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UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated April 2009

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SECTION 03 47 13

TILT-UP CONCRETE
08/08

NOTE: This specification covers the requirements for tilt-up concrete wall panels precast on a previously prepared casting bed, usually the floor slab, and erection with a crane by tilting to a near vertical position, lifting free of the floor, and placing in final location.

This section includes various materials such as release agents, lifting and bracing inserts, cast-in accessories, special finishes, and installation as related to tilt-up construction. This section also includes form liners, placing concrete, tolerances, and erection and cleanup of panels.

This section does not include concrete materials common to all concrete work such as cements, aggregates, and lime.

Drawings must illustrate a complete design, indicating sizes of panels, reinforcing, locations of lifting inserts, connections details, and relative location of various structural members to which panels are connected, with sufficient dimensions to convey adequately the quantity and nature of the required work. Drawings must indicate whether the interior or exterior surface is cast face up.

Bolted and welded joints and connections must be indicated when these connections are required to resist applied loads.

Architectural concrete wall panels must be indicated.

Formwork, reinforcing steel, and concrete are specified in Section 03 30 53 MISCELLANEOUS CAST-IN-PLACE CONCRETE.

Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable items(s) or

insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments and suggestions on this guide specification are welcome and should be directed to the technical proponent of the specification. A listing of technical proponents, including their organization designation and telephone number, is on the Internet.

Recommended changes to a UFGS should be submitted as a Criteria Change Request (CCR).

PART 1 GENERAL

1.1 REFERENCES

NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a RID outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ACI INTERNATIONAL (ACI)

ACI 302.1R (2004; Errata 2006; Errata 2007) Guide for Concrete Floor and Slab Construction

ACI 551.1R (2005) Tilt-up Concrete Construction Guide

ACI CP-50 (2007) Tilt-Up Supervisor & Technician Reference Guide

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M (2008; Errata 2009) Structural Welding Code - Steel

1.2 SUBMITTALS

NOTE: Review Submittal Description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's Quality Control system. Only add a "G" if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are [for Contractor Quality Control approval.][for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Submit **Fabrication Drawings** in accordance to specifications, with reference to contract drawings.

Show connection details, reinforcing details, and lifting devices on the installation drawings, used for the following items:

- Panels**
- Reinforcement and Embedded Items**

SD-04 Samples

Provide samples for the following in accordance with paragraph entitled, "Preparation," of this section.

- Concrete Panel
- Exposed Aggregate

SD-07 Certificates

Provide certificates for the following items showing conformance with referenced standards contained in this section.

- Facing Aggregate
- Concrete Aggregates
- Chemical Admixtures
- Release Agent

Show reinforcement steel conformance with referenced standards, in accordance with paragraph entitled, "Cast-In Accessories," of this section.

- Pick-Up Inserts
- Bracing Inserts
- Reglets

1.3 QUALITY ASSURANCE

1.3.1 Erector Qualifications

Provide an experienced supervisor for panel construction and erection having at least [2] [_____] years of successful experience in tilt-up construction, similar to the size and amount required for this project. Personnel working pursuant to this section, may at the Contracting Officer's option, be required to demonstrate technical competence by performing sample work [and/or by displaying their state qualifications/certificates], at no additional cost to the Government.

1.3.2 Tolerances

Apply the following tolerances to this work:

**NOTE: Tolerances may need to be changed depending
on location of work.**

Dimensional tolerances: Plus or minus 3.2 millimeter 1/8 inch in length and height, 4.8 millimeter 3/16 inch across diagonals

Bowing or warpage tolerance: Plus or minus 12.7 millimeter in 3050 millimeter 1/2 inch in 10 feet

Thickness tolerance: Plus 12.7, minus 3.2 millimeter 1/2, minus 1/8 inch

1.4 GENERAL REQUIREMENTS

Section 05 05 23 WELDING, STRUCTURAL, ACI 551.1R and ACI CP-50 apply to work specified in this section.

1.5 SHOP DRAWINGS

Include dimensions of panels and size and location of openings for concrete formwork on the Fabrication Drawings.

PART 2 PRODUCTS

2.1 RELEASE AGENT

NOTE: Additional finishes must be specified. Resin type agents must be used for panels to receive additional finishes.

[Use resin type release agent, containing no materials that could affect bond of subsequent finishes or natural appearance of exposed concrete surfaces.]

[Use paraffin type release agent.]

2.2 CAST-IN ACCESSORIES

2.2.1 Pick-Up Inserts

[Furnish [double] [single] type inserts.]

