

Panel Discussion: DC Mangimelli

► Communicating and Understanding Commercial Project ICF Basics:

1. Design Benefits
2. Practical Detailing
3. Elimination of Redundant or Duplicate Materials or Scopes
4. Interfacing Scopes; Materials, Sub-Trades & Effect on Building Envelope

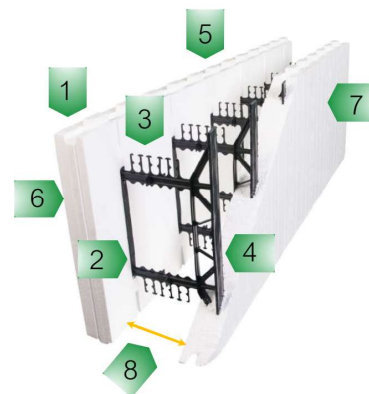
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Design Benefits

A Look Through- ICF

1. EPS Panels – 2.625" thick
2. Polypropylene Ties (webs) at 8" o/c, embedded in EPS, full height
3. Rebar chairs in Ties
4. Fastening Studs, 1.5" wide, both sides for attachment of exterior and interior finishes
5. Reversible interlock
6. Interior vapor retarder
7. ICF is an air barrier, and a WRB
8. Concrete cores – 4", 6", 8", 10" or 12"



Standard ICF Cut-away

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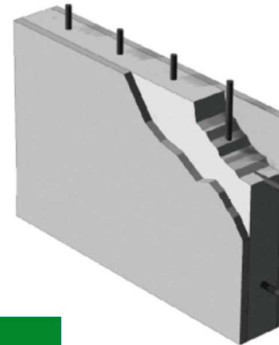
Design Benefits

ICF – Flat Wall Systems

Majority of ICFs are '*flat wall*' concrete core forms

Engineering design for *flat wall* ICFs follows standard concrete design principles per ACI 318 and in Canada CAN/CSA A23.3

Engineering, for below and above grade walls, plus lintels is listed in the IBC and IRC with reference to Standards for Flat Wall ICFs - ASTM E2634



The engineering and reinforcement design generally allows ICFs walls to be thinner than CMU and some poured concrete walls



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Design Benefits

Design Benefits

Full library of:

CAD Details – products and assemblies

BIM Details

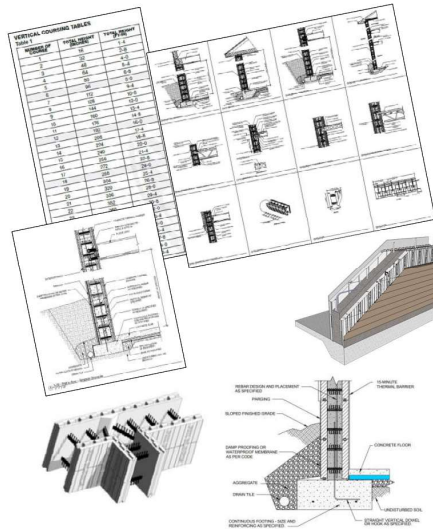
Technical Documents

Installation Instructions

Coursing tables

Estimating software

Design and construction Checklists



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Design Benefits

Design Benefits

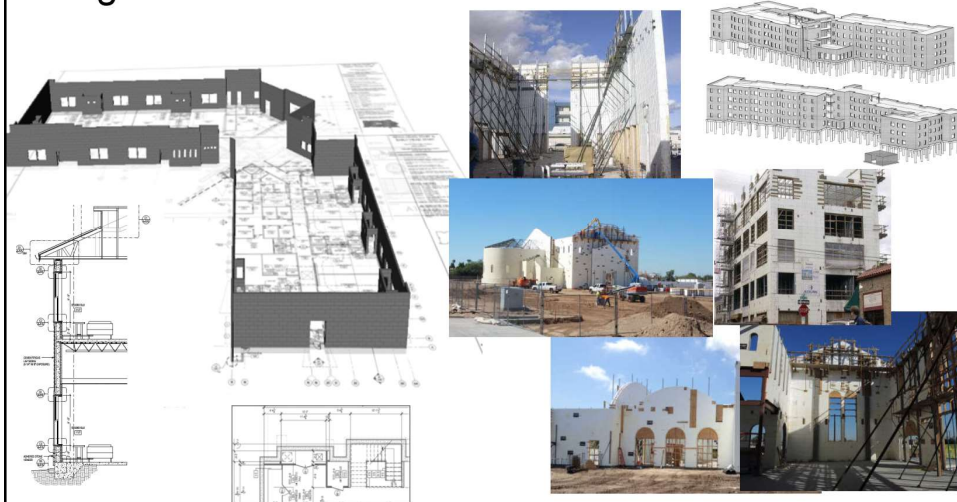
- ✓ ACI 318 designed flat wall reinforced concrete
- ✓ Multiple concrete core sizes
- ✓ Load bearing walls
- ✓ Shearwalls
- ✓ Tall walls
- ✓ Below grade foundations
- ✓ Demising / party walls
- ✓ Fire walls (4-hour FRR)
- ✓ High-performance envelope



