State of Florida
Building Code Compliance for Autoclaved Aerated Concrete

This submittal packet includes:
Memo Concerning Florida Product Approval
Report from 3rd Party Engineer Regarding Product Evaluation for AAC Panels
Report from 3rd Party Engineer Regarding Product Evaluation for AAC Block
ESR- 2447, Division 04- Masonry Units
ESR- 2448, Division 03- Concrete, Precast Structural Concrete
Missile Impact Test for 8” AAC Block
Missile Impact and Cyclic Wind Pressure Loading Test for 4” AAC Boards
Static Wind, Missile Impact and Cyclic Test for 2” AAC Boards

www.buildwithhebel.com
Phone: 877-41-HEBEL (43235)
Memorandum

To: All Florida Building Code Officials & Municipalities

From: Anthony L. Rentz, P.E.

Date: Monday, November 30, 2009

RE: Hebel Autoclaved Aerated Concrete (AAC) Products
Use in the State of Florida, Findings by Third Party Engineer
Directives for Reviewing and Permitting Agencies

Please find attached two (2) documents from Dr. John K. McCall, Ph.D., P.E., of McCall Engineering, LLC, Sarasota, Florida. Note that he and his staff have evaluated the applicability of the Xella Hebel Product Line as it would relate to the Florida Product Approval process.

Note that their findings, both for Non-reinforced AAC products (AAC Block Material) and Reinforced AAC products (AAC Panels, Boards, Lintels, etc.), indicate that due to the flexible and versatile nature of the product, a specific configuration (or array of configurations) for certification under the Florida Product Approval program would not include ALL possible design scenarios. Such an inclusive certification for the product line would be impossible. Therefore, Xella Hebel AAC does not and cannot fit the State’s “model” for Florida Product Approval. Just as CMU, sawn timber members, and general purpose concrete maintain no Florida Product Approval due to their application and configuration possibilities, this product line is subject to the same criteria.

In tandem with these findings, also note that the structural engineering applications, specifications, design criteria and guidelines for the product’s use are strictly governed by ASTM Standards (that are vigorously and frequently modified and updated) and the American Concrete Institute’s Standards of ACI 523.4R (for pre-cast panels) and ACI 530 Appendix “A” (for masonry applications). Also, this company maintains ICC-ES reports for both families of product, both reinforced and non-reinforced. The product has also undergone previous testing for configurations necessary for the product’s use in High-Velocity Hurricane-prone regions of the State.

Given both the above and the attached, projects designed with AAC products shall always be required to conform to the design standards as aforementioned. Each and every project will be unique in its character with regard to loading criteria, required performance, and sustainability. It is the responsibility of the Professional Design Engineer of Record to conform to all published design standards that govern the use of AAC for a given project and location, and it is the duty of the Reviewing Official to police and adjudicate all AAC design work as presented for review and permitting. This will always be the case, even if it were possible to assign a FPA number to the products.

Please review the attached. We welcome the opportunity to provide more information for clarity and support as needed. Please direct any comments, questions, or problems to this office in Adel, Georgia.
November 9, 2009

Xella Aircrete North America, Inc.
Attn: Anthony Rentz, P.E.
2400 Hebel Boulevard
Adel, GA, 31620

Re: Product Evaluation for AAC Panels

This document is intended as an aid to local building officials in reviewing the acceptability of use for the Aerated Autoclaved Concrete (AAC) panels manufactured by Xella Aircrete North America, Inc., (herein referred to as Xella) in accordance with ASTM C1452. Because the AAC panels are not suited for Florida Product Approval (FPA) as explained below, this document aims to mirror that function and allow for thorough and expedited local review of design using AAC.

The letter addresses the following two points:

- Summary of codes, design guides, evaluation reports, and testing standards used to support design and use of AAC
- Reasons for inapplicability of FPA for AAC

**AAC Supporting Design Documentation**

AAC can be designed as low-strength, reinforced concrete. Substantial research and development has been completed to validate the design and use of this material as such. These documents are summarized as follows:

- **ACI 523**: While not formally adopted as Code, this report was commissioned and prepared by ACI as a design guide for AAC panels. It includes extensive references demonstrating substantial research and testing in the use of AAC panels.
- **ICC-ES Report ESR-2248 for AAC Precast Panels**: This report provides national acceptance for AAC structures and associated design methods.

John K. McCall
FL PE# 17201
11/9/2009
• Cyclic and Missile Impact Test Reports by Construction Testing Corporation in Miami, FL per ASTM E1886-02 and E1996-02 standards: These tests confirm that 4” or thicker AAC panels satisfy High Velocity Hurricane Zone (HVHZ) missile requirements.
• Manufacture according to ASTM C1386 and ASTM C1452 standards: These are the ASTM standards for “Standard Specification for Precast Autoclaved Aerated Concrete (AAC) Wall Construction Units” and “Standard Specification for Reinforced Autoclaved Aerated Concrete Elements,” respectively.
• Quality Assurance Program validated by Underwriters Laboratories, which is a Quality Assurance Entity recognized by the State of Florida.

Reasons for inapplicability of FPA

In order to understand why Xella’s products are not suited for FPA, one must first understand the intention and method of the FPA process. As one of the primary means of assisting local building officials in evaluating the suitability of building components, the FPA has developed in recent years as the standard for acceptability. Through the process of obtaining a Florida Product Approval Number (FL#), manufacturers are able to present officials with a recognized certification that their products meet all applicable building codes and safety requirements.

Though a very useful tool, FPA has aspects which make it inapplicable for some products. In order to obtain an FL#, applicants must provide rigidly set specifications, including but not limited to exact dimensions, installation instructions, boundary conditions, and design pressure, for each eligible product. While beneficial for most products, this aspect rather acts as a limitation against AAC that renders FPA ineffective. AAC is a versatile material with literally hundreds of various configurations and strength designs which can be manipulated to meet the requirements of each individual project. Because of this versatility, AAC is not suited for the exacting coverage of an FL#.

The FPA process has evolved into the exacting procedure that it currently is in response to consumer needs. Earlier versions of the FPA process did allow for broad or generalized approval which would have been suitable for the versatility of AAC. However, this is no longer the intention of FPA. When site-specific conditions truly dictate the design of components, local jurisdiction and review must be employed.

Because of the variable nature of the AAC panels, site-specific design by a registered Florida Professional Engineer (FL PE) is required. As such, each design must be individually reviewed and accepted locally.

John K. McCall
FL PE# 17201
11/9/2009
November 9, 2009

Xella Aircrete North America, Inc.
Attn: Anthony Rentz, P.E.
2400 Hebel Boulevard
Adel, GA, 31620

Re: Product Evaluation for AAC Block

This document is intended as an aid to local building officials in reviewing the acceptability of use for the Aerated Autoclaved Concrete (AAC) block manufactured by Xella Aircrete North America, Inc. (herein referred to as Xella) in accordance with ASTM-C1386. Site-specific design for AAC block must be completed on a case-by-case basis by a Florida Licensed Professional Engineer (FL PE). Design must be completed according to the requirements laid out in ACI 530, which has been amended to address the design of AAC masonry. Because ACI 530 is a nationally and state referenced code, no further Product Approval or certification is required.

