



# Code Compliance Research Report CCRR-1006

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**DIVISION: 03 00 00—CONCRETE**  
**Section: 03 11 19—Insulating Concrete Forming**

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**REPORT SUBJECT:**  
**Advantage Insulating Concrete Forming (ICF) System**  
**– Stay-In-Place EPS Formwork For Concrete**  
**Construction**

## 1.0 SCOPE OF EVALUATION

This Research Report addresses compliance with the following Codes:

- 2015, 2012, 2009, and 2006 *International Building Code*® (IBC)
- 2015, 2012, 2009, and 2006 *International Residential Code*® (IRC)
- 2015 and 2010 *National Building Code of Canada* (NBC) – See Section 8.1

NOTE: This report references 2015 Code sections with [2012, 2009, and 2006] Code sections shown in square brackets where they differ.

The Advantage ICF system has been evaluated for the following properties:

- Physical properties
- Surface-burning characteristics
- Attic and crawl space fire evaluation
- Fire-resistance-rated construction

See Table 1 for applicable Code sections related to these properties.

## 2.0 USES

The Advantage Insulating Concrete Forming System is used as stay-in-place formwork for structural concrete load-bearing and nonload-bearing exterior and interior walls, concrete beams, lintels, foundation walls, and

retaining walls. The forms have been evaluated for use in buildings of Type V construction under the IBC and dwellings under the IRC.

## 3.0 DESCRIPTION

### 3.1 General:

The Advantage ICF System blocks consist of two expanded polystyrene (EPS) foam plastic boards separated by polypropylene cross-ties molded into the EPS boards. The EPS boards are 2-5/8 inches (66.7 mm) thick. Eight block types are recognized: standard block, half (top/bottom) block, 90-degree corner block, 45-degree corner block, taper top block, brick ledge block, short T block and long T block. The forms are available in two core thicknesses: 6 inches (152 mm) and 8 inches (203 mm).

The Advantage ICF System complies with ASTM E2634 and is a flat ICF system as defined in IRC Section R611.3.1 [R611.3]. See Table 3 for an illustration of the forms.

### 3.2 Foam Plastic Boards:

The EPS boards have a nominal density of 1.4 pcf (22.4 kg/m<sup>3</sup>), and a maximum flame-spread index of 25 and a maximum smoke-developed index of 450, when tested in accordance with ASTM E84. The foam plastic complies as Type II in accordance with ASTM C578.

### 3.3 Cross-ties:

The polypropylene cross-ties are spaced 8 inches (203 mm) on center for 6 inch thick concrete-core (152 mm) walls, and at 6 inches (152 mm) on center for 8 inch thick concrete-core (203 mm) walls, have openings to permit concrete to pass through, and have slots to support horizontal steel reinforcing bars. The cross-ties have flanges (fastening strips) located 1/4 inch (6.4 mm) below the EPS surface that are used for attaching interior and exterior wall coverings. The flanges are 1-5/8 inches wide (41.2 mm) by 3/16 inch (4.8 mm) thick. Refer to Table 2 for the maximum allowable lateral and withdrawal capacities of the fasteners in cross-tie flanges.



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### 3.4 Concrete:

Concrete must be normal-weight concrete complying with the IBC, with a maximum 3/4 inch (19 mm) aggregate size. Concrete must have a minimum compressive strength of 2500 psi (17.24 MPa) at 28 days. Under the IRC, concrete must comply with IRC Sections R404.1 [2006 – R404.4.5] (foundation walls and retaining walls) and R08.5.1 [2012, 2009 – R611.5.1, 2006 – R611.6.1] (walls), as applicable.

### 3.5 Reinforcement:

Deformed steel reinforcement bars must have a minimum yield stress of either 40 ksi (276 MPa) or 60 ksi (413 MPa), depending on the structural design. Under the IBC, the deformed steel bars must comply with Section 3.5.3.1 of ACI 318 and IBC Section 1903. If construction is based on the IRC, reinforcement must comply with IRC Sections R404.1.3.3.7 [2012, 2009 – R404.1.2.3.7, 2006 – R404.4.6] (foundation walls and retaining walls) and R608.5.2 [2012, 2009 – R611.5.2, 2006 – R611.6.2] (walls).

### 3.6 Additional Standards:

The Advantage Insulating Concrete Forming (ICF) System conforms to the standard requirements of CAN/ULC S717.1-12 "Standard for Flat Wall Insulating Concrete Forming (ICF) Units". See Intertek listing for current details on <https://bpdirectory.intertek.com>.

