ICC-ES Evaluation Report

ESR-1652

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DIVISION: 03 00 00—CONCRETE **Section: 03 41 00—Precast Structural Concrete** **DIVISION: 04 00 00—MASONRY** **Section: 04 22 26—Autoclaved Aerated Concrete Unit Masonry**	**REPORT HOLDER:** **AERCON FLORIDA, LLC**	**EVALUATION SUBJECT:** **AERCON AUTOCLAVED AERATED CONCRETE (AAC) PANELS AND AERCON THIN-BED MORTAR**	

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2018, 2015, and 2012 *International Building Code*® (IBC)
- 2018, 2015, and 2012 *International Residential Code*® (IRC)

Properties evaluated:

- Structural
- Thermal conductivity
- Fire resistance

2.0 USES

AERCON Autoclaved Aerated Concrete (AAC) Panels and AERCON Thin-Bed Mortar are used as structural members for roofs and floors, non-load bearing partition panels, and non-load bearing cladding panels. The AERCON AAC Panels may also be used under the IRC where an engineering design is submitted in accordance with Section R301.1.3 of the IRC.

3.0 DESCRIPTION

3.1 General:

AERCON AAC Panels consist of a noncombustible, siliceous material manufactured from a mixture of sand, quicklime and portland cement, aerated with aluminum powder and cured in a high-pressure autoclave, and comply with ASTM C1694 and ASTM C1693, which are equivalent to, and supersede, ASTM C1452, which is referenced in ASTM C1386. The reinforced panels are manufactured in a strength category, identified as AC4, with nominal dry density of 40 lb./ft.^{3} (600 kg/m^3). See Table 2 for properties.

The panels must be assembled using AERCON thin-bed mortar and grout. All of the products are permitted to be sawn, drilled or nailed. The panel units are used as structural roof and floor units, bearing wall panels, nonload-bearing cladding panels and partition panels. Figure 1 of this report illustrates typical products. Table 1 of this report provides the product sizes.

The panels are reinforced with smooth cold-drawn steel bars complying with ASTM A82, as required in ASTM C1694. Transverse bars must be welded to longitudinal reinforcement to provide reinforcement anchorage in compliance with ASTM C1694. Reinforcing steel bar diameters range from $^3/_{16}$ inch (4 mm) to $^1/_2$ inch (12 mm). All reinforcing bars are protected with a minimum 0.02-inch-thick (0.5 mm) anticorrosion treatment in compliance with ASTM C1694, and with a minimum $^1/_2$-inch (12.7 mm) cover of autoclaved concrete. At the end of the autoclaving process, the AAC panels contain approximately 30 percent by water weight; the internal water in the AAC panels dissipates naturally over time, where the overall moisture content stabilizes between 4 percent to 8 percent. All metal connectors, fasteners and accessories used with the material must be corrosion-resistant material determined by AERCON Florida, LLC, to be compatible with the precast units.

3.2 Thin-Bed Mortar

AERCON AAC Thin-Bed Mortar consists of fine sand and/or crushed marble, cement, lime and plasticizing and water-retaining additives. The mortar complies with the AAC thin-bed mortar requirements of Section 2103.2.1 of the 2018 and 2015 IBC [Section 2103.12 of the 2012 IBC], as applicable. AERCON AAC Thin-Bed Mortar comes dry-mixed and pre-bagged from the factory. Each bag weighs 55 pounds (25 kg). Mixing instructions are printed on the bag for the addition of water and the appropriate mixing sequence; each bag is combined with 1.75 gallons (6.6 L) of clear water and mixed for two minutes. The AERCON AAC Thin-Bed Mortar is used with AERCON AAC Panels of densities and strengths described in this report. The mortar has a minimum compressive strength of 1,000 psi (6.8 MPa) at 28 days. The mortared joints are approximately $^1/_{16}$-inch (1.5 mm) thick. The AERCON AAC Thin-Bed Mortar has a one-year shelf life from the date of manufacture when stored in unopened bags and protected from moisture.

3.3 Grout

Grout shall comply with grout requirements of Section 2103.3 of the 2018 and 2015 IBC [Section 2103.13 of the 2012 IBC].

4.0 DESIGN AND INSTALLATION

4.1 Design:

4.1.1 AERCON AAC Roof and Floor Panels:

The structural design must comply with Section 2101.2 of the IBC. Allowable design stresses and properties are presented in Table 2.

