

ICC-ES Evaluation Report

ESR-3076

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A Subsidiary of the International Code Council®

DIVISION: 07 00 00—THERMAL AND MOISTURE PROTECTION
Section: 07 21 00—Thermal Insulation

REPORT HOLDER:

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EVALUATION SUBJECT:

ECOBAY™ CC AND ECOBAY™ CC POLAR SPRAY-APPLIED POLYURETHANE FOAM INSULATIONS

1.0 EVALUATION SCOPE
Compliance with the following codes:

- 2009 *International Building Code*® (IBC)
- 2009 *International Residential Code*® (IRC)
- 2009 *International Energy Conservation Code*® (IECC)
- Other Codes (see Section 8)

Properties evaluated:

- Surface-burning characteristics
- Physical properties
- Thermal resistance (*R*-values)
- Attic and crawl space insulation
- Vapor permeance
- Air permeance
- Exterior walls in Types I through IV construction
- Fire-resistance-rated construction

2.0 USES

EcoBay™ CC and EcoBay™ CC Polar spray foam insulations are used as thermal insulating materials in Types I, II, III, IV and V construction under the IBC and dwellings under the IRC. The insulations are for use in wall cavities, floor assemblies, ceiling assemblies or attics and crawl spaces when installed in accordance with Section 4.4. Under the IRC, the insulations may be used as a vapor retarder when installed in accordance with Section 3.4, and as air-impermeable insulation when installed in accordance with Section 3.5. The insulations may be used

in Types I, II, III and IV construction when installed in accordance with Section 4.5, and in fire-resistance-rated construction when installed in accordance with Section 4.6.

3.0 DESCRIPTION
3.1 General:

EcoBay™ CC and EcoBay™ CC Polar spray foam insulations are medium-density polyurethane foam plastics. The materials are two-component, closed cell, one-to-one-by-volume spray foam insulations with a nominal in-place density of 1.9 pcf (30 kg/m³). The insulation is produced in the field by combining a polymeric isocyanate (A component) with a polymeric resin blend (B component). The insulation liquid components have a shelf life of six months when stored in factory-sealed containers. The components are supplied in nominally 55-gallon (208 L) drums and must be stored at temperatures between 65°F (18°C) and 85°F (29°C).

3.2 Surface-burning Characteristics:

The insulation at a maximum thickness of 4 inches (102 mm) and a nominal density of 1.9 pcf (30 kg/m³) have a flame-spread index of 25 or less and a smoke-developed index of 450 or less when tested in accordance with ASTM E 84. Thicknesses up to 8 inches (203 mm) for wall cavities and 12 inches (305 mm) for ceiling cavities are recognized based on room corner fire testing in accordance with NFPA 286, when covered with a minimum 1/2-inch-thick (12.7 mm) gypsum board or an equivalent thermal barrier complying with the applicable code.

3.3 Thermal Resistance (*R*-values):

The insulation has thermal resistance (*R*-value) at a mean temperature of 75°F (24°C) as shown in Table 1.

3.4 Vapor Permeance:

The foam plastic has a vapor permeance of less than 1 perm [5.7x10⁻¹¹ kg/(Pa-s-m²)] when applied at a minimum thickness of 1 inch (25.4 mm) and may be used where a Class II vapor retarder is required by the applicable code.

3.5 Air Permeance:

EcoBay™ CC and EcoBay™ CC Polar spray foam insulations are air-impermeable in accordance with Section R806.4 of the IRC, at a minimum 3/4-inch (19.1 mm) thickness, based on testing in accordance with ASTM E 283.

3.6 Bayseal™ IC Intumescent Coating:

Bayseal™ IC intumescent coating is a one-component, water-based polymer coating. Bayseal™ IC intumescent

coating is supplied in 5-gallon (19 L) pails and 55-gallon (208 L) drums and has a shelf life of one year when stored in a factory-sealed container at temperatures of 50°F (10°C) or above.

3.7 FlameSeal® TB Intumescent Coating:

Flame Seal® TB, manufactured by Flame Seal Products Inc., is a two-component, four-to-one-by-volume, liquid-applied, water-based polymer intumescent coating. The coating is supplied in 5-gallon (19 L) pails and 55-gallon (208 L) drums and has a shelf life of six months when stored in a factory-sealed container at temperatures between 40°F and 90°F (4°C and 32°C).

4.0 DESIGN AND INSTALLATION

4.1 General:

EcoBay™ CC and EcoBay™ CC Polar spray foam insulations must be installed in accordance with the applicable code, the manufacturer's published installation instructions, and this report. A copy of the manufacturer's published installation instructions must be available at all times on the jobsite during installation.

4.2 Application:

The insulation is spray-applied on the jobsite using a volumetric positive displacement pump as identified in the Bayer MaterialScience application instructions. The maximum service temperature must not exceed that specified in the manufacturer's published installation instructions. The foam plastic must not be used in electrical outlet or junction boxes or in contact with water or rain. The foam plastic must not be sprayed onto a substrate that is wet, or covered with frost or ice, loose scales, rust, oil, or grease.

The insulation may be applied at a maximum thickness of 3 inches (76 mm) per pass up to the maximum total thickness as specified in Sections 3.2, 4.3, 4.4, 4.5 and 4.6. Additional passes may be applied after ten minutes or more of curing time.

4.3 Thermal Barrier:

4.3.1 Application with a Prescriptive Thermal Barrier: EcoBay™ CC and EcoBay™ CC Polar spray foam insulation must be separated from the interior of the building by an approved thermal barrier of 1/2-inch-thick (12.7 mm) gypsum wallboard or an equivalent 15-minute thermal barrier complying with, and installed in accordance with, IBC Section 2603.4 or IRC Section R316.4, as applicable, except when installation is as described in Sections 4.3.2 and 4.3.3 or within an attic or crawl space as described in Section 4.4. Thicknesses of up to 8 inches (203 mm) for wall cavities and 12 inches (305 mm) for ceiling cavities are recognized, based on room corner fire testing in accordance with NFPA 286, when covered with a minimum 1/2-inch-thick (12.7 mm) gypsum board or equivalent thermal barrier complying with the applicable code.

4.3.2 Application without a Prescriptive Thermal Barrier with Flame Seal® TB Intumescent Coating: The prescribed 15-minute thermal barrier may be omitted when installation is in accordance with this section. The EcoBay™ closed cell insulation and Flame Seal® TB system may be used in lieu of the prescribed 15-minute thermal barrier. The foam plastic insulation thickness must not exceed 6 inches (152 mm) in walls and ceilings, and the insulation must be covered with 18 dry mils (0.46 mm) of Flame Seal® TB intumescent coating applied at a minimum rate of 1.6 gallons (6 L) per 100 square feet (9.3 m²). The substrate must be dry, clean and free of dirt

and loose debris or other substances that could interfere with the adhesion of the coating. Flame Seal® TB may be applied by airless sprayer at ambient temperatures between 50°F and 115°F (10°C and 46°C) and relative humidity of less than 70 percent.

4.3.3 Use as Interior Finish: The EcoBay™ closed cell insulation and Flame Seal® TB intumescent coating system, as described in Section 4.3.2, may be used as an interior wall and ceiling finish complying with IBC Section 803.1.1 in all construction types.

4.4 Attics and Crawl Spaces:

4.4.1 Application with a Prescriptive Ignition Barrier: When EcoBay™ CC and EcoBay™ CC Polar insulation is installed within attics or crawl spaces where entry is made only for service of utilities, an ignition barrier must be installed in accordance with IBC Section 2603.4.1.6 or IRC Sections R316.5.3 and R316.5.4, as applicable. The ignition barrier must be consistent with the requirements for the type of construction required by the applicable code, and must be installed in a manner so the foam plastic insulation is not exposed. The insulation as described in this section may be installed in unvented attics in accordance with IRC Section R806.4.