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Design Benefits

Design Benefits



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Design Benefits

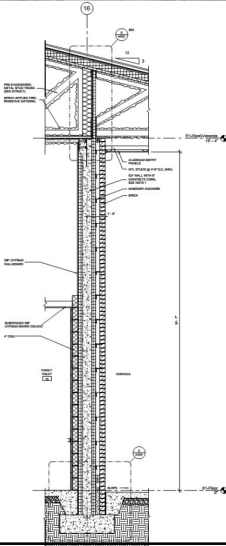
Design Benefits

Layout the wall coursing, from top of footing to top concrete in the full wall

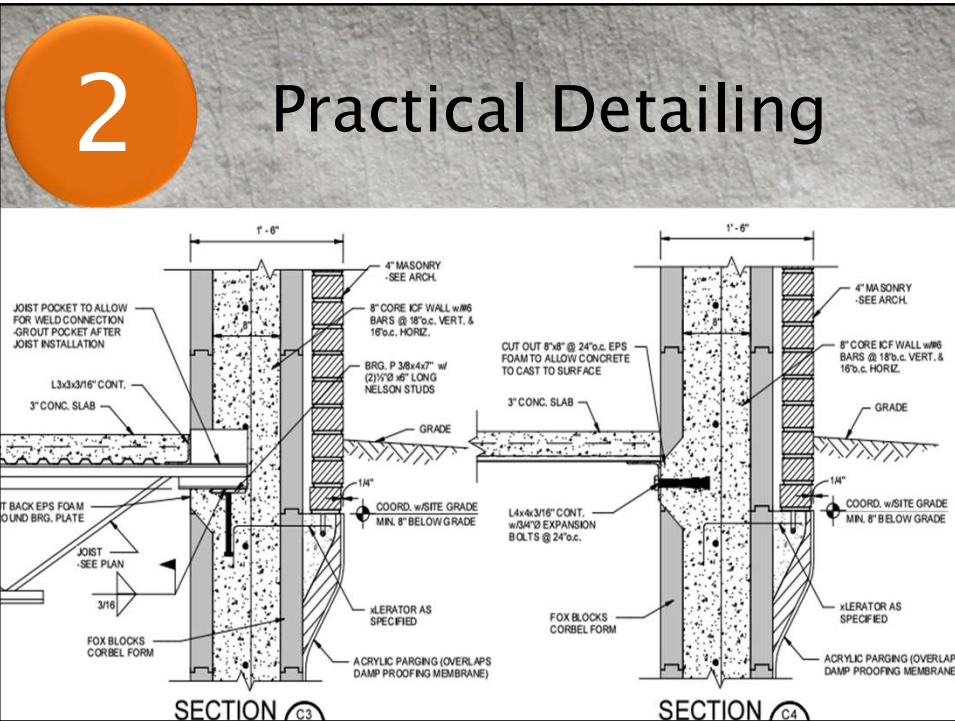
Wall dimensions, horizontal or vertical, are not dependent on ICF block height or length. Blocks can be easily cut to meet exact wall dimensions

Floor levels and opening locations are not dependent on ICF block coursing

Establish embedment locations for floor attachment to the side of the ICF. Beams, owsj, trusses, and roof attachments may bear on top of concrete