All panels are designed based on the project requirements substantiated by structural calculations based on Tables 1 and 2 as determined by the registered design professional and specified construction details.

4.1.2 AERCON Partition Panels:

AERCON Partition Panels are non-load bearing and are designed for 5 pounds per square foot (34 kPa) lateral loads perpendicular to the surface, to resist the minimum transverse load requirement specified in Section 1607.15 of the 2018 IBC (Section 1607.14 of the 2015 and 2012 IBC).

4.1.3 AERCON Cladding panels:

The structural design must comply with Section 2101.2 of the IBC. Allowable design stresses and properties are presented in Table 2.

All panels are designed based on the project requirements substantiated by structural calculations based on Tables 1 and 2 as determined by the registered design professional and specified construction details.

4.2 Installation:

4.2.1 General:

The AERCON Panels must be installed in accordance with this report and the approved construction plans, which must comply with Section 2104 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 provided in Figures 1 through 4. The typical details are intended as a guide only, and must be approved by the code official.

4.2.2 Roof and Floor Units: The units are manufactured with tongue-and-groove joints along the longer dimension, and chamfered edges, as illustrated in Figure 2 of this report. Diaphragm action must be assumed with these units, based upon calculations and construction details provided by the registered design professional to justify this assumption.

Units must have a minimum 2 ½ -inch (63.5 mm) bearing. Typical details of anchorage to structural steel are shown in Figure 3 of this report. Typical details are intended as a guide only, and when used must be substantiated by structural calculations and approved by the building official. Anchorage stirrups must be provided at alternating joints. Steel reinforcement within the top groove must have a minimum length equal to one-third the span. All grooves must be filled with concrete or grout. The allowable deflection of AERCON roof panels, due to the total load is L/180 and due to the live load is L/240. The allowable deflection of AERCON floor panels, due to the total load is L/240 and due to the live load is L/360.

Approved roof coverings must be used on all roof slabs. Floor slabs must be protected from moisture and abrasion by application of an appropriate topping, such as sand and cement mixture.

4.2.3 Cladding panels: All units are nonbearing and are designed to resist wind loads. Wall units have two layers of equal reinforcement and are placed with longitudinal edges either vertical or horizontal. Wall units placed vertically are produced with tongue-and-groove vertical edges as shown in Figure 4.

Typical connections to structural steel are shown in Figures 5, 6 and 7 of this report. Exterior panels and their connections must comply with the requirements of Section 13 of ASCE 7. Typical connections are intended as a guide only, and when used must be substantiated by structural calculations or other data submitted to and approved by the building official.

Typical exterior surface treatment involves the application of two coats of water-repellent, but not impermeable, acrylic paint. The first coat is brushed on and the second, containing coloring and optional mineral grains for texture, is roll- or spray-applied. The joints are painted prior to treatment of the surface, after which an elastic sealing compound is applied to expansion joints. Interior surfaces must be given an initial sand spackle coating before the surfaces are painted or wallpapered.

4.2.4 Partition Panels: These panels are nonload-bearing and are designed for 5 pounds per square foot (34 kPa) lateral loads perpendicular to the surface. The panels are 24 inches (608 mm) wide; 3 or 4 inches (75 mm or 102 mm) thick; are available in lengths between 7 feet and 10 feet (2134 mm and 3048 mm), in 2-inch (51 mm) increments; and have a rectangular cross section with reinforcement placed at mid-depth.

Partition panels must be joined with a cement-based adhesive provided by the manufacturer. Adequacy of connections to ceilings and floors must be justified by structural calculations or other data submitted to and approved by the building official.

4.2.5 Miscellaneous: Precast units must be at least 12 inches (305 mm) above 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 on-site when substantiated by structural calculations. Openings in roof and floor panels that are field-cut must have additional reinforcement substantiated by structural calculations or other data.

4.3 Fire-Resistance- Rated Construction:

4.3.1 Reinforced Panels: The minimum 8-inch-thick (203 mm), 2-foot-wide (610 mm), reinforced floor panels and roof panels have a restrained assembly fire resistance rating of 4 hours. The same panels have an unrestrained assembly fire resistance rating of 1 hour when the reinforcing in the panels has a minimum cover of $^{7}/_{8}$ inch (19.1 mm). Panel joints are reinforced with No. 3 deformed steel reinforcement bars and packed with normal-weight concrete. For restrained assemblies, perimeters are restrained by ring beams measuring 6 inches (152 mm) wide by the depth of the panels. The ring beams are reinforced with two No. 4 deformed steel reinforcement bars, placed at one-third and two-thirds the depth of the beam; and consist of normal-weight concrete of 3,000 psi (20.67 MPa). The loading is limited to 110 psf (5.3 kPa) live, 145 psf (6.9 kPa) total.

