

ICC Evaluation Service, Inc.
www.icc-es.org

Business/Regional Office ■ 5360 Workman Mill Road, Whittier, California 90601 ■ (562) 699-0543
Regional Office ■ 900 Montclair Road, Suite A, Birmingham, Alabama 35213 ■ (205) 599-9800
Regional Office ■ 4051 West Flossmoor Road, Country Club Hills, Illinois 60478 ■ (708) 799-2305

DIVISION: 04—MASONRY
Section: 04220—Concrete Masonry Units

REPORT HOLDER:

XELLA AIRCRETE NORTH AMERICA, INC.
2400 HEBEL BOULEVARD
ADEL, GEORGIA 31620
(229) 896-1593
www.xella-usa.com
sylvester.schmidt@xella.com

EVALUATION SUBJECT:

XELLA HEBEL AUTOCLAVED AERATED CONCRETE (AAC) MASONRY BLOCKS AND XELLA THIN BED MORTAR

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2006 *International Building Code*® (IBC)
- 2007 *Supplement to the International Building Code*® (IBC)
- Other Codes (see Section 8.0)

Properties evaluated:

- Structural
- Sound transmission
- Thermal conductivity

2.0 USES

Hebel Autoclaved Aerated Concrete (AAC) masonry blocks are used to construct unreinforced or reinforced exterior bearing walls and interior load-bearing and nonload-bearing, stiffening and shear masonry walls.

3.0 DESCRIPTION

3.1 General:

The Hebel AAC masonry blocks are precast, noncombustible masonry blocks manufactured of autoclaved aerated concrete. The autoclaved aerated concrete is produced from cement, lime, gypsum, quartz sand, water, and an expanding agent (aluminum paste) admixture. The batched raw materials are mixed together with water and then cast into steel molds. Due to the chemical reactions that take place, hydrogen gas is generated in the slurry mix, causing it to expand and form nonconnecting air cells and concrete with a uniform structure. After setting and before hardening, the AAC material is machine-cut into precast block units for masonry wall construction. The block units are then steam-cured under pressure in autoclaves where the material is transformed into a hard calcium silicate.

3.2 Materials:

3.2.1 Hebel AAC Masonry Blocks: Hebel AAC Masonry Blocks are produced in different ASTM C 1386 strength classes designated AAC2, AAC4, and AAC6, having compressive strengths, thermal properties and densities as summarized in Table 1. The Hebel Masonry Blocks are available in four different configurations: Blocks, Jumbo Blocks, U Blocks and Cored Blocks and various dimensions as shown in Tables 2, 3, 4, and 5, respectively. The Hebel Masonry Blocks are also available with tongue and groove in the Blocks, Jumbo Blocks and Cored Blocks configurations. The tongue and groove dimension is 1 inch (25.4 mm) high by 2 inches (51 mm) wide. All blocks share the same physical and structural properties and comply with ASTM C 1386 and IBC Section 2103.3.

3.2.2 Hebel Thin-Bed Mortar: Hebel Thin-Bed Mortar consists of inorganic aggregates; cement such as portland, iron portland, blast furnace and trass cement; and organic additives. The mortar complies with Section 2103.11.1 of the IBC. The Hebel Thin-Bed Mortar is a prebagged in dry form from the factory. Each bag weighs 48.5 pounds (22 kg). Mixing instructions are printed on the bag for the addition of water and the appropriate mixing sequence. Hebel Thin-Bed Mortar is used with Hebel AAC Masonry Blocks of all densities and strengths. The working life of the thin bed mortar mixture is four hours. The Thin-Bed Mortar has a one year shelf life from the date of manufacture when stored in unopened bags and protected from moisture.

3.2.3 Fasteners: Mechanical connections must be approved by the code official for each project.

4.0 DESIGN AND INSTALLATION

4.1 Design Strength of Hebel AAC Masonry Structures:

As set forth in IBC Section 2101, walls constructed of Hebel AAC Masonry Block units must be designed in accordance with IBC Section 2101.2, and Chapter 1 and Appendix A of the Building Code Requirements for Masonry Structures (ACI 530/ASCE 5/TMS 402).

4.1.1 Required Strength: Required strength must be determined in accordance with the strength design load combinations in Section 1605.2 of the IBC.

