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The Millennials have landed.

Session: 092917

Date: Thurs., Sept. 29, 2016

Time: 2:00 pm – 3:00 pm

Positive Impact of Insulated Concrete Forms: Sustainable, Economical, Efficient

Presented by:

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CONTINUING EDUCATION AIA

Introduction

- Goal: Explore Innovative Building Systems to:
  - Cut building costs
  - Increase speed to market
  - Support eco-friendly technology
- Result: Insulated Concrete Forms for Institutional Construction
  - Administration Building
  - West Village Residence Hall

Agenda

- Project Design Considerations
- Metrics: Up Front Savings and Life Cycle Cost
- Challenges of Using ICF on Institutional Projects

Project Design Considerations

Acoustics

- Located at a Freeway and Major Street
- Significant Traffic Noise
- Numerous Windows
- Board of Regent Meetings

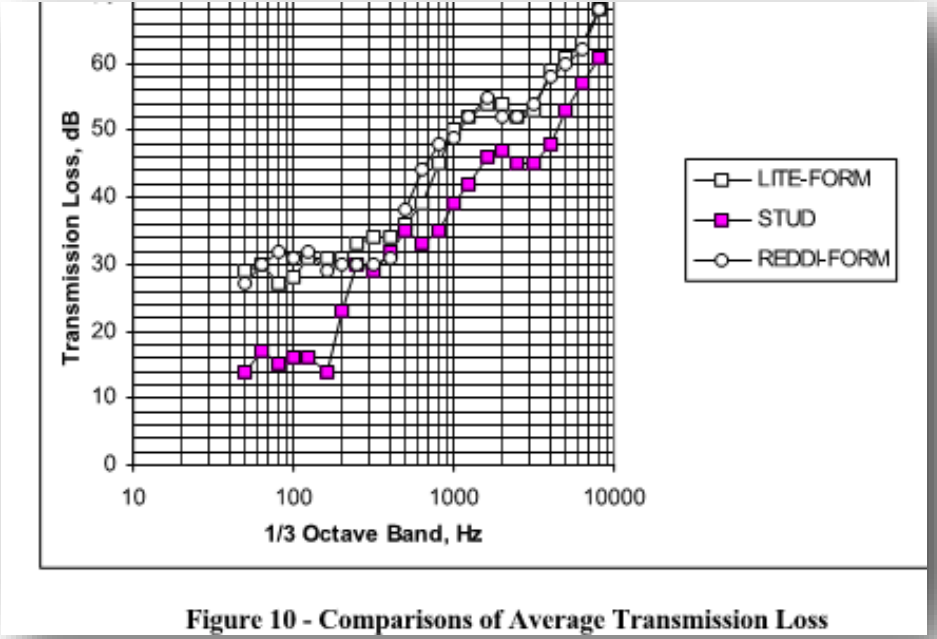


Figure 10 - Comparisons of Average Transmission Loss

Safety of Occupants

DAS for Cellular Service

- Rebar and Concrete in the Exterior Walls
- Low E Glass
- Structural Steel Floors and Roof

Metrics: Up Front Savings and Life Cycle Cost

Cost of Construction

Option	Structural Framing Options	Cost/SF (Gross)	Estimated Project Cost
1.a	6” ICF with 10” Hollow Core Plank (1 Corridor)***	$27.09	$5,825,246
1.b	6” ICF with 8” Hollow Core Plank (2 Corridor Walls)***	$28.05	$6,030,143
1.c	SMS with 10” Hollow Core Plank (1 Corridor)	$22.68	$4,877,200
1.d	SMS with 8” Hollow Core Plank (2 Corridor Walls)	$23.00	$4,944,260
2.a	SMS with Hambro (1 Corridor)	$26.35	$5,664,698
2.b	SMS with Hambro (2 Corridor Walls)	$27.28	$5,866,061
2.c	6” ICF with Hambro (1 Corridor)***	$29.04	$6,242,647
2.d	6” ICF with Hambro (2 Corridor Walls)***	$30.64	$6,585,805

