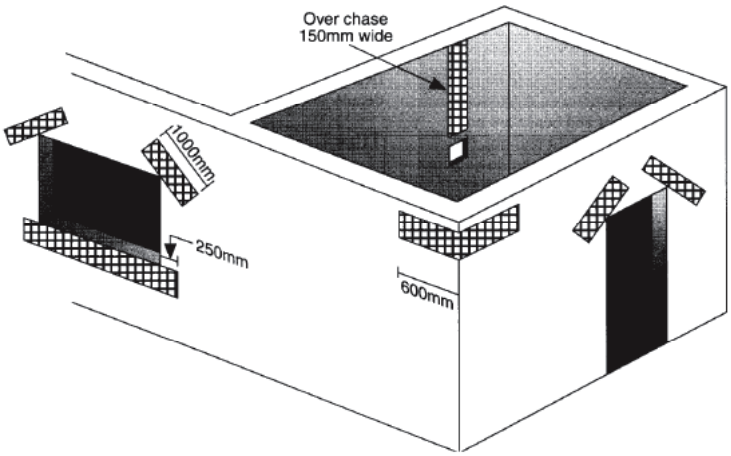
- Ends of lintels over doors and windows, where a fixed end is detailed;
- Across the sill of windows;
- Across the chases in the wall for services;
- Around external corners at the top of the wall; and
- Across joints on the underside of floor, wall and ceiling panels.

The matting should be bedded into a thin layer of render (Stage 1) prior to the final coat of render (Stage 2). This matting is available in two grades:

- 10mm grid x 330mm wide for external use; and
- 5mm grid x 330mm wide for internal use.

Note the purpose of the matting is to keep the render together and minimise consequential cracking of the render, it does not act as reinforcement. The different types of matting will minimise the cracking to various levels. The designer in conjunction with the render contractor should determine and specify the appropriate matting for the project.

Figure 9.1: Locations for Fibreglass Matting



CSR Hebel Panel Products

For walls constructed with CSR Hebel panel products (including CSR Hebel RWS), meshing is recommended in the following areas:

- The panel joint at all external corners, which do not have a control joint. Note CSR Hebel recommends a control joint be located at the corner or at the end of the first panel from the corner;
- Joints on the corners of splays, such as 45° windows; and
- All panel joints, other than control joints, when the coating system proposed is comprised of a sand/cement render and thin paint finish only. This is optional for a coating system that includes a high build acrylic texture coat or highly flexible acrylic membrane. The guarantee of a coating system without fibreglass matting is the responsibility of the coating manufacturer. CSR Hebel recommends the use of matting.

Control Joints

The control joint is a necessary part of the wall system to ensure the location of possible cracking is controlled, movement isolated and stresses relieved from the wall element. The control joint may serve as a location for the joint to open or close only, or both. The designer must consider the type and magnitude of movement when detailing the control joints.

Important: A common mistake with cement rendering and control joint installation is the application of the render over the joint. For joints that are designed to accommodate closing, this can be detrimental. The render restricts the joint from closing and reveals itself with cracking and spalling of the render. Secondary damage can result from water ingress through the crack and working its way behind the coating system. Importantly all joints should be filled with an appropriate flexible sealant that can accommodate the movements and durability for the application.

Ideally, the render should be terminated at the sealant/panel interface and not impede the differential movement between the panel, and adjacent concrete structure or another panel.

Painting

Only acrylic based paints should be used with AAC products.
Oil based paints do not provide a coating that breathes and hence are not recommended. Beware that painting only may not provide adequate protection against accidental damage. Consultation with the acrylic coatings manufacturer must be sought prior to application of darker colours onto the Hebel AAC substrate, as these coatings have high heat retention which may cause coating failure. Some coatings may exhibit larger expansion or contraction movement behaviour at these higher temperatures, which in turn stresses the bond between the coating and the AAC substrate.

Textured Coating

Acrylic coating manufacturers should be contacted for information on application and suitability of their coating products over Hebel AAC substrate.

Tiles

Ceramic and terracotta tiles can be fixed to floors and walls using proprietary tile adhesives as recommended by the adhesive manufacturer. Marble and other stone tiles should be fixed using appropriate adhesives e.g. Australian Building Adhesives, etc. Wet areas should be prepared with a suitable waterproof membrane, as specified in the BCA or as specified by the relevant authority, for the intended application.

9.6 CSR Hebel Render Products

CSR Hebel render products are stringently formulated polymer fortified cement based wall renders. These products contain washed graded silica sand, cement and a number of additives to ensure ease of application and workability.

Supplied in a dry powder form these products only requires the addition of water to produce a mortar paste that provides minimal drying shrinkage and excellent adhesion to Hebel Blocks and Hebel Panels, for use with both internal and external applications.