4.3.2 Partition Panels: The 4-inch-thick (102 mm) Category AC4 panels have a three-hour fire-resistance rating in a nonload-bearing configuration. The panels must be installed vertically, and the joints must be mortared using AERCON mortar described in Section 3.2. The exterior and interior surfaces need not be coated or covered with any other finishing materials. Horizontal steel reinforcement is minimum W-3 smooth wire, spaced 48 inches (1219 mm) on center, and vertical steel reinforcement is minimum W-2 smooth wire, spaced 12 inches (305 mm) on center. Reinforcement must be centered in the panel.

4.4 Special Inspection: Special inspection of AERCON AAC Panels must conform to Section 1705 of the IBC. The special inspector's duties, at a minimum, include verifying AAC panel and mortar identification; AAC panel placement; reinforcement placement or field reinforcement; and mortar preparation and application.

4.5 Thermal Characteristics:

The AERCON AAC Panels, when tested in accordance with ASTM C518, have thermal conductivity values as shown in Table 2.

5.0 CONDITIONS OF USE:

The AERCON AAC Panels as 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 Installation of the AERCON AAC panels must be in accordance with this report and the manufacturer's published installation instructions. In the event of a conflict between this report and the manufacturer's printed installation instructions, the more restrictive requirement governs.

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

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

5.4 Construction documents including specifications and engineering calculations specifying the use of AERCON 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 AERCON AAC Panels must comply with Section 4.0 of this report and the requirements set forth in the IBC for structural concrete.

5.6 The fire-resistance assemblies for AERCON AAC Panels can be found in Section 4.3 of this report. Other assemblies not detailed in Section 4.3 are considered outside the scope of this report. When requested, evidence of the fire-resistance rating for other assemblies must be submitted to the code official for their approval.

5.7 Special inspection must be provided and must comply with Section 4.4 of this report.

5.8 Use of AERCON AAC Panels for resisting vibratory or impact loads is outside the scope of this report.

5.9 AERCON AAC Panels used for lateral force–resisting systems must be limited to Seismic Design Category A or B.

5.10 AERCON AAC Roof and Floor Panels used for lateral force–resisting systems must be limited to buildings assigned to Seismic Design Category A and B.

5.11 The AERCON AAC Panels and AERCON Thin-Bed Mortar are manufactured under a quality control program with inspections by ICC Evaluation Service, LLC.

6.0 EVIDENCE SUBMITTED

6.1 Reports of standard specification for Precast AAC wall construction units test in compliance with ASTM C1386.

6.2 Reports of noncombustible materials test in compliance with ASTM E136.

6.3 Reports of fire tests in compliance with ASTM E119.

6.4 Reports of testing in compliance with ASTM C518.

7.0 IDENTIFICATION

7.1 Product labeling shall include, the name of the report holder, and the ICC-ES mark of conformity. The evaluation report number (ICC-ES ESR-1652) may be used in lieu of the mark of conformity. All panels produced in accordance with this report bear the name of the manufacturer (AERCON Florida, LLC), the piece mark number, and the strength class.

7.2 Thin-Bed Mortar is identified with the product name, manufacturer's name (AERCON Florida, LLC) and address, weight, mixing instructions, and evaluation report number (ESR-1652).

7.3 The report holder's contact information is the following:

AERCON FLORIDA, LLC
3701 COUNTY ROAD 544 EAST
HAINES CITY, FLORIDA 33844
(863) 422-6360
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info@aerconaac.com

TABLE 1—PRODUCTS AVAILABLE[1]

ITEM NO.	PRODUCT	AVAILABLE NOMINAL DIMENSIONS		
		Length	Height/Thickness	Width
1	AERCON—Interior Wall Panel	9 feet 8 inches, maximum	3, 4 and 6 inches	24 inches
2	AERCON—Load-bearing Wall Panel	12 feet 0 inch, maximum	8, 10 and 12 inches	24 inches, maximum
3	AERCON—Floor Panel	19 feet 6 inch, maximum	8, 10 and 12 inches	24 inches, maximum
4	AERCON—Roof Panel	19 feet 6 inch, maximum	8, 10 and 12 inches	24 inches, maximum

For **SI:** 1 inch = 25.4 mm, 1 foot = 305 mm.