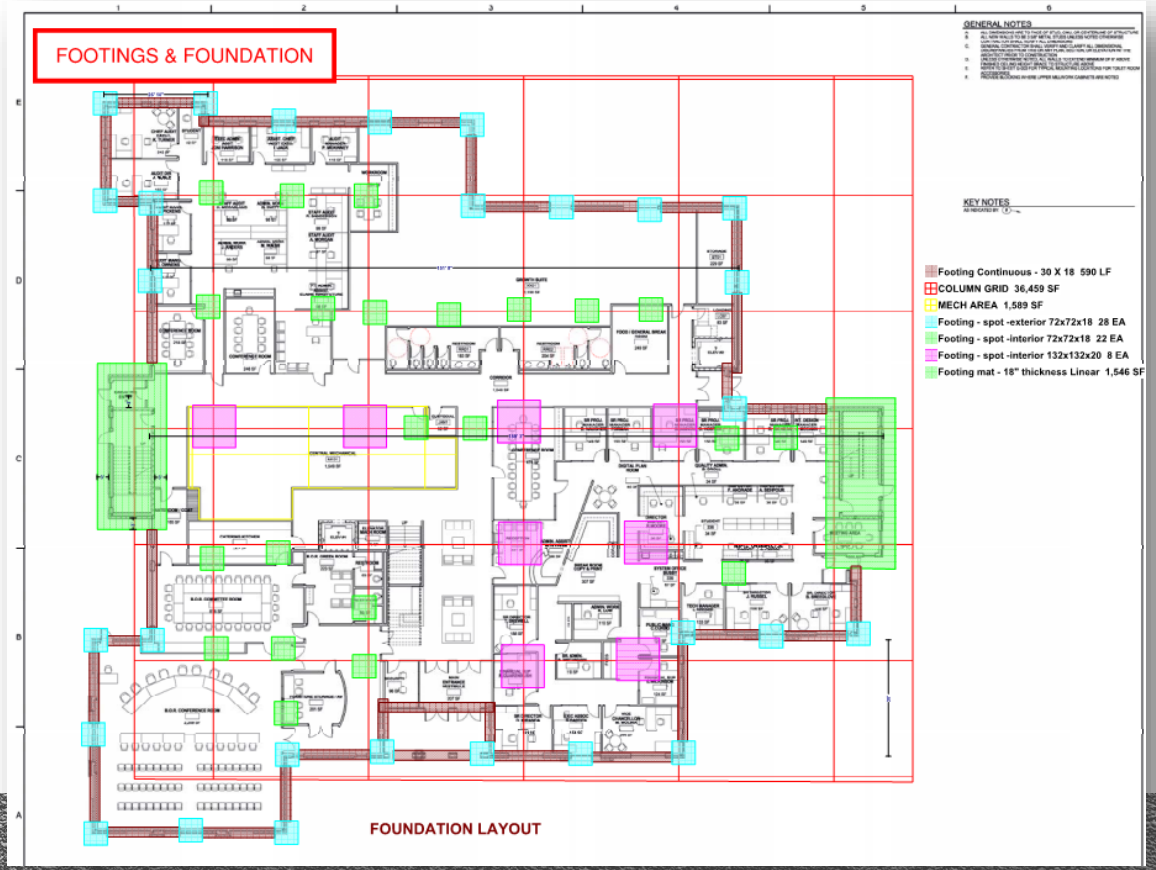
Scopes of Work and Dollars Affected

- Foundations
- Steel Structure Reduction
- Exterior Wall Changes
- Cooling Load Reduction
- Schedule Reduction