4.4.2 Application without a Prescriptive Ignition Barrier:

4.4.2.1 General: Where EcoBay™ CC and EcoBay™ CC Polar insulation is installed without a prescriptive ignition barrier as described in Section 4.4.2.2 or 4.4.3, in attics and crawl spaces, the following conditions apply:

- Entry to the attic or crawl space is only to service utilities and no storage is permitted.
- There are no interconnected attic or crawl space areas.
- Air in the attic or crawl space is not circulated to other parts of the building.
- Under-floor (crawl space) ventilation is provided when required by IBC Section 1203.3 or IRC Section R408.1, as applicable.
- Attic ventilation is provided when required by IBC Section 1203.2 or IRC Section R806, except when air-impermeable insulation is permitted in unvented attics in accordance with Section R806.4 of the IRC.
- Combustion air is provided in accordance with Section 701 of the 2009 *International Mechanical Code*® (IMC).

4.4.2.2 Use with Bayseal™ IC intumescent Coating: EcoBay™ CC and EcoBay™ CC Polar insulation may be spray-applied to the underside of roof sheathing and/or rafters, and the underside of wood floors and/or floor joists in crawl spaces as described in this section. The thickness of the foam plastic applied to the underside of the wood floor or roof sheathing must not exceed 12 inches (305 mm). The thickness of the spray foam insulation applied to vertical wall surfaces in attics and crawl spaces must not exceed 8 inches (203 mm). All foam plastic surfaces must be covered with 4 dry mils (0.1 mm) of Bayseal™ IC intumescent coating, applied at a rate of 0.5 gallon (1.9 L) per 100 square feet (9.3 m²). Bayseal™ IC intumescent coating is applied by brush, roller or airless sprayer at ambient temperatures between 50°F and 115°F (10°C and 46°C) and relative humidity of less than 75 percent. Surfaces to be coated must be dry, clean, and free of dirt, loose debris and any other substances that could interfere with adhesion of the coating. EcoBay™ CC and EcoBay™ CC Polar insulation, as described in this section, may be installed in unvented attics in accordance with IRC Section R806.4.

4.4.3 Attic Floors:

4.4.3.1 Use on Attic Floors with Bayseal™ IC Intumescent Coating: EcoBay™ CC and EcoBay™ CC Polar insulation may be installed at a maximum thickness of 8 inches (203 mm) between and over the joists in attic floors. All foam plastic surfaces must be covered with 4 dry mils (0.1 mm) of Bayseal™ IC intumescent coating uniformly applied at a rate of 0.5 gallon (1.9 L) per 100 square feet (9.3 m²) as described in Section 4.4.2.2. The insulation must be separated from the interior of the building (beneath the attic) by an approved thermal barrier. The ignition barrier in accordance with IBC Section 2603.4 and IRC Section R316.5.3 may be omitted.

4.5 Exterior Wall Assemblies in Types I, II, III and IV Construction (Figures 1–10):

General: When use is on exterior walls of Types I, II, III and IV construction, the assembly in which the EcoBay™ CC and EcoBay™ CC Polar spray-applied polyurethane insulation is used must comply with IBC Section 2603.5 and the insulation must be installed at a maximum thickness of 3⁵/₈ inches (92 mm). The potential heat of the EcoBay™ CC and EcoBay™ CC Polar spray-applied polyurethane insulation is 1838 Btu/ft² (20.9 MJ/m²) per inch of thickness, when tested in accordance with NFPA 259. See Figures 1 through 10 for exterior wall assemblies in Types I, II, III and IV construction.

Exterior Face: Nominally 3⁵/₈-inch-deep (92 mm), No 20 gage galvanized steel studs, spaced a maximum of 24 inches (610 mm) on center, are fastened to No. 20 gage galvanized steel floor and ceiling tracks using No. 8, 1¹/₂-inch-long (12.7 mm), self-tapping pan head framing screws. Georgia-Pacific DenGlass Gold Exterior Sheathing, 5¹/₈ inch (15.9 mm) thick, or Type X gypsum sheathing, 5¹/₈ inch (15.9 mm) thick and complying with ASTM C 79, is installed over the exterior side of the steel studs with the long end perpendicular to the steel studs, using No. 6, Type S, 1¹/₄-inch (31.7 mm), self-tapping, bugle head screws spaced 8 inches (203.2 mm) on center around the perimeter and 12 inches (305 mm) on center in the field. EcoBay™ CC or EcoBay™ CC Polar spray-applied polyurethane insulation may be installed to partially fill or fully fill the stud cavity up to a maximum thickness of 3⁵/₈ inches (92 mm), or may be applied to the exterior surface of the exterior sheathing at a maximum thickness of 3¹/₄ inches (82.6 mm).

Interior Face: For Figures 1, 2, 3 and 10, Type X gypsum wallboard, 5¹/₈ inch (15.9 mm) thick, and complying with ASTM C 1396, is installed with the long dimension perpendicular to the steel studs, using No. 6, Type S, 1¹/₄-inch (31.7 mm), self-tapping, bugle head screws spaced 8 inches (203.2 mm) on center around the perimeter and 12 inches (305 mm) on center in the field. All exposed gypsum wallboard joints must be taped with joint tape and compound, and all screws heads must be covered with joint compound, in accordance with ASTM C 840 or GA216. For Figures 4, 5 and 6, the interior face is a concrete masonry unit (CMU). For Figures 7, 8 and 9, the interior face is a concrete wall.

Exterior Wall Covering: Details of the exterior wall covering must be in accordance with Figures 1 through 9. When construction is as shown in Figure 10, details of the exterior wall covering must be provided to the code official by the report holder, designer or specifier, with an engineering analysis demonstrating that (1) the exterior wall covering conforms to ASTM E 136 and (2) the addition of the wall covering to the assembly described in this section and shown in Figure 10 does not negatively affect

conformance of the assembly with the requirements of IBC Section 2603.5. Attachment of the exterior wall covering to the structural element (framing, concrete or concrete masonry unit) of the wall must be designed to comply with the code to the satisfaction of the code official.

4.6 One-hour Fire-resistance-rated Exterior Wall Assemblies (Non-load-bearing):

General: When used in and on fire-resistance-rated exterior wall assemblies, the EcoBay™ CC and EcoBay™ CC Polar spray-applied polyurethane insulations must be installed in accordance with this section and Figures 11 through 16.

Assembly with Insulation on the Exterior of the Wall (Figure 11):

Exterior Face: Nominally 3⁵/₈-inch-deep (92 mm), No. 25 gage galvanized steel studs, spaced a maximum of 24 inches (610 mm) on center, are fastened to No. 25 gage galvanized steel floor and ceiling tracks. One layer of Type X gypsum sheathing, 5¹/₈ inch (15.9 mm) thick and complying with ASTM C 79, is installed over the exterior side of the steel studs with the long dimension parallel to the steel studs and with vertical joints offset a minimum of 24 inches (610 mm) from the vertical joints in the interior Type X gypsum wallboard, and the horizontal joints offset a minimum of 24 inches (610 mm) from the horizontal joints in the interior Type X gypsum wallboard. The exterior sheathing is attached using 1¹/₄-inch-long (31.7 mm), self-drilling drywall screws spaced 8 inches (203.2 mm) on center around the perimeter and 12 inches (305 mm) on center in the field. All exposed gypsum sheathing and gypsum wallboard joints must be taped with joint tape and compound, and all screws heads must be covered with joint compound, in accordance with ASTM C 840 or GA216. When applied to the exterior surface of the exterior sheathing, EcoBay™ CC or EcoBay™ CC Polar spray-applied polyurethane insulation may be installed at a maximum thickness of 3 inches (76.2 mm).

