

Technical Sheet and Installation Guide

Hebel RAAC® Wall Panel

Autoclaved Aerated Concrete



 hebel **RAAC USA Inc.**
POWERED BY XELLA GROUP DE

xella



About us

Xella Aircrete North America, the leading manufacturer of **Hebel RAAC® Autoclaved Aerated Concrete (AAC)** is an amazingly innovative building material that has been used in Europe for more than 80 years and in the US for more than 15 years. Products and systems have been developed for all types of the construction industry: Industrial, commercial, high-rise buildings, schools, hospital and more.

Hebel® AAC is a lightweight concrete that is formed into blocks and reinforced panels for a wide range of loadbearing and non-loadbearing construction applications. It is manufactured from sand, cement, recycled material, lime, gypsum, aluminium paste and water. It is moulded, cut and steam pressure cured in an autoclave before being packed, ready for transport.

Hebel® AAC delivers more benefits than the traditional materials such as strength, acoustics, fire and pest resistance and is installed faster, saving valuable construction time.

It has a unique combination of thermal mass and insulation providing a more comfortable living environment.

Why Hebel

One of the world's leading manufacturers of Hebel autoclaved aerated concrete [AAC], Xella Aircrete North America is transforming the building industry with Hebel, its ultra-lightweight concrete.

Committed to providing the United States with environmentally responsible building products that conserve material and energy usage, Xella's Hebel Aerated Concrete is recognized as the largest producer in Europe by capacity based on management estimates based on different sources and member of the Green Building Council. In addition, it has a high UL rating for fire resistance.

Xella Aircrete North America is a division of Germany-based Xella International.

More than 6.000 employees for Xella's total 97 plants and offices throughout 30 countries worldwide, including North America, Europe and Asia.

Hebel Aerated Concrete provides contractors with strong, easy-to-install blocks and reinforced panels that are one-third the weight of traditional concrete and replace traditional multi-step construction processes. In addition, Hebel is energy efficient, fire resistant and long lasting, which, over time, will reduce energy, insurance and maintenance costs to building owners. A wide range of industries can benefit from Hebel's custom blocks and reinforced panels, including those in the commercial, educational, hospitality, industrial, institutional, governmental and residential markets.



Aerated Concrete Hebel®:

Unique properties in a single material.

Benefits



Thermal Insulation

Buildings constructed of HEBEL AAC provide substantial energy savings in both hot and cold climates. The unique closed cellular structure and the thermal mass contribute to a high R-value and airtightness which reduce heating and cooling costs and improve indoor air quality. Buildings have seen savings on air conditioning up to 35% by using HEBELMC.



Structural Performance

Strength can resist wind pressures without reinforcement. Shear wall strength can resist lateral loads. High impact resistance.



Fire Resistant

HEBEL AAC has proven to remain fully intact and withstand the stress of fire for up to 4 hours without any impairment to its stability. Even under intense heat, HEBEL AAC remains tightly sealed against smoke and gas, emitting no toxic fumes.



Acoustic Insulation

The solid wall construction of a building made of Hebel AAC provides exceptional acoustic insulation. Its porous structure and high surface mass, coupled with its ability to dampen mechanical vibration energy, greatly reduces outside environmental.



Resistance to humidity

Your works are always protected against moisture. It allows the passage of water vapor, reducing condensation. It is an inert material.



Green Building

Hebel and green building attributes

- Recyclable, inert & non-toxic.
- Energy saving, manufacturing through occupancy.
- Excellent life-cycle cost.
- Durable, natural finish options.
- Supports LEED credits.

Add up USGBC LEED Credits with Hebel

Physical Properties

The physical properties of HEBEL Autoclaved Aerated Concrete are unique to any other building material. Properties such as thermal insulation and fire resistance can not be met by another product alone.

- Speed of Construction
- Thermal Insulation & Energy Savings
- Superior Fire Resistance

- Sustainable
- Relatively high strength for a low density
- Workability
- Acoustic Performance
- Precision

This product meets Standards and Evaluation issued by:



ASTM
C 1693-11
ASTM
C 1660-09



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Hebel RAAC® Wall Panel Autoclaved Aerated Concrete

Uses and applications

The Hebel wall panel system uses its excellent thermal, fire resistance, and lightness features to be one of the best options as curtain wall solution in industrial and commercial projects. The process is simpler and quicker than conventional methods.