Please contact our office with any questions.
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 AAC8, 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 IEC 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 IEC. 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/ASCE 5/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 (45768 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 Aircrète North America, Inc. published installation instructions, the Hebel Installation 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 regarding 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-resistant 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 at least 3 inches (76 mm) in diameter. Field-installed cores for blocks 8 inches (203 mm) thick or thicker must be at least 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 1/2-inch-by-1/2-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. Frequent inspections and records must be made of all work in progress. 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.

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 Aircrète 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 Calzada de Dolores 999 No. 1, Pasqueria, Nuevo Laredo, 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 Aircrète 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 (Xello 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:

8.7 Identification:
See Section 7.0.

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

<table>
<thead>
<tr>
<th>STRENGTH CATEGORY</th>
<th>MINIMUM COMpressive STRENGTH</th>
<th>NOMINAL DRY BULK DENSITY</th>
<th>THERMAL CONDUCTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$F_{\text{AAC}}$ (psi)</td>
<td>(pcf)</td>
<td>(Btu/ln ft $^2$ $^\circ$F)</td>
</tr>
<tr>
<td>AAC2</td>
<td>270</td>
<td>31</td>
<td>0.80</td>
</tr>
<tr>
<td>AAC4</td>
<td>560</td>
<td>37</td>
<td>0.97</td>
</tr>
<tr>
<td>AAC6</td>
<td>870</td>
<td>44</td>
<td>1.25</td>
</tr>
</tbody>
</table>

For SI: 1 inch = 25.4 mm, 1 foot = 305 mm, 1 psi = 0.0069 MPa, 1pcf = 16.02 kg/m³, 1 Btu/ln ft $^2$ $^\circ$F = 0.14 W/m K.

### TABLE 2—DIMENSIONS FOR HEBEL AAC BLOCK UNITS

<table>
<thead>
<tr>
<th>STRENGTH CLASS</th>
<th>THICKNESS (inches)</th>
<th>HEIGHT (inches)</th>
<th>NOMINAL LENGTH (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAC2, AAC4, AAC6</td>
<td>2, 3, 4, 5, 6, 7, 8, 10, 12</td>
<td>8 and 12</td>
<td>24</td>
</tr>
</tbody>
</table>

For SI: 1 inch = 25.4 mm.

### TABLE 3—DIMENSIONS FOR HEBEL JUMBO BLOCK UNITS

<table>
<thead>
<tr>
<th>STRENGTH CLASS</th>
<th>THICKNESS (inches)</th>
<th>HEIGHT (inches)</th>
<th>NOMINAL LENGTH (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAC2, AAC4, AAC6</td>
<td>6, 7, 8, 10, 12</td>
<td>24</td>
<td>40 and 48</td>
</tr>
</tbody>
</table>

For SI: 1 inch = 25.4 mm.

### TABLE 4—DIMENSIONS FOR HEBEL U BLOCK UNITS

<table>
<thead>
<tr>
<th>STRENGTH CLASS</th>
<th>Thickness (inches)</th>
<th>Height (inches)</th>
<th>a (inches)</th>
<th>b (inches)</th>
<th>c (inches)</th>
<th>d (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAC2</td>
<td>8</td>
<td>8</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>AAC4</td>
<td>10</td>
<td>8</td>
<td>2</td>
<td>6</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>AAC6</td>
<td>12</td>
<td>8</td>
<td>2</td>
<td>8</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

For SI: 1 inch = 25.4 mm.
TABLE 5—DIMENSIONS FOR HEBEL UNIT CORED-BLOCK

<table>
<thead>
<tr>
<th>STRENGTH CLASS</th>
<th>THICKNESS (Inches)</th>
<th>CORE DIAMETER (Inches)</th>
<th>CORE VOLUME (ft³)</th>
<th>d1 (Inches)</th>
<th>d2 (Inches)</th>
<th>d3 (Inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAC2</td>
<td>8</td>
<td>4</td>
<td>0.08</td>
<td>4</td>
<td>2</td>
<td>18</td>
</tr>
<tr>
<td>AAC4</td>
<td>10</td>
<td>4</td>
<td>0.08</td>
<td>5</td>
<td>3</td>
<td>17</td>
</tr>
<tr>
<td>AAC6</td>
<td>12</td>
<td>4</td>
<td>0.00</td>
<td>0</td>
<td>4</td>
<td>16</td>
</tr>
</tbody>
</table>

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).

FIGURE 1—REINFORCEMENT DETAILS
wires are welded to longitudinal reinforcement to provide anchorage. Reinforcing steel wire diameters range from $\frac{1}{8}$ inch (4 mm) to $\frac{3}{16}$ inch (8 mm). The longitudinal wire spacing is 2.36 inches (60 mm) on center, with a maximum of nine wires on each face. All reinforcing wire is protected with rust inhibitor in compliance with ASTM C 1452.

The average moisture content of the AAC panels at delivery is 20 to 35 percent by weight. Moisture content lessens gradually and moisture equilibrium is usually reached at approximately 5 percent by weight after six months to one year.

All metal connectors, fasteners and accessories used must be of corrosion-resistant material compatible with the precast panel material. The Hebel AAC panels comply with ASTM C 1452 as strength classes AAC4 or AAC6.

See Table 1 for available panel strengths, densities and thermal properties.

3.2 Hebel Floor Panels:

The floor panels are 24 inches (610 mm) wide and are manufactured with grooved edges along the longer dimension. All units have two layers of equal or unequal reinforcement. The panels are available in different strength categories and thicknesses to suit a range of spans. Thermal characteristics of Hebel AAC floor panels are shown in Table 1, and the design values are shown in Table 2.

3.3 Hebel Roof Panels:

The roof panels are similar to Hebel floor panels with respect to geometry, physical characteristics, and installation procedures. Thermal characteristics of reinforced Hebel AAC roof panels are shown in Table 1, and design values are shown in Table 2.

3.4 Hebel Horizontal and Vertical Wall Panels:

Hebel horizontal and vertical wall panels are available in the same strength categories and have the same thermal characteristics as noted in Table 1 for Hebel floor and roof panels. Design values are noted in Table 3. Wall panels have two layers of equal amounts of reinforcement and are placed either vertically or horizontally. Wall panels spanning vertically from floor to floor have either tongue-and-groove edges, groove-to-groove edges, or ongitudinal square edges with square edges at supports. Tongues and grooves measure 2 inches (51 mm) in diameter. Wall panels spanning horizontally have tongue-and-groove edges or square edges perpendicular to supports, with square edges along supports.

3.4.1 Hebel Curtain Wall Panels: Hebel curtain wall panels are non-load-bearing panels. The panels are similar to the Hebel horizontal and vertical wall panels except that the curtain wall panels are only used for non-load-bearing applications. The panels can be installed horizontally or vertically.
3.4.2 **Hebel Lintels**: Hebel lintels are reinforced and used to span openings in walls. The AAC6 lintels can be used for load-bearing and nonload-bearing applications.

3.4.3 **Hebel Thin-Bed Mortar**: Hebel thin-bed mortar consists of inorganic aggregates, cement and organic additives. The mortar complies with Sections 2103.11.1 and 2103.11.2 of the IBC. Thin-bed mortar comes dry-mixed and prebagged 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. The Hebel thin-bed mortar is used with Hebel AAC panels of all densities and strengths. The working life of the thin bed mortar is four hours. Thin-bed mortar has a one-year shelf life from the date of manufacture when stored in unopened bags and protected from moisture.