## 4.0 INSTALLATION

### 4.1 General:

Design and installation of the Advantage ICF system must comply with this report, the applicable Code, and the manufacturer's published installation instructions, which must be available on the jobsite during installation.

### 4.2 Design:

**4.2.1 IBC Method:** Solid concrete walls must be designed and constructed in accordance with IBC Chapter 16 and 19, as applicable. Footings and foundations must be design in accordance with IBC Chapter 18.

**4.2.2 Alternative IBC Wind Design Method:** Solid concrete walls may be designed and constructed in accordance with the provisions of Section 209 of ICC 600, subject to the limitations found in IBC Section 1609.1.1.1 in accordance with Exception 1 to Section 1609.1.1.1. Design and construction under the provisions of ICC 600 are limited to resisting wind forces.

**4.2.3 IRC Method:** Solid concrete walls and foundations must be designed in accordance with IRC Sections R608 [2012 - R611] and R404.1.2 [2006 – R404.4], as applicable for flat wall systems.

**4.2.4 Alternative IRC Methods:** When used to construct buildings that do not conform to the applicability limits of IRC Sections R404.1.3.7 [2012, 2009 - R404.1.2, 2006 – R404.4.1] and R608 [2012, 2009 and 2006 - R611.2], construction must be in accordance with the prescriptive provisions of the 2007 Prescriptive Design of Exterior Concrete Walls (PCA 100), or the structural analysis and design of the concrete must be in accordance with ACI 318, ACI 322 and IBC Chapters 16, 18, and 19. For jurisdictions adopting the 2006 IBC the structural analysis and design of the concrete must be in accordance with ACI 318 and IBC Chapter 19 as applicable.

### 4.3 Interior Finish:

**4.3.1 General:** ICF units exposed to the building interior must be finished with an approved 15-minute thermal barrier, such as minimum 1/2 inch thick (12.7 mm) regular gypsum wallboard complying with ASTM C1396, installed vertically or horizontally, and attached to the cross-tie flanges with minimum 0.136 inch diameter (3.5 mm) by 1-5/8 inch long (41 mm), Type S, fine-thread gypsum wallboard screws spaced a maximum of 12 inches (305 mm) on center vertically and 16 inches (406 mm) on center horizontally. The screws must penetrate a minimum of 1/4 inch through the flange. Gypsum board joints and screw heads must be taped and finished with joint compound in accordance with ASTM C840 or GA216. See Section 4.3.2 for installation details for crawl space applications without an ignition barrier on the interior face.

**4.3.2 Attic and Crawl Space Installations:** When the ICFs are used for walls of attic or crawl spaces, an ignition barrier complying with IBC Section 2603.4.1.6,

or IRC Sections R316.5.3 or R316.5.4, is required, except when all of the following conditions are met:

- Entry to the attic or crawl space is only to service utilities, and no storage is permitted.
- There are no interconnected attic or basement areas.
- Air in the attic or crawl space is not circulated to other parts of the building.
- Under-floor (crawl space) ventilation is provided that complies with IBC Sections 1203.4 [2012, 2009, 2006 - 1203.3] or IRC Section R408.1, as applicable.
- Attic ventilation is provided when required by IBC Section 1203.2 or IRC Section R806, as applicable.
- Combustion air is provided in accordance with IMC (*International Mechanical Code*) Section 701 [2006 – 701 and 703].
- The ICFs must have at least one label as described in Section 7.0 visible in every 160 square feet (15 m<sup>2</sup>) of wall area.

#### 4.4 Exterior Finish:

**4.4.1 Above Grade:** The exterior surface of the ICF must be covered with an approved wall covering in accordance with the applicable Code or a current evaluation report. When the wall covering is mechanically attached to structural members, the wall covering must be attached to the flanges of the embedded cross-ties with fasteners, described in Table 2, having sufficient length to penetrate through the flange a minimum of 1/4 inch (6.4 mm). The fasteners have an allowable fastener withdrawal and lateral shear strength as noted in Table 2.

The fastener spacing must be designed to support the gravity loads of the wall covering and to resist the negative wind pressures. The negative wind pressure capacity of the exterior finish material must be the same as that recognized in the applicable Code for generic materials, or that recognized in a current evaluation report for proprietary materials and must not exceed the maximum withdrawal capacity of the fasteners listed in Table 2.