4.1.2 Design Strength: AAC masonry members must be proportioned such that the design strength exceeds the required strength. Design strength must be determined in accordance with Appendix A of ACI 530/ACSE5/TMS 402.

4.1.3 Seismic Design Provisions: Hebel AAC masonry must comply with the provisions of Section 2106 of the IBC, Section 1613.6.4 of the 2007 Supplement to the IBC, and Chapter 1 and Appendix A of ACI 530/ASCE 5/TMS 402. Hebel AAC masonry block units, when used in the seismic force-resisting system of structures, are not limited in height

when assigned to Seismic Design Category B. Height is limited to 35 feet (48768 mm), for structures assigned to Seismic Design Category C. Masonry structures and components must comply with the requirements in IBC Sections 2106.1 and 2106.2.

4.1.4 Thermal Characteristics: Hebel AAC masonry blocks, when tested in accordance with ASTM C 1363, have thermal conductivity values as shown in Table 1.

4.1.5 Sound Transmission: Walls constructed of minimum 8-inch-thick (203 mm) Hebel AAC masonry blocks provide a minimum Sound Transmission Class (STC) rating of 50 in accordance with Section 1207.2 of the IBC, and ASTM E 90.

4.2 Installation:

The Xella's Aircrete North America, Inc., published installation instructions, the Hebel Installation Manual and this report must be strictly adhered to, and a copy of the instructions must be available at all times on the jobsite during installation. Additionally, drawings and/or specifications must supplement the published instructions, and feature detailed information concerning how the Hebel AAC block units described in this report are to be integrated into the building under construction.

Exterior walls exposed to weather and/or outside moisture must have a code-complying weather-resistive barrier.

With the exception of the first course, which is placed on an ASTM C 270 Type M leveling mortar bed in accordance with IBC Section 2103.11.2, Hebel AAC masonry block units used in wall construction are laid with Hebel Thin-Bed Mortar with horizontal and vertical joint mortaring. Vertical joints need not be mortared when the tongue-and-groove block system is used. The thin-bed mortar must be mixed and applied according to Xella's or Hebel published installation instructions such that the joints are 0.04 to 0.12 inch (1 mm to 3 mm) in thickness. The block unit walls must be built in running bond, i.e., the vertical joints must be staggered a minimum of one-quarter the length of the unit but not less than 4 inches (102 mm).

Cored blocks must be placed within 24 inches (610mm) of corners, each side of openings, and each side of movement joints to accommodate vertical reinforcement. Cores on the blocks must either be factory installed or drilled on site. Field-installed cores for 6-inch-thick (152 mm) blocks must be a minimum of 3 inches (76 mm) in diameter. Field-installed cores for blocks 8 inches (203) thick or thicker must be a minimum of 4 inches (102 mm) in diameter. Vertical reinforcement size and spacing must be specified by the structural design professional. Vertical reinforcement must be spliced to reinforcement dowels from the foundation and continuing up the walls through the vertical cores with a 90-degree hook in bond beam, as shown in Figures 1. The cores must then be filled with fine grout in accordance with ASTM C 476.

A bond beam consisting of a row of U-blocks must be installed at the top of each floor level of the AAC wall. Two deformed, minimum No. 4 reinforcing bars must be installed in the U-shaped cavity that runs horizontally through the wall. The vertical reinforcement in the vertical core must terminate with a 90-degree hook in the bond beam. A truss anchor plate or double wood sill plate must be anchored to the bond beam. Bent pieces of deformed reinforcement must be used to tie the cores and corner together. The details of reinforcement, including splice length, must comply with ACI 530/ASCE 5/TMS 402.

The thin-bed mortar must be applied to a clean masonry unit surface, using a $\frac{3}{16}$ -inch-by- $\frac{3}{16}$ -inch (4.8 mm by 4.8 mm) notched trowel. The minimum ambient temperature during installation must be 40°F (4°C). Hebel AAC block units must

be cut to exact shapes and sizes with a hand saw or an electric saw. Ordinary wood-working tools may be used, but special saws and scraping tools are also available.

4.3 Special Inspection:

Special inspection of structural masonry must conform to IBC Section 1704. The special inspector's duties include verifying masonry unit and mortar identification; unit placement; reinforcement placement for field reinforcement; mortar preparation; and application.