4.0 **DESIGN AND INSTALLATION**

4.1 **Design Strength of Hebel AAC Panels**:

4.1.1 **Design Strength: General**: Design strength for the use of Hebel AAC panels must be in accordance with Section 1901.2 of the IBC, using the design information in Table 2 or Table 3, as applicable.

4.1.2 **Roof and Floor Panels**: Table 2 shows design values for roof and floor panels. Tables 4, 5 and 6 show allowable loads for roof and floor panels.

4.1.3 **Horizontal and Vertical Wall Panels**: Design values for wall panels are noted in Table 3. The design assumptions for the reinforced panels must comply with the Building Code Requirements for Reinforced Concrete (ACI 318), Section 10.2.

4.2 **Installation**:

4.2.1 **General**: The Hebel AAC panels must be installed in accordance with this report and the approved construction plans, which must comply with Section 1901.4 of the IBC. A copy of the plans and this report must be available at the jobsite at all times during installation.

Typical installation details are illustrated in Figures 1 through 4. The typical details are intended as a guide only, and must be substantiated for approval by the code official.

4.2.2 **Roof and Floor Panels**: Roof assemblies must be covered with an approved, fully adhered, Class A, B or C roof covering without insulation or mechanical attachments. Floor slabs must be protected from moisture and abrasion by application of an approved topping. All grooves must be reinforced with one minimum No. 3, Grade 60 deformed reinforcement bar and filled with grout. The roof and floor panels may be installed on reinforced concrete, steel, masonry, AAC or heavy timber. Minimum bearing depths for roof and floor panels on different supporting surfaces are shown in Figure 1.

4.2.3 **Horizontal and Vertical Wall Panels**: A waterproof course membrane may be used on top of the foundation where the panels will be placed to protect against ground moisture. Exterior walls exposed to weather and/or outside moisture must have a code-complying water-resistive barrier. The first horizontal or vertical panel must be laid in a Type M leveling cement bed mortar. The first horizontal or vertical panels may be installed without using Type M cement bed mortar if the top surface of the supporting element is even. Proper anchoring of each horizontal or vertical panel to the main structure must be in accordance with Xella's published installation manual and as illustrated in Figures 2, 3 and 4. After the first wall panel is anchored to the main structure, thin-bed mortar must be applied to the panel's longitudinal side just before installation of the next panel. It is necessary to apply the Hebel thin-bed mortar to the joints when working with Hebel tongue-and-groove panels. Vertical joints with a 0.40-inch to 0.60-inch (10 mm to 20 mm) gap between the horizontal panels are necessary to accommodate structural movements caused by thermal expansion and shrinkage. Joints must be sealed with approved plasto-elastic compound.

4.3 **Sound Transmission**: Walls, partitions and floor/ceiling assemblies constructed of minimum 8-inch-thick (203 mm) AAC panels provide a minimum STC rating of 50 in accordance with IBC Section 1207.2 and ASTM E 90. Floor/ceiling assemblies constructed of minimum 8-inch-thick (203 mm) AAC panels provide an impact insulation class (II C) rating of not less than 50 in accordance with IBC Section 1207.3 and ASTM E 492.

4.4 **Thermal Insulation**:

Hebel AAC panels, when tested in accordance with ASTM C 236, have overall heat transmission values as shown in Table 1.

4.5 **Fasteners**:

Mechanical connections using fasteners are subject to approval by the code official for each project.

4.6 **Miscellaneous**:

The panels must be at least 12 inches (305 mm) above an adjacent grade unless appropriately protected from absorption of moisture. Grooves for electrical wiring and holes for junction boxes are permitted to be cut or routed at the jobsite subject to submittal of substantiating data from the registered design professional and approval of the code official. Openings in roof and floor panels that are field-cut must have additional reinforcement substantiated by structural calculations or other data submitted to the code official for approval.

4.7 **Special Inspection**:

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

5.0 **CONDITIONS OF USE**

The Hebel Autoclaved Aerated Concrete (AAC) Panels as described in this report comply with, or are suitable alternatives to what is specified in, the IBC, subject to the following conditions:

5.1 The published installation manual and this report must be available at all times at the jobsite during construction. The instructions within this report govern if there are any conflicts between the manufacturer's installation manual and this report.

5.2 Connections of the panels to the supporting structures must be designed to the satisfaction of the code official.

5.3 The Hebel AAC panel structures are designed using the design strength procedures outlined in this report, and the design must be in accordance with the applicable code.

5.4 Plans, specifications, engineering calculations and other construction documents specifying the use of Hebel AAC panels 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.
5.5 Inspection and installation of the Hebel AAC panels must comply with the requirements set forth in the IBC for structural concrete.

5.6 Special inspection must be provided and must comply with Section 4.7 of this report.

5.7 Use of Hebel AAC panels for vibratory or impact loads is out of the scope of this report.

5.8 Wall panels used for lateral force resisting systems must be limited to Seismic Design Category A or B.

5.9 The Hebel AAC panels are manufactured in Adel, Georgia, by Xella Aircrēte North America, Inc., under a quality control program with inspections by Underwriters Laboratories Inc. (AA-688).

5.10 The Hebel thin-bed mortar is manufactured by Xella Mexicana at Carretera Dulces Nombres Km 9.1, Pesquería, Nuevo Laredo, Mexico, under a quality control program with inspections by Underwriters Laboratories Inc. (AA-688).

6.0 EVIDENCE SUBMITTED

6.1 Data in accordance with the ICC-ES Acceptance Criteria for Concrete Floor, Roof and Wall Systems and Concrete Masonry Wall Systems (AC15), dated June 2007.

6.2 Test reports in accordance with the requirements of ASTM C 1452.

7.0 IDENTIFICATION

All Hebel AAC product labels include the evaluation report number (ESR-2448), the name of the inspection agency (Underwriters Laboratories Inc.), and the following information for field identification:

7.1 Hebel AAC Panels: All pallets of AAC wall panels recognized in this report carry the manufacturer's name (Xella Aircrēte North America, Inc.) and/or trademark (Xella); the brand name (Hebel); a code that indicates the production plant in Adel, Georgia, and the production date; the product type; and the strength class and density in accordance with Table 1 of this report.

7.2 Hebel Thin-Bed Mortar: The packages of Hebel thin-bed mortar carry the manufacturer's name (Xella Mexicana), the brand name (Hebel), the weight, and mixing and application instructions.

8.0 OTHER CODES

8.1 Evaluation Scope:
The Hebel AAC panels and Hebel thin-bed mortars described in this report were also evaluated for compliance with the requirements of 1997 Uniform Building Code™ (UBC).

8.2 Uses:
See Section 2.0.

8.3 Description:
See Section 3.0.

8.4 Design and Installation:
Hebel AAC panels must be designed and installed in accordance with Section 1926 of the UBC. Specifications for tests and materials must be in accordance with Section 1903 of the UBC. Durability requirements must be in accordance with Section 1904 of the UBC.

