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Legacy report on the 1997 *Uniform Building Code*™ and the 2000 *International Building Code*®

DIVISION: 03—CONCRETE

Section: 03410—Plant-Precast Structural Concrete

AERCON ROOF, FLOOR, CURTAIN WALL AND PARTITION AUTOCLAVED LIGHTWEIGHT CONCRETE PANELS AND PRECISION BLOCKS

AERCON FLORIDA, LLC
3701 COUNTY ROAD 544 EAST
HAINES CITY, FLORIDA 33844

1.0 SUBJECT

AERCON Roof, Floor, Curtain Wall and Partition Autoclaved Lightweight Concrete Panels and Precision Blocks.

2.0 DESCRIPTION

2.1 General:

AERCON is 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. The reinforced panels are manufactured in three strength categories, identified as ACR2, ACR3 and ACR4, with nominal dry densities of 25 lb./ft.³ (400 kg/m³), 31 lb./ft.³ (500 kg/m³) and 40 lb./ft.³ (600 kg/m³), respectively. (See Table 2.) The Precision Block products are manufactured in three strength categories identified as AC2, AC4 and AC6, with nominal dry densities of 25 lb./ft.³ (400 kg/m³), 31 lb./ft.³ (500 kg/m³) and 40 lb./ft.³ (600 kg/m³), respectively. (See Table 3.) The AERCON panels and precision blocks are alternatives to concrete and masonry described in the 1997 *Uniform Building Code*™ (UBC) and the 2000 *International Building Code*® (IBC).

The blocks and 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 curtain walls and partition panels. The blocks are used as reinforced and unreinforced exterior and interior bearing and nonload-bearing walls. Figure 1 of this report illustrates typical products. Table 1 of this report provides the product sizes.

2.2 Reinforced Panels:

2.2.1 General: The panels are reinforced with smooth cold-drawn steel bars complying with ASTM A 82. Transverse bars must be welded to longitudinal reinforcement to provide reinforcement anchorage. 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, and with a minimum ¹/₂-inch (12.7 mm) cover of autoclaved concrete. The average moisture content, at delivery, is approximately 30 percent by weight. 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.

2.2.2 Design:

All units must be designed in accordance with ACI-523.2, published by the American Concrete Institute, and either Section 1926 of the UBC or Appendix A of *Building Code Requirements for Reinforced Concrete* (ACI 318-99), published by the American Concrete Institute, for buildings constructed in accordance with the IBC. Use of AERCON panels, as a portion of the structural frame, is limited to Seismic Zones 0, 1 or 2 (UBC) or Seismic Design Categories A or B (IBC).

2.2.3 Roof and Floor Units:

2.2.3.1 General: The units are manufactured with tongue-and-groove joints along the longer dimension, and chamfered edges, as illustrated in Figure 2 of this report. Tables 4 and 5 of this report indicate allowable loads for roof and floor units. Diaphragm action must be assumed with these units, based upon calculations and construction details provided to justify this assumption.

Units must have a minimum 2-inch (51 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. Maximum cantilever of a unit must be limited to double its thickness, unless substantiated by structural calculations or other data submitted to and approved by the building official.

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.

2.2.3.2 Fire Resistance: 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 $\frac{7}{8}$ 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 with $f'_c = 3,000$ psi (20.67 MPa). The loading is calculated in accordance with Section 2.2.2 and is limited to 110 psf (5.3 kPa) live, 145 psf (6.9 kPa) total.

2.2.4 Curtain Walls: All units are nonbearing and are designed to resist wind loads as set forth in Table 6 of this report. 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 1632 and 1633 of the UBC or Section 1621 of the IBC. 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.

2.2.5 Partition Panels:

2.2.5.1 General: These panels are nonload-bearing and are designed for 5 psf (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.

2.2.5.2 Fire Resistance: The 4-inch-thick (102 mm) Category ACR4 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 2.3.1. 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.

2.2.6 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.

2.3 Precision Blocks:

2.3.1 General: The AERCON Precision Blocks are solid blocks manufactured from the same material and by the same method as used for the AERCON reinforced panels. The blocks are used for either reinforced or nonreinforced, exterior or interior, load-bearing or nonload-bearing walls. The dimensions for the blocks are presented in Table 1 of this report. The tolerances are $\frac{1}{16}$ inch (1.5 mm) for all dimensions.

