

December 13, 2013

Kevin Westaby  
Cornerstone Innovations Inc.  
1775 Balsam Avenue  
Alexander, IA 50420  
Email: kevin@permaformicf.com

**RE: PERMA FORM ICF  
ALEXANDER, IA**

**JOB #2013-2174**

Dear Mr. Westaby

At your request, we have reviewed the structural engineering requirements for the referenced project. As a preliminary analysis of the Perma Form ICF (Insulated Concrete Form) system, the scope of this report is limited to the horizontal reinforcement of the 9' tall, 8" thick below grade wall. These findings and opinions are presented for your information.

To analyze the Perma Form ICF concrete form system, reference was made to the 2012 International Residential Code (IRC).

## Engineering Assumptions

- Residential dwelling basement wall, 9' tall, 8" thick
- Seismic category A
- No concrete wall above, only light framing
- Wall is straight with no corners, angles or curves
- No window or door openings
- Concrete  $f'_c > 2,500$  psi & conforms to 2012 IRC Section R404.1.2.3
- .120" in diameter welded wire 120 ksi horizontal reinforcement

## Horizontal Reinforcement

The construction of the 8" thick Perma-Form ICF system consists of concrete horizontally reinforced with welded wire with (3) .120" diameter wires spaced at 4" OC. These wires act as the horizontal reinforcement, interlocking with the wires of the adjacent form panels. In my opinion, this splice condition will develop to the full strength of the reinforcement after the concrete is cured.

# Norton & Schmidt

1775 BALSAM AVENUE  
ALEXANDER, IA 50420  
KEVIN WESTABY

JOB #2013-2174  
DECEMBER 13, 2013

Based on my equivalent reinforcement calculations, the horizontal welded wire configuration is the equivalent of 4.67 horizontal #4 bars by cross-sectional area and the equivalent of 14 horizontal #4 bars by tensile strength. This exceeds the horizontal reinforcement requirement of the 2012 IRC, which requires a minimum of 3 horizontal #4 bars. See attached Horizontal Reinforcement calculations.

Analysis of the vertical reinforcement requirements has not been included in this report or in the attached Reinforcement Calculations, but may be required in some cases. Vertical reinforcement in the wall system shall meet or exceed the local codes and/or specific project requirements.

## Summary

Based on my calculations and the requirements stated in the 2012 IRC, the current Perma Form ICF system is adequately reinforced in the horizontal direction.

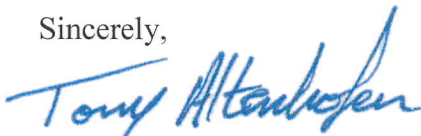
It should be noted that design criteria other than those listed in the Engineering Assumptions above may require different size and/or spacing of the reinforcement. Alternate site conditions or placement of the reinforcement may change the outcome of this analysis.

## Scope

These calculations were a comparison of the Perma Form ICF system and the horizontal reinforcement requirements of the 2012 International Residential Code (IRC). No attempt was made to review other wall sizes or configurations or to analyze the vertical reinforcement requirements. When making visual observations of a building or its components, it is required that certain assumptions be made regarding the construction conditions. This is a general report and does not refer to any specific project or site. The owner or recipient of this report agrees that, we will be held harmless, and indemnified and defended, by you from and against all claims, loss, liability or expense, including legal fees arising out of the services provided by this report.

If you would like further analysis or if there are any questions, please contact us.

Sincerely,

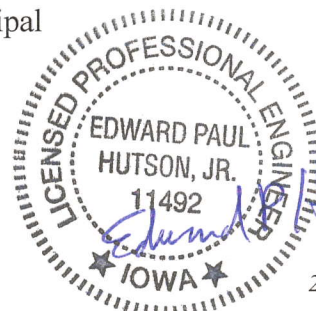


Tony Altenhofen, EIT  
Project Engineer



Edward P. Hutson Jr., PE, SECB  
Principal

Enclosure: Reinforcement Calculations  
AutoCAD Details  
Billing Invoice



*Edward P. Hutson Jr.*  
Dec 13, 2013  
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## Horizontal Reinforcement

(See Engineering Assumptions in Report)

### Required Horizontal Reinforcement per 2012 IRC Table R404.1.2(1)

#4 Bars Required for 9' Wall	3 Bars
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### Equivalent Reinforcement By Area

.120" $\emptyset$ Wire Area	0.011 in <sup>2</sup>
# of Wires Provided	81 Wires
Total Wire Area Provided	0.916 in <sup>2</sup>
#4 Bar Area	0.196 in <sup>2</sup>
# of Equivalent #4 Bars	4.67 > 3 Bars OK