8.5 Conditions of Use:
The Hebel AAC Panels and Hebel Thin Bed Mortars comply with, or are suitable alternatives to what is specified in, the UBC, subject to the conditions in Section 5.0 and the following:

8.5.1 Walls used as lateral force-resisting systems must be limited to Seismic Zone 0 or 1.

8.5.2 Inspection and installation of Hebel AAC panels must comply with the requirements of the UBC. Special inspection must be in accordance with Section 1701.1 of UBC.

8.6 Evidence Submitted:
See Section 6.0.

8.7 Identification:
See Section 7.0.

---

### TABLE 1—THERMAL CHARACTERISTICS OF HEBEL FLOOR, ROOF AND WALL PANELS PER INCH OF THICKNESS

<table>
<thead>
<tr>
<th>STRENGTH CATEGORY</th>
<th>NOMINAL DRY BULK DENSITY (pcf)</th>
<th>THERMAL RESISTANCE, R (ft² h °F/Blu in)</th>
<th>THERMAL CONDUCTIVITY, K (Blu in / ft² h °F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAC4</td>
<td>37</td>
<td>0.90</td>
<td>1.11</td>
</tr>
<tr>
<td>AAC6</td>
<td>44</td>
<td>0.76</td>
<td>1.32</td>
</tr>
</tbody>
</table>

For SI: 1 inch = 25.4 mm, 1 pcf = 16.02 kg/m² 1 Blu. in. h °F = 0.144 W/m²K.
### TABLE 2—DESIGN VALUES FOR HEBEL FLOOR AND ROOF PANELS

<table>
<thead>
<tr>
<th>STRENGTH CATEGORY</th>
<th>NOMINAL COMPRESSIVE STRENGTH, $f'_c$ (psi)</th>
<th>MAXIMUM BULK DENSITY (pcf)</th>
<th>DESIGN DEAD WEIGHT (pcf)</th>
<th>NOMINAL SLAB THICKNESS (inches)</th>
<th>DEAD WEIGHT (psf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAC4</td>
<td>680</td>
<td>37</td>
<td>46</td>
<td>4</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td></td>
<td></td>
<td>6</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td></td>
<td></td>
<td>7</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td></td>
<td></td>
<td>8</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td></td>
<td></td>
<td>9</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td></td>
<td></td>
<td>10</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td></td>
<td></td>
<td>12</td>
<td>38</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td>45</td>
</tr>
<tr>
<td>AAC6</td>
<td>870</td>
<td>44</td>
<td>54</td>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td></td>
<td></td>
<td>5</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td></td>
<td></td>
<td>6</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td></td>
<td></td>
<td>7</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td></td>
<td></td>
<td>8</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td></td>
<td></td>
<td>9</td>
<td>35</td>
</tr>
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<td></td>
<td>10</td>
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<td>10</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td></td>
<td></td>
<td>12</td>
<td>44</td>
</tr>
</tbody>
</table>

For SI: 1 inch = 25.4 mm, 1 pcf = 16.02 kg/m³.

### TABLE 3—DESIGN VALUES FOR HEBEL WALL PANELS

<table>
<thead>
<tr>
<th>STRENGTH CATEGORY</th>
<th>NOMINAL COMPRESSIVE STRENGTH, $f'_c$ (psi)</th>
<th>MAXIMUM BULK DENSITY (pcf)</th>
<th>DESIGN DEAD WEIGHT (pcf)</th>
<th>NOMINAL SLAB THICKNESS (inches)</th>
<th>LIGHTLY REINFORCED</th>
<th>REINFORCED</th>
<th>LIGHTLY REINFORCED</th>
<th>REINFORCED</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAC4</td>
<td>580</td>
<td>37</td>
<td>44</td>
<td>4</td>
<td>15</td>
<td>15</td>
<td>18</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td></td>
<td></td>
<td>5</td>
<td>16</td>
<td>16</td>
<td>22</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td></td>
<td></td>
<td>6</td>
<td>22</td>
<td>22</td>
<td>26</td>
<td>26</td>
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<td>7</td>
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<td>33</td>
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<td></td>
<td>9</td>
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<td>37</td>
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<td></td>
<td></td>
<td>12</td>
<td>44</td>
<td>44</td>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td>AAC6</td>
<td>870</td>
<td>44</td>
<td>50</td>
<td>4</td>
<td>17</td>
<td>17</td>
<td>21</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td></td>
<td></td>
<td>5</td>
<td>21</td>
<td>21</td>
<td>25</td>
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<td>6</td>
<td></td>
<td></td>
<td>6</td>
<td>25</td>
<td>25</td>
<td>29</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td></td>
<td></td>
<td>7</td>
<td>29</td>
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<td></td>
<td>12</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
</tbody>
</table>

For SI: 1 inch = 25.4 mm, 1 psi = 0.0069 MPa, 1 pcf = 16.02 kg/m³.
### TABLE 4—ALLOWABLE LOAD TABLE FOR HEBEL FLOOR PANELS AAC6

<table>
<thead>
<tr>
<th>PANEL THICKNESS (inches)</th>
<th>MOMENT CAPACITY (lb-ft/ft)</th>
<th>SUPERIMPOSED UNIFORM LOAD, w (psf)</th>
<th>Dead Weight (psl)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>63</td>
<td>68</td>
</tr>
<tr>
<td>6</td>
<td>1,985</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>7</td>
<td>2,776</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>8</td>
<td>3,680</td>
<td>17</td>
<td>17</td>
</tr>
<tr>
<td>9</td>
<td>4,732</td>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td>10</td>
<td>5,917</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>12</td>
<td>6,333</td>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>

For SL: 1 inch = 25.4 mm, 1 foot = 305 mm, 1 psf = 47.88 Pa, 1 lb-ft./ft. = 4.448 N-mm, 1 pcf = 16.02 kg/m².

### TABLE 5—ALLOWABLE LOAD TABLE FOR HEBEL ROOF PANELS AAC4

<table>
<thead>
<tr>
<th>PANEL THICKNESS (inches)</th>
<th>MOMENT CAPACITY (lb-ft/ft)</th>
<th>SUPERIMPOSED UNIFORM LOAD, w (psf)</th>
<th>Dead Weight (psf)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>20</td>
<td>23</td>
</tr>
<tr>
<td>4</td>
<td>571</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>5</td>
<td>937</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>6</td>
<td>1,388</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>7</td>
<td>1,942</td>
<td>17</td>
<td>17</td>
</tr>
<tr>
<td>8</td>
<td>2,576</td>
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<td>19</td>
</tr>
<tr>
<td>9</td>
<td>3,311</td>
<td>21</td>
<td>21</td>
</tr>
<tr>
<td>10</td>
<td>4,141</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>12</td>
<td>6,056</td>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>

For SL: 1 inch = 25.4 mm, 1 foot = 305 mm, 1 psf = 47.88 Pa, 1 lb-ft./ft. = 4.448 N-mm, 1 pcf = 16.02 kg/m².