[1]Products are keyed to Figure 1 by item number.

TABLE 2—REINFORCED PANELS

ALLOWABLE STRESSES AND PHYSICAL PROPERTIES	STRENGTH CATEGORIES
	AC4
Minimum compressive strength, f_c^N, psi	626
Allowable compressive strength, psi	157
Allowable flexural compressive strength, psi	209
Allowable flexural tensile strength, psi	24.0
Allowable shear strength, psi	17.0
Modulus of elasticity (E), psi	360×10^3
Coefficient of thermal expansion, 1/°F	4.4×10^{-6}
Thermal conductivity, Btu·in./(ft²·h·°F)	1.11
Design dead weight, pcf	49.0
Dry density, pcf	40 ± 1.6

For **SI:** 1 psi = 6.89 kPa, 1/°F = 1/0.556°C, 1 pcf = 16.018 kg/m³, 1 Btu·in./(ft²·h·°F) = 0.1441 $\frac{W}{m \cdot K}$

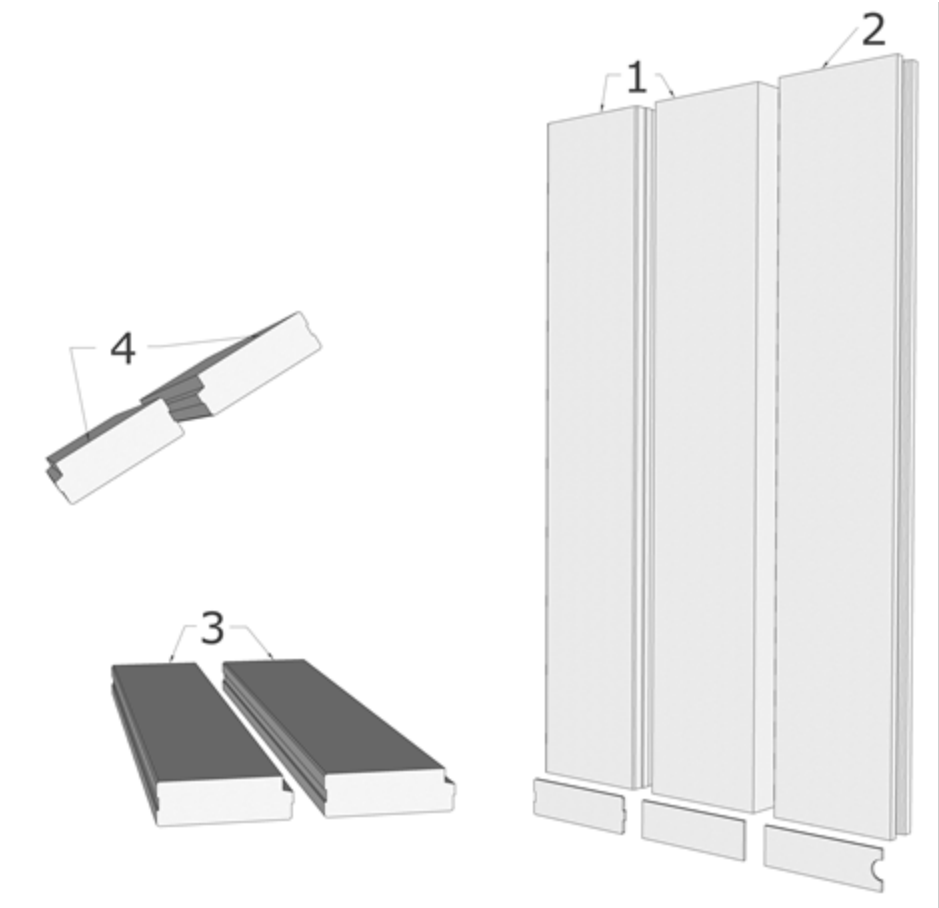

FIGURE 1—AERCON PRODUCT LINE
(See Table 1 for product description and item number)