**4.4.2 Below Grade:** Materials used to dampproof or waterproof basement walls must be specified by Plasti-Fab Ltd., and must comply with the applicable Code or a current evaluation report. The material must be compatible with the ICF foam plastic units, and free of solvents that will adversely affect the EPS foam plastic panels. Dampproofing, waterproofing,

and drainage requirements must comply with the applicable Code. No backfill can be applied against the wall until the complete floor system is in place, unless the wall is designed as a freestanding wall that does not rely on the floor system for structural support.

#### 4.5 Foundation Walls:

The ICF system may be used as a foundation stem wall when supporting wood-framed construction, provided the structure is supported on concrete footings complying with the applicable Code. For jurisdictions adopting the IRC, compliance with Section R404 [2006 – R404.4] is required. For jurisdictions adopting the 2006 IBC, compliance with Section 1805.5 is required.

#### 4.6 Retaining Walls:

The ICF system may be used to construct retaining walls, with reinforcement designed in accordance with accepted engineering principles, Section 4.2 of this report and the applicable Code.

#### 4.7 Protection Against Termites:

Where the probability of termite infestation is defined by the Code official as "very heavy", the foam plastic must be installed in accordance with IBC Section 2603.9 [2603.8] or IRC Section R318.4, [2006 – R 320.5] as applicable. Areas of very heavy termite infestation must be determined in accordance with IBC Figure 2603.9 [2603.8] or IRC Figure R301.2 (6).

#### 4.8 Fire-Resistance-Rated Construction:

The ICFs may be used to construct load-bearing and nonload-bearing fire-resistance-rated wall assemblies as described in Intertek Design Listing [PFL-ICF 180-01](#).

#### 4.9 Special Inspection:

**4.9.1 IBC:** Special inspection is required as noted in IBC Section 1705 [1704] for placement of reinforcing steel and concrete, and for concrete cylinder testing. When an EIFS wall covering is applied, special inspection in accordance with IBC Sections 1704 [1704.1] and 1705.16 [2012 - 1705.15, 2009, 2006 - 1704.14, 1704.12] is required.

**4.9.2 IRC:** For walls designed in accordance with Section 4.2.3 or PCA 100 (Section 4.2.4), special inspection is not required. When walls are designed in accordance with the IBC, as described in Section 4.2.4, special inspection is required as described in Section 4.9.1.

## 5.0 CONDITIONS OF USE

The Advantage Insulating Concrete Forming System described in this Research Report complies with, or is a suitable alternative to, what is specified in those Codes listed in Sections 1.0 and 2.0 of this report, subject to the following conditions:

**5.1** The ICFs must be manufactured, identified and installed in accordance with this Research Report, the manufacturer's published installation instructions, and the applicable Code. The provisions in this report take precedence over the provisions in the manufacturer's instructions.

**5.2** When required by the Code official, calculations showing compliance with the general design requirements of the applicable Code must be submitted to the building official for approval, except where calculations are not required under IRC Section R608.1 [2012, 2009, 2006 - R611.1]. The calculations and details must be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

**5.3** When required by the Code official, calculations and details showing compliance with IRC Section R608.5.3 [2012, 2009 and 2006 - R611.5.3] and R404.1.3.3.6 [2012, 2009 and 2006 - R404.1.2.3.6] must be submitted, establishing that the ICFs provide sufficient strength to contain concrete during placement and the cross-ties are capable of resisting the forces created by fluid pressure of fresh concrete. The calculations and details must be prepared by registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

**5.4** The ICFs must be separated from the building interior with an approved 15-minute thermal barrier, except for attic and crawl space construction as detailed in Section 4.3.2.

**5.5** Use of the ICF system is limited to Type V-B construction (IBC) and dwellings under the IRC.

**5.6** The plastic cross-ties must be stored indoors away from direct sunlight.

**5.7** Special inspection must be provided in accordance with Section 4.8 of this report.

**5.8** The forms are manufactured by Plasti-Fab Ltd., at their facility located in Crossfield, Alberta, Canada, and are produced under a quality control program with inspections conducted by Intertek Testing Services NA Inc. (AA-647).

**5.9** The approval of building products is the responsibility of the Authority Having Jurisdiction.

**5.10** Code Compliance Research Reports shall not be used in any manner that implies an endorsement of the product, material, or system by Intertek.

**5.11** The current status of any Code Compliance Research Report can be verified on the <https://bpdirectory.intertek.com>.

## 6.0 SUPPORTING EVIDENCE

**6.1** Data in accordance with the ICC-ES Acceptance Criteria for Stay-in-place, Foam Plastic Insulating Concrete Form (ICF) Systems for Solid Concrete Walls (AC353), dated October 2012.