[Furnish [corrosion-resistant steel] [hot-dip galvanized] inserts.]

2.2.2 Bracing Inserts

Furnish [corrosion-resistant steel] [hot-dip galvanized] inserts with a height corresponding to the thickness of the panel.

2.2.3 Reglets

NOTE: Select either metal or polyvinylchloride reglets. If metal reglets are required, specify either corrosion-resistance steel or hot-dip galvanized. Minimum thickness for metal reglets is 0.38 millimeter 0.015 inch.

[Furnish [corrosion-resistant] [hot-dip galvanized-] steel, 0.48 millimeter 28-gage, metal reglets with styrofoam rigid filler.]

[Furnish extruded polyvinylchloride reglets with styrofoam rigid filler.]

2.2.4 Sleeves

NOTE: Delete paragraph heading and the following two sentences if sleeves are specified under another

section or if they are not required.

[Furnish pipe sleeves, size as indicated.]

[Furnish sheetmetal sleeves, size as indicated.]

2.2.5 Lifting Devices

Furnish hot-dipped galvanized [angle] [swivel] type lifting devices.

2.3 FACING AGGREGATE

NOTE: Delete paragraph heading and the following eight sentences when facing aggregates are not required. Select applicable option(s).

Use [gravel][limestone][quartz][marble][granite][glass][ceramic] aggregate.

Match color and gradation appearance of facing aggregates of panels to the accepted sample panel.

2.4 WATER ABSORPTION

NOTE: Maximum absorption is 2 percent but must not be less than the percentage obtained by testing the facing aggregates in the sample panel.

Water absorption of facing aggregates must be not less than the percentage obtained by testing the facing aggregates in the approved sample panel.

2.5 CONCRETE AGGREGATES

Conform to Section 03 30 53 MISCELLANEOUS CAST-IN-PLACE CONCRETE for concrete aggregates, except that coarse aggregate ranges from 31.5 to 9.5 millimeter 1-1/4 to 3/8 inch in size.

2.6 CHEMICAL ADMIXTURES

NOTE: Specify admixtures when they are not included under cast-in-place concrete.

[Conform to ASTM C 494/C 494M, Type B for retarder.]

[Conform to ASTM C 494/C 494M, Type C for accelerator.]

2.7 FORM LINERS

NOTE: Delete the paragraph heading and the following eight sentences when form liners are not required. If required, select type of liner from list below.

Furnish [rubber matting][wood board][plywood panel][nailed-on inserts][fiberglass][plastic sheets][pattern as shown on drawings] form liners.

PART 3 EXECUTION

3.1 PREPARATION

[Cast a 1200 by 1200 millimeter 4 by 4 foot sample Concrete Panel on a casting slab to demonstrate releasing ability of release agent and architectural effects. Also provide three test panels, 300 by 300 millimeter 12 by 12 inches of Exposed Aggregate.]

Clean forms and the casting slab of extraneous materials. Locate the casting area for the panel in an area where floor joints are preferably avoided or at least minimize the impact to the panel being casted. Spackle and/or caulk floor joints and temporarily patch floor openings that occur in the casting area.

NOTE: Editor must specify and/or verify at the time of submittal review that the releasing agent is compatible with the final finish, such as sealants, paints, etc.

Treat casting slab with a Release Agent before placing reinforcing and embedded items. Use care not to scuff the release agent when placing reinforcing and embedded items.

Retreat scuffed areas with the release agent, using care not to coat reinforcing and embedded items. Repair holes and spalling within the slab surface from previous cast and allow to cure before applying a new coat of releasing agent.

NOTE: Editor must include concrete requirements for tilt-up panels within 03 30 00 CAST-IN-PLACE CONCRETE and 03 30 53 MISCELLANEOUS CAST-IN-PLACE CONCRETE. These may include joint locations, Slab thickness, Levelness, imbed locations, etc.

Field verify and correct any errors in the footings and foundations such as levelness, imbed locations, etc. prior to lifting. Refer to 03 33 00 CAST-IN-PLACE ARCHITECTURAL CONCRETE for additional requirements.

3.2 REINFORCEMENT AND EMBEDDED ITEMS

Accurately locate reinforcing and items to be embedded in the panels in accordance with approved drawings and placed into forms.

NOTE: Delete the following paragraph when the supporting members are not poured-in-place columns.

Extend horizontal reinforcing rods at sides of panels a minimum of 300 millimeter 12 inches into column forms.