Construction Advantages

- Superior Fire rating.
- Speed of Construction.
- Durability (Low maintenance)
- Lightweight (37pcf)
- Lightweight equipment needed to install.
- 5 people crew to install.
- Custom made.
- Workability.

Application:

- Commercial
- Industrial
- Hospitality
- Assisted Living
- Dorms
- Fire walls

Certifications:

NOM, ONNCCE, ASTM, UL, IAPMO, ACI, USGBC, TOI.



More benefits of Hebel® Wall Panel

- Fire resistance.
- Strength and security.
- Wind load capacity.
- Acoustic performance.
- Thermal performance.
- Pest and rot resistant.
- Not Mildew.
- Low maintenance.
- Friendly to the environment and Sustainable.
- Grants LEED points.



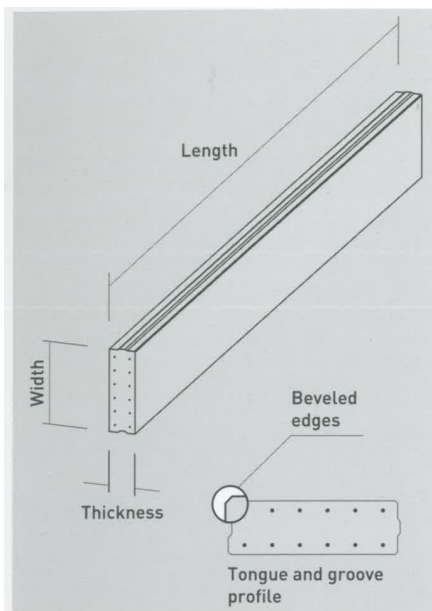


Fig. 1: Hebel® Wall Panel (AAC steel reinforced element).

1 Technical Sheet

1.1 Hebel® Wall Panel

General Features

Lightweight, fire resistant*, water penetration resistant**, pest resistant, fast and easy to install, versatile and affordable. Hebel AAC Wall Panel is a steel reinforced element. Reinforcement is Grade 70 steel covered with an anti-corrosive coat. Manufactured according to ASTM C1693/ASTM C1694

* Under ASTM E119-95 UL®

** ASTM E514

Uses

Hebel® Wall Panel can be used with steel or concrete structures as curtain walls in horizontal and/or vertical arrangement. Suitable for commercial and industrial buildings.

Dimensions

Length:^[1] Up to 20 ft.

Width:^[2] 24 in.

Nominal Thickness:^{[2][3]}
4, 5, 6, 7, 8, 10 and 12 in.

^[1] Tolerance $\pm 3/16"$, ^[2] Tolerance $\pm 1/8"$, ^[3] Nominal Thickness. Manufactured according to ASTM C 1693 / ASTM C1694.

Characteristic	Unit	AAC-4 Class	AAC-6 Class
Compressive Strength (f'ac)	psi	580	870
Nominal Density	pcf	31	37
Design Weight	pcf	37	45
Drying Shrinkage	%	<0.02	<0.02
Thermal Expansion Coefficient	1/°F	4.4×10^{-6}	4.4×10^{-6}
Modulus of Elasticity	psi	295,800	377,000
Thermal Conductivity	BTU-in/ ft ² -h°F	0.9124	0.9811
Allowable Bearing Stress	psi	348	523

Table 1: Physical and Design Properties.

Design Weight

Thickness* in	AAC-4		AAC-6	
	psf	lb/ft**	psf	lb/ft**
4	12.3	24.6	14.7	29.5
5	15.3	30.7	18.4	36.9
6	18.4	36.9	22.1	44.2
7	21.5	43.0	25.8	51.6
8	24.6	49.1	29.3	59.0
10	30.7	61.4	36.8	73.7
12	36.8	73.7	44.2	88.5

*Nominal dimension. **Considering a 24 in panel width.

Table 2: Wall Panel Weight.

Thermal Properties

Thickness* in	Thermal Resistance "R" ft ² h °F/Btu	
	AAC-4	AAC-6
4	4.32	4.40
5	5.39	5.50
6	6.47	6.60
7	7.55	7.70
8	8.63	8.80
10	10.79	11.0
12	12.95	13.19

*Nominal dimension.