Interior Face: Type X gypsum wallboard, 5¹/₈ inch (15.9 mm) thick and complying with ASTM C 1396, is installed with the long dimension parallel to the steel studs using 1¹/₄-inch-long (31.7 mm), self-drilling drywall screws spaced 8 inches (203.2 mm) on center around the perimeter and 12 inches (305 mm) on center in the field. All exposed gypsum wallboard joints must be taped with joint tape and compound, and all screws heads must be covered with joint compound, in accordance with ASTM C 840 or GA216.

Exterior Wall Covering: The exterior wall covering for the assembly in Figure 11 must be either minimum 3¹/₄-inch-thick (19.1 mm) Portland cement plaster (stucco) on metal lath; minimum 2-inch-thick (50.8 mm) natural stone; minimum 1¹/₂-inch-thick (38.1 mm) artificial cast stone veneer; minimum 2-inch-thick (50.8 mm) CMU; or minimum 2-inch-thick (50.8 mm) clay brick veneer. Attachment of the exterior wall covering to the structural framing of the wall must be designed to comply with the code to the satisfaction of the code official.

Assemblies with Insulation in the Wall Cavity (Figures 12–16):

Exterior Face: Nominally 5¹/₂-inch-deep (140 mm), No. 20 gage galvanized steel studs, spaced a maximum of 24 inches (610 mm) on center, are fastened to No. 20 gage galvanized steel floor and ceiling tracks. One layer of Type X gypsum sheathing, 5¹/₈ inch (15.9 mm) thick and complying with ASTM C 1396, is installed over the exterior side of the steel studs with the long dimension parallel to

the steel studs, with vertical joints offset a minimum of 24 inches (610 mm) from the vertical joints in the interior Type X gypsum wallboard, and the horizontal joints offset a minimum of 24 inches (610 mm) from the horizontal joints in the interior Type X gypsum wallboard. The exterior sheathing is attached using No. 6, 1¹/₄-inch-long (31.7 mm), self-drilling drywall screws spaced 8 inches (203.2 mm) on center around the perimeter and 12 inches (305 mm) on center in the field. All exposed gypsum sheathing and gypsum wallboard joints are taped with joint tape and compound, and all screws heads are covered with joint compound, in accordance with ASTM C 840 or GA216. DuPont™ Tyvek® HomeWrap® water-resistant barrier may be attached to the exterior side of the Type X gypsum sheathing using corrosion-resistant staples when installed in accordance with Section 4.2 of [ESR-2375](#). EcoBay™ CC or EcoBay™ CC Polar spray-applied polyurethane insulation may be installed to a maximum thickness of 3 inches (76.2 mm) to partially fill the stud cavity.

Interior Face: Type X gypsum wallboard, 5/8 inch (15.9 mm) thick and complying with ASTM C 1396, is installed with the long dimension parallel to the steel studs using No. 6, 1¹/₄-inch-long (31.7 mm), self-drilling drywall screws spaced 8 inches (203.2 mm) on center around the perimeter and 12 inches (305 mm) on center in the field. All exposed gypsum wallboard joints must be taped with joint tape and compound, and all screws heads must be covered with joint compound, in accordance with ASTM C 840 or GA216.

Exterior Wall Covering: Details of the exterior wall covering must be in accordance with Figures 12 through 16. Attachment of the exterior wall covering to the structural framing of the wall must be designed to comply with the code, to the satisfaction of the code official.

5.0 CONDITIONS OF USE

The EcoBay™ CC and EcoBay™ CC Polar spray-applied foam plastic insulations 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 products must be installed in accordance with the manufacturer's published installation instructions, this evaluation report and the applicable code(s). If there are any conflicts between the manufacturer's published installation instructions and this report, this report governs.
- 5.2 The insulation must be separated from the interior of the building by an approved 15-minute thermal barrier in accordance with IBC Section 2603.4 or IRC Section R316.4, except when installation is as described in Sections 4.3.2, 4.3.3 and 4.4.
- 5.3 The insulation must not exceed the thicknesses noted in Sections 3.2, 4.3, 4.4, 4.5 and 4.6.
- 5.4 The insulation must be protected from prolonged exposure to weather during and after application.
- 5.5 The insulation must be applied by contractors certified by Bayer MaterialScience, LLC.
- 5.6 Use of the insulation in areas where the probability of termite infestation is "very heavy" must be in accordance with IRC Section R318.4 or IBC Section 2603.8, as applicable.
- 5.7 Jobsite certification and labeling of the insulation must comply with IRC Sections N1101.4 and N1101.4.1

and IECC Sections 303.1.1 and 303.1.2, as applicable.

- 5.8 Use of the insulation in exterior wall assemblies in Types I, II, III and IV construction must be in accordance with Section 4.5.
- 5.9 Use of the insulation in fire-resistance-rated construction must be in accordance with Section 4.6.
- 5.10 EcoBay™ CC and EcoBay™ CC Polar spray-applied foam insulation components are produced by Bayer MaterialScience, LLC, in Phoenix, Arizona, and Spring, Texas, under a quality control program with inspections by Underwriters Laboratories Inc. (AA-668).

6.0 EVIDENCE SUBMITTED

- 6.1 Data in accordance with the ICC-ES Acceptance Criteria for Spray-applied Foam Plastic Insulation (AC377), dated October 2010, including reports of tests in accordance with Appendix X of AC377.
- 6.2 Reports of room corner tests in accordance with NFPA 286 and UL 1715.
- 6.3 Reports of potential heat of foam plastics tests in accordance with NFPA 259.
- 6.4 Reports of air permeance tests in accordance with ASTM E 283.
- 6.5 Reports of vapor permeance tests in accordance with ASTM E 96.
- 6.6 Reports of fire tests in accordance with NFPA 285.
- 6.7 Reports of fire tests in accordance with ASTM E 119.

7.0 IDENTIFICATION

Components for EcoBay™ CC and EcoBay™ CC Polar spray-applied foam plastic insulations are identified with the manufacturer's name (Bayer MaterialScience, LLC), address and telephone number; the product name (EcoBay™ CC or EcoBay™ CC Polar); mixing instructions; the density; the flame-spread and smoke-development indices; the expiration date; the evaluation report number (ESR-3076); and the name of the inspection agency (Underwriters Laboratories Inc.).

Each pail of Bayseal™ IC intumescent coating is labeled with the manufacturer's name (Bayer MaterialScience, LLC) and address; the product name (Bayseal™ IC); and use instructions.

Each pail of Flame Seal™ TB intumescent coating is labeled with the manufacturer's name (Flame Seal Products Inc.) and address; the product name (Flame Seal™ TB); and use instructions.

8.0 OTHER CODES

In addition to the codes referenced in Section 1.0, the products described in this report were evaluated for compliance with the requirements of the following codes:

- 2006 *International Building Code*® (2006 IBC)
- 2006 *International Residential Code*® (2006 IRC)
- 2006 *International Energy Conservation Code*® (2006 IECC)
- 2003 *International Building Code*® (2003 IBC)
- 2003 *International Residential Code*® (2003 IRC)
- 2003 *International Energy Conservation Code*® (2003 IECC)

The products comply with the above-mentioned codes as described in Sections 2.0 through 7.0 of this report, with the revisions noted below:

- **Application with a Prescriptive Thermal Barrier:** See Section 4.3.1, except the approved thermal barrier must be installed in accordance with Section R314.4 of the 2006 IRC or Section R314.1.2 of the 2003 IRC, as applicable.
- **Application with a Prescriptive Ignition Barrier:** See Section 4.4.1, except attics must be vented in accordance with Section 1203.2 of the 2006 and 2003 IBC or Section R806 of the 2003 IRC, and crawl space ventilation must be in accordance with Section 1203.3 of the 2006 and 2003 IBC or Section R408 of the 2006 and 2003 IRC, as applicable. Additionally, an ignition barrier must be installed in accordance with Sections R314.5.3 or R314.5.4 of the 2006 IRC or Section R314.2.3 of the 2003 IRC, as applicable.