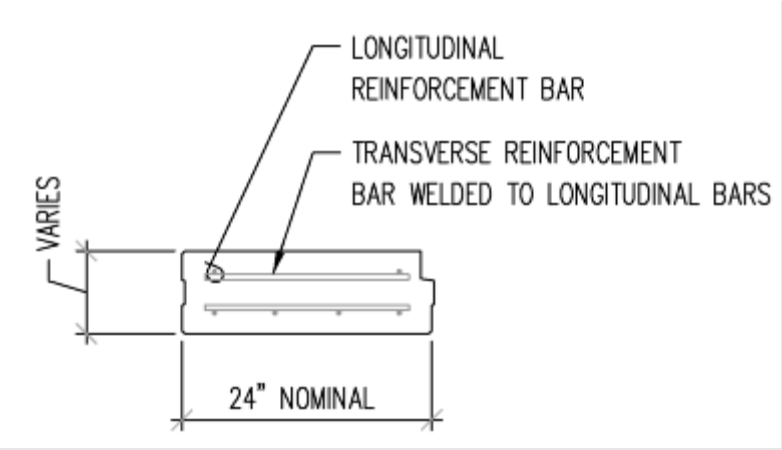

FIGURE 2—CROSS SECTION OF TYPICAL ROOF AND FLOOR UNITS

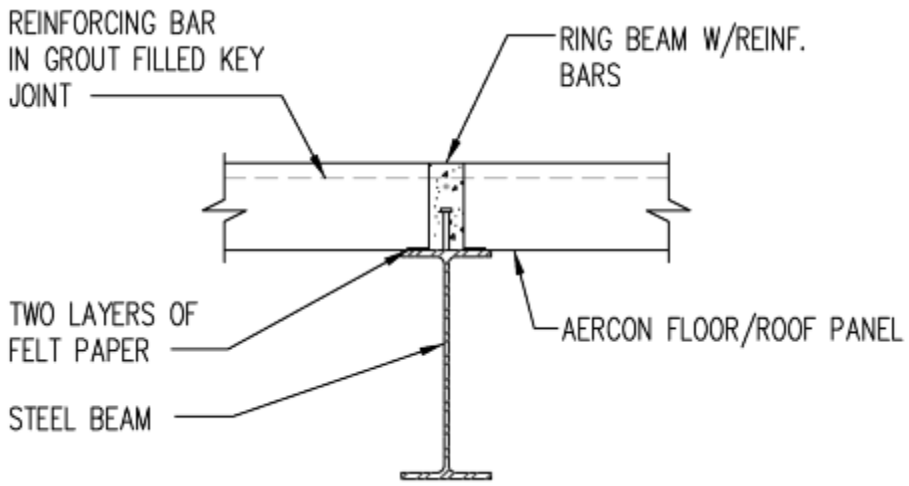

FIGURE 3—TYPICAL ANCHORAGE OF ROOF AND FLOOR UNITS TO STRUCTURAL STEEL FRAME

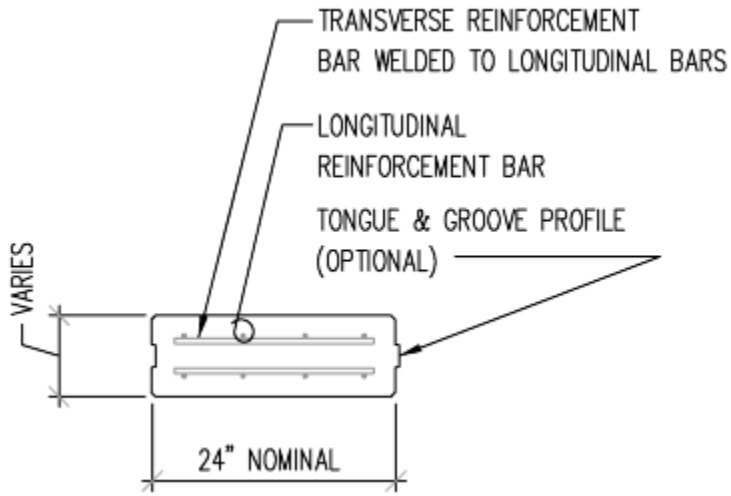

FIGURE 4—CROSS SECTION OF TYPICAL VERTICAL WALL UNITS

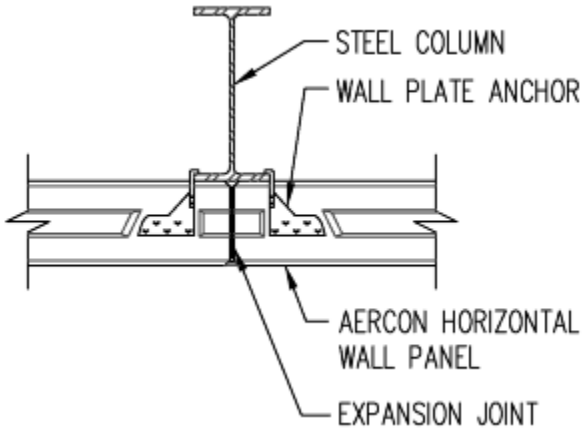

FIGURE 5—TYPICAL CONNECTION OF HORIZONTAL WALL UNITS TO STRUCTURAL STEEL FRAME (PLAN)