Table 3: Hebel® Wall Panel R' Value.

Acoustic Performance

Assembly Type	STC	Report No.
Hebel® 6" wall AAC-4 Unfinished	44	AS-TL958AX
Hebel® 8" wall AAC-6 Unfinished	50	AS-TL1026AX
Hebel® 10" wall AAC-4 Unfinished	50	AS-TL978AX

*Note: Testing performed at Acoustic Systems Inc., Austin, TX in accordance with ASTM E90, "Standard Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions".

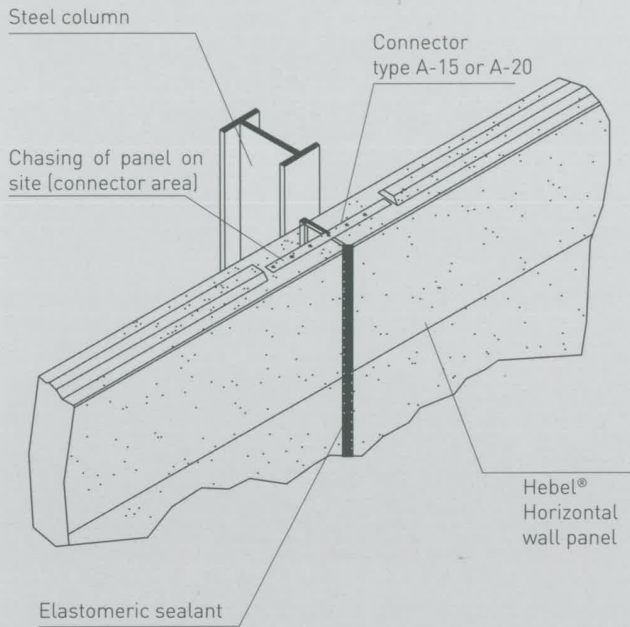
Table 4: Hebel® Wall Panel acoustic performance.

Fire Performance

Material	Thickness* in	Fire Rating Hrs.	UL Design Number (UL Fire Resistance Directory 1998)
Reinforced Wall Panels AAC-4 and AAC-6	6 and up	4	U920

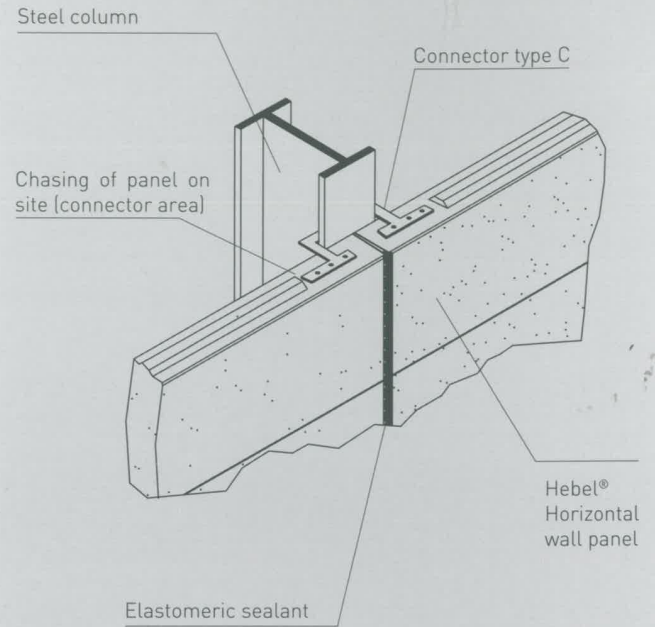
Note: Testing performed at Underwriters Laboratories Inc. under ASTM E119 (UL/ANSI 263) "Fire Tests of Building Construction and Materials".

Table 5: Hebel® Wall Panel fire rating.