2.3.1.1 AERCON Thin-bed Mortar: AERCON Precision Blocks are laid with a proprietary AERCON thin-bed mortar, supplied in a dry, ready-to-mix form, containing fine sand and/or crushed marble, cement, lime and plasticizing and water-retaining additives. Packaged in 55-pound (25 kg) bags, the mortar has a shelf life of 12 months. Each bag is combined with 1.75 gallons (6.6 L) of clear water and mixed for two minutes. The mortar has a minimum compressive strength of 1,000 psi (6.9 MPa) at 28 days. The mortared joints are approximately $\frac{1}{16}$ inch (1.5 mm) thick.

2.3.2 Design: The structural design must comply with Chapter 21 of the UBC or ACI 530-99 (IBC). Allowable design stresses and properties are presented in Table 3 of this report. Use of AERCON Precision Blocks as a portion of the structural frame is limited to Seismic Zones 0 and 1(UBC) or Seismic Design Category A (IBC).

2.3.3 Exterior and Interior Protection: Cementitious stucco or other approved exterior wall claddings need to be applied over exterior walls. The interior surfaces need to be coated with cementitious or gypsum-based plaster or other interior wall finishes. Basement walls must be built with strength class AC4 or AC6 Precision Blocks only. For this application, precautions must be taken to allow for the drying of the wall. This is achieved either by applying impermeable protection below-grade on the outside, in which case heat-drying takes place toward the inside, or by applying a noncapillary air-permeable cover (e.g., mineral wool mat) on the outside, below ground level. In the latter case, the drying takes place through both sides of the basement wall.

2.3.4 Fire Resistance: The minimum 6-inch-thick (200 mm) Precision Blocks have a "bearing wall fire resistance rating" of 4 hours and a "nonbearing wall fire resistance rating" of 4 hours. The density of the Precision Blocks must be 25 to 43 pcf (400 to 650 kg/m³). The Precision Blocks must be laid in a running bond, and the head and bed joints mortared with AERCON mortar. For bearing walls, the load must be calculated in accordance with Section 2.3.2, and is limited to 11,560 plf (168.7 kN/m).

2.4 Installation:

The units must be installed in accordance with this report, and the UBC or the IBC, as applicable, and with the approved structural plans. Copies of the plans and this report must be available at the jobsite at all times during installation. The instructions within this report must govern if there are any conflicts between the manufacturer's instructions and this report.

2.5 Special Inspection:

2.5.1 UBC: Special inspection of concrete reinforced panels, structural masonry precision blocks, and fastener placement shall conform to Section 1701.5 of the UBC.

2.5.2 IBC: Special inspection of concrete reinforced panels, structural masonry precision blocks, and fastener placement shall conform to Section 1704 of the UBC.

2.5.3 Inspector's Duties: The special inspector's duties include verifying panel, masonry unit and mortar identification; panel and unit placement; mortar preparation; and application.

2.6 Identification:

All panels produced in accordance with this report bear the name of the manufacturer (Aercon Florida, LLC), the piece mark number, the strength class, the name of the inspection agency (Underwriters Laboratories), and the evaluation report number (ER-3700). Each cube or pallet of Precision Blocks produced in accordance with this report bear a label with the strength class, the name of the inspection agency (Underwriters Laboratories), and the evaluation report number (ER-3700). Mortar is identified with the product name, manufacturer's name (Aercon Florida, LLC) and address, weight, mixing instructions, and evaluation report number (ER-3700).

3.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Interim Criteria for Concrete and Concrete Masonry Walls (AC15), dated June 2003; reports of tests in accordance with UBC Standard 7-1 (ASTM E 119); and a quality control manual.

4.0 FINDINGS

That the **AERCON Autoclaved Lightweight Concrete Panels and Precision Blocks** described in this report comply with the 1997 *Uniform Building Code*™ and the 2000 *International Building Code*®, subject to the following conditions:

4.1 Material is permitted where noncombustible materials are required.

4.2 All units are designed in accordance with the applicable code, using the allowable stresses in this report.

4.3 Design calculations and details for specific applications are furnished to the building official, and verify compliance with this report and the applicable code.