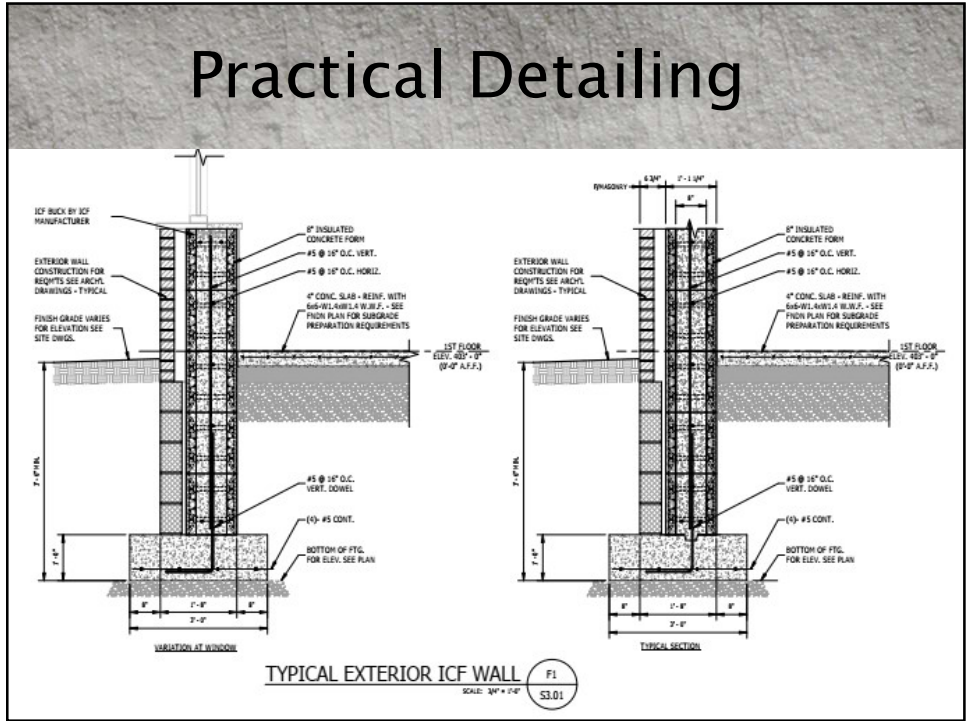


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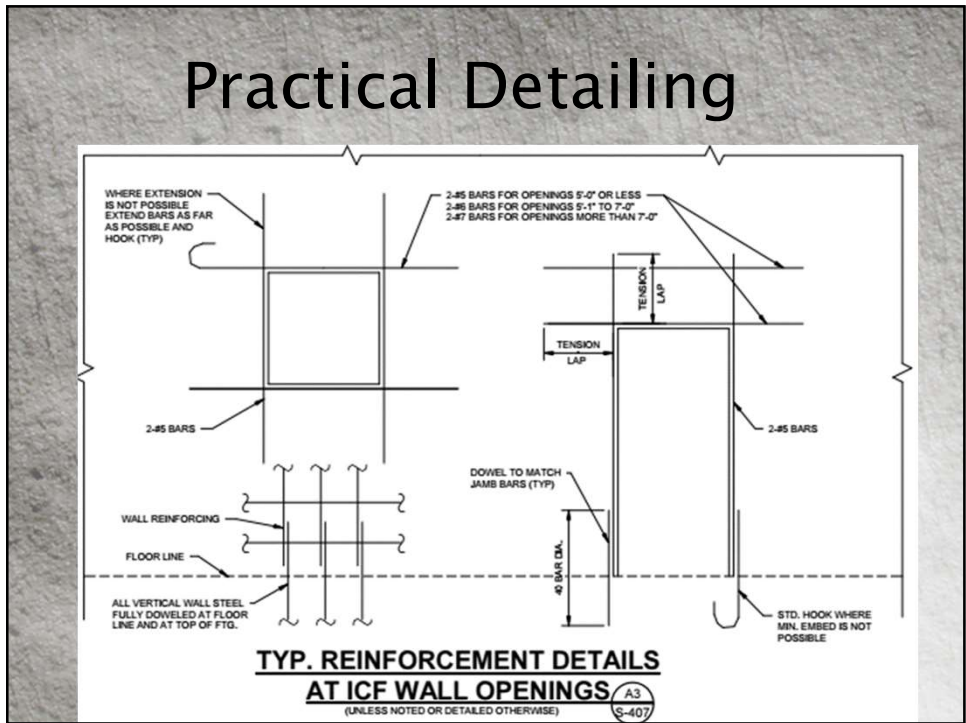
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Practical Detailing