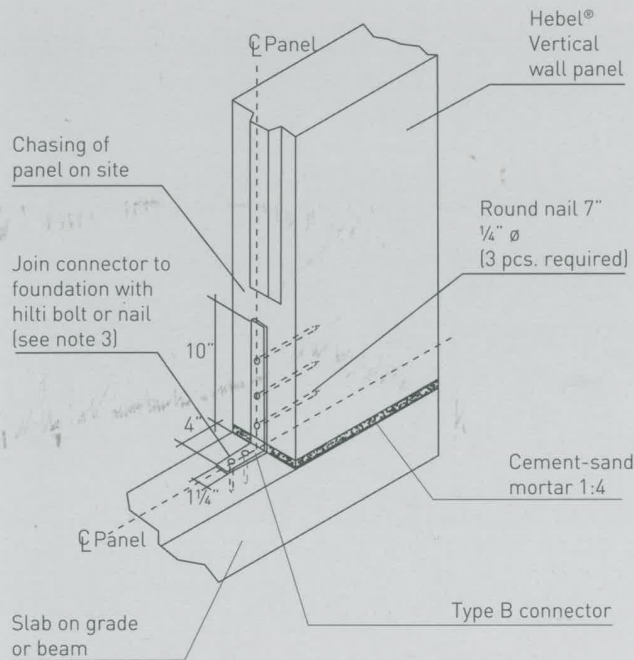
Isometric View

Fig. 2: Typical connection in Hebel® Horizontal Wall Panels using type "A" connector.



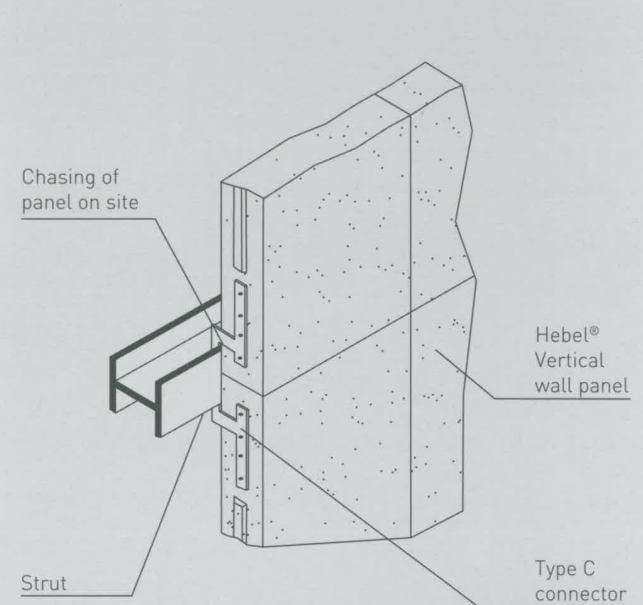
Isometric View

Fig. 3: Typical connection in Hebel® Horizontal Wall Panels using type "C" connector.



Isometric View

Fig. 4 : Typical bottom connection in Hebel® Vertical Wall Panels using type "B" connector.



Isometric View

Fig. 5: Typical middle connection in Hebel® Vertical Wall Panels using type "C" connector.

2 Design Considerations

2.1 General Considerations

- Hebel® Wall Panels can be used as a partition or curtain wall and shall be designed in order to comply with safety and serviceability requirements as specified by ACI 318-95 and following guidelines of ACI 523.4/R-09.
- Main structure [steel or concrete] should be designed according to Local Building Codes.

- The design of Hebel® Wall Panel should consider wind loads according to Local Building Codes and the slenderness ratio must be revised as follows:

al Hebel® Wall in horizontal arrangement:

- Maximum quantity of panels installed without brackets: 20 pieces [maximum total height: 40 ft].
- Panel slenderness ratio:
For $t \leq 16$ in: $l/t \leq 40$
For $16 < t \leq 24$ in: $l/t \leq 38$
For fitting units $l \leq 16$ in; $b \leq 24$ in: $l/t \leq 35$

Where: t =Panel thickness, l =Panel length, b =Panel width.

b] Hebel® Wall in vertical arrangement:

- Maximum height of wall: 60 ft
- Panel slenderness ratio:
For single unit walls or top course of a multi-course wall $l/t \leq 40$

For multi-course walls, except the course on top $l/t \leq 35$

Where: t =Panel thickness, l =Panel length, b =Panel width.

- Fitting panels should not be less than 16 in. wide. If more than one fitting panel is required on a wall, at least two normal [non-fitting] panels shall be installed between them.
- Maximum capacity for steel connectors can be checked in Table 1.