**6.2** Data in accordance with the ICC-ES Acceptance Criteria for Stay-in-place, Foam Plastic Insulating Concrete Form (ICF) Systems for Solid Concrete Walls (AC353), dated October 2012, editorially revised October 2015.

**6.3** Data in accordance with ASTM E2634-11.

**6.4** Data in accordance with CAN/ULC-S701-11.

**6.5** Data in accordance with CAN/ULC S717.1-12.

**6.6** Intertek Listing Report "[Plasti-Fab Ltd. Advantage Insulated Concrete Forming System](#)".

## 7.0 IDENTIFICATION

The Advantage insulating concrete forms are identified by a marking bearing the report holder's name (Plasti-Fab, Ltd.), the product name, the manufacturing location, the serial number, the Intertek Mark, and the Code Compliance Research Report number (CCRR-1006).

When use is in an attic or crawl space without an ignition barrier, as described in Section 4.2.2.2, one label bearing the evaluation report number and the phrase "Acceptable for use in attics and crawl spaces" must be visible in every 160 ft<sup>2</sup> (14.7 m<sup>2</sup>) of exposed exterior wall area.

## 8.0 OTHER CODES

### 8.1 National Building Code of Canada:

The Advantage ICF system, with properties described in Sections 3.0, 6.0, and 7.0 of this Research Report, comply with CAN/ULC-S701 as Type 2 EPS and therefore complies with the requirements of the following NBC Articles: 3.1.4.2., 3.1.5.12., 3.1.5.14., 3.1.5.15., [3.1.5.12.], 5.10.1.1., 9.10.3.2., 9.10.17.10., 9.15.4.1., 9.23.17.2., and 9.25.2.2.

## 9.0 CODE COMPLIANCE RESEARCH REPORT USE

**9.1** Approval of building products and/or materials can only be granted by a building official having legal authority in the specific jurisdiction where approval is sought.

**9.2** Code Compliance Research Reports shall not be used in any manner that implies an endorsement of the product by Intertek.

**9.3** Reference to the <https://bpdirectory.intertek.com> is recommended to ascertain the current version and status of this report.

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**TABLE I – PROPERTIES EVALUATED**

PROPERTY	IBC SECTION <sup>1</sup>	IRC SECTION <sup>1</sup>
Physical properties	N/A	R404.1.3.3.6.1 [R404.1.2.3.6.1] and R608.4.4 [R611.3]
Surface Burning Characteristics	2603.4 [2603.3]	R316.3 [R316.1]
Attic and crawl space applications	2603.4.1.6 and 2603.9 [2603.4.1.6 and 2603.10]	R316.5.3, R316.5.4 and R316.6
Fire Resistance	703.2	R302.1
Exterior walls in Types I – IV construction	2603.5	N/A

<sup>1</sup>2015 Code sections are shown with 2012 code sections in parentheses, where different.









**TABLE 2 – ALLOWABLE WITHDRAWAL AND LATERAL CAPACITIES OF FASTENERS IN CROSS-TIE FLANGES**

FASTENER <sup>1</sup>	ALLOWABLE LOAD CAPACITY (lbf)	
	Lateral	Withdrawal
No. 6, coarse-thread drywall screw	51	41
No. 8, coarse-thread drywall screw	61	48

For SI: 1 lb = 4.45 N, 1 inch = 25.4 mm

<sup>1</sup>Fasteners must be of sufficient length to penetrate through the flange a minimum of 1/4 inch