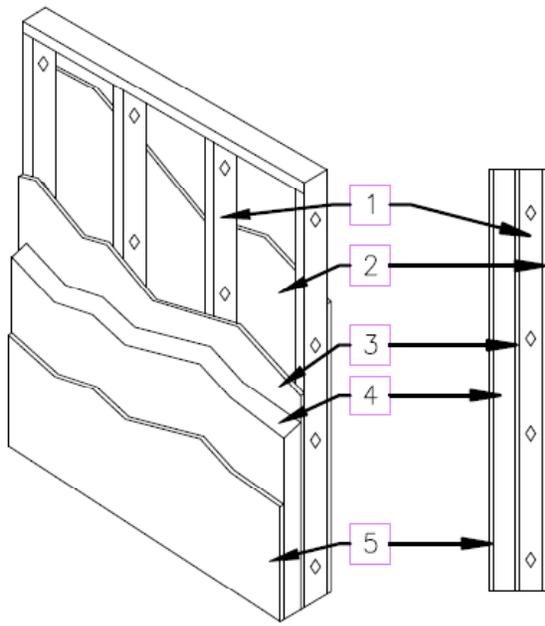
- **Application without a Prescriptive Ignition Barrier:** See Section 4.4.2, except attics must be vented in accordance with Section 1203.2 of the 2006 and 2003 IBC or Section R806 of the 2003 IRC, and crawl space ventilation must be in accordance with Section 1203.3 of the 2006 and 2003 IBC or Section R408 of the 2006 and 2003 IRC, as applicable.
- **Protection Against Termites:** See Section 5.6, except use of the insulation in areas where the probability of termite infestation is “very heavy” must be in accordance with Section R320.5 of the 2006 IRC or Section R320.4 of the 2003 IRC.
- **Jobsite Certification and Labeling:** See Section 5.7, except jobsite certification and labeling must comply with Sections 102.1.1 and 102.1.1.1, as applicable, of the 2006 IECC.

TABLE 1—THERMAL RESISTANCE (R-VALUES)¹

THICKNESS (inches)	R-VALUE (°F.ft ² .h/Btu)
1	6.9
2	14
3	21
3.5	24
4	28
5	34
5.5	38
6	41
7	48
7.5	52
8	55
9	62
10	69
11	76
12	83

For SI: 1 inch = 25.5 mm; 1°F.ft².h/Btu = 0.176 110°K.m²/W.

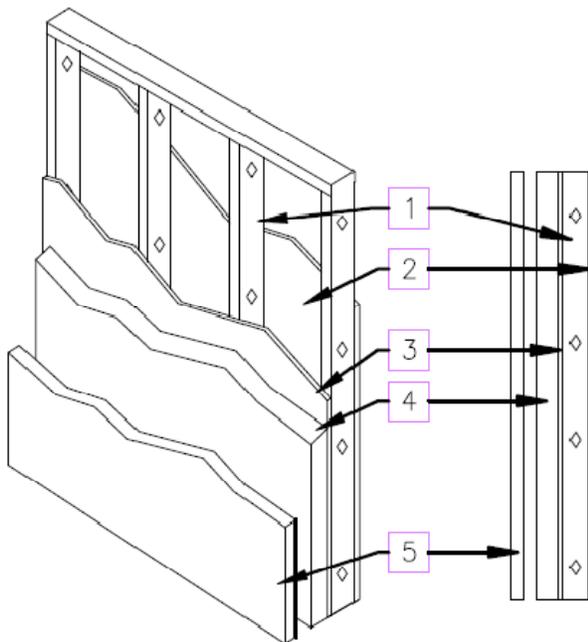
¹R-values are calculated based on tested K values at 1 and 3.5-inch thicknesses.



NOTES:

1. NOMINAL 3⁵/₈ INCH MINIMUM 20 GAGE STEEL STUDS, SPACED MAXIMUM 24 INCHES ON CENTER WITH LATERAL BRACING IN ACCORDANCE WITH THE CODE.
2. 5/8 INCH THICK TYPE X GYPSUM WALLBOARD.
3. 5/8 INCH THICK TYPE X EXTERIOR GYPSUM SHEATHING.
4. MAXIMUM 3¹/₄ INCH THICKNESS OF BAYER MATERIALSCIENCE, LLC CLOSED CELL (CC) SPRAYED POLYURETHANE FOAM (SPF) WALL INSULATION MATERIAL.
5. MINIMUM 3/4" THICK EXTERIOR PORTLAND CEMENT-SAND TYPE STUCCO OVER METAL LATH.

FIGURE 1—STUCCO EXTERIOR WALL COVERING FOR EXTERIOR WALL ASSEMBLY IN TYPES I, II, III and IV CONSTRUCTION. SEE SECTION 4.5 FOR ADDITIONAL DETAILS

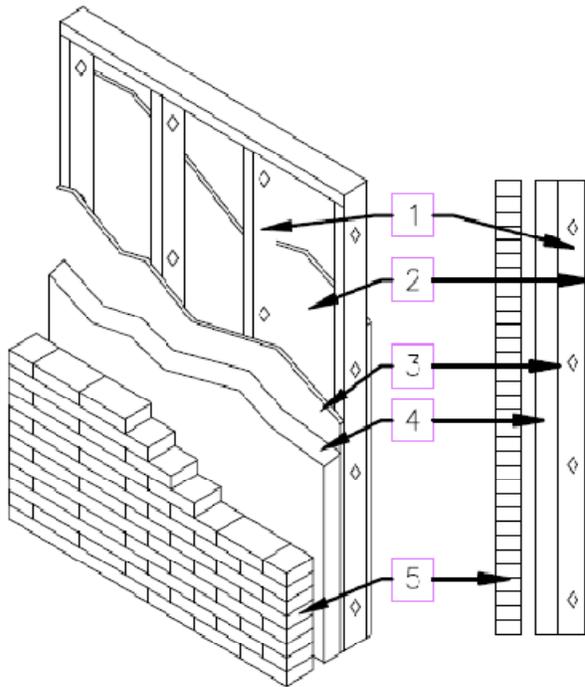


NOTES:

1. NOMINAL 3⁵/₈ INCH MINIMUM 20 GAGE STEEL STUDS, SPACED MAXIMUM 24 INCHES ON CENTER WITH LATERAL BRACING IN ACCORDANCE WITH THE CODE.
2. 5/8 THICK TYPE X GYPSUM WALLBOARD.
3. 5/8 INCH THICK TYPE X EXTERIOR GYPSUM SHEATHING.
4. MAXIMUM 3¹/₄ INCH THICKNESS OF BAYER MATERIALSCIENCE, LLC CLOSED CELL (CC) SPRAYED POLYURETHANE FOAM (SPF) WALL INSULATION MATERIAL.
5. MINIMUM 2 INCH THICK LIMESTONE, LEAVING MAXIMUM 2 INCH AIR GAP BETWEEN LIMESTONE AND FOAM PLASTIC INSULATION.