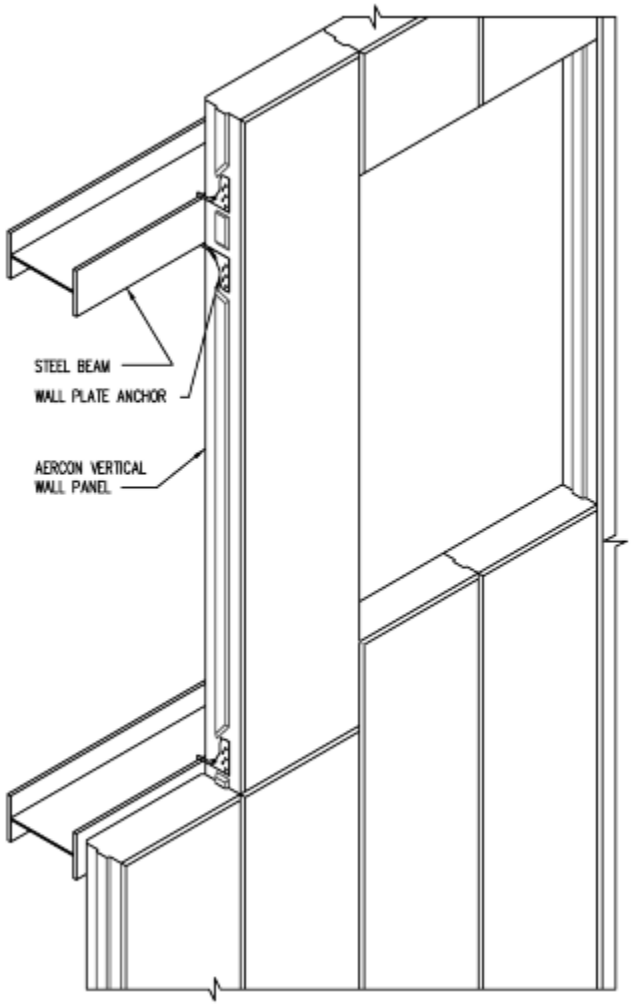

FIGURE 6—TYPICAL CONNECTION OF VERTICAL WALL UNITS TO STRUCTURAL STEEL FRAME (PLAN)

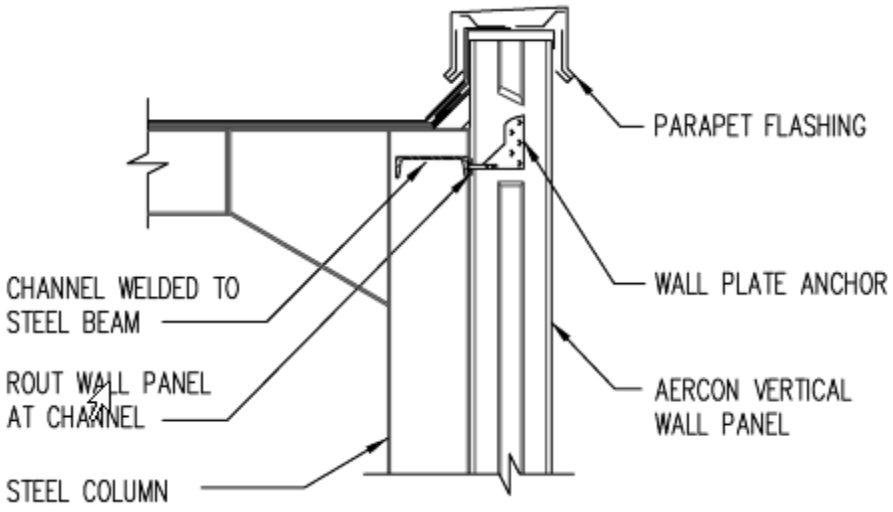

FIGURE 7—TYPICAL CONNECTION OF VERTICAL WALL UNITS TO STRUCTURAL STEEL FRAME (PLAN)