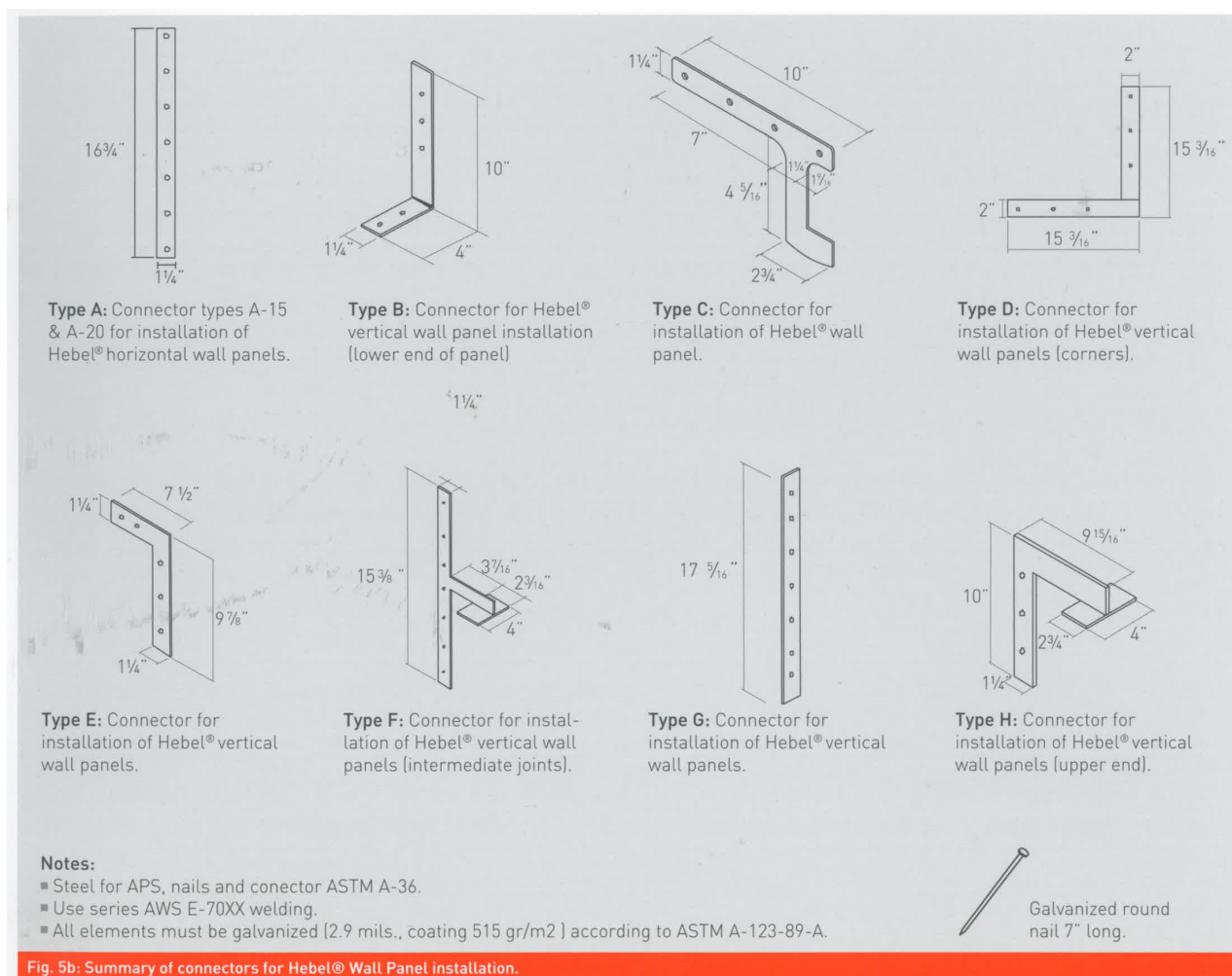


Fig. 5b: Summary of connectors for Hebel® Wall Panel installation.

3 Installation Guide

3.1 General Installation Guidelines

Before Installation of Hebel® Wall Panels.

1. Check Foundation.

- Foundation must be designed according to Local Building Codes. Verify the level of slab foundation.