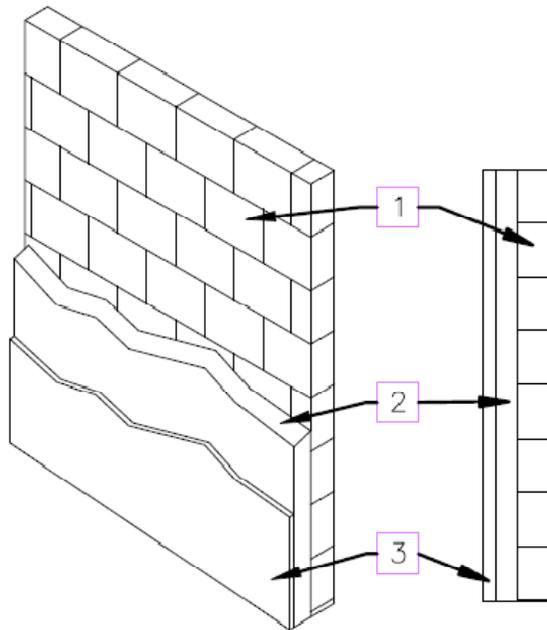
FIGURE 2—LIMESTONE EXTERIOR WALL COVERING FOR EXTERIOR WALL ASSEMBLY IN TYPES I, II, III AND IV CONSTRUCTION. SEE SECTION 4.5 FOR ADDITIONAL DETAILS

NOTES



1. NOMINAL 3⁵/₈ INCH MINIMUM 20 GAGE STEEL STUDS, SPACED MAXIMUM 24" ON CENTER WITH LATERAL BRACING IN ACCORDANCE WITH THE CODE.
2. ⁵/₈ INCH THICK TYPE X GYPSUM WALLBOARD.
3. ⁵/₈ INCH THICK TYPE X EXTERIOR GYPSUM SHEATHING.
4. MAXIMUM 3¹/₄ INCH THICKNESS OF BAYER MATERIALSCIENCE, LLC CLOSED CELL (CC) SPRAYED POLYURETHANE FOAM (SPF) WALL INSULATION MATERIAL.
5. STANDARD 4 INCH CLAY BRICK AND TYPE S MORTAR IN RUNNING BOND PATTERN, LEAVING MAXIMUM 2 INCH AIR GAP BETWEEN BRICK AND FOAM PLASTIC INSULATION.

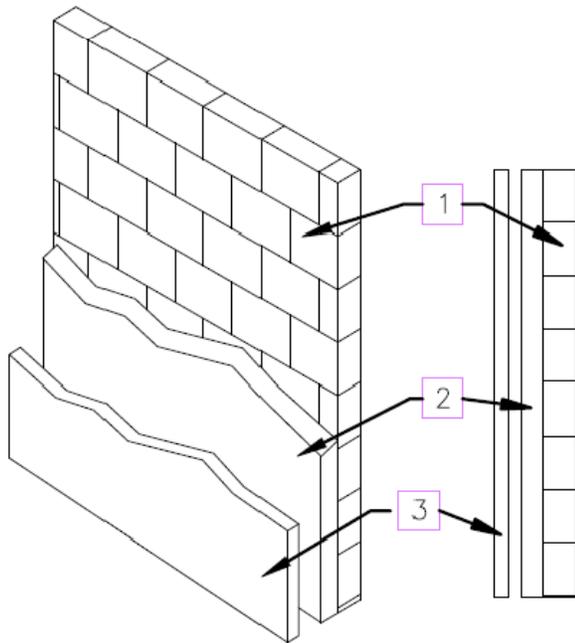
FIGURE 3—MASONRY BRICK EXTERIOR WALL COVERING FOR EXTERIOR WALL ASSEMBLY IN TYPES I, II, III AND IV CONSTRUCTION. SEE SECTION 4.5 FOR ADDITIONAL DETAILS



NOTES:

1. CMU WALL.
2. MAXIMUM 3¹/₄ INCH THICKNESS OF BAYER MATERIALSCIENCE, LLC CLOSED CELL (CC) SPRAYED POLYURETHANE FOAM (SPF) WALL INSULATION MATERIAL.
3. MINIMUM ³/₄ INCH THICK EXTERIOR PORTLAND CEMENT-SAND TYPE STUCCO OVER METAL LATH.

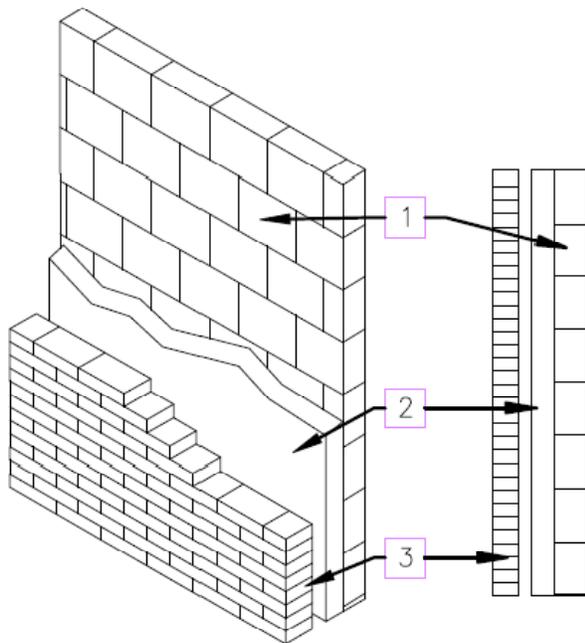
FIGURE 4—STUCCO EXTERIOR WALL COVERING FOR EXTERIOR WALL ASSEMBLY IN TYPES I, II, III AND IV CONSTRUCTION. SEE SECTION 4.5 FOR ADDITIONAL DETAILS



NOTES:

1. CMU WALL
2. MAXIMUM 3¹/₄" THICKNESS OF BAYER MATERIALSCIENCE, LLC CLOSED CELL (CC) SPRAYED POLYURETHANE FOAM (SPF) WALL INSULATION MATERIAL.
3. MINIMUM 2 INCH THICK LIMESTONE, LEAVING MAXIMUM 2 INCH AIR GAP BETWEEN LIMESTONE AND FOAM PLASTIC INSULATION.

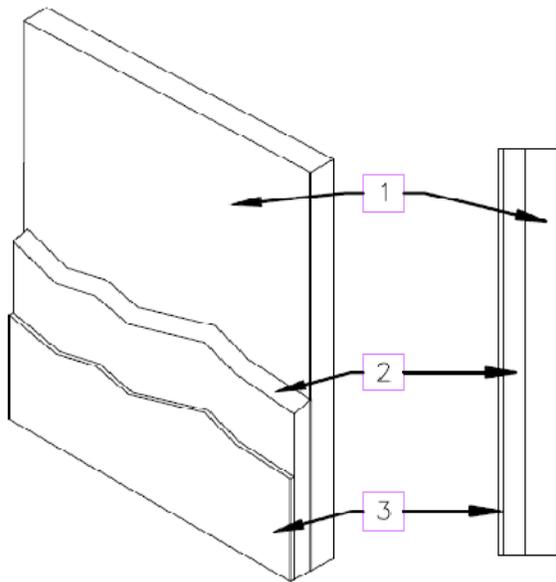
FIGURE 5—LIMESTONE EXTERIOR WALL COVERING FOR EXTERIOR WALL ASSEMBLY IN TYPES I, II, III AND IV CONSTRUCTION. SEE SECTION 4.5 FOR ADDITIONAL DETAILS



NOTES:

1. CMU WALL.
2. MAXIMUM 3¹/₄ INCH THICKNESS OF BAYER MATERIALSCIENCE, LLC CLOSED CELL (CC) SPRAYED POLYURETHANE FOAM (SPF) WALL INSULATION MATERIAL.
3. STANDARD 4 INCH CLAY BRICK AND TYPE S MORTAR IN RUNNING BOND PATTERN, LEAVING MAXIMUM 2 INCH AIR GAP BETWEEN BRICK AND FOAM PLASTIC INSULATION.