### TABLE 6—ALLOWABLE LOAD TABLE FOR HEBEL ROOF PANELS AAC6

<table>
<thead>
<tr>
<th>PANEL THICKNESS (inches)</th>
<th>MOMENT CAPACITY (lb-ft/ft)</th>
<th>SUPERIMPOSED UNIFORM LOAD, w (psf)</th>
<th>Dead Weight (psf)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>20</td>
<td>23</td>
</tr>
<tr>
<td>4</td>
<td>814</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>5</td>
<td>1,340</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>6</td>
<td>1,955</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>7</td>
<td>2,776</td>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td>8</td>
<td>3,680</td>
<td>21</td>
<td>21</td>
</tr>
<tr>
<td>9</td>
<td>4,732</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>10</td>
<td>5,917</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>12</td>
<td>8,653</td>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>

For SL: 1 inch = 25.4 mm, 1 foot = 305 mm, 1 psf = 47.88 Pa, 1 lb-ft./ft. = 4.448 N-mm, 1 pcf = 16.02 kg/m².

Notes to Tables 4, 5 and 6:

1. The allowable superimposed loads are derived from strength design loads by removal of the load factors and capacity reduction factors used in strength design calculations.
2. Design unit weights of material are 46 pcf for AAC4 and 54 pcf for AAC6.
3. The roof and floor slabs are designed for dead weight and uniformly distributed downward superimposed loads only. If uplift (wind) forces are encountered, further investigation is necessary to determine the uplift load capacity.
4. Total load deflection (DL + LL) does not exceed 1/300 of span for roof slabs having spans less than or equal to 19.4 feet or for floor slabs. Total load deflection limit for roof slabs having spans greater than or equal to 19.4 feet is 1/200 of the span.
5. More stringent deflection limits and/or analysis of long-term deflection must be provided if slabs support nonstructural panels likely to be damaged by large deflections.
6. Values for lightly reinforced vs. reinforced panels within Table 3 are not applicable to the actual panel design. The terms are used to estimate the design weight of the wall panels. Reinforcement within the reinforced panel is listed on the panel label.
Steel Construction
Minimum 'a' is 2" (50 mm) or L/80, whichever is greater.
(where L = clear span + a)

Reinforced or Plain Concrete Construction
Minimum 'a' is 2" (50 mm) of L/80, whichever is greater.

Timber Construction
Minimum 'a' is 2" (50 mm) or L/80, whichever is greater.

Masonry Construction
Minimum 'a' is 2.75" (70 mm) or L/80, whichever is greater.

AAC Material
Minimum 'a' is 2" (50 mm) for center bearing and 2.75" (70 mm) for end bearing.

NOTE:
Larger bearing depths shall be provided to accommodate anchorage requirements and/or permissible bearing stresses at the support.

FIGURE 1—TYPICAL HORIZONTAL WALL PANEL CONNECTION AND MINIMUM BEARING DEPTHS OF ROOF AND FLOOR PANELS
EXTERIOR WALL SECTION

FIGURE 2—EXTERIOR WALL SECTION
INTERIOR BEARING WALL SECTION

FIGURE 3—INTERIOR BEARING WALL
TYPICAL VERTICAL LOAD-BEARING WALL PANEL

FIGURE 4—TYPICAL VERTICAL LOAD-BEARING WALL PANEL
CONSTRUCTION TESTING CORPORATION
13873 N.W. 19th Avenue Miami, Florida 33054
Phone: 305-685-6657 Fax: 305-685-6659 Email: ctelab@bellsouth.net

Report No: 06-009 TAS 21 March 2006

Test Notification # 06-009
Test Date: 10 March 2006

TESTING OF 8 INCH AUTOCLAVED AERATED CONCRETE BUILDING BLOCK WALLS

Client:
Contec Mexicana S.A. de C.V.
Rio Amacuzac 1201 Ote Col. Valle Oriente
Garza Garcia, N.L. Mexico C.P. 66269
Phone: 011-81-8399-2424 ext. 455 & Fax: 011-81-8399-2460

Product:
CONTEC™ 8 INCH AAC BLOCK

General: Large Missile Impacts, per FBC 2004, TAS 201-94

Witness to Testing:
Yamil G. Kuri, P.E. : CTC Official Witness
Raina Williams, CTC Test Assistant
George Dotzler, CTC Test Engineer

Description of Specimen: Specimens consisted of Autoclaved Aerated Concrete (AAC) Blocks manufactured by CONTEC Mexicana S.A. de C.V. of Garza Garcia, N.L. Mexico. These blocks are nominally eight inches thick (7-7/8", 200 mm actual), 24 inches wide and nominally eight inches tall (7-7/8", 200 mm actual) (see diagram below). These blocks had an average unit weight of 29.8 Pounds per Cubic Foot (PCF) these unit weights vary during production from 28.0 to 34.0 PCF. These blocks were assembled and tested as a wall assembly four feet wide by four feet tall. This wall consisted of only 8" AAC Blocks and mortar. The mortar was CONTEC THIN BED MORTAR TYPE 1. Blocks were bedded into mortar applied approximately 1/16" to 3/32" thick and allowed to cure at least 24 hours before testing. Three identical specimens were prepared (see diagram below) for impact testing.

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06-009 TAS : 21 March 2006 : Page 1 of 3
Impact and Cyclic Wind Loading / Manner of Testing: In accordance with the FLORIDA BUILDING CODE 2004, TESTING APPLICATIONS STANDARD (TAS) 201-94, IMPACT TEST PROCEEDURES and TESTING APPLICATIONS STANDARD (TAS) 203-94, CRITERIA FOR TESTING PRODUCTS SUBJECT TO CYCLIC WIND PRESSURE LOADING.

The specimen, A, B & C as previously described, were each impacted three times with a 9.05 lb, 96" long, S4S, 2x4, of No. 2 Southern Pine lumber, in locations as directed by the client consulting engineer. Data shown below, impacts as shown in the photograph above. Data follows:

<table>
<thead>
<tr>
<th>ID</th>
<th>Size</th>
<th>Location Rt(in), Up(in)</th>
<th>Location Description</th>
<th>Velocity Ft/Sec</th>
<th>Depth (Inches) of Penetration</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>48&quot; x 48&quot;</td>
<td>10, 6</td>
<td>Lower Left Corner</td>
<td>52.5</td>
<td>1/2</td>
</tr>
<tr>
<td>A</td>
<td>48&quot; x 48&quot;</td>
<td>24, 24</td>
<td>Center</td>
<td>50.5</td>
<td>1/2</td>
</tr>
<tr>
<td>B</td>
<td>48&quot; x 48&quot;</td>
<td>24, 24</td>
<td>Center</td>
<td>49.3</td>
<td>1/2</td>
</tr>
<tr>
<td>B</td>
<td>48&quot; x 48&quot;</td>
<td>38, 7</td>
<td>Lower Right Corner</td>
<td>49.3</td>
<td>9/16</td>
</tr>
<tr>
<td>C</td>
<td>48&quot; x 48&quot;</td>
<td>10, 6</td>
<td>Lower Left Corner</td>
<td>49.9</td>
<td>3/4</td>
</tr>
<tr>
<td>C</td>
<td>48&quot; x 48&quot;</td>
<td>24, 24</td>
<td>Center</td>
<td>49.7</td>
<td>1/2</td>
</tr>
<tr>
<td>C</td>
<td>48&quot; x 48&quot;</td>
<td>11, 42</td>
<td>Upper Left Corner</td>
<td>50.6</td>
<td>1/2</td>
</tr>
</tbody>
</table>

(1): Impact location given on Cartesian grid, right and up from lower left hand corner.
(2): The location description relative to the product assembly.
(3): Impact velocity measured with an Oehler Chronometer model 35P, verified by the video method.
(4): Readings made from the deformed product to a reference plane with a steel ruler.