Foundations

Conventional Structural Steel Building

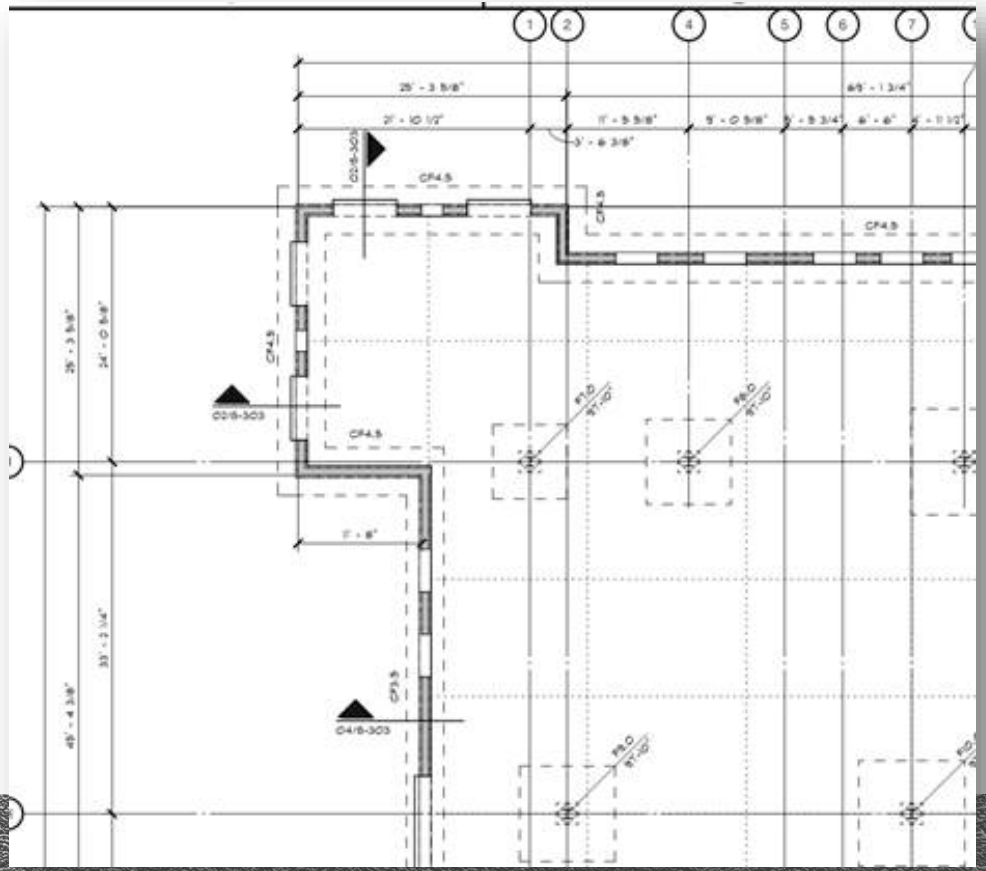
- Spot footings
- Grade beams
- Mat footings



Foundations

ICF Structure

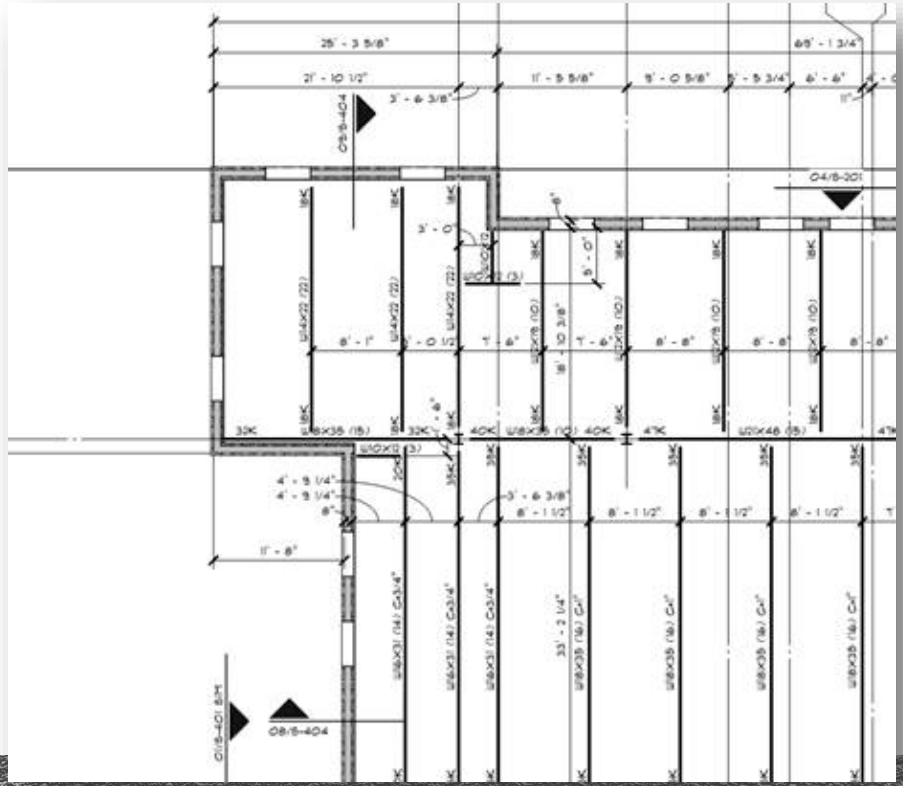
- Continuous footings
- Spot footings on interior only
- More CY of concrete
- More efficient installation