4.4 Panels are produced by Aercon Florida, LLC, at 3701 County Road 544 East, Haines City, Florida, with inspections by Underwriters Laboratories (AA-668).

4.5 Data establishing compliance of Precision Blocks with the density compressive strength requirements for each class as described in this report accompanies each shipment and is submitted to the building official for each project.

4.6 Inspection and installation of AERCON Reinforced Panels complies with the requirements set forth in the applicable code for precast concrete inspection, including special inspection described in Section 2.5 of this report.

4.7 Inspection and installation of AERCON Precision Blocks units complies with the requirements set forth in the applicable code for structural masonry, including special inspection described in Chapter 17 of the applicable code.

This report is subject to re-examination in one year.

TABLE 1—PRODUCTS AVAILABLE¹

ITEM NO.	PRODUCT	AVAILABLE NOMINAL DIMENSIONS		
		Length	Height/Thickness	Width
1	AERCON—Precision Block	20 and 24 inches	8 inches	3, 4, 4.5, 6, 8, 10 and 12 inches
2	AERCON—Tongue and Groove Precision Block	20 and 24 inches	8 inches	4, 4.5, 6, 8, 10 and 12 inches
3	AERCON—U-Block	24 inches	8 inches	8, 10 and 12 inches
4	AERCON—Clean-Out Block	8 inches	8 inches	8, 10 and 12 inches
5	AERCON—Lintel	8 feet 0 inch, maximum	8 inches	4, 6, 8, 10 and 12 inches
6	AERCON—Tongue and Groove Modular Block	24 inches	24 inches	4, 6, 8, 10 and 12 inches
7	AERCON—Interior Wall Panel	9 feet 8 inches, maximum	3, 4, 4.5 and 6 inches	24 inches
8	AERCON—Load-bearing Wall Panel	12 feet 0 inch, maximum	8, 10 and 12 inches	24 inches, maximum
9	AERCON—Floor Panel	20 feet 0 inch, maximum	8, 10 and 12 inches	24 inches, maximum
10	AERCON—Roof Panel	20 feet 0 inch, maximum	8, 10 and 12 inches	24 inches, maximum
11	AERCON—Cored Precision Block	24 inches	8 inches	8, 10 and 12 inches

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

¹Products are keyed to Figure 1 by item number.

TABLE 2—REINFORCED PANELS

ALLOWABLE STRESSES AND PHYSICAL PROPERTIES	STRENGTH CATEGORIES		
	ACR2	ACR3	ACR4
Minimum compressive strength, f_c^N , psi	313	470	626
Allowable compressive strength, psi	78	118	157
Allowable flexural compressive strength, psi	104	157	209
Allowable flexural tensile strength, psi	24.0	24.0	24.0
Allowable shear strength, psi	8.0	12.0	17.0
Modulus of elasticity (E), psi	190×10^3	260×10^3	360×10^3
Coefficient of thermal expansion, $1/^\circ\text{F}$	4.4×10^{-6}	4.4×10^{-6}	4.4×10^{-6}
Thermal conductivity, $\text{Btu}\cdot\text{in.}/(\text{ft}^2\cdot\text{h}\cdot^\circ\text{F})$	0.80	0.97	1.11
Design dead weight, pcf	32.0	39.0	49.0
Dry density, pcf	25 ± 1.6	31 ± 1.6	40 ± 1.6

For SI: 1 psi = 6.89 kPa, $1/^\circ\text{F} = 1/0.556^\circ\text{C}$, 1 pcf = 16.018 kg/m^3 , $1 \text{ Btu}\cdot\text{in.}/(\text{ft}^2\cdot\text{h}\cdot^\circ\text{F}) = 0.1441 \frac{W}{m \cdot K}$.