CSR Hebel renders are designed to alleviate failings of on-site mixed renders and unsuitable bagged renders that have not been formulated specifically for CSR Hebel block and panel products.

Product Selection

Depending upon surface alignment and CSR Hebel product type, there is a choice of two renders. (refer to Table 9.1)

Wall Preparation

Job planning is the most important step in the coating sequence, this will save in time and money and ultimately ensure a high standard of quality control.

The finished appearance is highly dependant on the standard of wall construction workmanship, check entire wall perimeter with a straight edge, chalk mark any deviations and damaged areas. This will indicate areas requiring additional filling or repair prior to render coat being applied.

Examine that control joints and expansion joint have been installed as per the CSR specification, this can be done injunction with the builder / installer.

It is recommended that an on-site sample completed to visually communicate to the customer the level of finish that is acceptable to both parties, including permissible substrate variation, correct texture profile and colour.

- Choose scaffolding type and suitability for safety and ease/speed of application.

Table 9.1 Render Selection

Render Product Selection		Features	Benefits
CSR Hebel Block	Hebel HighBuild™6-8mm per coat	Ready mixedAcrylic polymer modifiedHigher buildSelf priming to substrateExcellent adhesion	Just add waterCuring aidCovers greater imperfectionsCan be floated to a sponge finishEconomical
CSR Hebel Panel	Hebel SkimCoat™2-4mm per coat	Ready mixedAcrylic polymer modifiedFibre reinforcedFlexibleLow shrinkageLow-build-fast applicationSelf priming to substrate and to subsequent coatingExcellent adhesion	Just add waterAdhesion & cure controlJoint line cover reinforcingJoint crack resistanceJoint coverEconomicalLower overall unit costs of coating system

- Masking windows, doors, flooring and adjacent property will make or break a job, attention to detail is crucial.
- Any exposed steel reinforcing must be cleaned off of any flash rust then primed with a suitable zinc rich primer.
- Start and stop points must be pre-planned prior to commencement, providing uninterrupted working areas for best practise, and outcome.
- Always terminate the Hebel render application above the damp proof course line. Never bridge the damp proof course, otherwise this could cause water damage of the coating system.

Patching

Fill all chipped and damaged Blocks and Panels with CSR Hebel Patching Mortar or equivalent and allow to dry.

Sanding/Levelling

An advantage of CSR Hebel wall systems is that surface misalignment in both the Block and Panel systems can levelled, utilising the levelling plane or the sanding float to achieve a truer flat surface.

Cleaning

Remove all mortar runs by scraping as soon as possible, the longer the mortar is left to cure the harder the material becomes, making this task unnecessarily more labour intensive. Remove all free dust, dirt, grease, oils, moss, fungi, mastic compounds and any other foreign matter that could affect the adhesion of the CSR Hebel Render. Brush the surface with a stiff bristle broom to remove all loose particles. All surfaces must be clean, sound and free of powdery residue.

Corner Beading

Beading can be used on corners and edges for aiding in impact / knock resistance. The beading used must be external grade and be securely fixed straight and true. These are traditionally fixed using either flat head external grade nails or dollops of render. Corner beads may need to be rebated into the corners of the Hebel blocks or panel prior to the application of the render.

Pre-Wetting

AAC's absorbent nature aids in adhesion however excessive absorption will generally require tempering with water to reduce surface suction particularly in warmer weather. Alternatively the surface suction can be reduced by the application of a sealer/primer application of a mixture made of one (1) part 100% acrylic bonding agent, such as Dulux AcraTex 500/4 AcraBond, to six (6) parts water applied to the clean, water damped surface.

Climatic Conditions

- CSR Hebel render products must not be applied below 5ºC and at elevated temperatures above 30ºC or in hot windy conditions.
- CSR Hebel render products should be protected from rain and frost for the first 24 hours.
- Application on large areas in full sun should be avoided (and/or the surface should be cooled and tempered with plenty of fresh water).
- Always work in shaded areas.
- If wet weather conditions are forecasted, application should be stopped to give to product sufficient time to set.
- Protect the finished work around down pipes, spouts or where water may continually splash or wet the surface.

Storage

Bags of CSR Hebel render should be stored under cover, above ground and protected from water damage.

Precautions

• In hot conditions, wetting or tempering (light water spray) of the freshly applied CSR Hebel render products is recommended to aid finishing.

• During hot weather the applied CSR Hebel render products should be re-wetted 2-3 times per day over the first 2 days to promote proper curing (cement hydration).

• Allow to cure for 7 days.

• Application on large areas in full sun exposure should be avoided.

• Thin thickness render systems will not hide imperfections, rough surfaces or poor preparation.