Structural Steel Reduction

ICF

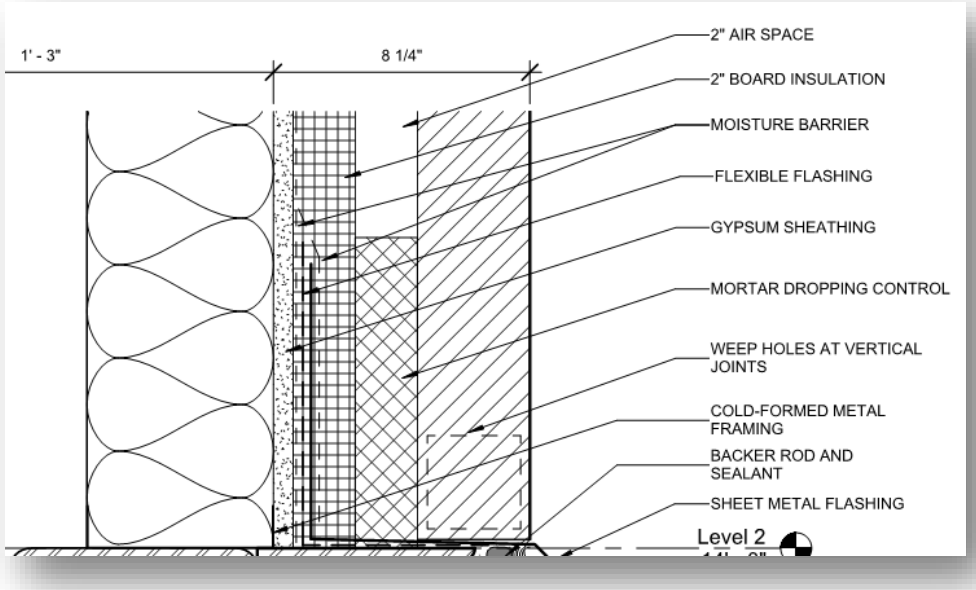
- Reduction of perimeter steel
- Removal of moment connections



Exterior Wall Changes

Typical Exterior Wall

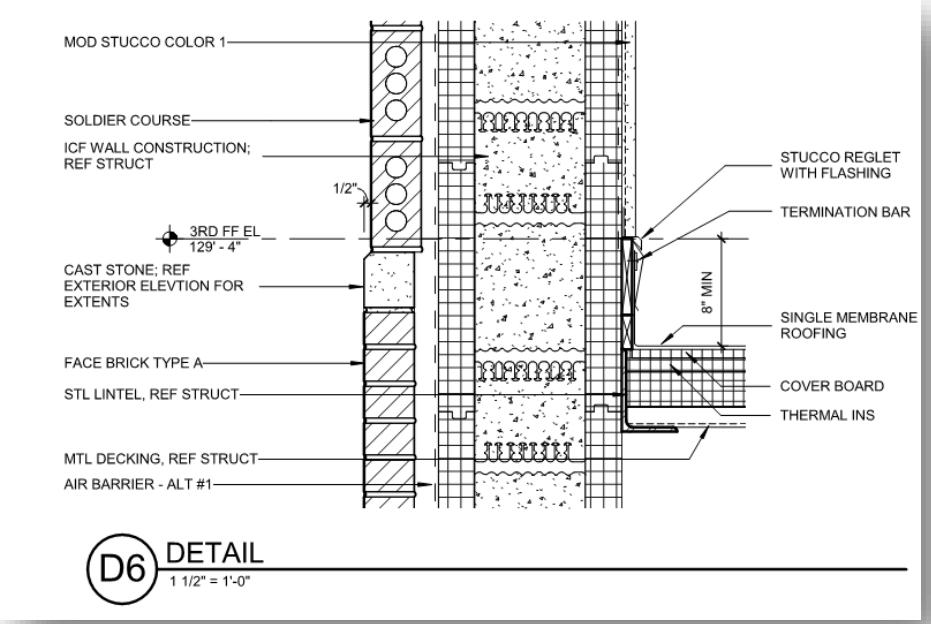
- Ext drywall partitions
  - 6” metal stud
  - Exterior sheathing
  - Batt insulation
- Damp-proofing
- Rigid board insulation