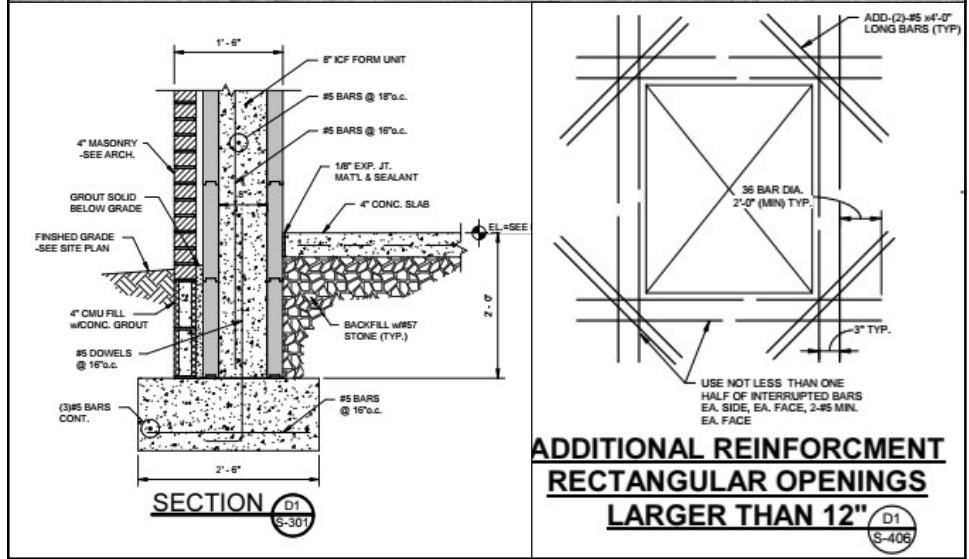
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Practical Detailing



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Practical Detailing



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Redundant Materials & Sub-Trades

Typical Building Project

- ✓ Division 03 or 04 or 05 or 06 Structural Walls
- ✓ Division 07 WRB, A/V, Dampproofing, Insulation
- ✓ Division 09 Add Non-Structural Metal Framing to CMU

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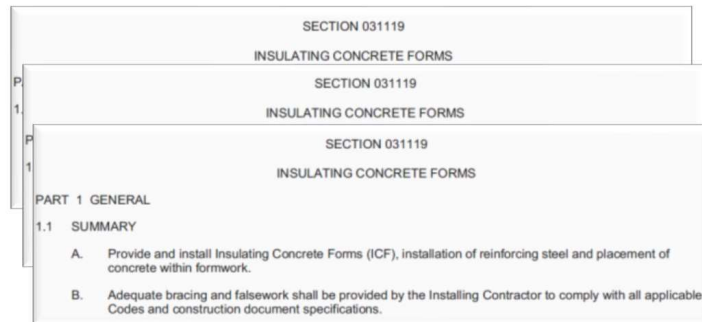
Redundant Materials & Sub-Trades

ICF Specification

CSI – Concrete Section
Insulating Concrete Forms
03 11 19

Division 03 Concrete, 031119 ICF

- ✓ **Structural Mass Walls**
- ✓ **WRB, A/V, Insulation**
- ✓ **Attachments**



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Redundant Materials & Sub-Trades

ICF Construction Advantages

Install in a running bond, blocks interlock tightly together
Installing one block equals 5.33 sq.ft. of wall



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Redundant Materials & Sub-Trades

ICF Construction Advantages

Construction Speed

Fewer sub-trades reduces staging timeframes for installation of:

- WRB
- air-barrier
- vapor barrier
- insulation and strapping

Allowance for faster close-in, to be weather tight to enable start of interior finishes

Expect 10% to 15%+ reduction in overall construction schedule

Faster completion + faster occupancy = \$

MAN HOUR RATES

- To budget a job properly for efficiency in crew size
- To budget a job properly to land job
- To be profitable.

Man Hour Rates (MHR) have been around for decades. Most contractors document their production rates without realizing that time / square footage built will give them a man hour rate similar to one found in most cost estimating programs, such as RS Means. For most Insulated Concrete Forms (ICF) this has become a common practice. Over 20 years of history have established accurate numbers to budget future jobs with.

MHR	JOB TYPE	NOTES
1 055 or less	Very efficient crew building a simple job with less than six corners, less than four openings and few or no embeds.	Best job to build at top of list at low cost rate.
2 060 065 070	Average job with less than eight corners, less than eight openings, and less than eight embeds.	The job is in the middle of the list.
3 075 080 085	Most common MHR for new crews on moderate or large jobs. This covers complex residential jobs with 12 or less corners. This MHR also works with large commercial jobs with basic 18" o/c rebar and few openings.	Most jobs in the middle of the list. The job is in the middle of the list.
4 085 090 095	Very complex residential jobs with 12 or more corners and many openings and embeds. Also includes commercial jobs with many openings and embeds or more than 3 levels in height.	Jobs in the middle of the list.
5 100 and over	Jobs with at least three of the following: More than 8 short corners (30" or less), high seismic rebar design, more than 10 openings, many embeds, extreme weather, using the wrong scaffold for wall height, over 3 levels in height.	Jobs in the middle of the list.