TABLE 3—PRECISION BLOCKS

ALLOWABLE STRESSES AND PHYSICAL PROPERTIES	STRENGTH CATEGORIES		
	AC2	AC4	AC6
Minimum compressive strength of masonry, f_m , psi	345	570	855
Allowable compressive strength of masonry, psi	85	140	210
Allowable flexural compressive strength, psi	115	190	285
Allowable flexural tensile strength, psi	24	24	24
Allowable shear strength, psi	9	15	22
Modulus of elasticity (E), psi	190×10^3	260×10^3	360×10^3
Coefficient of thermal expansion, $1/^\circ\text{F}$	4.4×10^{-6}	4.4×10^{-6}	4.4×10^{-6}
Thermal conductivity, $\text{Btu}\cdot\text{in.}/(\text{ft}^2\cdot\text{h}\cdot^\circ\text{F})$	0.80	0.97	1.25
Design dead weight of masonry, pcf	31	37	47
Dry density of a masonry unit, pcf	25 ± 1.6	31 ± 1.6	40 ± 1.6

For SI: 1 pcf = 16.018 kg/m^3 , 1 psi = 6.89 kPa, $1/^\circ\text{F} = 1/0.556^\circ\text{C}$, $1 \text{ Btu}\cdot\text{in.}/(\text{ft}^2\cdot\text{h}\cdot^\circ\text{F}) = 0.1441 \frac{W}{m \cdot K}$.

TABLE 4—ROOF UNITS (24-INCH WIDTH)^{1,2,3}

ALLOWABLE SUPERIMPOSED LOAD (psf)	THICKNESS (inches)	NOMINAL LENGTH (feet)						
		8	10	12	14	16	18	20
22.5	4	X	X	NP	NP	NP	NP	NP
	6	X	X	X	X	X	X	NP
	8	X	X	X	X	X	X	X
	10	X	X	X	X	X	X	X
32.8	4	X	X	NP	NP	NP	NP	NP
	6	X	X	X	X	X	NP	NP
	8	X	X	X	X	X	X	X
	10	X	X	X	X	X	X	X
43.0	4	X	X	NP	NP	NP	NP	NP
	6	X	X	X	X	X	NP	NP
	8	X	X	X	X	X	X	X
	10	X	X	X	X	X	X	X
63.5	6	X	X	X	X	NP	NP	NP
	8	X	X	X	X	X	X	NP
	10	X	X	X	X	X	X	X

For **SI**: 1 inch = 25.4 mm, 1 foot = 305 mm, 1 psf = 47.89 Pa.

¹All roof units are designed for deflection of less than $L/360$ of the span due to live loads and less than $L/240$ of the span due to live load and dead load.

²Tolerances: Length: $\pm 1/4$ inch.
Width: $\pm 1/16$ inch.
Thickness: $\pm 1/16$ inch.

³X= Permitted; NP = Not permitted.

TABLE 5—FLOOR UNITS (24-INCH WIDTH)^{1,2,3}

ALLOWABLE SUPERIMPOSED LOAD (psf)	THICKNESS (inches)	NOMINAL LENGTH (feet)						
		8	10	12	14	16	18	20
48.0	6	X	X	X	NP	NP	NP	NP
	8	X	X	X	X	X	NP	NP
	10	X	X	X	X	X	X	X
83.5	6	X	X	X	NP	NP	NP	NP
	8	X	X	X	X	X	NP	NP
	10	X	X	X	X	X	X	NP

For **SI**: 1 inch = 25.4 mm, 1 foot = 305 mm, 1 psf = 47.89 Pa.

¹All floor units are designed for deflection of less than $L/360$ of the span due to live loads and less than $L/240$ of the span due to live load and dead load.

²Tolerances: Length: $\pm 1/4$ inch.
Width: $\pm 1/16$ inch.
Thickness: $\pm 1/16$ inch.

³X= Permitted; NP = Not permitted.

TABLE 6—CURTAIN WALL UNITS (24-INCH WIDTH)^{1,2}

ALLOWABLE SUPERIMPOSED LOAD (psf)	THICKNESS (inches)	NOMINAL LENGTH (feet)			
		10	14	18	20
30.8	6	X	X	X	X
	8	X	X	X	X
	10	X	X	X	X

For **SI**: 1 inch = 25.4 mm, 1 foot = 305 mm, 1 psf = 47.89 Pa.

¹All wall units are designed for deflection of less than $L/240$ of the span due to live loads.

²Tolerances: Length: $\pm 1/4$ inch.
Width: $\pm 1/16$ inch.
Thickness: $\pm 1/16$ inch.

³X= Permitted.