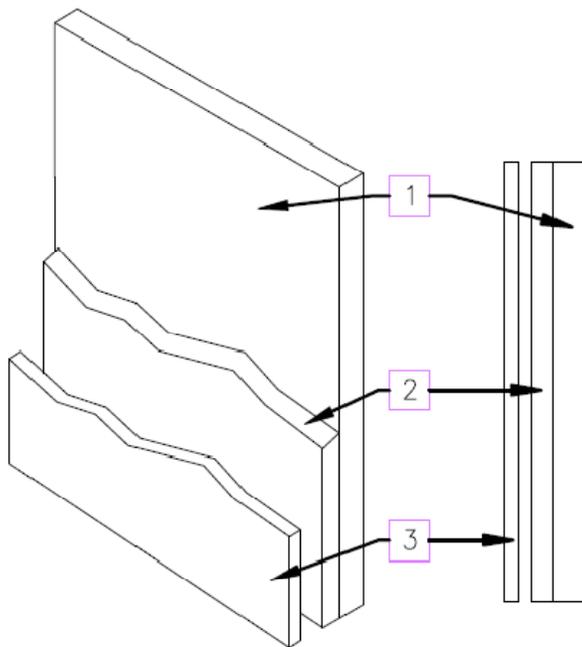
FIGURE 6—MASONRY BRICK EXTERIOR WALL COVERING FOR EXTERIOR WALL ASSEMBLY IN TYPES I, II, III AND IV CONSTRUCTION. SEE SECTION 4.5 FOR ADDITIONAL DETAILS



NOTES

1. CONCRETE WALL.
2. MAXIMUM 3¹/₄ INCH THICKNESS OF BAYER MATERIALSCIENCE, LLC CLOSED CELL (CC) SPRAYED POLYURETHANE FOAM (SPF) WALL INSULATION MATERIAL.
3. MINIMUM 3³/₄ INCH THICK EXTERIOR PORTLAND CEMENT SAND TYPE STUCCO OVER METAL LATH.

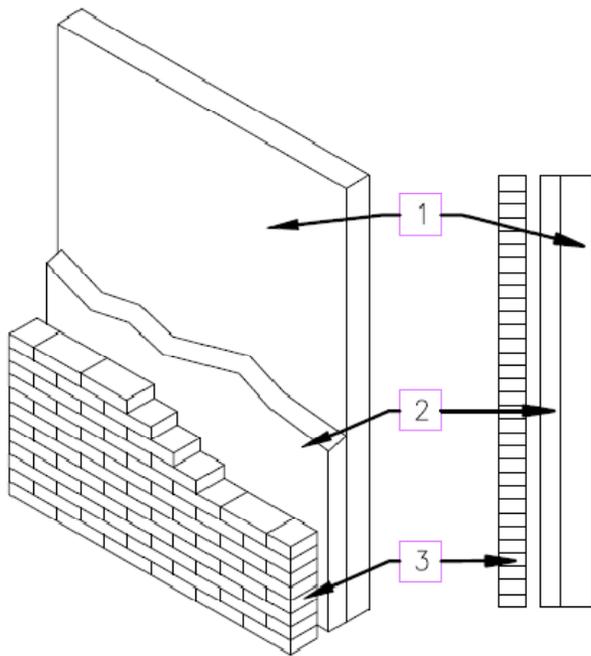
FIGURE 7—STUCCO EXTERIOR WALL COVERING FOR EXTERIOR WALL ASSEMBLY IN TYPES I, II, III AND IV CONSTRUCTION. SEE SECTION 4.5 FOR ADDITIONAL DETAILS



NOTES

1. CONCRETE WALL.
2. MAXIMUM 3¹/₄ INCH THICKNESS OF BAYER MATERIALSCIENCE, LLC CLOSED CELL (CC) SPRAYED POLYURETHANE FOAM (SPF) WALL INSULATION MATERIAL.
3. MINIMUM 2 INCH THICK LIMESTONE WALL, LEAVING MAXIMUM 2 INCH AIR GAP BETWEEN LIMESTONE AND FOAM PLASTIC INSULATION.

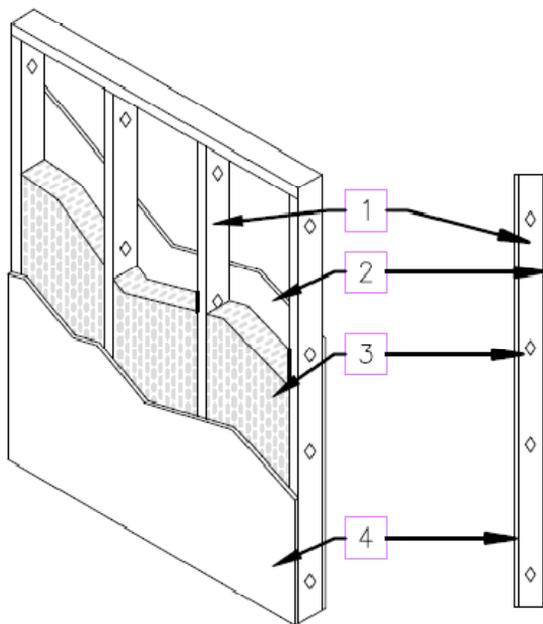
FIGURE 8—LIMESTONE EXTERIOR WALL COVERING FOR EXTERIOR WALL ASSEMBLY IN TYPES I, II, III AND IV CONSTRUCTION. SEE SECTION 4.5 FOR ADDITIONAL DETAILS



NOTES

1. CONCRETE WALL.
2. MAXIMUM 3¹/₄ INCH THICKNESS OF BAYER MATERIALSCIENCE, LLC CLOSED CELL (CC) SPRAYED POLYURETHANE FOAM (SPF) WALL INSULATION MATERIAL.
3. STANDARD 4 INCH CLAY BRICK AND TYPE S MORTAR IN RUNNING BOND PATTERN, LEAVING MAXIMUM 2 INCH AIR GAP BETWEEN BRICK AND FOAM PLASTIC INSULATION.

FIGURE 9—MASONRY BRICK EXTERIOR WALL COVERING FOR EXTERIOR WALL ASSEMBLY IN TYPES I, II, III AND IV CONSTRUCTION. SEE SECTION 4.5 FOR ADDITIONAL DETAILS



NOTES

1. NOMINAL 3⁵/₈ INCH MINIMUM 20 GAGE STEEL STUDS, SPACED MAXIMUM 24 INCHES ON CENTER WITH LATERAL BRACING IN ACCORDANCE WITH THE CODE.
2. 5/8 INCH TYPE X GYPSUM WALLBOARD.
3. BAYER MATERIAL SCIENCE, LLC CLOSED CELL (CC) SPRAYED POLYURETHANE FOAM (SPF) WALL INSULATION MATERIAL, TO PARTIALLY FILL OR FULLY FILL THE CAVITY, APPLIED TO EXTERIOR GYPSUM SHEATHING.
4. 5/8 INCH THICK TYPE X EXTERIOR GYPSUM SHEATHING.

NOTE: DETAILS OF THE EXTERIOR WALL COVERING MUST BE PROVIDED TO THE CODE OFFICIAL BY THE REPORT HOLDER, DESIGNER OR SPECIFIER, WITH AN ENGINEERING ANALYSIS DEMONSTRATING THAT (1) THE EXTERIOR WALL COVERING CONFORMS TO ASTM E136 AND (2) THE ADDITION OF THE WALL COVERING TO THE ASSEMBLY SHOWN IN FIGURE 10 DOES NOT NEGATIVELY AFFECT CONFORMANCE OF THE ASSEMBLY WITH THE REQUIREMENTS OF IBC SECTION 2603.5.