3.3 CASTING

NOTE: When structurally possible the panel thickness should be equal to nominal thickness of wood members to increase installation and cost efficacy.

Cast Panels individually on a temporary casting slab or on the concrete floor slab of the building at the Contractor's option. Refer to section 03 30 53 MISCELLANEOUS CAST-IN-PLACE CONCRETE and comply with ACI 302.1R. Vibrate concrete to produce the maximum density without voids throughout the entire panel thickness. Care must be taken not to displace reinforcement or inserts or to score forms, liners, or the casting slab.

[Install [_____] millimeter inch cant strip along edges of formwork.]

[Install strong backs at locations where panel legs are less than [_____] millimeter inches in width.]

Furnish plastic chairs for placement of reinforcing. If steel chairs must be used then they are to be plastic tipped.

3.4 FINISHES

Finish exposed face surfaces of panels to match the approved sample panel.

NOTE: Select finish required for inside surface of panels.

Unexposed panel backs usually have a smooth float finish or a broom finish. When the inside surfaces are exposed, the panels can receive a smooth steel-trowel finish or light broom finish.

Furnish exposed panels with a [smooth trowel] [light broom] [exposed aggregate] [[brick][stone] pattern] finish.

Furnish and install architectural accents and reveals per construction drawings.

Furnish unexposed panel backs with a [smooth float] [broom] finish.

Cracks, voids, protrusions, spalls, or nonuniform color or texture are not acceptable. Patch and repair minor defects from casting to match adjacent final finish.

3.5 CURING

After casting, form-cure panels until sufficient strength has developed to permit handling the units without damage.

NOTE: The number of days for moisture curing may be changed to meet project requirements.

After removal of forms, moist-cured panels for a minimum of 6 calendar days.

3.6 FIELD QUALITY CONTROL

NOTE: Specify higher-strength concrete if required.

Do not start erection of panels until representative concrete test cylinders have a minimum compressive strength as specified on the drawings.

Locate pickup points in concrete panels so that concrete tensile stresses during erection do not exceed 10 percent of the cylinder compressive strength at time of erection.

3.7 ERECTION

Level setting bed for wall panels using high-strength mortar so that the panel in place will have a level tolerance within 1 to 500.

Erect panels using spreader bars, chockers with equalizer sheaves, adjustable bracing, and other erecting accessories required to place panels in location. Bracing equipment must meet applicable codes.

Tilt panels from the casting platform to slope within 1 horizontal to 6 vertical.

Plumb initial setting of panels within 75 millimeter 3 inches of true.

Plumb final setting of panels with adjustable braces to vertical tolerance of 1 to 500, leaving braces in place until panels are secured in their final location as indicated.

NOTE: Panels may be connected to steel columns, precast concrete columns, or cast-in-place concrete columns. Details of connecting panels to supporting structures must be indicated. Delete paragraphs not applicable.

Bolt panels to the supporting structure with High-strength bolts as specified in Section 05 12 00 STRUCTURAL STEEL.

Weld panels to the supporting structure.

NOTE: Include all the following paragraphs for welded panels.

Welding must meet the requirements of AWS D1.1/D1.1M.

Before welding, clean surfaces of loose scale, slag, rust, grease, and other foreign substances that could affect the strength of the welds.

Weld connections with weld materials that correspond to the steel being welded.

Use and maintain shielded metal arc welding.

Provide inspection gages for checking the size, length, and quality of welds.

Correct or replace welds having cracks, surface porosity, slag accumulation, insufficient throat, or concavity.

Remove weld splatter from steel surfaces to be painted.

Brace panels with adjustable turnbuckle pipe braces or timber braces.

**NOTE: Select either plastic or portland mortar.
Portland mortar (dry-packing) is recommended for
tighter joints.**

Pack joints between wall panels and foundation and wall panels and columns with [portland cement] [plastic] mortar.

3.8 PATCHING

Dry -pack holes in panels left after lifting rigging has been removed with nonshrink mortar to match adjacent surfaces.

NOTE: Select one of the following paragraphs.

**Specify sack-rubbed cleaning when surface air
pockets and minor rust stains occur.**

**Specify acid-cleaning solution when stains are
caused by rust from reinforcing and impurities in
curing water.**

[Wet stained surfaces, coat surfaces with a thick mortar mixture, and rub the area with burlap pads to remove the excess mortar and fill surface voids.]

[Remove surface stains with diluted muriatic acid, scrubbing with stiff brushes and flushing with clean water.]

-- End of Section --