9.7 CSR Hebel Block Render System

Purpose

Hebel HighBuild™ render is fast to apply on both internal and external surfaces. It levels irregularities and produces a high quality even, true surface. It can be applied at a thickness as low as 4 mm (with the addition of Dulux AcraTex 500/4 AcraBond) or as thick as 12 mm. (in two successive coats) relative to the degree of cover required. Hebel HighBuild™ render can be finished with a wood float, plastic float or sponge.

It is an ideal base for the subsequent application of acrylic texture profiles providing a variety textured finishes that is them protected by a high build exterior weather proofing membrane coating. Hebel HighBuild™ render will add to the acoustic and thermal properties of the Hebel substrate.

Equipment

Hebel HighBuild™ render can be applied via mortar spray/pump or conventional hawk and trowel method, it is ruled level with straight edges and finished with wood or soft foam finishing floats.

Mixing

The mixing ratio is a 20kg bag of Hebel HighBuild™ to 3.0 to 4.0 litres of clean cold water: The water and bonding agent (if required) should first be measured into a 15L clean plastic container and render powder slowly incorporated using a power stirrer for a minimum period of 2 minutes, to produce a smooth, lump free consistency.

Thin bed applications require the addition of a 100% acrylic bonding agent in the following quantities per 20kg bag of Hebel HighBuild:

2-4 mm thick render coats	300ml 500/4 AcraBond
6mm thick renders coats	100ml 500/4 AcraBond

If the job is large a greater quantity of water and 500/4 AcraBond can be mixed into a 100-200Ltr container, the mix ratio can be calculated:

2-4 mm thick renders coats	2 part 500/4 AcraBond to 5 parts water
4mm thick renders coats	1 part 500/4 AcraBond to 5 parts water
6mm thick renders coats	1 part 500/4 AcraBond to 8 parts water

Render thicknesses greater than 6mm do not require the addition of an acrylic bonding agent, providing that ambient temperature is not too high that it will cause rapid drying, in such conditions wetting or tempering of the freshly applied Hebel HighBuild™ render is recommended.

Application Techniques

• Badly aligned substrates may require a work screed at the top and bottom of the work area.

• Applications by hawk and trowel should occur in two passes, a tight first pass followed by a second levelling pass wet on wet. The render should then stand for a

short period. Allow for surface moisture to stabilise then screed with a suitable straight edge to a uniform surface.

- Apply more Hebel HighBuild™ render to any low areas as required.
- Once the surface is true and level use a wooden or soft foam to produce a uniform surface finish.
- If a three coat paint finish is being applied, the surface must be finished to produce a uniformed textured appearance with no bald spots. Otherwise these areas will slow through any paint system, making the wall appearance patchy.
- Hebel HighBuild™ render droppings should not be re-tempered with water and should be discarded.
- Always terminate the Hebel HighBuild™ render application above the damp course line.
- Never bridge the damp course.
- Thoroughly clean all equipment with water.

Reinforcing Mesh Installation

The use of alkali-resistant glass-fibre mesh is recommended at corners of wall openings (doors and windows) to minimise corner cracking. The mesh should be embedded into the wet first Hebel HighBuild™ render pass of the rendering process.

Drying and Curing Times

Hebel HighBuild™ render will dry at 25° C and 50% relative humidity in around 3 - 6 hours depending on the dampness of the substrate. As a general rule however, cement renders should be kept damp for the first 12 hours to ensure proper hydration of the mixture. If drying is too rapid, hydration will be greatly reduced affecting overall render tensile strength and may become friable.

Working Times

As a guide the useable life of mixed material is approximately 1-2 hours at 25°C and 50% relative humidity.

Coverage Rates

Average Thickness	Coats	Approx. Material Usage kg/m2
*4 mm	1	7.2
*6 mm	1	10.8
8 mm	1	14.4
10 mm	1-2	18
12 mm	1-2	21
16 mm	2	28.8
Key: Conversion factor is 1 mm thickness/m^2 requires 1.8 kg of Hebel HighBuild™ render.		
* The use of 500/4 AcraBond is recommended for application with a render thickness less than 6mm.		

Special Information: *This information should be read in conjunction with AcraTex 500/4 AcraBond information data sheet.

9.8 CSR Hebel Panel Render System

Purpose

Hebel SkimCoat™ render is designed for use with CSR Hebel panel systems. It is fast to apply to both external and internal surfaces. It can be applied up to straight and true panel surfaces at up to 4mm in a single application to produce a high quality even, true surface. The render is a unique blend of polymer and aggregate. It is the ideal substrate for finishing with a high build acrylic texture coating plus an exterior weatherproofing coating or quality acrylic topcoat in interior applications.

Equipment

Hebel SkimCoat™ render can be applied via conventional hawk and trowel method, the use of a spatular maybe useful for smaller areas.

Mixing

The mixing ratio is one 20kg bag of Hebel SkimCoat render to 4.4 to 5.0 litres of clean cold water. The water should first be measured into a 15L clean plastic container and the render powder slowly incorporated using a power stirrer for a minimum period of 2 minutes, to produce a smooth, lump free consistency.