FIGURE 10—EXTERIOR WALL ASSEMBLY IN TYPES I, II, III AND IV CONSTRUCTION. SEE SECTION 4.5 FOR ADDITIONAL DETAILS

NOTES:

1. NOMINAL 3⁵/₈ INCH DEEP MINIMUM 20 GAGE STEEL STUDS, SPACED MAXIMUM 24 INCHES ON CENTER WITH LATERAL BRACING IN ACCORDANCE WITH THE CODE.
2. 5/8 INCH THICK TYPE X GYPSUM WALLBOARD.
3. 5/8 INCH THICK TYPE X EXTERIOR GYPSUM SHEATHING.
4. MAXIMUM 3 INCH THICKNESS OF BAYER MATERIALSCIENCE, LLC CLOSED CELL (CC) SPRAYED POLYURETHANE FOAM (SPF) APPLIED TO TYPE X EXTERIOR GYPSUM SHEATHING.

NOTE:

NON-LOAD BEARING WALL ASSEMBLY
 INTERIOR AND EXTERIOR FIRE EXPOSURE
 1—HOUR RATING

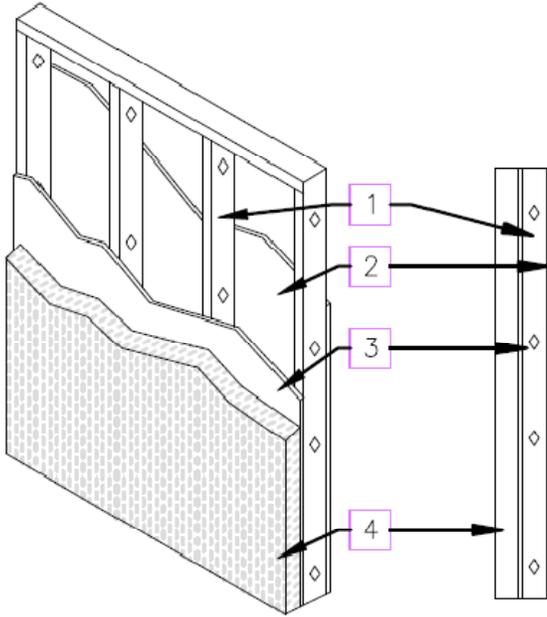


FIGURE 11—FIRE-RESISTANCE-RATED, 1-HOUR, EXTERIOR WALL ASSEMBLY WITH INSULATION ON THE EXTERIOR OF THE WALL. SEE SECTION 4.6.2 FOR ADDITIONAL DETAILS

NOTES:

1. NOMINAL 5¹/₂ INCH DEEP x 1⁵/₈ INCH WIDE, MINIMUM 20 GAGE STEEL STUDS, SPACED MAXIMUM 24 INCHES ON CENTER WITH LATERAL BRACING IN ACCORDANCE WITH THE CODE.
2. 5/8 INCH THICK TYPE X GYPSUM WALLBOARD.
3. MAXIMUM 3 INCH THICKNESS OF BAYER MATERIALSCIENCE, LLC CLOSED CELL (CC) SPRAYED POLYURETHANE FOAM (SPF) WALL INSULATION MATERIAL APPLIED TO THE TYPE X EXTERIOR GYPSUM SHEATHING.
4. 5/8 INCH THICK TYPE X EXTERIOR GYPSUM SHEATHING.
5. 5/16 INCH THICK JAMES HARDIE HARDIEPANEL FIBER CEMENT BOARD ORIENTED HORIZONTALLY, JOISTS OFFSET FROM THE TYPE X EXTERIOR GYPSUM SHEATHING.

NOTE:

NON-LOAD BEARING WALL ASSEMBLY
 INTERIOR FIRE EXPOSURE ONLY
 1-HOUR RATING

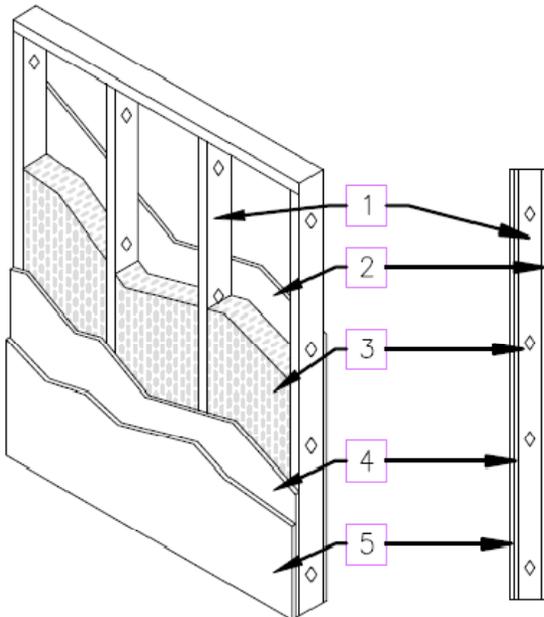
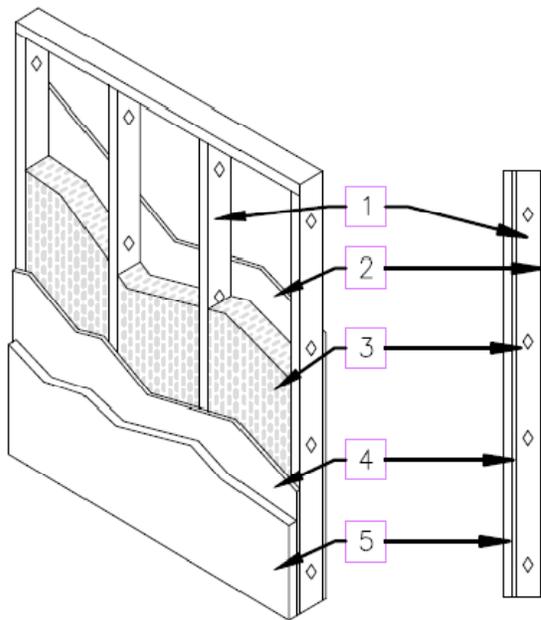


FIGURE 12—FIRE-RESISTANCE-RATED, 1-HOUR, EXTERIOR WALL ASSEMBLY WITH INSULATION IN THE WALL CAVITY. SEE SECTION 4.6.3 FOR ADDITIONAL DETAILS

NOTES:



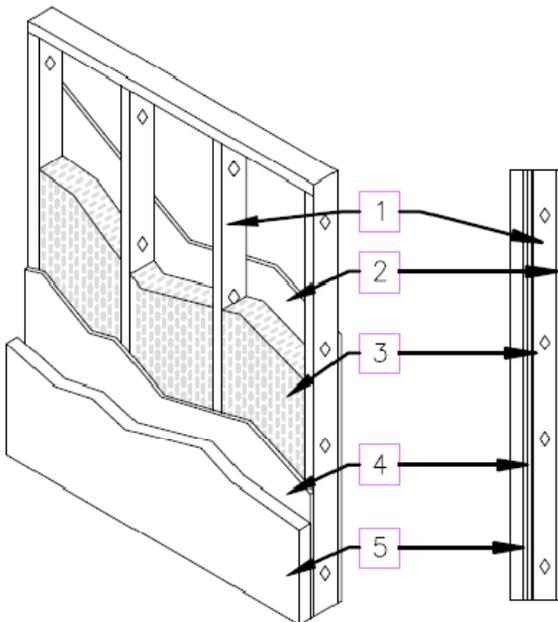
1. NOMINAL 5¹/₂ INCH DEEP x 1⁵/₈ INCH WIDE MINIMUM 20 GAGE STEEL STUDS, SPACED MAXIMUM 24 INCHES ON CENTER WITH LATERAL BRACING IN ACCORDANCE WITH THE CODE.
2. 5/8 INCH THICK TYPE X GYPSUM WALLBOARD.
3. MAXIMUM 3 INCH THICKNESS OF BAYER MATERIALSCIENCE, LLC CLOSED CELL (CC) SPRAYED POLYURETHANE FOAM (SPF) WALL INSULATION MATERIAL APPLIED TO EXTERIOR GYPSUM SHEATHING.
4. 5/8 INCH THICK TYPE X EXTERIOR GYPSUM SHEATHING.
5. MINIMUM 3/4 INCH THICK EXTERIOR PORTLAND CEMENT-SAND TYPE STUCCO ON METAL LATH.