HOW TO GAIN YOUR MHR:
 1. Plan the job
 2. Proper Crew Size for job
 3. Hire experienced crew
 4. Proper Scaffolding
 5. Proper Formwork
 6. Proper Rebar
 7. Fine Training for Crew

Square Foot of Job (SFJ) = Length * Height (of Fox Walls being built)

SFJ * MHR = MAN HOURS TO BUILD JOB

Example: Job has 180 Linear Feet (LF) of wall that is 10' tall. 180' * 12' = 2160 square feet (SF)
 Job has 6 corners with 15 openings and basic 18" o/c rebar design. Crew has a lot of experience and ICF scaffold is used. The experienced crew is 0.075 MHR per sq. ft. (use .085 MHR) as a budget number. With experience you will become more efficient, saving more work with more profit.
2160 * .085 = 183.6 Total Man Hours (TMH) for job
 183.6 TMH / 8 man crew = 30.8 Total Crew Hours (TCH)

These numbers are estimates only. Many factors will affect the outcome of jobs which needs to be taken into account. Please document all work and select items in detail and record history when compiling budget for proprietary work. Use available to those contractors for whom your history ability to be built into the document.

Expected Man-Hour rates:
0.075 to 0.085 per gross sq.ft. of ICF

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Interfacing Materials, Sub-Trades & Considerations

RELATED SELECTIONS

- Section 03 40 00 - Pre-cast Concrete
- Section 04 00 00 - Masonry
- Section 05 16 00 - Metal Framing Systems
- Section 06 00 00 - Wood, Plastics and Composites
- Section 07 11 00 - Damp proofing
- Section 07 13 00 - Sheet Waterproofing
- Section 07 14 00 - Fluid-Applied Waterproofing
- Section 07 24 00 - Exterior Insulation Finishing Systems
- Section 07 46 00 - Siding
- Section 07 60 00 - Flashing and Sheet Metal
- Section 08 00 00 - Openings
- Section 09 20 00 - Plaster and Gypsum Board
- Section 09 22 00 - Plaster
- Section 09 70 00 - Wall Finishes
- Section 15 00 00 - Mechanical
- Section 15 00 00 - Electrical
- Section 22 10 50 - Plumbing

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Interfacing Materials, Sub-Trades & Considerations



Chase Cutting Tools

Cutting chase width to be snug for a friction fit placement of the wiring will assist in securing the wiring in the wall.

Any electrical services that are mounted on the exterior face of a Fox blocks wall must be sealed water tight with an acrylic sealant.

In all installations for wiring or outlet boxes, a minimum layer of EPS is recommended covering the concrete.

Utilizing a hot knife to cut the chase for outlets boxes ensures a clean tight fit.



Outlet Boxes

PRIOR TO COMMENCEMENT OF ICF WORK:

Pre-Construction Meetings – Interfacing Subs

Designer's printed recommendations for the proper installation of all **plumbing, mechanical and electrical** component installations, penetrations, interior and exterior finishes and attachment of structural elements.



In the general design, vertical plumbing services should not be located in the concrete cavity.

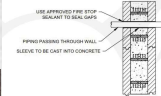
If plumbing services must be installed vertically, in the concrete cavity, an engineered design is required to create a void in the concrete.

Fire blocking material must be added around sleeves to maintain fire rating where required.

Ensure all sleeves can withstand the placement of concrete. Temporary, internal support may be required on larger diameter sleeves.



Sleeves



Sleeve Detail

Do not allow debris from cutting holes in the EPS to fall into the wall cavity.

For drainage purposes insert the sleeve at a slight angle so that the exterior side of the sleeve is slightly lower than the interior side of the sleeve.

Prior to concrete placement ensure all sleeves are in place and secured.

In the event a sleeve is required, after concrete placement, core drill the hole trying to avoid cutting any reinforcement in the wall.