5.0 CONDITIONS OF USE

The Hebel AAC Block Masonry Units and the Hebel Thin Bed Mortar described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

- 5.1 The Hebel AAC masonry block structures must be installed in accordance with the applicable code, the Hebel Installation Manual and this report. In the event of a conflict between Hebel Installation Manual and this report, this report governs.
- 5.2 Plans, specifications, engineering calculations and other construction documents specifying the use of these autoclaved aerated concrete masonry blocks, must be submitted to the code official for approval. The calculations and documents must be prepared by a registered design professional when required by the statutes of the jurisdiction where the project is to be constructed.
- 5.3 Surfaces of basement walls in contact with the ground must be waterproofed.

Exterior walls and other building elements exposed to weather and/or outside moisture must have code-complying weather-resistance coverings.
- 5.4 Inspection and installation of construction using Hebel AAC masonry blocks must comply with the requirements set forth in the applicable code for structural masonry.
- 5.5 Special inspection must be provided and must comply with Section 4.3 of this report.
- 5.6 The Hebel AAC masonry block units must be manufactured in Adel, Georgia, by Xella Aircrete North America, Inc., under a quality control program with inspections by Underwriters Laboratories Inc. (AA-688).
- 5.7 The Hebel Thin-Bed Mortar must be manufactured by Xella Mexicana at Carretera a Dulces Nombres Km 9.1, Pasqueria, Nuevo Lardeo, Mexico, under a quality control program with inspections by Underwriters Laboratories Inc. (AA-688).

6.0 EVIDENCE SUBMITTED

Reports of tests demonstrating compliance with ASTM C 1386.

7.0 IDENTIFICATION

All Hebel AAC product labels include the evaluation report number (ESR-2447), the name of the inspection agency [Underwriters Laboratories Inc. (AA-688)] and the following information for field identification:

- 7.1 **Xella Hebel AAC Masonry Block Units:** All pallets of Hebel AAC masonry block units recognized in this report bear the manufacturer's name (Xella Aircrete North America, Inc., and of the brand name (Hebel), along with, a code that indicates the production plant and production date, the product type and the strength class and density in accordance with Table 1 of ASTM C 1386.

7.2 Hebel AAC Thin-Bed Mortar: Packages of Hebel AAC Thin-Bed Mortar carry the manufacturer's name (Xella Mexicana), the brand name (Hebel), the weight, mixing instructions and application instructions.

8.0 OTHER CODES

8.1 Evaluation Scope:

The Hebel AAC blocks and the Hebel Thin Bed Mortar described in this report were also evaluated for compliance with the requirements of 1997 *Uniform Building Code*™ (UBC).

8.2 Uses:

The Hebel AAC masonry blocks, when installed in accordance with this report, are permitted for use as reinforced, unreinforced, exterior and interior, load-bearing and nonload-bearing walls and shear walls.

8.3 Description:

See Section 3.0.

8.4 Design and Installation:

Design of walls constructed of Hebel AAC block is based on unreinforced working stress design in accordance with Section 2107 of the UBC, using the physical characteristics in Table 1 of this report. Use of AAC masonry block units under this evaluation report is limited to Seismic Zones 0 and 1.

8.5 Conditions of Use:

Special inspection must be done in accordance with Section 1701.5 of the UBC.

8.6 Evidence Submitted:

Data in accordance with the ICC-ES Acceptance Criteria for Concrete Floor, Roof and Wall Systems and Concrete Masonry Wall Systems (AC15), dated June 2008; and the Acceptance Criteria for Seismic Design Factors and Coefficients for Seismic-Force-Resisting Systems of Autoclaved Aerated Concrete (AAC) (AC215), dated October 2003.

8.7 Identification:

See Section 7.0.

TABLE 1—PHYSICAL CHARACTERISTICS OF HEBEL AAC STANDARD AND JUMBO BLOCK UNITS

STRENGTH CATEGORY	MINIMUM COMPRESSIVE STRENGTH f'_{AAC} (psi)	NOMINAL DRY BULK DENSITY (pcf)	THERMAL CONDUCTIVITY (Btu. in./h. ft. ² °F)
AAC2	290	31	0.80
AAC4	580	37	0.97
AAC6	870	44	1.25

For SI: 1 inch = 25.4 mm, 1 foot = 305 mm, 1 psi = 0.0069 MPa, 1 pcf = 16.02 kg/m³, 1 Btu. in./h.ft².°F = 0.144 W/m.K.