NOTE:

NON-LOAD BEARING WALL ASSEMBLY
 INTERIOR FIRE EXPOSURE ONLY
 1-HOUR RATING

FIGURE 13—FIRE-RESISTANCE-RATED, 1-HOUR, EXTERIOR WALL ASSEMBLY WITH INSULATION IN THE WALL CAVITY. SEE SECTION 4.6.3 FOR ADDITIONAL DETAILS

NOTES:



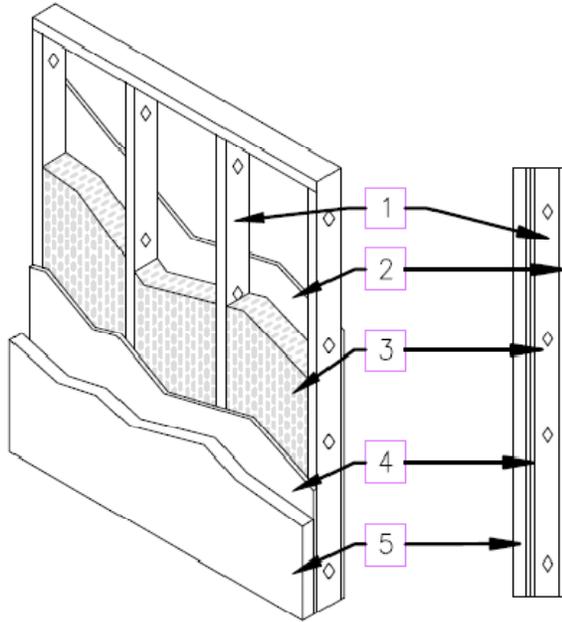
1. NOMINAL 5¹/₂ INCH DEEP x 1⁵/₈ WIDE MINIMUM 20 GAGE STEEL STUDS, SPACED MAXIMUM 24 INCHES ON CENTER WITH LATERAL BRACING IN ACCORDANCE WITH THE CODE.
2. 5/8 INCH THICK TYPE X GYPSUM WALLBOARD.
3. MAXIMUM 3 INCH THICKNESS OF BAYER MATERIALSCIENCE, LLC CLOSED CELL (CC) SPRAYED POLYURETHANE FOAM (SPF) WALL INSULATION MATERIAL APPLIED TO EXTERIOR GYPSUM SHEATHING.
4. 5/8 INCH THICK TYPE X EXTERIOR GYPSUM SHEATHING.
5. MINIMUM 2 INCH THICK NATURAL STONE.

NOTE:

NON-LOAD BEARING WALL ASSEMBLY
 INTERIOR FIRE EXPOSURE ONLY
 1-HOUR RATING

FIGURE 14—FIRE-RESISTANCE-RATED, 1-HOUR, EXTERIOR WALL ASSEMBLY WITH INSULATION IN THE WALL CAVITY. SEE SECTION 4.6.3 FOR ADDITIONAL DETAILS

NOTES:



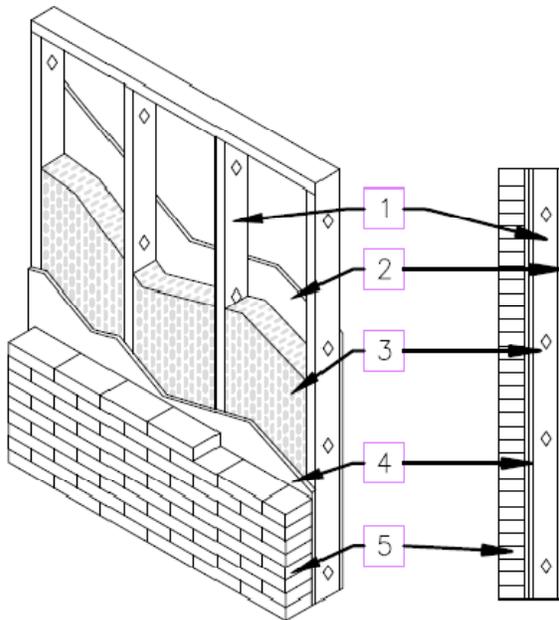
1. NOMINAL 5¹/₂ INCH DEEP x 1⁵/₈ INCH WIDE, MINIMUM 20 GAGE STEEL STUDS, SPACED MAXIMUM 24 INCHES ON CENTER WITH LATERAL BRACING IN ACCORDANCE WITH THE CODE.
2. 5⁵/₈ INCH THICK TYPE X GYPSUM WALLBOARD.
3. MAXIMUM 3 INCH THICKNESS OF BAYER MATERIALSCIENCE, LLC CLOSED CELL (CC) SPRAYED POLYURETHANE FOAM (SPF) WALL INSULATION MATERIAL APPLIED TO EXTERIOR GYPSUM SHEATHING.
4. 5⁵/₈ INCH THICK TYPE X EXTERIOR GYPSUM SHEATHING.
5. MINIMUM 1¹/₂ INCH ARTIFICIAL CAST STONE VENEER OR 2 INCH THICK CONCRETE MASONRY UNIT (CMU).

NOTE:

NON-LOAD BEARING WALL ASSEMBLY
 INTERIOR FIRE EXPOSURE ONLY
 1-HOUR RATING

FIGURE 15—FIRE-RESISTANCE-RATED, 1-HOUR, EXTERIOR WALL ASSEMBLY WITH INSULATION IN THE WALL CAVITY. SEE SECTION 4.6.3 FOR ADDITIONAL DETAILS

NOTES:



1. NOMINAL 5¹/₂ INCH DEEP x 1⁵/₈ INCH WIDE, MINIMUM 20 GAGE STEEL STUDS, SPACED MAXIMUM 24 INCHES ON CENTER WITH WALL BRACING IN ACCORDANCE WITH THE CODE.
2. 5⁵/₈ INCH THICK TYPE X GYPSUM WALLBOARD.
3. MAXIMUM 3 INCH THICKNESS OF BAYER MATERIALSCIENCE, LLC CLOSED CELL (CC) SPRAYED POLYURETHANE FOAM (SPF) WALL INSULATION MATERIAL APPLIED TO EXTERIOR GYPSUM SHEATHING.
4. 5⁵/₈ INCH THICK TYPE X EXTERIOR GYPSUM SHEATHING.
5. MINIMUM 4 INCH THICK STANDARD CLAY BRICK

NOTE:

NON-LOAD BEARING WALL ASSEMBLY
 INTERIOR FIRE EXPOSURE ONLY
 1-HOUR RATING

FIGURE 16—FIRE-RESISTANCE-RATED, 1-HOUR, EXTERIOR WALL ASSEMBLY WITH INSULATION IN THE WALL CAVITY. SEE SECTION 4.6.3 FOR ADDITIONAL DETAILS