Exterior Wall Changes

ICF Exterior Wall

- Delete exterior drywall partitions
- Dampproofing?
- Delete rigid board insulation
- Add interior furr out?



Cooling Load Reduction

ICF Impact on Cooling Load

- Reduce amount of air leakage
- Better insulation at exterior walls
- Load reduction at TTU System Office Building: 15 tons of HVAC capacity

Up Front Savings at TTU System Office Bldg

	Qty	Unit	$ / Unit	Total
ICF System				
Foundation	188	CY	$ 800	$ 150,400
Steel Embed Allowance	1	LS	$ 30,000	$ 30,000
ICF (insulation, concrete, rebar, formwork) - Includes 1'-8" below grade	44,281	SF	$ 19.50	$ 863,480
Fluid Applied Membrane Air Barrier (includes cleaning polystyrene)	32,815	SF	$ 5.20	$ 170,638
Drywall interior side	2,545	LF	$ 16.00	$ 40,720
*VRF System	235	TONS	$ 7,000	$ 1,645,000
Schedule Reduction	(3)	WKS	$ 15,500	$ (46,500)
Subtotal				**$ 2,853,738**
Conventional Structural Steel System				
Foundation	153	CY	$ 972	$ 148,716
Steel (columns & bracing)	120	TONS	$ 4,200	$ 504,000
Steel rigid moment connections	162	EA	$ 600	$ 97,200
Exterior Drywall Partition (includes thermal insulation)	2,545	LF	$ 98.00	$ 249,410
Parapet framing	640	LF	$ 32.00	$ 20,480
Rigid Insulation	2,545	LF	$ 22.00	$ 55,990
Fluid Applied Membrane Air Barrier	32,815	SF	$ 4.50	$ 147,668
*VRF System	250	TONS	$ 7,000	$ 1,750,000
Subtotal				**$ 2,973,464**
ICF System Total				**$ 2,853,738**
Conventional Structural Steel System Total				**$ 2,973,464**
Deduct for ICF System				**$ (119,726)**