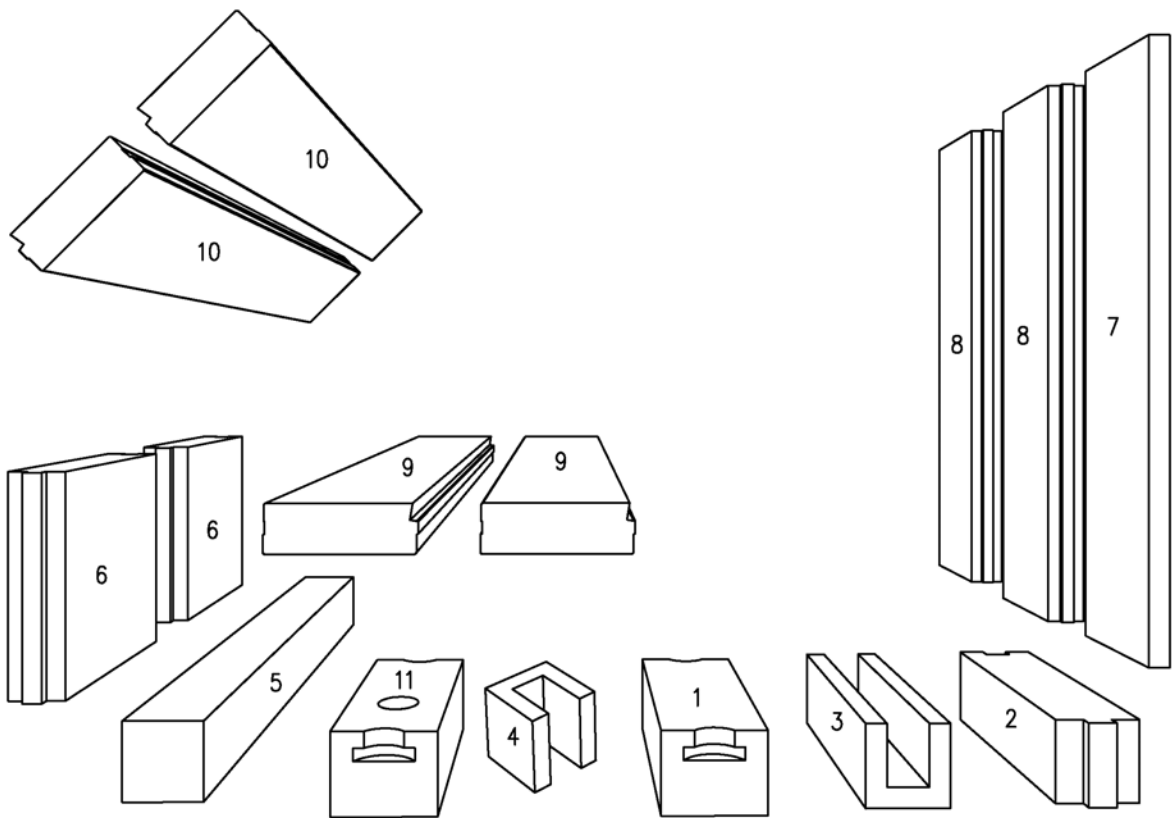


FIGURE 1—AERCON PRODUCT LINE
(See Table 1 for product description and item number)