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06-009 TAS : 21 March 2006 : Page 2 of 3
CONSTRUCTION TESTING CORPORATION
13873 N.W. 19th Avenue Miami, Florida 33054
Phone : 305-685-6657 Fax : 305-685-6659 Email : ctclab@bellsouth.net

Report No: 06-009 TAS 21 March 2006
Test Notification # 06-009
Test Date : 10 March 2006

SUMMARY OF TESTING : 8 INCH AUTOCLAVED AERATED CONCRETE BUILDING BLOCK WALLS

Client:
Contec Mexicana S.A. de C.V.
Rio Amacuzac 1201 Ote Col. Valle Oriente
Garza Garcia, N.L. Mexico C.P. 66269
Phone: 011-81-8399-2424 ext .455 & Fax: 011-81-8399-2460

Product: CONTEC™ 8 INCH AAC BLOCK

IMPACTS: Specimens A, B & C were impacted in accordance with FBC 2004 TAS 201-94, none failed as a result of large missile impacts.

Respectfully submitted,

CONSTRUCTION TESTING CORPORATION
(Miami-Dade Certification # 01-092404)

Report by George Dotzler: ____________________________

Test witnessed & report reviewed
By Yamil G. Kuri, P.E. : ____________________________

MAY 04 2006

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06-009 TAS : 21 March 2006 : Page 3 of 3
TESTING OF 4 INCH AUTOCLAVED AERATED CONCRETE BUILDING PANELS

Client:
Contec Mexicana S.A. de C.V.
Rio Amacuzac 1201 Ote Col. Valle Oriente
Garza Garcia, N.L. Mexico C.P. 66269
Phone: 011-81-8399-2424 ext .455 & Fax: 011-81-8399-2460

Product: CONTEC™ 4 INCH AAC BOARD SYSTEM

General: This test report incorporates into one document two testing activities. These are:
1. Large Missile Impacts, per FBC 2004, TAS 201-94
2. Cyclic Wind Pressure Loading, per FBC 2004, TAS 203-94

Witness to Testing:
Yamil G. Kuri, P.E. : CTC Official Witness
Raina Williams, CTC Test Assistant
George Dotzler, CTC Test Engineer

Description of Specimen: Specimens consisted of Autoclaved Aerated Concrete (AAC) Panels manufactured by Contec Mexicana S.A. de C.V. of Garza Garcia, N.L. Mexico. These panels are nominally four inches thick (3-7/8" actual), 24 inches across and are manufactured in lengths up to twenty feet long. The panels tested were cut at eight feet long. These panels have two ~3/16" (5mm) diameter welded wire meshes reinforcement where nine wires are run along the panel axis at 2-3/8" (60 mm) from each other and repeating segments of wire along the panel length at 3-1/2" (89 mm) from each other. Each wire mesh is located at 1" (26mm) from the panel surface, front and back. (See Diagram : Typical 4" AAC Panel).

These 4" AAC Panels were mounted on to a wall framing system utilizing both steel and wood framing so that both materials would be qualified. The wall system utilized vertical studs at 16" on center nominal spacing. Steel studs utilized were 20 gauge galvanized steel (Mic’d @ 0.0675" w/ galvanic coating & Mic’d @ 0.0655" w/o galvanic coating).manufactured by Steel HQ Bahamas, Ltd of North Miami, Florida while wood studs were of stud grade Southern Pine Fir form a local builders supply company.

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Typical test frame elevation & section through steel framing.

The test frame was 8 feet wide by 8 feet tall and was fabricated of studs at 16" on center, four AAC panels were horizontally mounted upon this test frame while only three were tested. Both steel and wood studs were utilized as illustrated in the diagram, to qualify both fabrication materials, the same fasteners were utilized for both stud types and each panel passed over and was secured to both stud types. The AAC panels were secured with ITW Buildex # 12 x 3-¼" ROOFGRIP Self Drilling Screws with DEMAND Products, Inc. AAC Power Panel Plate DP500 Tab Washers at each stud intersection secured at 8" on center.
Impact and Cyclic Wind Loading / Manner of Testing: In accordance with the FLORIDA BUILDING CODE 2004, TESTING APPLICATIONS STANDARD (TAS) 201-94, IMPACT TEST PROCEEDURES and TESTING APPLICATIONS STANDARD (TAS) 203-94, CRITERIA FOR TESTING PRODUCTS SUBJECT TO CYCLIC WIND PRESSURE LOADING.

The specimen, B1, B2 & B3 as previously described, were each impacted three times with a 9.05 lb, 96" long, S4S, 2x4, of No. 2 Southern Pine lumber, in locations as directed by the client consulting engineer. Data shown below, impacts as shown in the diagram above. Data follows

Impact Test Results

<table>
<thead>
<tr>
<th>ID</th>
<th>Size</th>
<th>Location Description</th>
<th>Velocity (Ft/Sec)</th>
<th>Depth (Inches) of Penetration</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1</td>
<td>96&quot; x 96&quot;</td>
<td>89, 78 Lower Right Corner</td>
<td>79.3</td>
<td>1 1/2</td>
</tr>
<tr>
<td>B1</td>
<td>96&quot; x 96&quot;</td>
<td>49, 84 Center on Stud</td>
<td>80.1</td>
<td>1 1/8</td>
</tr>
<tr>
<td>B1</td>
<td>96&quot; x 96&quot;</td>
<td>46, 84 Center</td>
<td>79.8</td>
<td>7/8</td>
</tr>
<tr>
<td>B2</td>
<td>96&quot; x 96&quot;</td>
<td>73, 60 Center</td>
<td>79.3</td>
<td>2</td>
</tr>
<tr>
<td>B2</td>
<td>96&quot; x 96&quot;</td>
<td>33, 60 Center on Stud</td>
<td>81.6</td>
<td>7/8</td>
</tr>
<tr>
<td>B2</td>
<td>96&quot; x 96&quot;</td>
<td>7, 66 Upper Left Corner</td>
<td>80.9</td>
<td>2</td>
</tr>
<tr>
<td>B3</td>
<td>96&quot; x 96&quot;</td>
<td>64, 37 Center on Stud</td>
<td>79.6</td>
<td>7/8</td>
</tr>
<tr>
<td>B3</td>
<td>96&quot; x 96&quot;</td>
<td>25, 37 Center</td>
<td>79.7</td>
<td>1 1/4</td>
</tr>
<tr>
<td>B3</td>
<td>96&quot; x 96&quot;</td>
<td>88, 31 Lower Right Corner</td>
<td>79.7</td>
<td>1 3/4</td>
</tr>
</tbody>
</table>

(1) : Impact location given on Cartesian grid, right and up from lower left hand corner.
(2) : The location description relative to the product assembly.
(3) : Impact velocity measured with an Oehler Chronometer model 35P, verified by the video method.
(4) : Readings made from the deformed product to a reference plane with a steel ruler.
Following impacts specimens B1, B2 & B3 were cyclic wind loaded as directed by the FBC 2004, TAS 203-94, CRITERIA FOR TESTING PRODUCTS SUBJECT TO CYCLIC WIND PRESSURE LOADING, in accordance with Table 1626: Cyclic Wind Pressure Loading, located in chapter 16, FBC 2004. In general, numerous static air pressure cycles are applied to the specimen at varying load levels based upon the positive and negative design load levels. A detailed account follows:

Polyethylene film 2 mil thick and tape were used to seal against air leakage during loads. These were used in a manner that did not influence the test results.

