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USACE / NAVFAC / AFCEC / NASA	**UFGS-03 47 13 (August 2016)**

Preparing Activity: NASA	**Superseding**
	UFGS-03 47 13 (August 2008)
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UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated January 2021

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08/16

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SECTION 03 47 13

TILT-UP CONCRETE
08/16

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NOTE: This guide 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.

Ensure drawings 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. Verify that drawings indicate whether the interior or exterior surface is cast face up.

Ensure bolted and welded joints and connections are indicated when these connections are required to resist applied loads.

Ensure architectural concrete wall panels are indicated.

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

Adhere to UFC 1-300-02 Unified Facilities Guide

Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable item(s) or insert appropriate information.

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

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).
****

PART 1 GENERAL

Section 05 05 23.16 STRUCTURAL WELDING, Section 03 30 53 MISCELLANEOUS CAST-IN-PLACE CONCRETE, and Section 07 92 00 JOINT SEALANTS, along with ACI 551.1R and ACI CP-50 apply to work specified in this section.

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 Reference Identifier (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.

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 302.1R	(2015) Guide for Concrete Floor and Slab Construction
ACI 551.1R	(2014) Tilt-up Concrete Construction Guide
ACI CP-50	(2007) Tilt-Up Supervisor & Technician Reference Guide

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2020) Structural Welding Code - Steel

ASTM INTERNATIONAL (ASTM)

ASTM C494/C494M	(2019) Standard Specification for Chemical Admixtures for Concrete

1.2 ADMINISTRATIVE REQUIREMENTS

1.2.1 Pre-Installation Meetings

No later than [30] [_____] days after Contract Award, the Contracting Officer will schedule a pre-installation meeting. Bring to attention of the Contracting Officer any discrepancies found in the architectural and structural drawings. Submit the following:

a. Submit Fabrication Drawings signed and sealed by a registered professional engineer. Include dimensions of panels and size and location of openings for concrete formwork on the fabrication drawings. Show connection details, reinforcing details, and lifting devices on the installation drawings, used for the following items:

(1) Panels

(2) Reinforcement and Embedded Items

b. Submit certificates for the following items showing conformance with referenced standards contained in this section:

(1) Facing Aggregate

(2) Concrete Aggregates

(3) Chemical Admixtures

(4) Release Agent

(5) Pick-Up Inserts

(6) Bracing Inserts

(7) Reglets

1.3 SUBMITTALS

****

NOTE: Review Submittal Description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project. The Guide Specification technical editors have classified those items that require Government approval, due to their complexity or criticality, with a "G." Generally, other submittal items can be reviewed by the Contractor's Quality Control System. Only add a “G” to an item,

if the submittal is sufficiently important or complex in context of the project.

For Army projects, fill in the empty brackets following the "G" classification, with a code of up to three characters 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.

The "S" classification indicates submittals required as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES.

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" or "S" classification. Submittals not having a "G" or "S" classification are [for Contractor Quality Control approval.][for information only. When used, a code following the "G" classification 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

Fabrication Drawings

Panels

Reinforcement and Embedded Items

SD-04 Samples

Concrete Panel Sample; G[, [____]]

Exposed Aggregate; G[, [____]]

SD-07 Certificates

Facing Aggregate

Concrete Aggregates

Chemical Admixtures

Release Agent

Pick-Up Inserts

Bracing Inserts

Reglets

1.4 QUALITY CONTROL

1.4.1 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.

1.4.2 Tolerances

Apply the following tolerances to this work:

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

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

b. Bowing or warpage tolerance: Plus or minus 12.7 millimeter in 3050 millimeter 1/2[_____] inch in 10 feet

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

[1.4.2.1 Samples

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

]PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

2.1.1 Water Absorption

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

Ensure water absorption of facing aggregates is not less than the percentage obtained by testing the facing aggregates in the approved sample panel.

2.2 EQUIPMENT

2.2.1 Form Liners

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

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

2.3 MATERIALS

2.3.1 Chemical Admixtures

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

[Provide admixture conforming to ASTM C494/C494M, Type B for retarder.

][Provide admixture conforming to ASTM C494/C494M, Type C for accelerator.

]

2.3.2 Release Agent

****
NOTE: Ensure additional finishes are specified. Ensure resin type agents are 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.

]

2.3.3 Facing Aggregate

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

Provide [gravel][limestone][quartz][marble][granite][glass][ceramic] aggregate. Match color and gradation appearance of facing aggregates of panels to the accepted sample panel.

2.3.4 Concrete Aggregates

Provide concrete aggregates conforming 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.

2.4 CAST-IN ACCESSORIES

2.4.1 Pick-Up Inserts

[Provide [double] [single] type inserts.

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

]2.4.2 Bracing Inserts

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

2.4.3 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.
****

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

][Provide extruded polyvinylchloride reglets with styrofoam rigid filler.

]2.4.4 Sleeves

****
NOTE: Delete paragraph heading and the following two sentences if sleeves are specified under another section or if they are not required.
****

[Provide pipe sleeves, size as indicated.

][Provide sheetmetal sleeves, size as indicated.

]2.4.5 Lifting Devices

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

PART 3 EXECUTION

3.1 PREPARATION

Clean forms and the casting slab of extraneous materials. Locate the casting area for the panel in an area were 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: 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.

Re-treat 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: Include concrete requirements for tilt-up panels within Section 03 30 00 CAST-IN-PLACE CONCRETE and Section 03 30 53 MISCELLANEOUS CAST-IN-PLACE CONCRETE. These may include joint locations, Slab thickness, Levelness, embed locations, etc.
****

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

3.2 INSTALLATION

3.2.1 Reinforcement And Embedded Items

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

]3.2.2 Casting

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

Cast panels individually on a temporary casting slab or on the concrete floor slab of the building. 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. Do not displace reinforcement or inserts, or cause scoring of forms, liners, or the casting slab.

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

][Install strong backs at locations were panel legs are less then [_____]

millimeter inches in width.

] Furnish plastic or plastic tipped steel chairs for placement of reinforcing.

3.2.3 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.
****

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

Provide architectural accents and reveals per construction drawings.

Provide 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.

3.2.4 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-cure panels for a minimum of 6 calendar days.

3.3 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.

3.4 ERECTION

Level the 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 as required to place panels in location. Ensure bracing equipment meets applicable codes.

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

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. Ensure details of connecting panels to supporting structures are indicated. Delete paragraphs which are 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.
****

Ensure welding meets 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.

3.5 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 --