SECTION 031300 – PERMANENT FORMS – INSULATED CONCRETE FORMS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies the provision and installation of insulated concrete forms and the installation of reinforcing steel within formwork.

1. Furnish all labor, materials, tools and equipment to perform the installation of Insulated Concrete Forms.
2. Furnish all labor to include placement of reinforcing steel within forms and final cleanup.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section “Structural Special Inspection.”
2. Division 3 Section “Structural Precast Concrete – Plant Cast.”
3. Division 3 Section “Cast-In-Place Concrete.”
4. Division 7 Section “Thermal and Moisture Protection.”

C. Coordination: Unless other satisfactory agreements are specifically entered into by contractors concerned, all miscellaneous iron and steel, sleeves, anchors, etc., required by work of other contractors, will be furnished and installed by such other contractors with the cooperation of this contractor.

D. Products supplied but not specified or installed under this section:

1. *EPS* compatible modified bituminous sheet waterproofing membrane.

E. Products installed but not specified or supplied under this section:

1. Reinforcing steel.
2. Window and Door opening bucks.

F. Adequate bracing and false work shall be provided by the Installing Contractor to comply with all applicable Codes and hold the formwork to proper lines and level.

1.3 DEFINITIONS

A. *EPS*- Acronym for “Expanded Polystyrene” when referencing the insulating foam component of the Insulated Concrete Form.

B. *ICF*- Acronym for “Insulated Concrete Form.”

C. *Access & Form Alignment System*- a form alignment & scaffold system designed exclusively for use with Insulated Concrete Forms.

D. *Window or Door Opening Buck*- a pre-manufactured or site constructed frame assembly consisting of wood or plastic material (or combination thereof) used to frame a rough opening within the forming system that will retain concrete around the opening. The frame can also provide for subsequent anchorage of doors and windows within the wall assembly.

1.4 SYSTEM DESCRIPTION / PERFORMANCE REQUIREMENTS

A. Insulated concrete wall forming system shall consist of 2 flame resistant panels of expanded polystyrene (*EPS*) connected by either high-density polypropylene hinged pin foldable webs or EPS embedded polystyrene fastening strips interconnected with slide in format - high density polypropylene web connectors.

B. All web fastening strips to run full height of form and be fitted top and bottom with reversible fitting, “triple-tooth” interlocking mechanisms to enable positive vertical interlocking of forms with each other. Wall system webs to provide min. 1 ½” (38mm) wide fastening strips @ 8” (200mm) o/c approx 1/2” (13mm) below wall face for full wall height to facilitate finish fastening of both interior and exterior finishes.

1. Full height fastening strips also to be positioned within corner forms to provide capability of connecting finishes full height within 4” (100mm) or less of all corner conditions.

C. All form units may be constructed capable of being shipped to site in folded condition to minimize shipping cost and site storage space requirement. Foldable forms shall be capable of being deployed to installation ready condition by simply unfolding the unit in a single pull motion or pull motion combined with insertion of a single web (at corner condition).

D. EPS foam panels shall be moulded with single socket 1” (25mm) wide reversible tooth interlocks positioned in pairs along top of all panels.

E. Wall system to provide minimum specified concrete thickness at all locations throughout wall area.

F. Wall system to provide accurate positioning of steel within form cavity to conform to reinforcing requirements of ACI 318.

1. Reinforcing bar positioners shall be capable of supporting vertical reinforcing placed at any spacing and horizontal reinforcing placed at 18” on center. Alternate reinforcing spacing may be requested of Architect; however, Insulated Concrete Form Installer shall be responsible for all additional cost of reinforcement size and spacing to accommodate the form system.

G. *EPS* foam panels with concrete to provide min. insulation level of R 22.4 across full line of form unit cavity widths.

H. *EPS* foam to provide maximum vapor permeation of 3.5 Perm-in. (200 ng/Pa.s.m^2)/25mm.

I. Finished wall assembly to provide min. rating of STC sound attenuation performance as follows:

1. 6” core and thicker - STC 50.

1.5 SUBMITTALS

A. General: Furnish submittals in quantity, format, and other Conditions of the Contract and as specified in Division 1 of the Project Manual.

1. Computer generated electronic structural construction document files (ACAD) will be made available to the Contractor. The Contractor will be required to sign the Engineer’s standard release of liability form and pay a handling fee of $50.00 per drawing prior to receiving the drawing files. Rules for use of said files shall be as defined in the CRSI “Code of Standard Practice” Sections 4.19 and 6.4.1.
2. Shop drawing resubmittals are reviewed for conformance with review marks only. Any changes or questions originating on a resubmittal shall be clearly clouded.

B. Relevant laboratory tests or data that validate product compliance with performance criteria specified prior to commencement of work under this Section.