TABLE 2—DIMENSIONS FOR HEBEL AAC BLOCK UNITS

STRENGTH CLASS	THICKNESS (inches)	HEIGHT (inches)	NOMINAL LENGTH (inches)
AAC2, AAC4, AAC6	2, 3, 4, 5, 6, 7, 8, 10, 12	8 and 12	24

For SI: 1 inch = 25.4 mm.

TABLE 3—DIMENSIONS FOR HEBEL JUMBO BLOCK UNITS

STRENGTH CLASS	THICKNESS (inches)	HEIGHT (inches)	NOMINAL LENGTH (inches)
AAC2, AAC4, AAC6	6, 7, 8, 10, 12	24	40 and 48

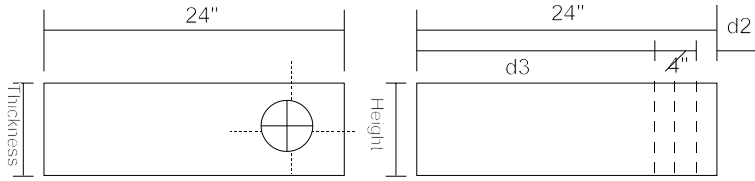
For SI: 1 inch = 25.4 mm.

TABLE 4—DIMENSIONS FOR HEBEL U BLOCK UNITS

STRENGTH CLASS	Thickness (inches)	Height (inches)	a (inches)	b (Inches)	c (Inches)	d (inches)
AAC2	8	8	2	4	2	2
AAC4	10	8	2	6	2	2
AAC6	12	8	2	8	2	2

For SI: 1 inch = 25.4 mm.

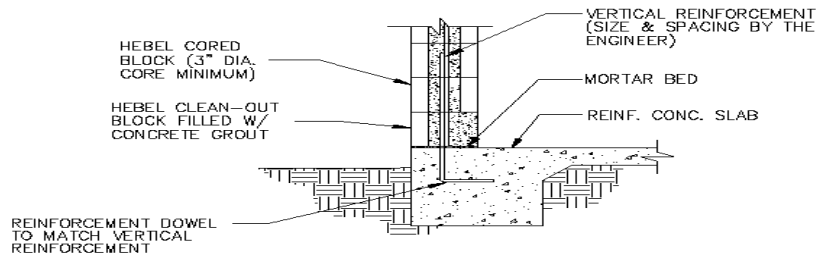
TABLE 5—DIMENSIONS FOR HEBEL UNIT CORED-BLOCK



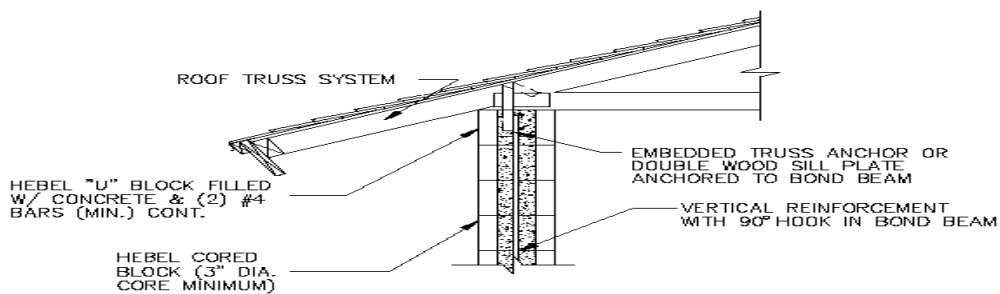
STRENGTH CLASS	THICKNESS (inches)	CORE DIAMETER (inches)	CORE VOLUME (ft ³) ¹	d1 (inches)	d2 (inches)	d3 (inches)
AAC2	8	4	0.06	4	2	18
AAC4	10	4	0.06	5	3	17
AAC6	12	4	0.06	6	4	16

For SI: 1 inch = 25.4 mm.

¹ Core volume based on block height of 8 inches (203 mm). Block length is 24" (610 mm).



SECTION @ FOUNDATION
SCALE: 3/4" = 1'-0"



SECTION @ TOP OF WALL
SCALE: 3/4" = 1'-0"

FIGURE 1—REINFORCEMENT DETAILS