Application Techniques

- Check the trueness (level) of the work areas prior to commencement of the application. Badly aligned panels can be corrected by using a Hebel Levelling Plane or the Hebel Sanding Float.
- The application is similar to standard cement render. Apply with a traditional hawk and trowel to achieve a skimcoat of about 2mm. As Hebel SkimCoat™ render is setting, skim the entire surface with a flattened trowel to eliminate application trowel marks, making this a smooth surface for the following acrylic texture coatings.
- An additional application of Hebel SkimCoat™ render to low areas may be required to achieve a flatter surface, use a straight edge to determine the straightness of the wall.
- Hebel SkimCoat™ render droppings should not be re-tempered with water and should be discarded.
- Always terminate the Hebel SkimCoat™ render application above the damp course line. Never bridge the damp course.
- Thoroughly clean all equipment with water.

Working Time, Drying and Curing Times

As a guide the useable life of mixed material is approximately 1-2 hours at 25°C and 50% relative humidity, and surface dry in around 4 hours depending on application conditions, and dampness of the substrate.

As a general rule, however, renders should be kept damp for the first 12 hours to ensure proper hydration of the mixture. If drying is too rapid, hydration will not take place and the render will not develop its full strength and will become friable. Note: During hot weather, the wall must be cured for two days after application by re-wetting the render 2 - 3 times per day.

Hebel SkimCoat™ render should be allowed to cure for a minimum of 7 days prior to the application of subsequent coatings.

Coverage Rates

Average Thickness	Coats	Approx. Material Usage kg/m2
2 mm	1	3.6
4 mm	1	7.2
Key: Conversion factor is 1 mm thickness/m2 requires 1.8kg of Hebel FR Render		

Special Information: Thin bed renders will not hide imperfections, rough surfaces or poor preparations.

9.9 Finishing the CSR Hebel AAC/Render Substrate

General

CSR Hebel wall systems require an appropriate external coating system and sealant detailing to infill framing of penetrations and movement joints to ensure a water resistant and vapour permeable building envelop barrier is achieved. The primary function of the coating system and sealant detailing is to prevent water penetrating into the cavity space of the wall. Important: infill framing (window framing) is not to drain into the cavity space.

Finishes – Performance Requirements

Generally for walls, the CSR Hebel AAC substrate is coated with a high build (blocks) or skim coat (panels) render to provide a true, smooth substrate surface for the following water resistant coating system. The appropriateness and application coating system should be verified and performed in

accordance with the recommendations of the coating manufacturer.

Performance Requirements for the coating systems, the following are items to be considered when selecting a coating system:

Manufacturer Approved

All coating systems applied to CSR Hebel external wall systems should be approved by the coating manufacturer as being appropriate for coating an AAC substrate.

Surface Adhesion

The substrate preparation and coating application should be in accordance with the coating manufacturer's specification.

Before applying finishes in coastal areas (refer to definition), all panels must be thoroughly washed with fresh water to remove any salt residue. Refer to coating manufacturer for additional requirements.

Water Resistant

The primary objective of the coating system is to prevent water ingress through it, yet allow vapour in and out of the AAC substrate.

The effectiveness of the coating can be specified by the manufacturer.

Acrylic resin coating materials have a proven water-resistance capability.

Vapour Permeable

For the coating to allow vapour to pass through it, the coating must be vapour permeable.

The coating system should exhibit the following performance requirement:

- $w \cdot s_d \leq 0.2$ kg/(m . $h^{0.5}$)

where;

coefficient of water absorption, $w \leq 0.5$ kg/(m^2. $h^{0.5}$) and,

equivalent air layer thickness of water vapour diffusion, $s_d \leq 2$m.

means that minimal dampness has been absorbed regardless of the time factor.

A coating with an s_d = 2m has the same diffusion characteristics as a 2m thick air layer.

Compatibility

Ensure the coating system is compatible with the substrates. That is, acrylic resin despersion-based coatings may not adhere to silicone sealants.

Durability.

The coating must be durable and not deteriorate with exposure to light (UV) and weather.

Elasticity

The coating must be able to bridge a 1mm minimum crack width.

The coating manufacturer can specify the minimum design specification (thickness), so that the coating is serviceable.

This list of performance requirements indicates that a specific fit-for-purpose coating system should be adopted, and that a simple paint coating would most likely be an inadequate coating system. Variations to the coating system should be approved by the coating system manufacturer or representative. The coating system should have a tested history of successful application on an AAC substrate. CSR Hebel recommends the application be performed by coating manufacturer approved applicators.

Sealants

All movement joints and gaps between the panels and infill framing must be filled with an appropriate flexible sealant. Refer to the 'Design & Detailing Considerations' section for more information on sealants.