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Interfacing Materials, Sub-Trades & Considerations

Interfacing Sub-Trades

Electrical and plumbing systems are easily installed into the EPS insulation after concrete placement

Service sleeves installed prior to concrete

Embedments are easily installed to be cast into the concrete

Compatible for all floor and roof systems

Columns and pilasters are easily designed into or with an ICF

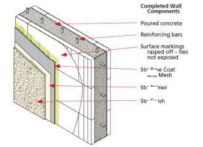


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Interfacing Materials, Sub-Trades & Considerations

Finishes

ICFs are compatible with all exterior finishes
 Interior gypsum board directly applied with screws, into fastening strips, having continuous solid backing
 No issue with nail pops, as in wood framed walls
 Solid attachment of finishes, recommended with appropriate screw



Gypsum board



Brick or Stone Veneer



Siding



Direct applied Acrylic or Stucco Finish

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Interfacing Materials, Sub-Trades & Considerations



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► **Communicating and Understanding
Commercial Project ICF Basics**

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Panel Discussion: Justice Olson

- 5 Breaking Down Materials & Labor
(Holabird & Graceland Case Study)
- 6 ICF Scope Inclusions & Exclusions
- 7 Organizing Your Won Project (Pre-Con)
- 8 Best Practices-Executing Commercial
ICF Projects

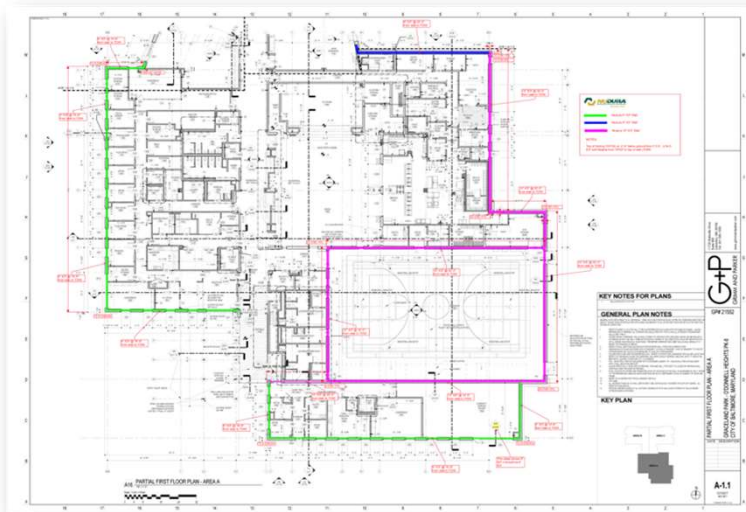
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Breaking Down Labor and Materials

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5. Breaking Down Labor and Materials



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5. Breaking Down Labor and Materials

Dougherty ICF
 402 W Spring Street
 Dondreville, WI 53033
 (608) 533-1931, (414) 426-9525-9080 (fax)

To: (14) Estimated Cost
 At: (14) Estimate
 10/14/2014
 10/14/2014
 10/14/2014
 10/14/2014
 10/14/2014
 10/14/2014

Request # 14-111-001
 • 16' x 16' O/C walls
 • 16' x 16' O/C walls
 • 16' x 16' O/C walls
 • 16' x 16' O/C walls
 • 16' x 16' O/C walls
 • 16' x 16' O/C walls
 • 16' x 16' O/C walls
 • 16' x 16' O/C walls
 • 16' x 16' O/C walls
 • 16' x 16' O/C walls
 • 16' x 16' O/C walls

Maston Creek Services
 16400 W. Linn Road, Suite 100
 Franklin, WI 53126
 (608) 782-1111

To: (14) Estimate
 10/14/2014

Request # 14-111-001
 • 16' x 16' O/C walls
 • 16' x 16' O/C walls
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Greenco ICF Construction, Inc.
 4000 W. Linn Road, Suite 100
 Franklin, WI 53126
 (608) 782-1111

To: (14) Estimate
 10/14/2014

Request # 14-111-001
 • 16' x 16' O/C walls
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ICF Scope: \$1,026,000 or \$18.83 sqft
 ICF Scope: \$1,032,360 or \$18.94 sqft
 ICF Scope: \$994,142 or \$18.26 sqft
 Projected ICF Budget: \$1,076,381 or \$18.85 sqft six month prior to actual bid date

5. Breaking Down Labor and Materials

Cost of goods typically average about 50-60% of the overall budget or \$9.66 for this case study

• Material Breakdown:

ICF Forms	43%
Concrete	33%
Rebar (16" & 18" O/C Vert & Hort)	14%
Bucks (20% glazing)	6%
Pumping	4%



5. Breaking Down Labor and Materials

Cost of Labor typically average about 40-50% of the overall budget or \$9.17 for this case study

Form Install	18%
Rebar Placement	16%
Bracing (Install and remove)	28%
Bucks Placement	7%
Concrete Placement	18%
Material Handling	13%

Note* These averages are for a highly experienced installation crew.