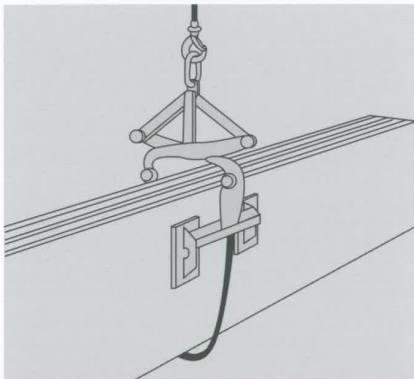


Fig. 6: Lifting gear (Hebel® horizontal wall panels).

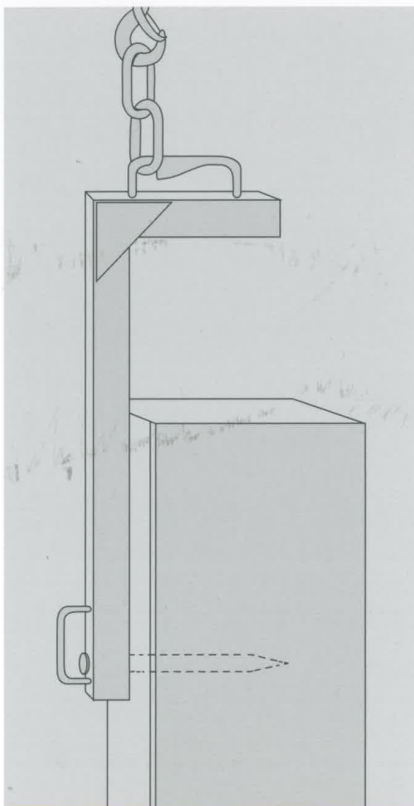


Fig.6b: Lifting hook (Hebel® vertical wall panels).

2. Check Structure

- Check plumb and alignment of columns/structure.
- Complete visual inspection of entire supporting structure for panels [bracing, etc.].

3. Clear the Unloading and Provisional Storage Area

- Flat surfaces are required for unloading pallets, preferably close to final position.
- Place pallets over wood blocks [panels must not be in contact with ground].

4. Check Material and Installation Logistics

- Verify dimensions, positions and quantity of the panels according to construction drawings.
- Define sequence of panel installation.
- Define type of installation equipment [crane or similar].
- Evaluate quantity of personnel required [see Table 6: Average efficiency for Hebel® Wall Panel Installation].

5. Check for Metal Accessories.

- Hebel® connectors for wall panel installation.
- If type "A" [A-15 or A-20] connector will be used, fix connection steel angles to the structure [steel or concrete]. spaced as indicated in construction drawings.

3.2 Installation Guide

1. Installation of Hebel® Horizontal Wall Panels

- a] Mark center of panels on the tongue side.
- b] Unpack panels using scissors or hammer ax.
- c] Identify the panel that will be laid according to previous logistics.
- d] Chase tongue areas where connectors will be placed.
- e] Place lifting gear at the center of the panel over tongue side and proceed with lifting.

Item	Average Efficiency (panels/shift)	Personal Required	Notes
Hebel® Horizontal Wall Panel	75	4 men installing 2 assistants for lifting gear	When installation of steel structure allows for continuous installation of Hebel® Wall Panels.
	50		When installation of structure does not allow for continuous installation of Hebel® Wall Panels.
Hebel® Vertical Wall Panel	25	1 welder and assistant 1 coordinator 2 assistants for lifting gear 1 assistant for connector placement	When bottom anchorage is with continuous steel angle
	65		When bottom anchorage is with steel channel or double steel angle
	60		When bottom anchorage is with connector Type B

Table 6: Average Efficiency for Hebel® Wall Panel Installation



Fig.7: Unpacking panels.



Fig.8: Place lifting gear at the center of the panel.



Fig.9: Nail the connector to the panel (type A connector).



Fig.10: Sliding second panel.

fi Place cement sand mortar bed [1:4] for leveling the first row of panels. If required, use wedges while setting mortar bed.

gi Set the panel with the tongue side up.

hi When placing first row of panels, use provisional clamps to fix panel to structure while connector is placed.

il If type "C" connector is used, just place it in its final position and nail to panel [see Fig 91. The type of connector to be used should be specified in construction drawings.

jl This procedure is followed for the next panels [see Fig.10].

kl Seal vertical joints between panels using backer rod and caulking.

ll Seal horizontal joints between panels with caulking.