C. Manufacturer’s product installation manual.

D. Valid product evaluation report for applicable code jurisdiction of ICC-ES ESR-2092.

E. Installer’s proof of training documentation by ICF Manufacturer.

F. Minutes of preinstallation conference.

G. Furnish submittals in quantity and format as specified in Division 1 of the Project Manual.

1.6 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified. Each contractor having reference to ACI Documents shall maintain copies of same on project site.

AMERICAN CONCRETE INSTITUTE

1. ACI 117-90 – Tolerance for Concrete Construction and Material.
2. ACI 315-92 – Details and Detailing of Concrete Reinforcement.
3. ACI 318-05 – Building Code Requirements for Reinforced Concrete and Commentary.

AMERICAN SOCIETY FOR TESTING AND MATERIAL (ASTM)

1. ASTM C31 – Practice for Making and Curing Concrete Test Specimens in the Field.
2. ASTM C236 – Steady State Thermal Performance of Building Assemblies.
3. ASTM C473 - Physical Testing of Gypsum Board Products & Gypsum Lath
4. ASTM E84 - Surface Burning Characteristics of Building Materials

CONCRETE REINFORCING STEEL INSTITUTE (CRSI):

1. CRSI – Manual of Standard Practice.

2. CRSI 63 – Recommended Practice for Placing Reinforcing Bars.
3. CRSI 65 – Recommended Practice for Placing Bar Nomenclature.

B. Installer Training: Conduct a thorough training with the manufacturer or the manufacturer's representative for the installer on the project.

C. Qualifications of Workers: Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper execution of the work required by this Division.

D. Preinstallation Conference: ICF Installer shall attend pre-concrete construction conference at Project site to comply with requirements of Division 1 Section "Project Meetings."

1. Installer shall be prepared to coordinate provision of access, storage area, and protection and spatial requirements for form alignment placement steel storage & forming.

E. Fire-Test-Response Characteristics: Provide insulated concrete forms identical to those tested as part of an assembly for fire resistance per ASTM E 119 by a testing and inspection agency performing testing and follow-up services, that is acceptable to authorities having jurisdiction.

1. Fire-Resistance Ratings: As indicated by design designations listed in UL "Fire Resistance Directory," or by Warnock Hersey or another testing and inspecting agency.
2. Labeling: Identify forms with appropriate markings of applicable testing and inspecting agency.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect ICF from soiling, deformation, and other damage during delivery, storage, and handling.

B. Deliver products in original factory packaging, bearing identification of product, manufacturer and batch/lot number.

C. *Trained Installer* shall furnish product packaging labels to contractor as required to maintain traceability of product for duration of contract.

D. Protect with a waterproof covering and ventilate. Ensure that UV protection is provided for material, should on-site storage extend beyond 30 days.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that my be incorporated in the Work include, but are not limited to, the following:

1. BUILDBLOCK Building Systems, 9701 N. Broadway Ext, Oklahoma City, Oklahoma. Phone: 405-840-3386 Fax: 831-597-0792.
2. Fox Blocks (Airlite Plastics Company), 6110 Abbott Drive, Omaha, NE 68110 Phone: (877) 369-2562 Fax: (402) 408-5099
3. NUDURA Corporation, Unit 1, 80 Ellis Drive, Ontario Canada L4M 6E7 Phone: (866) 468-6299. Fax: (705) 726-2110.
4. Quad-Lock Building Systems Ltd., 7398 – 132nd Street, Surrey, BC V3W 4M7 Phone: (888) 711-5625 or (604) 590-3111 Fax: (604) 590-3111

2.2 ICF COMPONENTS

A. General: Provide manufacturer's standard form units with EPS on both faces, including all corners, caps, tapers, etc. for a complete form installation. Form length, width, and height to be manufacturer's standard. Coordinate form dimensions with spacing of reinforcing and wall dimensions.

1. EPS Thickness: 2 5/8" (66 mm).
2. Structural Concrete Thickness: 8" (203 mm).

B. Form products that may be incorporated into work include:

1. Standard Form Unit.
2. 90 Degree Form Unit.
3. Brick Ledge Extension.
4. End Cap.
5. Height Adjuster.
6. Molded Brick Ledge.

2.3 ACCESSORIES

A. Form Joint Tape: Compressible foam tape; pressure sensitive; AAMA800, "Specification 810.1, Expanded Cellular Glazing Tape"; minimum ¼ inch thick.

B. Form Joint Sealant: Elastomeric sealant complying with ASTM C920, Type M or S, Grade NS, that adheres to form joint substrates.

2.4 WALL ALIGNMENT SYSTEM

A. The Installer shall furnish and utilize the ICF manufacturer's recommended Wall Access and Form Alignment System (to be provided as an installation component of the wall system) to facilitate construction of the wall assembly, and to provide adjustment for ensuring plumbness of the wall during construction.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting framing and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the ICF system.