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ICF Scope Inclusions & Exclusions

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6. ICF Scope Inclusions & Exclusions

Included in any ICF Installers bid should be the following:

1. ICF product and accessories
2. Concrete for the ICF Wall (Only)
3. All Rebar for the ICF Wall (Only)
4. Window & Door Buck material
5. All Labor Associated with the ICF Assembly
6. Pump Trucks (ICF Wall Only)
7. Building/ Wall Layout
8. An Approved ICF Scaffold System



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6. ICF Scope Inclusions & Exclusions

Excluded in the ICF Installers bid but installed by the installer:

1. All Weld Plates
2. Embeds
3. Ledger Connections
4. Cast in Place Brick Ties



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6. ICF Scope Inclusions & Exclusions

All Penetrations will be coordinated with the ICF installer but installed by the Subcontractors of said trade:

1. All Electrical Penetrations/Sleeves
2. All Plumbing Penetrations/Sleeves
3. All HVAC Penetrations/Sleeves

Note All Penetrations/Sleeves Will Be Supplied And Located By Each Trade*



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Organizing your Won Project (Pre-Con)

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7. Organizing Your Won Project (Pre-Con)

- 1) Turn in submittal package required
- 2) Review All Shop Drawings/Coordination Drawings
- 3) Review The Building/Construction Schedule
- 4) Schedule a Mock-up Wall Construction
- 5) Schedule Final Pre-Con Meeting 2 Weeks prior to Construction
- 6) Material On-Site 1 week before Construction Start
- 7) Start Building
- 8) Weekly Construction Meetings



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Best Practices For A Successful Commercial Project

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8. Best Practices

- Accelerate ICF education of Owners, CM, A & E's and subcontractors
- Establish ICF design parameters, optimize dimensions and elevations
- Design drawing review & recommendations
- Ensure use of simplified and cost effective ICF connection detailing
- Specifications, ensure ICF material and scope spec's are coordinated
- Budget costing assistance to ensure competitive ICF bid process
- ICF Project scheduling
- Assist coordination and interface with MEP and finishing trades
- Provide ICF project oversight through design, pre-con and construction phases
- Early coordination of submittals and ICF coordination drawings:



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8. Best Practices

As with any building construction, the first step is to install the footing for the wall. Standard footings are installed according to applicable building codes and engineering requirements. Stepped footings are easily accommodated with the flexibility of ICF construction. Most ICFs require the footings be within $\frac{1}{4}$ " of level.



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8. Best Practices

As modular units with standard length forms and corners, the walls are assembled very fast. Building dimensions are determined, building corner pins are located, and the form units are then easily stacked similar to building blocks in a running bond pattern. Most ICF manufacturers recommend developing a pattern when placing forms to ensure the placement is as efficient as possible.



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8. Best Practices

- ▶ Depending on wall requirements, reinforcing is designed per ACI 318, IBC, and IRC specifications or manufacturer's prescriptive tables. Reinforcing steel is placed into the notches provided by the ICF webbing. Reinforcement is typically rebar #4 or #5 and is generally installed in a single mat horizontally and vertically.



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8. Best Practices

ICF design (notches in web) allows for accurate positioning of the steel in the wall—vertical at 8" or 16" o.c. and horizontally at 16" or 18" or 24" o.c.

- Noncontact lap splicing, No wire ties required, Single or double mat, ICF design allows rebar to a min. $\frac{3}{4}$ " from face of concrete per ACI 318 – 7.7.1(c)



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8. Best Practices

The concrete mix has a higher slump of 5" to 6" for ICF walls, and for 4" and 6" forms a small aggregate at $\frac{3}{8}$ " is specified. This allows for better flow within the forms. Most ready-mix suppliers offer an ICF mix design. Concrete core widths are available in 4", 6", 8", 10", and 12" thicknesses. The concrete placed within the walls will require consolidation, which is usually done internally. Concrete is placed continuously in lifts of 4", which is standard.



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8. Best Practices

The key to a successful ICF project is the use of an ICF alignment and bracing system. The system not only braces the walls but also adjusts and aligns them to be straight and plumb, and serves to safely support workmen. The wall alignment bracing is placed as the wall is stacked. There are systems available for tall walls, and all wall alignment systems are engineered to be OSHA (Occupational Safety & Health Administration) compliant.



