SECTION 031115 – CONCRETE FORMWORK FOR STEAM UTILITY DISTRIBUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to this section.

1.2 SUMMARY

A. This section includes the design, installation and removal of forms for cast-in-place concrete.

B. Related sections include the following:

1. Division 03 Section "Concrete Reinforcement For Steam Utility Distribution."
2. Division 03 Section "Concrete Accessories for Steam Utility Distribution."
3. Division 03 Section "Cast-In-Place Concrete for Steam Utility Distribution."

C. Division of Work:

1. In accordance with the General Conditions, Contractor is responsible for dividing the Work among the Subcontractors and Suppliers and for delineating the work to be performed by specific trades.

2. The following are suggestions as to how the Work may be divided. This is not a complete list of all the work:

a. Mechanical, electrical and plumbing trades: Supply, locate and install premanufactured items including inserts, sleeves, and other embedded items required by those respective trades.

b. Formwork Subcontractor:

1) Supply and install site fabricated box-outs for chases, sleeves and other miscellaneous openings for mechanical, electrical and plumbing trades.

2) Install other inserts, embedded parts, box-outs for openings, chases, reveals and recesses, except those specifically mentioned above that are by mechanical, electrical or plumbing trades. Special inserts, embedded parts or other special requirements needed by a specific trade shall be supplied by that trade to the formwork Subcontractor for installation.

c. Contractor: Coordinate location of mechanical, electrical and plumbing inserts, embedded parts, openings and recesses with respective trades.

1.3 REFERENCES

A. Except as herein specified or as indicated on the Drawings, the work of this section shall comply with the following:

1. American Concrete Institute:

a. ACI 301 - Specifications for Structural Concrete for Buildings.
b. ACI 347 - Recommended Practice for Concrete Formwork.

1.4 DESIGN AND PERFORMANCE REQUIREMENTS

A. Form construction:

1. Provide required forms, shores, bracing, breast timbers, form ties, and accessories and in sufficient quantities so as not to delay the Work.

2. Provide removable panels for inspection and cleaning.

3. Provide chamfered strips in exposed corners of concrete stair stringers, piers, columns, beams, spandrels, internal corners and for similar conditions throughout the Work.

4. Apply form release agent in accordance with manufacturer's instructions. Do not allow to stand in puddles in the forms and prevent bonding of concrete at construction joints.

5. Construct forms to allow for installation of waterstops.

6. Thoroughly clean embedded waterstops and concrete surfaces prior to constructing forms for the next pour.

7. Tie waterstops up to prevent folding while placing concrete.

8. Coordinate work of other sections and cooperate with trade involved in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchor and other inserts. Do not perform work unless specifically indicated on Drawings or reviewed prior to installation.

9. Fabricate forms for easy removal without hammering or prying against the concrete surfaces. Kerf wood inserts for forming keyways, reglets, recesses and the like to prevent swelling and for easy removal.

10. Provide temporary openings where interior area of formwork is inaccessible for cleanout, inspection before concrete placement and placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.

1.5 QUALITY ASSURANCE

A. Design: The design and engineering of formwork, as well as its construction, shall be the responsibility of Contractor.

B. Notifications: Notify Engineer at least 24 hours in advance of placing concrete.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Formwork facing materials:

1. As-cast, smooth form finish areas:

a. Location: All surfaces.

b. The form facing material shall produce a smooth, hard, uniform texture on the concrete. It may be plywood, tempered concrete-form-grade hardboard, metal, plastic, paper; or other approved material capable to producing the desired finish. The arrangement of the facing material shall be orderly and symmetrical with the number of seams kept to the practical minimum. It shall be supported by studs or other backing capable of preventing excessive deflection (see ACI 301, Table 4.3.1 for tolerances). Material with raised grain, torn surfaces, worn edges, patches, dents or other defects which will impair the texture of the concrete surface shall not be used.

2. Deflection: Maximum deflection of forms shall be 1/240 of span or 1/4-inch, whichever is less.

B. Form ties:

1. At as-cast, smooth form finish areas:

a. Use steel rod, snap type; or wood cone, snap type, adjustable in length and of type which will leave no metal within 3/4-inch of surface.

b. Ties shall not be fitted with any device which will leave a hole larger than 7/8-inch diameter.

c. Working assembly as job conditions require.

2. For concrete walls, in addition to the above requirements, also provide waterstop type feature on the tie.

C. Form release agent: Use a chemically neutral agent in hydrocarbon solvent that will effectively prevent absorption of moisture and prevent bond with the concrete. Magic Kote by Symons, Crete-lease 727 by Cresset Company; or equal.

PART 3 - EXECUTION

3.1 ERECTION

A. Install wall form ties in a regular repetitive pattern.

B. Embedded items: Set and build into the work anchorage devices 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 the respective items.

C. Cleaning: Clean forms as erection proceeds, to remove foreign matter. Remove cuttings, shavings and debris from within forms. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports. Retighten forms after concrete placement if required to eliminate mortar leaks.

D. Applying form release agent:

1. Temperature of release agent and surfaces to which it is applied shall be a minimum of 70 degrees F.

2. Apply release agent by spray only.

3. Uniformly coat all surfaces with a thin film.

4. Wipe off excess with clean towels.

5. Apply in strict accordance with manufacturer's recommendations.

E. Form and support removal:

1. Forms and supports shall remain in place for not less than the following periods of time:

a. Building walls: 12 to 24 hours.

b. Sides of beams and girders: 12 to 24 hours.

	WHERE DESIGN LIVE LOAD IS: Less than Dead Load	Greater than Dead Load

c. Joist, beam, or girder soffits:

1) Under 10 feet clear span between supports:	7 days	4 days
2) 10 to 20 feet clear span between supports:	14 days	7 days
3) Over 20 feet clear span between supports:	21 days	14 days

d. Slabs:

1) Under 10 feet clear span between supports:	4 days	3 days
2) 10 to 20 feet clear span between supports:	7 days	4 days
3) Over 20 feet clear span between supports:	10 days	7 days

2. In any event, do not remove until concrete in walls has reached 30% of design strength, and in structural members and slabs has reached 75% of design strength.

3. Special precautions shall be taken when concrete is placed in average temperatures of 50 degrees F or below to ensure that forms are not removed before design strengths mentioned above are met.

4. If high-early-strength cement is used, the periods of time may be reduced as allowed by Engineer. This does not relieve Contractor of Contractor’s liability.

5. Remove forms in such a manner and at such times as required to ensure complete safety of persons involved and so as to fully protect and maintain structural integrity of members.

6. When the formwork is removed, cure the exposed concrete as specified under Division 03 Section "Cast-in-Place Concrete for Steam Utility Distribution."

7. Particular care shall be taken in removing forms to minimize damage to concrete surfaces.

3.2 FIELD QUALITY CONTROL

A. Inspect and check completed formwork, shoring and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties and parts are secure.

B. Clean and repair surfaces of forms to be reused in the work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable. Apply new form coating compound material to concrete contact form surfaces as specified for new formwork.

C. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten clean surfaces and tighten forms to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces. Do not use metal cover plates for repairing defects in forms for exposed concrete work.

D. Inform Engineer when formwork is complete and has been cleaned, to allow for inspection. Obtain review prior to placing concrete.

E. Allow Engineer to inspect each section of plywood type formwork prior to reuse.

END OF SECTION 031115