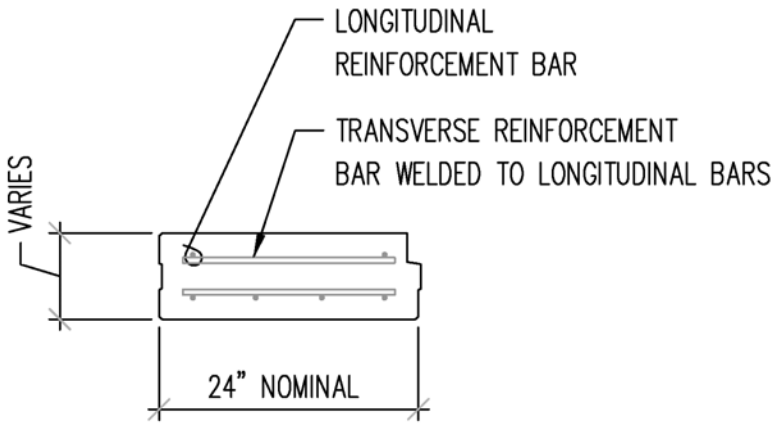


FIGURE 2—CROSS SECTION OF TYPICAL ROOF AND FLOOR UNITS

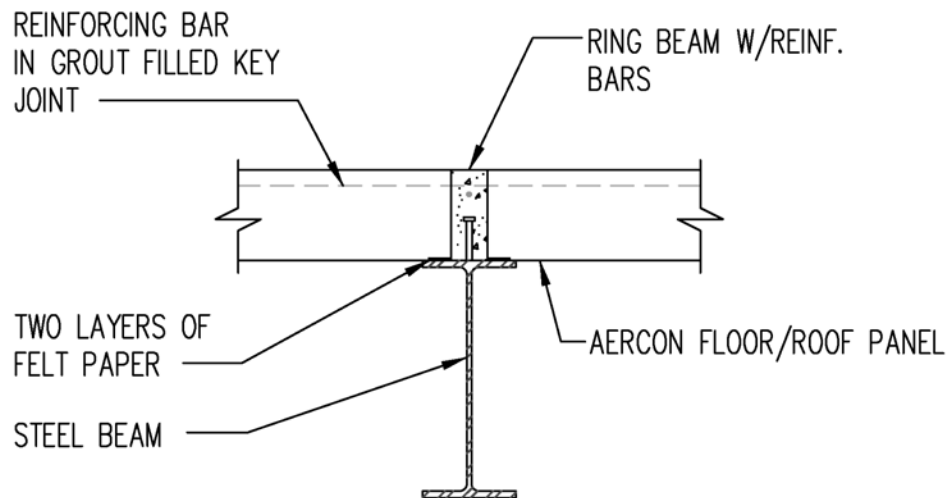


FIGURE 3—TYPICAL ANCHORAGE OF ROOF AND FLOOR UNITS TO STRUCTURAL STEEL FRAME

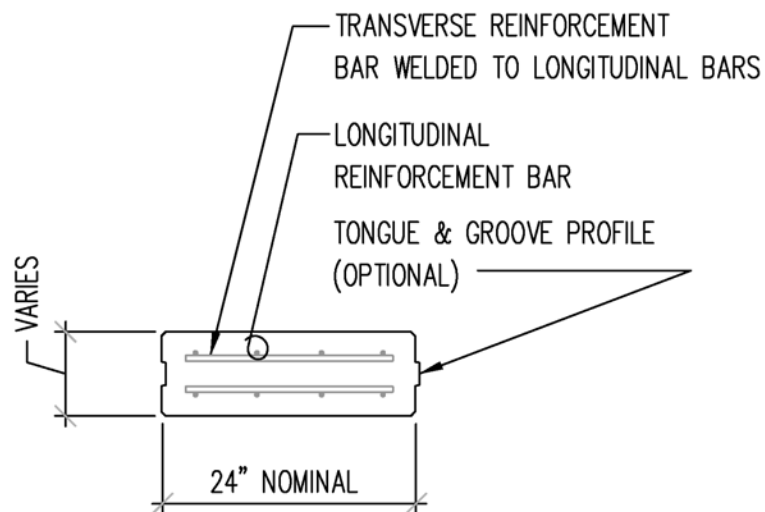


FIGURE 4—CROSS SECTION OF TYPICAL VERTICAL WALL UNITS

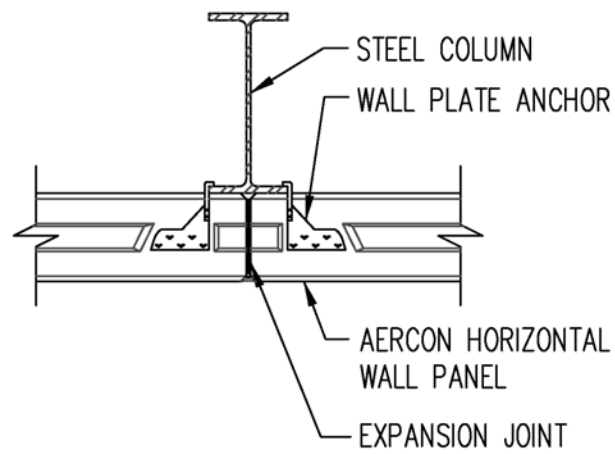


FIGURE 5—TYPICAL CONNECTION OF HORIZONTAL WALL UNITS TO STRUCTURAL STEEL FRAME (PLAN)