**TABLE 3 – ADVANTAGE ICF SYSTEM DIMENSIONS**

Product	Feature	150 mm Metric	6" Imperial	200 mm Metric	8" Imperial
 Standard Block	Height:	419	16-1/2"	419	16-1/2"
	Width:	286	11-1/4"	337	13-1/4"
	Length:	1219	48"	1219	48"
 Corner Block	Height:	419	16-1/2"	419	16-1/2"
	Width:	286	11-1/4"	337	13-1/4"
	Length:	813 + 406	32" + 16"	737 + 432	29" + 17"
 7-1/2" Height Adjuster	Height:	191	7-1/2"	191	7-1/2"
	Width:	286	11-1/4"	337	13-1/4"
	Length:	1219	48"	1219	48"
 Taper Top Block	Height:	419	16-1/2"	419	16-1/2"
	Width:	286	11-1/4"	337	13-1/4"
	Length:	1219	48"	1219	48"
	Bearing at Top:	249	9-3/4"	292	11-1/2"
 45° Corner Block	Height:	419	16-1/2"	419	16-1/2"
	Width:	286	11-1/4"	337	13-1/4"
	Length:	645 + 241	25-3/8" + 9-1/2"	540 + 236	21-1/4" + 9-1/4"
 Brick Ledge	Height:	419	16-1/2"	419	16-1/2"
	Width at Top:	400	15-3/4"	451	17-3/4"
	Width at Bottom:	286	11-1/4"	337	13-1/4"
	Length:	1219	48"	1219	48"
 Short T Block	Height:	419	16-1/2"	419	16-1/2"
	Width:	286	11-1/4"	337	13-1/4"
	Length:	933 + 121	36-3/4" + 4-3/4"	832 + 95	32-3/4" + 3-3/4"
 Long T Block	Height:	419	16-1/2"	419	16-1/2"
	Width:	286	11-1/4"	337	13-1/4"
	Length:	933 + 527	36-3/4" + 20-3/4"	832 + 400	32-3/4" + 15-3/4"

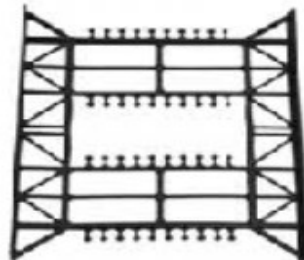


Figure 1 – Advantage ICF System Web Connector

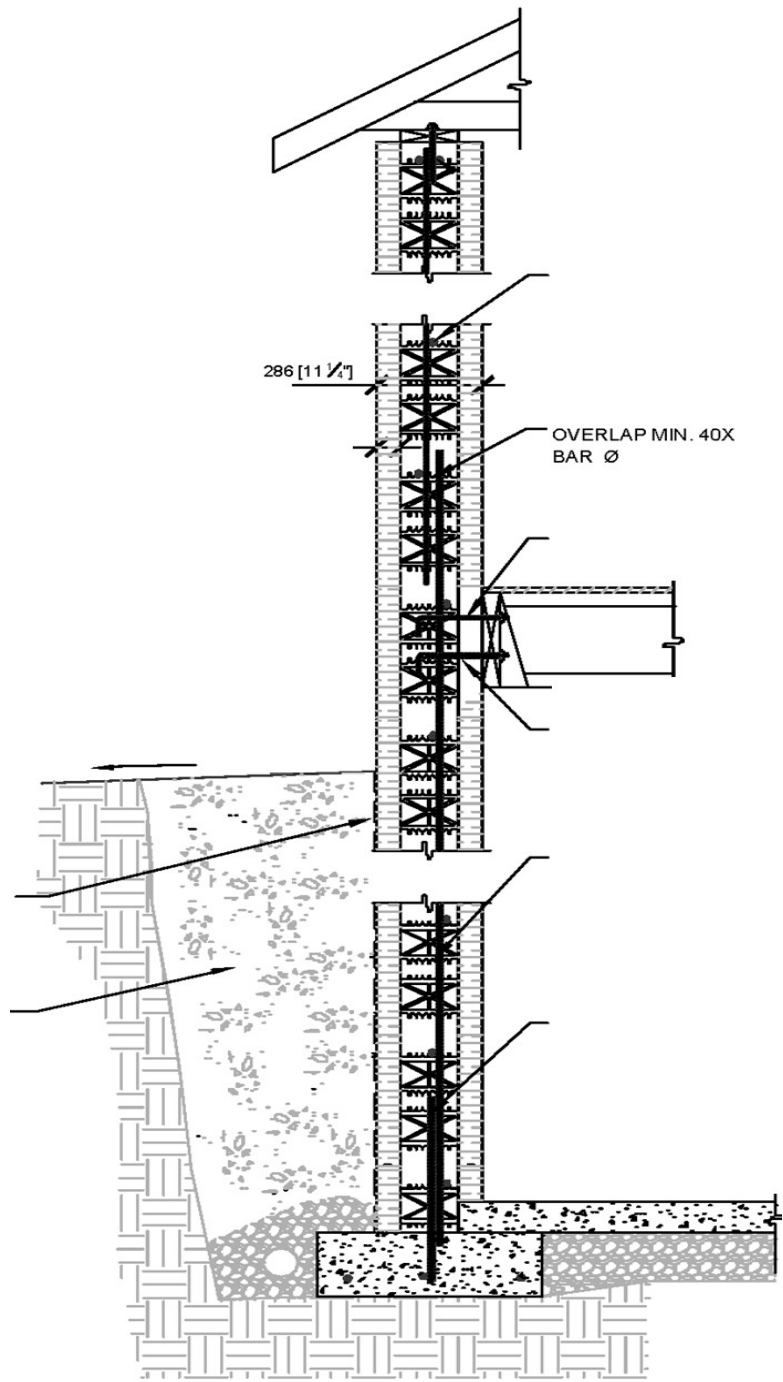


Figure 2 – Typical Wall Section, Advantage ICF System, Foundation and Above Grade