ICF	$2,853,738
Steel	$2,973,464
Savings	**$119,726**

3 Week Schedule Reduction

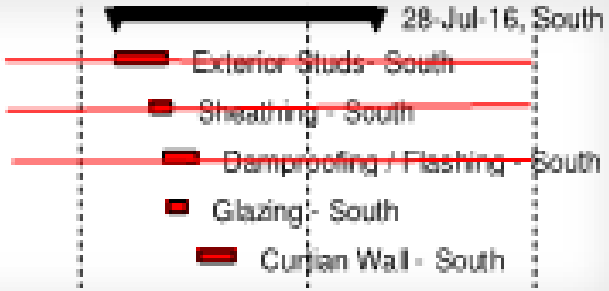
Life Cycle Cost at West Village

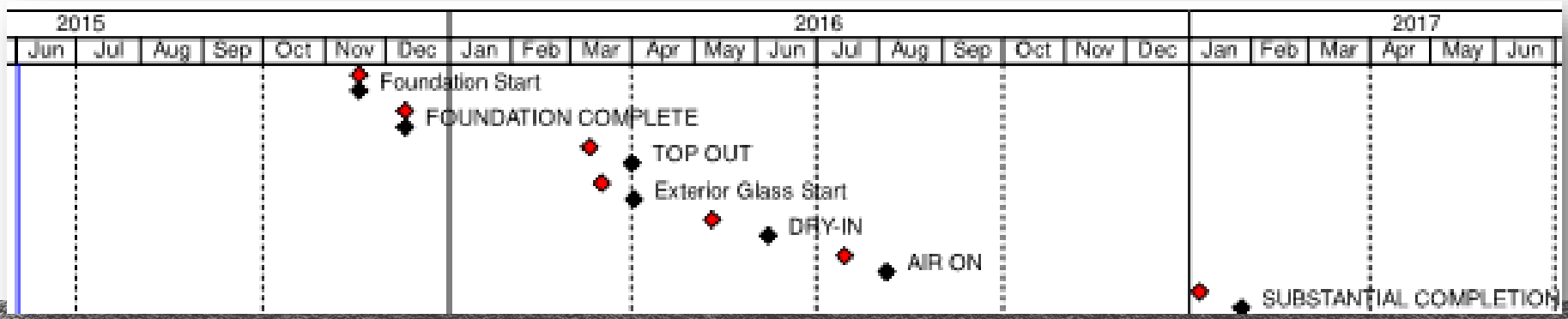
- ICF Efficiencies Reduce HVAC Tonnage 30-40%
- Savings Equate to $430,000 or $1.83/SF
- Estimated Energy Savings of $156,180*

*Not including VRF savings

Reduce Work Activities = Potential Schedule Reduction

South	74	14-Apr-16	28-Jul-16
Exterior Studs- South	15	14-Apr-16	04-May-16
Sheathing - South	6	29-Apr-16	06-May-16
Damproofing / Flashing - South	10	04-May-16	17-May-16
Glazing - South	6	06-May-16	13-May-16
Curtian Wall - South	10	18-May-16	01-Jun-16





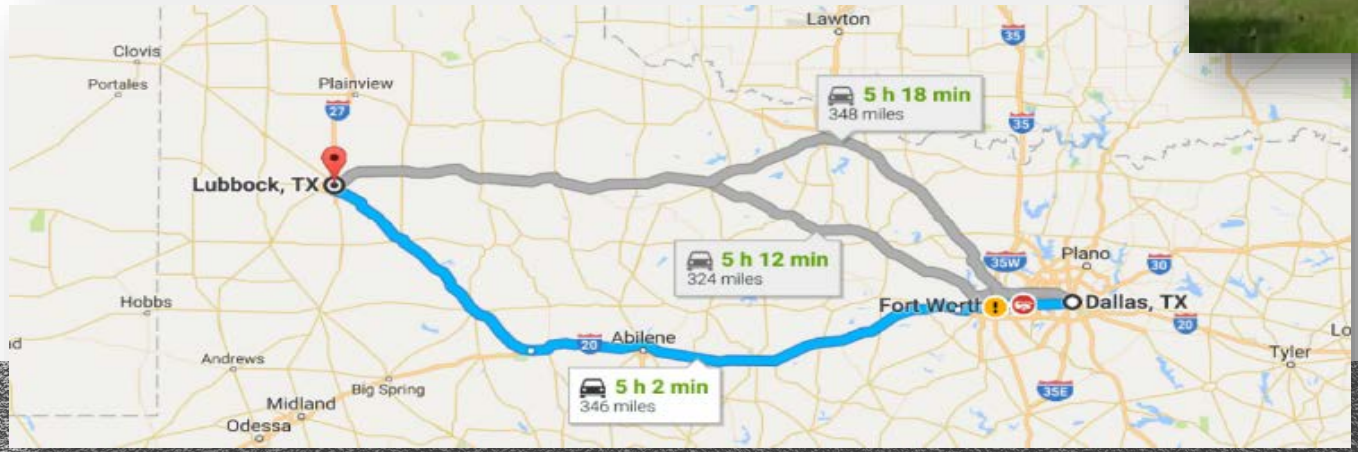
Schedule Considerations

- Building Layout
- Coordination With Other Trades
- Windows/Embeds and Block Outs