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SUMMARY OF TESTING: 4 INCH AUTOCLAVED AERATED CONCRETE BUILDING PANELS

Client:
Contec Mexicana S.A. de C.V.
Rio Amacuzac 1201 Ote Col. Valle Oriente
Garza Garcia, N.L. Mexico C.P. 66269
Phone: 011-81-8399-2424 ext .455 & Fax: 011-81-8399-2460

Product:
CONTEC™ 4 INCH AAC BOARD SYTEM

IMPACTS: Specimens B1, B2 & B3 were impacted in accordance with FBC 2004 TAS 201-94, none failed as a result of large missile impacts.

CYCLIC WIND LOADS: Specimens were subjected to cyclic wind loads in accordance with FBC 2004 TAS 203-94. Specimens B1, B2 & B3 successfully completed the cyclic wind loads to verify a Design Load of +110.0 PSF /-110.0 PSF.

CONCLUSION: Following testing all specimen were disassembled. No failures were observed in the specimen. This product was tested in accordance with and meets the requirements to comply with the Florida Building Code 2004, Sections 1609.1.4.

Respectfully submitted,
CONSTRUCTION TESTING CORPORATION
(Miami-Dade Certification # 01-0924.04)

Report by George Dotzler:

Test witnessed & report reviewed
By Yamil G. Kuri, P.E.:
TESTING OF 2 INCH AUTOCLAVED AERATED CONCRETE BUILDING PANELS

Client: Contec Mexicana S.A. de C.V.
Rio Amacuzac 1201 Ote Col. Valle Oriente
Garza Garcia, N.L. Mexico C.P. 66269
Phone: 011-81-8399-2424 ext .455 & Fax: 011-81-8399-2460

Product: CONTEC™ 2 INCH AAC BOARD SYSTEM

General: This test report incorporates into one document three testing activities. These are:
1. Static Wind, per ASTM E 330-02
2. Large Missile Impacts, per ASTM E 1886-02 & E 1996-02 @ Missile Level D: Wind Zone 4
3. Cyclic Static Air Pressure Loading, per ASTM E 1886-02 & E 1996-02, Table 1

Witness to Testing:
Yamil G. Kuri, P.E. : CTC Official Witness
Raina Williams, CTC Test Assistant
George Dotzler, CTC Test Engineer

Description of Specimen: Specimens consisted of Autoclaved Aerated Concrete (AAC) Panels manufactured by Contec Mexicana S.A. de C.V. of Garza Garcia, N.L. Mexico. These panels are nominally two inches thick (1.97" actual), 24 inches across and are manufactured in lengths up to twenty feet long. The panels tested were cut at eight feet long. These panels have a ~3/16" (5mm) diameter welded wire mesh reinforcement where three wires are run along the panel axis at 9-7/16" (240 mm) from each other and repeating segments of wire along the panel length at 6-5/8" (168 mm) from each other. The wire mesh is also located at the mid depth of the panel. (See Diagram: Typical 2" AAC Panel).

These 2" AAC Panels were mounted on to a wall framing system utilizing both steel and wood framing so that both materials would be qualified. The wall system utilized vertical studs at 16" on center nominal spacing. Steel studs utilized were 20 gauge galvanized steel (Mic’d @ 0.0675" w/ galvanic coating & Mic’d @ 0.0655" w/o galvanic coating), manufactured by Steel HQ Bahamas, Ltd. of North Miami, Florida while wood studs were of stud grade Southern Pine Fir form a local builders supply company.
**Typical test frame elevation & section through steel framing.**

The test frame was 8 feet wide by 8 feet tall and was fabricated of studs at 16" on center, four AAC panels were horizontally mounted upon this test frame while only three were tested. Both steel and wood studs were utilized as illustrated in the diagram, to qualify both fabrication materials, the same fasteners were utilized for both stud types and each panel passed over and was secured to both stud types. The AAC panels were secured with ITW Buildex # 12 x 3-1/4” ROOFGRIP Self Drilling Screws with DEMAND Products, Inc. AAC Power Panel Plate DP500 Tab Washers at each stud intersection secured at 8” on center.

![Diagram of test frame](image)

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Static Wind Loading / Manner of Testing: In accordance with ASTM E 330-02 Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference:

The loads applied to the specimen in a 45 second load cycle (10 seconds from zero to the load, 30 second duration at load & 5 seconds to release load) were at levels specified by the client's Consulting Engineer. Polyethylene film (2 mil) and tape were used to seal air leakage during loads these were used in a manner that did not influence the results. Gauges were mounted along the centerline of the specimen’s primary span to record deflections. These gauges were mounted to a gauge bar attached to the support beam to record deflection only of the panel between the beams and not any secondary deflection of the beams themselves. The deflection readings follow:

<table>
<thead>
<tr>
<th>Specimen</th>
<th>Load PSF in H2O</th>
<th>Load at Load</th>
<th>Defl'n at Load</th>
<th>Defl'n at Recovery</th>
<th>Percent Recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>0.0</td>
<td>0.000</td>
<td>0.000</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>41.6</td>
<td>8.00</td>
<td>0.000</td>
<td>ERR</td>
<td>ERR</td>
</tr>
<tr>
<td></td>
<td>83.2</td>
<td>16.00</td>
<td>0.000</td>
<td>ERR</td>
<td>ERR</td>
</tr>
<tr>
<td></td>
<td>124.8</td>
<td>24.00</td>
<td>0.000</td>
<td>ERR</td>
<td>ERR</td>
</tr>
<tr>
<td></td>
<td>166.4</td>
<td>32.00</td>
<td>0.000</td>
<td>ERR</td>
<td>ERR</td>
</tr>
<tr>
<td></td>
<td>208.0</td>
<td>40.00</td>
<td>0.000</td>
<td>ERR</td>
<td>ERR</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specimen</th>
<th>Load PSF in H2O</th>
<th>Load at Load</th>
<th>Defl'n at Load</th>
<th>Defl'n at Recovery</th>
<th>Percent Recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>A2</td>
<td>0.0</td>
<td>0.000</td>
<td>0.000</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>41.6</td>
<td>8.00</td>
<td>0.000</td>
<td>ERR</td>
<td>ERR</td>
</tr>
<tr>
<td></td>
<td>83.2</td>
<td>16.00</td>
<td>0.000</td>
<td>ERR</td>
<td>ERR</td>
</tr>
<tr>
<td></td>
<td>124.8</td>
<td>24.00</td>
<td>0.000</td>
<td>ERR</td>
<td>ERR</td>
</tr>
<tr>
<td></td>
<td>166.4</td>
<td>32.00</td>
<td>0.000</td>
<td>ERR</td>
<td>ERR</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specimen</th>
<th>Load PSF in H2O</th>
<th>Load at Load</th>
<th>Defl'n at Load</th>
<th>Defl'n at Recovery</th>
<th>Percent Recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>A3</td>
<td>0.0</td>
<td>0.000</td>
<td>0.000</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>41.6</td>
<td>8.00</td>
<td>0.000</td>
<td>ERR</td>
<td>ERR</td>
</tr>
<tr>
<td></td>
<td>83.2</td>
<td>16.00</td>
<td>0.000</td>
<td>ERR</td>
<td>ERR</td>
</tr>
<tr>
<td></td>
<td>124.8</td>
<td>24.00</td>
<td>0.000</td>
<td>ERR</td>
<td>ERR</td>
</tr>
<tr>
<td></td>
<td>166.4</td>
<td>32.00</td>
<td>0.000</td>
<td>ERR</td>
<td>ERR</td>
</tr>
</tbody>
</table>

Chamber failed at load, no further testing.