Cautions

- Handle panels with care to avoid a damage.
- Panels must be flush with the support structure before nailing.
- Clean the groove side of panels.
- Make chases needed prior to installation.

2. Installation of Hebel® Vertical Wall Panels

ai Unpack panels using scissors or hammer ax.

bi Identify the panel that will be laid according to previous logistics.

ci Chase tongue areas where connectors will be placed.

di If needed, place cement sand mortar bed [1:4] for leveling the first row of panels. Wedges can be used to adjust panels while setting mortar bed.

el Turn down the panel over wood blocks and place the lifting hook into lateral hole all Hebel® Vertical Wall Panels are manufactured with a lateral hole [see Fig. 11).

fl Lift the panel and place it in its final position.

gl Check alignment and plumb using a mason's level.

h) Place bottom connector [type ..s..) over tongue side, nail to the panel using galvanized T nails and fix to the foundation using a powder-actuated fastening tool and pins for concrete [see application requirements, see fig 13).

il Place the upper connector [middle connector if two or more rows will be installed) [see Fig. 14]. The type of connector to be used should be specified in construction drawings.

jl This prpcedure is followed for the next panels.

kl Once the first row of panels is installed, proceed with installation of second row of panels, as required, using middle and upper connectors [see Fig. 15 and Fig. 16).

ll Seal joints between panels with caulking.

ml Seal joints at corners using backer rod and caulking.

Cautions

- Handle panels with care or fork-lift to avoid damage.
- Panels must be flush with the support structure before nailing.
- Clean the groove side of the panels.
- Make chases needed prior to installation.



3. Cutting Panels

According to construction drawings, identify Hebel® Wall Panels prepared to be cut. Hebel® Wall Panels can be cut to length to fit openings or frame heights.

Permissible cutting lengths are in function of the project dimensions. Along its length, Hebel® Wall Panels can be cut 1/3 the width.

Cutting Procedures

a] Prepare a flat surface for cutting site.

b] Check dimensions of cuts to be made.

c] For transversal cuts, wood pieces must be placed along the sides of the cut and at the edges of the panel.

d] For longitudinal cuts, wood pieces must be placed at every 9 ft. minimum for 6 to 12 in. thick panels and at every 6 ft. for panels 4 and 5 in. thick.

e] Check for full contact between wood pieces and panel. Wedge if necessary.

f] Trace the cut dimensions and place arulerasaguide.

g] Proceed with panel cutting, verifying that cutting dimensions comply with specifications.

h] Apply anticorrosive paint at exposed reinforce bar tips.

4. Openings

Steel frames are required at openings for doors, windows, vents, etc. [see Fig. 181. Opening locations and steel profiles must be specified in construction drawings.



Fig.15: Plumbing the panel in second course.

5. Surface Patching

Use Hebel® Repair Mortar to patch chips, breaks and other imperfections on surfaces of Hebel® Wall Panels.

Hebel® Repair Mortar is mixed in a plastic bucket, adding water [see instructions on the bag] and mixed with a stirrer using a power drill or by manual means [depending on quantity to be used]. It is applied using a spatula.

6. Renders and Finishes

Hebel® Wall Panel can be finished with elastomeric paints [Block filler, primer and elastomeric paint], Hebel® Stucco, acrylic finishes, cement based finishes, etc. Joints between panels will be visible. For plane surfaces without visible joints, call Hebel® for technical assistance.



Fig.16: Second course of Hebel® Vertical Wall Panels.



Caution: Use safety gear: Hard hat, gloves, dust mask and goggles to avoid excessive inhalation of dust and protection of the eyes when handling Hebel® Wall Panels.



Fig.17: Cutting panel.



Fig.18: Openings using steel frames: a) Windows b) Doors.