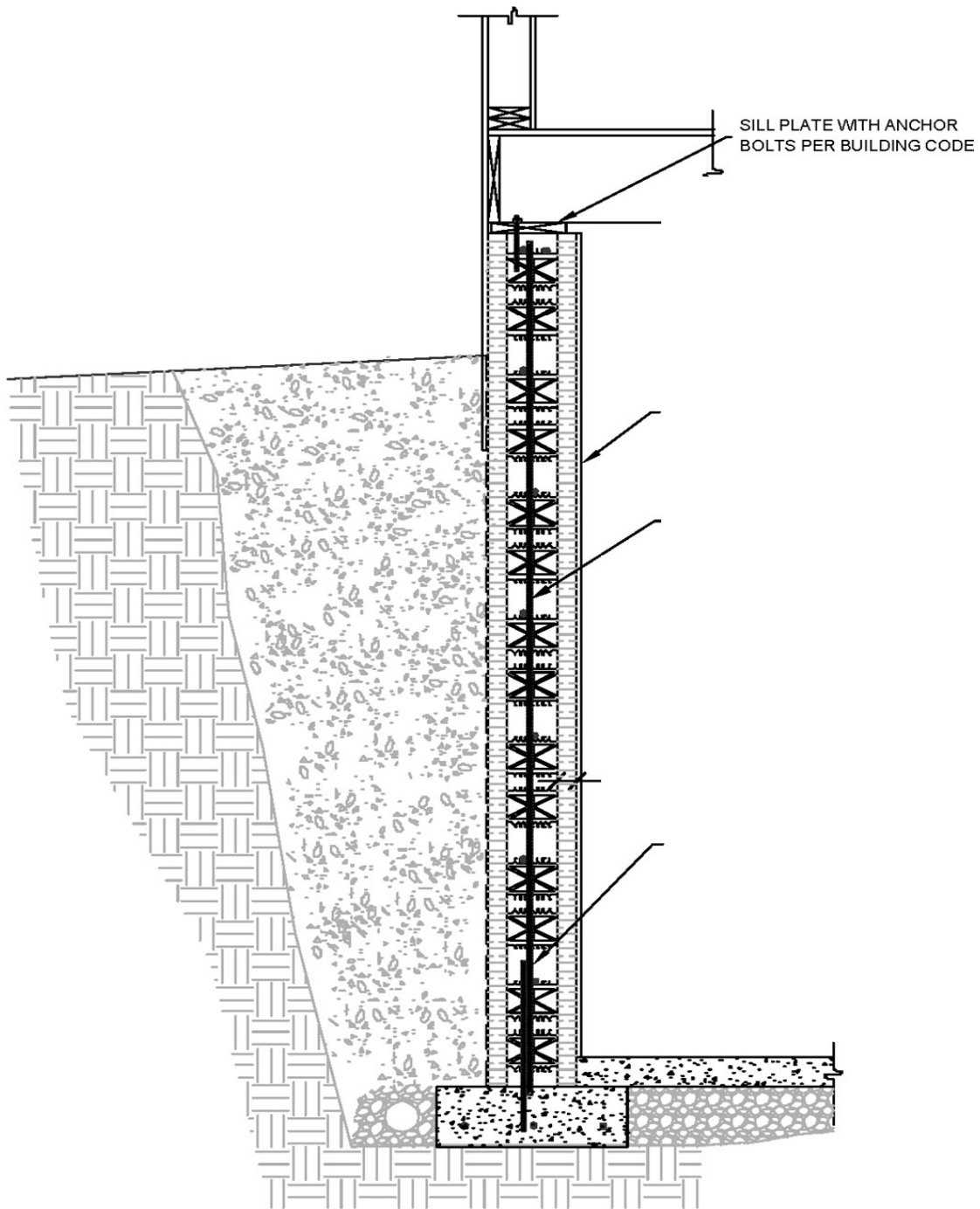


Figure 3 – Typical Wall Section, Advantage ICF System, Foundation and Wood Stud Above Grade