Challenges of Using ICF on an Institutional Project

Challenge: Limited Subcontractor Availability

- Mostly Residential
- Most Subcontractors Located in Larger Metro Areas



Solution: Focus on Select Subcontractors

1. Utilize ICF Block Suppliers
   - NurDura
   - FoxBlocks
2. Utilize Design Professional Accustomed to ICF
3. Make Project Attractive
   - Good detailing
   - Quality specifications
   - Appropriate schedule

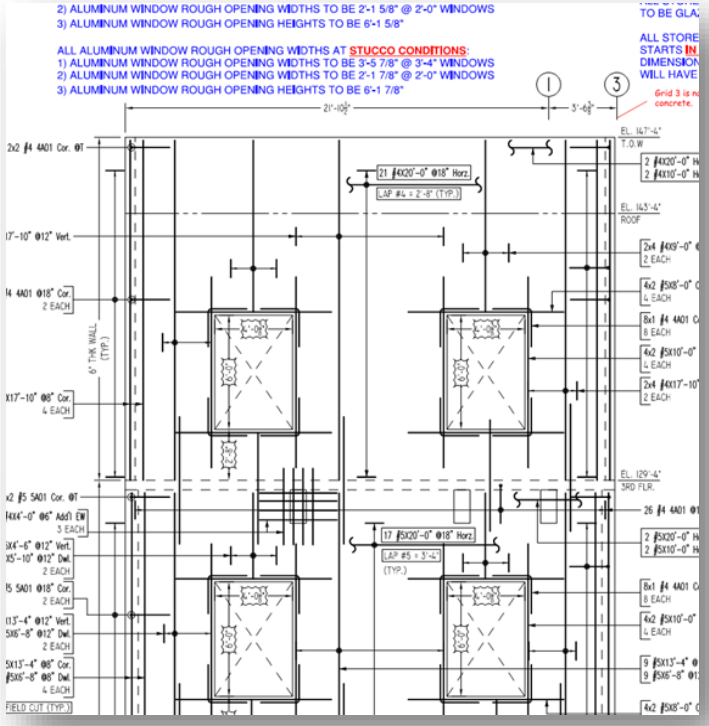
Question:
Drawing A-602 provides a masonry opening of 23'-10 7/8" for the horizontal portion of storefront AL15. However, drawing S-102 indicates an inside face of foam to inside face of foam dimension of the stair wells to be 23'-6 7/8". Due to the storefront masonry opening dimension being greater than the inside dimension of the stairwells, please provide a specific jamb detail of the storefront condition interfacing with the ICF walls at these locations. Additionally, drawing A-602 indicates detail C3/A-502.1 for the jamb condition of storefront AL15. Please confirm detail C3 on A-502.1 is to be a cut through the vertical window of AL15 as shown on A-602.

Challenge: Delivering Institutional Quality

- Subcontractors Not Accustomed to Delivering Quality Level
- Difficulty Increases with Building Height
- Openings + Embeds = Honeycombs

Solution: Buy/Specify ICF Systems

- Pre-formed Shapes
- Require Shop Drawings
- Alignment Systems
- ICF Outrigger Brackets



Solution: Plan Ahead/Problem Areas

- Conduct Preconstruction with Supplier, Installer and Design Professional
- Increase Window Buck Reinforcement
- Reduce Aggregate Size
- Leave Out Window Bucks at Sills

Solution: Plan Ahead/Problem Areas

- Horizontal Stiff Backs on Outside
- Plumb Walls & Corners Before & During Placement
- Post Pour Honeycomb Checks at Embeds
- Identify Problem Areas After Placement / Learn From Mistakes

Challenge: Safety

- Lack of Knowledge of Institutional Expectations
- Introduction of Multiple Stories

Solution: Plan Ahead

- Help ICF Sub Plan Ahead
- Utilize ICF Outrigger Systems
- Expand on Existing Knowledge
- Specify/Buy Engineered Systems
- Plan for Leading Edge/Gaps in Protection

Conclusion: Key Benefits of ICF

- ✓ Cost Savings
- ✓ Schedule Reduction
- ✓ Eco-Friendly
- ✓ Utility Savings
- ✓ Safe Shelter

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Seminar Evaluation

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