7. Application Requirements

Tools

- Hammer ax
- Rubber mallet
- Sanding float
- Mason's level
- Brush
- Chasing tool
- Plastic bucket
- Stirrer for power drill
- Spatula
- Scissors for unpacking
- Clamps

Equipment

- Saw with 14" or 16" diamond.
- Vertical wall panel lifting hook
- Horizontal wall panel lifting gear
- Powder-actuated fastening tool [HILTI DX36M or similar]
- Crane
- 1/2" Power drill
- Safety gear [goggles, dust mask, gloves, hard hat]

Additional Material

Additional material needed, available through Xella Aircrete North America, Inc.:

- Hebel® Repair Mortar
- Connectors and nails

Additional material needed, not available, through Xella Aircrete North America, Inc.:

- Backer rod
- Caulking
- Cement-sand mortar
- Panel wedges
- 4x4 in. wood blocks, 2 ft. long
- Anticorrosive paint

4 Hebel®Repair Mortar

4.1 Technical Sheet

Description

Hebel® Repair Mortar is a dry-mixed [ready mix] component consisting of inorganic aggregates in a fine powder, Portland cement and additives to improve the mortar's properties.

Use

Hebel®Repair Mortar may be used on Hebel®blocks and panels for patching and aesthetic repairs.

Mixing the Repair Mortar

For each pound of mortar add approximately 6 ounces of water. Use a plastic bucket for mixing. A variable speed drill with the Hebel® stirrer is used for mixing the repair mortar with water. Follow instructions printed on the bag.

5 Fasteners

Fasteners

Anchors used with AAC shall be made of plastic or nylon. Wood, fiber, lead, metal or expansion anchors are not recommended. Use power drills to make holes for fasteners and masonry drill-bits recommended [diameter] on table 7 [drill-bit diameter may differ from recommended by fastener manufacturer; specifications have been adapted for AAC]. Percussion drilling or inverting the rotation direction when drilling shall be avoided. The anchor shall penetrate tightly in the hole to avoid rotation when placing the screw. When using Fischer anchors, the external finish layer surrounding the hole should be removed to allow the anchor to fully penetrate into the AAC element.

Hebel® AAC Nail:

Hebel® galvanized AAC nails are designed specifically to provide a definitive anchorage in the AAC.

Helpful Hints For Using Hebel®Repair Mortar

- Working life of mixture is about 4 hours.
- Do not wipe away any excess mortar that exudes from the patching area right away as it might smear. Let it set partially and then scrape off with a spatula and sand down.
- It is recommended to wear safety equipment [gloves, dust mask, etc.] since Repair mortar contains cement and this may cause irritation to the skin, eyes or breathing.

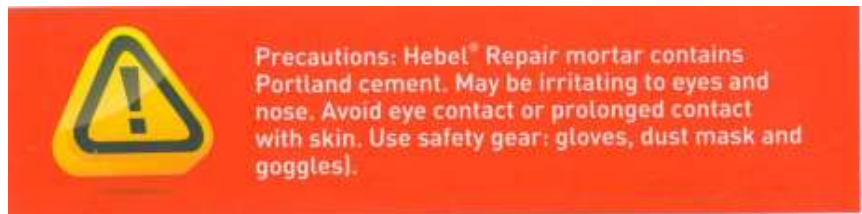
Delivery, Storage and Use of Hebel® Repair Mortar

Repair mortar comes dry from the factory and is packed in sealed sacks. Sacks should be protected against damage, placed in a dry area and protected against moisture or freezing.

Do not apply if temperature is below 4°C [39°F] or in rainy conditions.

Tools

- Stirrer for Power drill
- Plastic bucket
- 1/T Power drill



Hebel® AAC nails are directly hammered into the AAC element - no drilling is required.

Screws

Always use screws of the diameter recommended on table 7. Minimum length of screw is defined by the anchor length plus the thickness of the finish layer and the thickness of the element to be fixed.

Precautions

Load values [pull-out strength] shown in chart shall be used only as a reference guide; field testing is suggested according to project requirements. The load values [lb] shown in chart are for direct pull-out and a safety factor of 5 is included in them. Full penetration of screws into the anchor is assumed to obtain such load values.

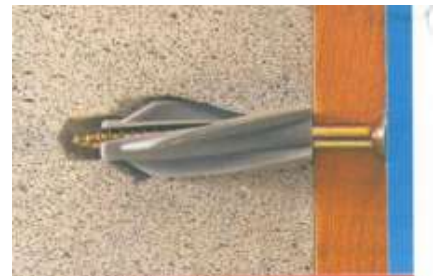


Fig. 19: Minimum screw length.



Fig. 20: Recommended nails & anchors.