### Equivalent Reinforcement By Strength

Tensile Strength of Wire	120000 psi
.120" $\emptyset$ Wire Area	0.011 in <sup>2</sup>
Tensile Strength per Wire	1357 lb
# of Wires Provided	81 Wires
Total Wire Strength Provided	109931 lb
Tensile Strength of #4 Bar	40000 psi
#4 Bar Area	0.196 in <sup>2</sup>
Tensile Strength per #4 Bar	7854 lb
# of Equivalent #4 Bars	14.00 > 3 Bars OK





# Norton & Schmidt

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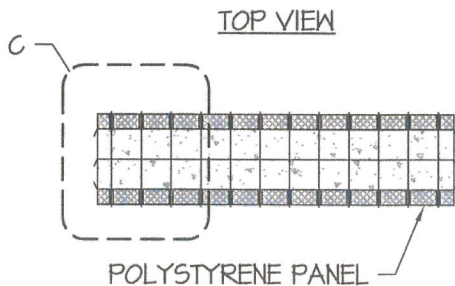
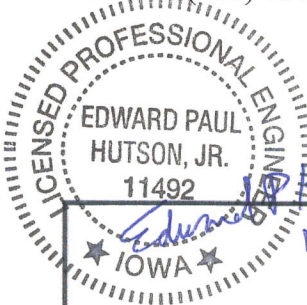
Alexander, IA 50420

Drawn by: TJA Checked by: EPH Date: 12/13/13

Not to scale unless otherwise noted.

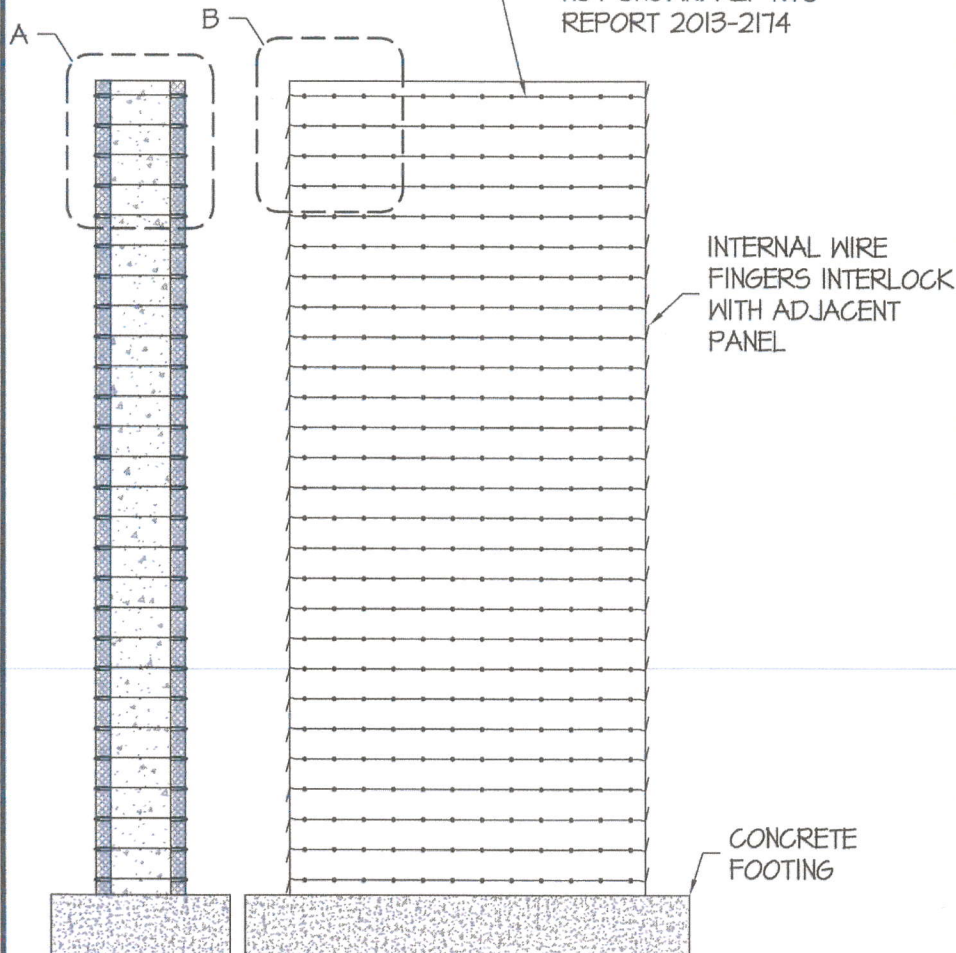
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## Perma Form ICF



WELDED WIRE HORIZONTAL  
REINFORCEMENT WITH 4" SPACING

\*VERTICAL REINFORCEMENT  
NOT SHOWN. REF N&S  
REPORT 2013-2174



ELEVATION VIEW