B. Verify that footings are within +/-¼" (6mm) of level and that steps footing increments match standard form unit height. Where partial or half course is intended for starting course elevation, ensure step footing increment is equal to cut form unit less ½" (13mm).

C. If specified, ensure reinforcing steel dowels are in place at specified centers along footing lengths.

3.2 PREPARATION

A. Clean all dirt and debris from top of footings prior to commencing work.

3.3 FORMS

A. General: All work shall be in strict conformance with manufacturer's installation recommendations. Design, erect, support, brace, and maintain formwork to support vertical, lateral, static, and dynamic loads that might be applied until concrete structure can support such loads. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances and surface irregularities complying with the following ACI 347 limits:

1. Provide Class A tolerances for concrete surfaces exposed to view.
2. Provide Class C tolerances for other concrete surfaces.

B. The installer shall ensure manufacturer's procedures for the following work are employed on site (as outlined in the manufacturer's product Installation manual):

1. First Course Placement.
2. Horizontal Reinforcement Placement.
3. Successive Course Placement.
4. Door & Window Opening Construction.
5. Form Alignment & Scaffolding Installation.
6. Vertical Reinforcement Placement.
7. Pre-Concrete Placement Inspection.
8. Concrete Placement.
9. Access & Form Alignment Assembly Removal.

C. Construct forms to sizes, shapes, lines, and dimensions shown and to obtain accurate alignment, location, grades, level, and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, reglets, chamfers, anchorages and inserts, and other features required in the Work.

D. Provide temporary openings for clean-outs and inspections where interior area of formwork is inaccessible before and during concrete placement. Securely brace temporary openings and set tightly to forms to prevent losing concrete mortar.

E. Ensure the form units are tight end to end to maintain proper dimension.

F. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.

G. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before placing concrete. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

3.4 SERVICE PENETRATIONS

A. Service penetrations (e.g.- electrical service conduits, water service pipes, air supply and exhaust ducts etc.) shall be installed at the required locations as indicated by the appropriate trade.

B. Service penetrations exceeding 16” x 16” (400mm x 400mm) in area shall be reinforced.

C. Prior to concrete placement, install service penetration sleeves (supplied by others) at designated locations to create voids where services can be passed through at later date.

3.5 PLACING REINFORCEMENT

A. General: Comply with Concrete Reinforcing Steel Institute’s recommended practice for “Placing Reinforcing Bars,” for details and methods of reinforcement placement and supports and as specified.

B. Deliver reinforcement to job site bundled, tagged and marked. Use waterproof tags indicating bar size, length, and mark corresponding to placing drawings.

C. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.

D. Accurately position, support, and secure reinforcement against displacement.

1. Horizontal reinforcement is to be installed into notches provided in the web of the ICF by the manufacturer. The horizontal reinforcement is to be installed after each course of form units.
2. When a single mat of reinforcing is specified to be centered in the wall, alternate the position of the horizontal rebar (each side of the vertical rebar), from one successive course to another, in order to create a cage for maintaining the alignment of the vertical reinforcement.
3. Vertical reinforcement is to be installed after the form units are installed and prior to placement of the concrete. Wet setting of vertical reinforcement is not permitted.

E. Lap reinforcement at splices per lap length schedule provide on drawings.

F. Reinforce around all openings according to details and schedules on drawings.

G. Place reinforcement to maintain minimum coverage as indicated for concrete protection.

H. Welding of reinforcing bars will not be permitted without approval of the Architect/Engineer.

I. When permitted, field bend bars cold, except during cold weather when moderate heating is necessary to avoid brittle failures.

3.6 INSTALLING EMBEDDED ITEMS

A. General: Set and build into formwork anchorage devices, anchor bolts, and other embedded items required for other work that is attached to or supported by cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached.

B. Reinforce forms where embed plates, etc. are required to be mounted flush with exterior face of insulation.

3.7 PROTECTION

A. Provide temporary coverage of installation to reduce exposure to Ultra Violet light should final finish application be delayed longer than 60 days.

3.8 QUALITY CONTROL

A. At least seven days following ICF concrete pour, but prior to placement of loads on ICF walls, (2) 1’x1’ sections of insulation per 50’ feet of ICF wall length (one per side) shall be removed by the contractor in presence of Special Inspector for observation of concrete wall surface to verify condition of concrete walls (specific locations shall be determined by the SER). Severe honeycombing or other indications of unconsolidated concrete deemed insufficient by the sole discretion of the structural engineer of record to accommodate the design intent or the requirements set forth in the drawings and specifications shall be repaired or replaced, to the extent as directed by the SER, at no additional cost to the owner. Testing required by the SER, such as sounding of concrete, etc. to verify extent of insufficient concrete is by the ICF contractor at no additional cost to the owner.

END OF SECTION 031300