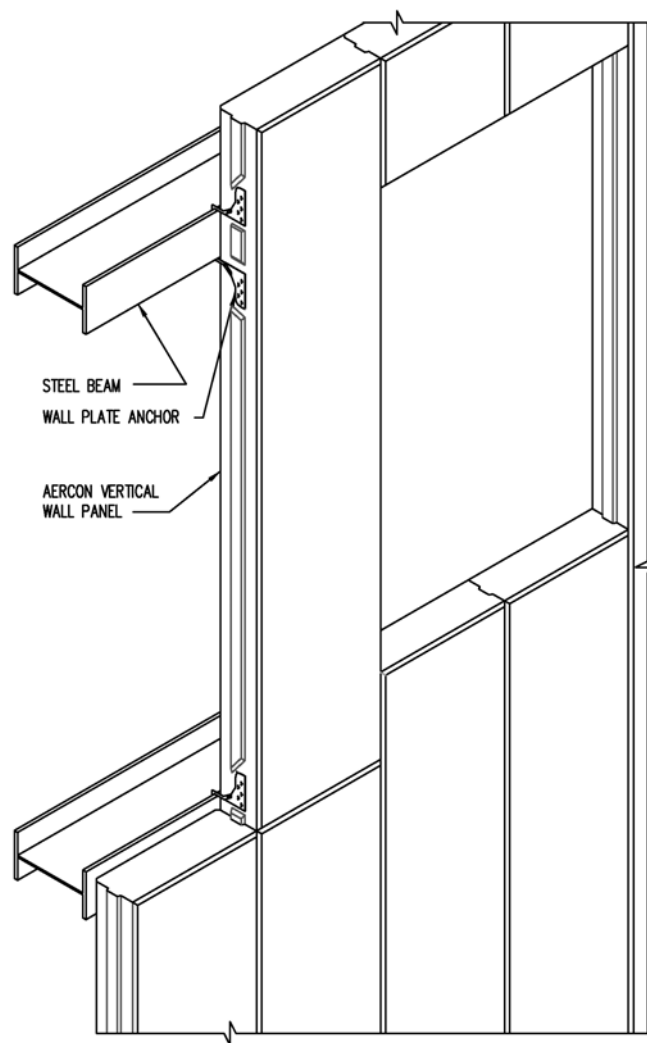


FIGURE 6—TYPICAL CONNECTION OF VERTICAL WALL UNITS TO STRUCTURAL STEEL FRAME (PLAN)

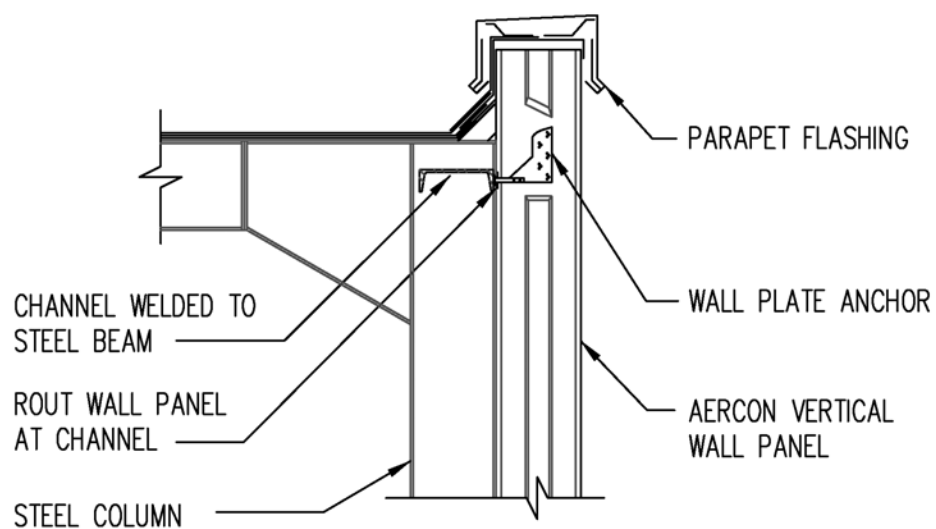


FIGURE 7—TYPICAL CONNECTION OF VERTICAL WALL UNITS TO STRUCTURAL STEEL FRAME (PLAN)