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8. Best Practices

ICFs are compatible for the connection of any floor system, be it on top of the wall or into the side of the wall. Intermediate floor connections can be integrated to hang off the ICF wall or can be imbedded into the core of the concrete wall. Any floor type can be used with ICF construction, including: hollow core slabs, steel joists with concrete slabs, steel joists with steel pan decks and a concrete slab, wood joists, or any other floor system on the market.



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8. Best Practices

- ▶ Embedments or steel plates designed with steel studs or determined reinforcement can be added to the face of the form prior to the concrete placement or added to the top during placement. Embedments are crucial for carrying floors, roofs, beams, stairs, signage, and other heavy, all-hung features.



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8. Best Practices

As with CMU construction, the electrical contractor is not required on site for conduit installation until the ICF walls are complete, saving time and money on the electrical installation.

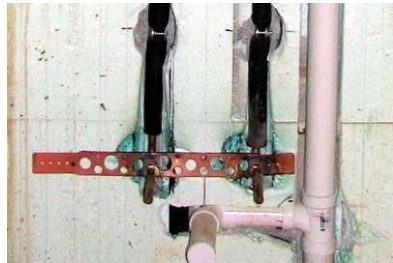
Rough-in for electrical work is accomplished in various ways in the ICF wall face. Electrical chases can be created using a number of different tools, including an electric chain saw, hot knife, or a reciprocating saw. Chases are usually cut into the EPS foam after the concrete has been placed in the wall. Electrical boxes are mechanically fastened to the fastening strip of the form or directly to the concrete.



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8. Best Practices

By cutting and removing the foam, PVC pipe up to 1 ½" with a coupler can be recessed into the wall with no added framing. PVC piping or chases can be cut into the form (prior to placement) for those mechanicals passing through the concrete core.



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► Communicating and Understanding Commercial Project ICF Basics

Justice Olson

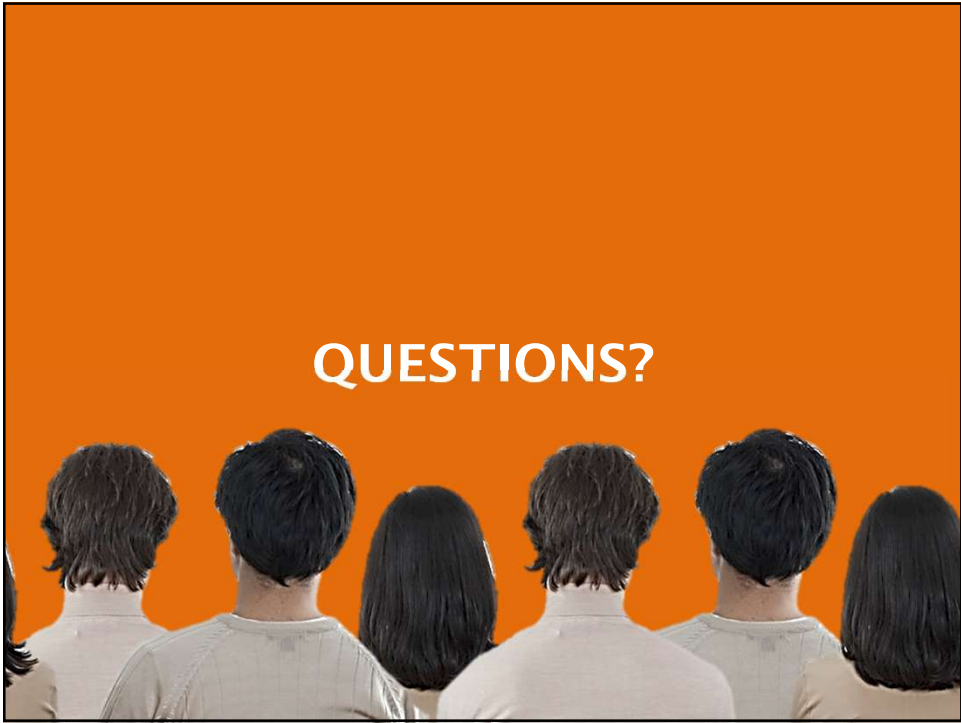
Quality Control/Midwest Technical Rep

Nudura Systems, Inc. - Now part of the Tremco Construction Products Group

O. 866.468.6299 | M. 608.553.0082

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