Specimens B1, B2 & B3 as previously described, were each impacted twice (as shown in the diagram, right) with a 9.05 lb, 96" long, S4S, 2x4, of No. 2 Southern Pine lumber in locations as directed in the reference specification ASTM E 1996-02 and at Missile Level D with the Wind Zone 4 additional impact locations option. Data follows:

**Impact Test Results**

<table>
<thead>
<tr>
<th>ID</th>
<th>Size</th>
<th>Location</th>
<th>Location Description</th>
<th>Velocity Ft/Sec</th>
<th>Depth of Penetration</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1</td>
<td>96&quot; x 96&quot;</td>
<td>8, 66</td>
<td>Upper Left Corner</td>
<td>49.9</td>
<td>Pass Through</td>
</tr>
<tr>
<td>B1</td>
<td>96&quot; x 96&quot;</td>
<td>72, 60</td>
<td>Center</td>
<td>51.6</td>
<td>Pass Through</td>
</tr>
<tr>
<td>B2</td>
<td>96&quot; x 96&quot;</td>
<td>24, 36</td>
<td>Center</td>
<td>49.5</td>
<td>Pass Through</td>
</tr>
<tr>
<td>B2</td>
<td>96&quot; x 96&quot;</td>
<td>88, 30</td>
<td>Lower Right Corner</td>
<td>50.4</td>
<td>Pass Through</td>
</tr>
<tr>
<td>B3</td>
<td>96&quot; x 96&quot;</td>
<td>8, 8</td>
<td>Lower Left Corner</td>
<td>51.1</td>
<td>Pass Through</td>
</tr>
<tr>
<td>B3</td>
<td>96&quot; x 96&quot;</td>
<td>72, 12</td>
<td>Center</td>
<td>49.8</td>
<td>Pass Through</td>
</tr>
</tbody>
</table>

(1) : Impact location given on Cartesian grid, right and up from lower left hand corner.
(2) : The location description relative to the product assembly.
(3) : Impact velocity measured with an Oehler Chronometer model 35P, verified by the video method.
(4) : Readings made from the deformed product to a reference plane with a steel ruler.

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Following impacts, specimens B1, B2 & B3 were cyclic wind loaded as directed in the reference specification ASTM E 1996-02, Table 1: Cyclic Static Air Pressure Loading. In general, numerous static air pressure cycles are applied to specimens at varying load levels based upon the positive and negative design load levels. A detailed account follows:

### Cyclic Wind Loading Data

<table>
<thead>
<tr>
<th>No. Cycles</th>
<th>Range</th>
<th>Design Low PSF</th>
<th>Low PSF</th>
<th>High PSF</th>
<th>Defl'ns B1 Low Inches</th>
<th>High Inches</th>
<th>Defl'ns B2 Low Inches</th>
<th>High Inches</th>
<th>Defl'ns B3 Low Inches</th>
<th>High Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>NA</td>
<td>0.000</td>
<td>NA</td>
<td>0.000</td>
<td>NA</td>
<td>0.000</td>
<td>NA</td>
<td>0.000</td>
<td>NA</td>
</tr>
<tr>
<td>3500</td>
<td>20% to 50% Pos. DL</td>
<td>110.0</td>
<td>22.0</td>
<td>55.0</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>300</td>
<td>0% to 60% Pos. DL</td>
<td>110.0</td>
<td>0.0</td>
<td>66.0</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>600</td>
<td>50% to 80% Pos. DL</td>
<td>110.0</td>
<td>55.0</td>
<td>88.0</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>100</td>
<td>30% to 100% Pos. DL</td>
<td>110.0</td>
<td>33.0</td>
<td>110.0</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
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</tr>
<tr>
<td>0</td>
<td></td>
<td>NA</td>
<td>0.000</td>
<td>NA</td>
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<td>0.000</td>
<td>NA</td>
<td>0.000</td>
<td>NA</td>
</tr>
<tr>
<td>50</td>
<td>30% to 100% Neg. DL</td>
<td>(100.0)</td>
<td>(33.0)</td>
<td>(110.0)</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>1050</td>
<td>50% to 80% Neg. DL</td>
<td>(100.0)</td>
<td>(55.0)</td>
<td>(88.0)</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>50</td>
<td>0% to 60% Neg. DL</td>
<td>(100.0)</td>
<td>0.000</td>
<td>(66.00)</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>3350</td>
<td>20% to 50% Neg. DL</td>
<td>(110.0)</td>
<td>(22.0)</td>
<td>(55.0)</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
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<tr>
<td>0</td>
<td></td>
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<td>9000</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Polyethylene film 2 mil thick and tape were used to seal against air leakage during loads. These were used in a manner that did not influence the test results.

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06-007CM ASTM : 21 March 2006 : Page 5 of 6
SUMMARY OF TESTING: 2 INCH AUTOCLAVED AERATED CONCRETE BUILDING PANELS

Client: Contec Mexicana S.A. de C.V.
Rio Amacuzac 1201 Ote Col. Valle Oriente
Garza Garcia, N.L. Mexico C.P. 66269
Phone: 011-81-8399-2424 ext .455 & Fax: 011-81-8399-2460

Product: CONTEC™ 2 INCH AAC BOARD SYSTEM

WIND LOADS: Specimen A1, A2 & A3 were subjected to static wind loads in accordance with ASTM E 330-02, these verified a Design Load of + 110.0 PSF /- 110.0 PSF.

IMPACTS: Specimens B1, B2 & B3 were impacted in accordance with ASTM E 1886-02 per specification ASTM E 1996-02 at Missile Level D with the Wind Zone 4 additional impact locations option. No openings were formed through which a three inch diameter sphere could pass, None failed as a result of impacts.

CYCLIC WIND LOADS: Specimens B1, B2 & B3 were subjected to cyclic wind loads in accordance with ASTM E 1886-02 per the specification ASTM E 1996-02, Table 1. Specimens A, B & C successfully completed the cyclic wind loads to verify a Design Load of + 110.0 PSF /- 110.0 PSF.

CONCLUSION: Following testing all specimen were disassembled. No failures were observed in the specimen. The product described here in complies with Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors and Storm Shutters Impacted by Windborne Debris in Hurricanes at Missile Level D with the Wind Zone 4 additional impact locations option exercised. This product was tested in accordance with and meets the requirements to comply with the Florida Building Code 2004, Sections 1609.1.4.

Respectfully submitted,

CONSTRUCTION TESTING CORPORATION

Report by George Dotzler: ________________________________
Test witnessed & report reviewed
By Yamil G. Kuri, P.E.: ________________________________

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