
USACE / NAVFAC / AFCEA / NASA UFGS-03 41 33.00 10 (April 2006)

Preparing Activity: USACE Replacing without change
UFGS-03410A (February 2004)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMLR dated 9 October 2006

Latest change indicated by CHG tags

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SECTION 03 41 33.00 10

PRECAST/PRESTRESSED CONCRETE FLOOR AND ROOF UNITS 04/06

NOTE: This guide specification covers the requirements for precast/prestressed concrete floor and roof units, single and double tees and hollow-core and solid flat slabs.

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).

Use of electronic communication is encouraged.

Brackets are used in the text to indicate designer choices or locations where text must be supplied by the designer.

PART 1 GENERAL

NOTE: Except for speciality items, most precast floor and roof units manufactured in this country are prestressed. Units are available in four basic shapes: single and double tees and hollow-core and solid flat slabs. T-sections are capable of spanning greater lengths than flat-slab sections. Designer should consult PCI MNL-120 for limitations.

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 318 (2005) Building Code Requirements for Structural Concrete and Commentary

ACI 318M (2005) Metric Building Code Requirements for Structural Concrete and Commentary

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M (2006) Structural Welding Code - Steel

PRECAST/PRESTRESSED CONCRETE INSTITUTE (PCI)

PCI MNL-116 (1999) Quality Control for Plants and Production of Structural Precast Concrete Products

PCI MNL-120 (1999) Design Handbook - Precast and Prestressed Concrete

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.] [information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Precast/Prestressed Units[; G][; G, [_____]]

Detail drawings shall consist of erection instructions and the following as applicable:

- a. Anchorage for work of other trades.
- b. Anchorage to supporting construction, if required by the design.
- c. Headers for openings where additional structural work is required.
- d. Joints between units and between units and other construction.
- e. Reinforcing including prestressing steel details.
- f. Pick-up points for handling units.
- g. Minimum concrete compressive strengths at initial prestress and 28 days, initial prestress to be applied, and minimum release strength.
- h. Shoring, unless structural computations are submitted showing that allowable concrete stresses during the work will not be exceeded when shoring is not used.
- i. Layout plan and member identification marks.

SD-03 Product Data

Precast/Prestressed Units

Complete design analysis and load charts signed by a professional engineer and in booklet form for the units to be furnished. Analysis shall include mixture proportion; concrete strength; stress calculations; complete camber calculation showing initial camber, estimated long term camber, and anticipated long term camber and deflection. Design analysis shall indicate which code the design was based on.

SD-06 Test Reports

Tests

Certified copies of test reports including all data and results of tests performed as required by **PCI MNL-116**.

1.3 GENERAL REQUIREMENTS

NOTE: **PCI MNL-116** basically covers plant fabrication of precast/prestressed concrete. All material requirements are covered in the manual; altering these requirements will not be permitted except for special circumstances to establish critical job requirements and only when alteration is economically justified.

Precast/prestressed units shall be produced under plant-controlled conditions conforming to **PCI MNL-116** by a firm certified under the PCI Plant Certification Program and specializing in providing precast/prestressed concrete floor and roof units and related services.

1.4 DESIGN

NOTE: The design of precast/prestressed concrete units is normally the responsibility of the manufacturer and, unless otherwise warranted, should remain so to avoid contractual difficulties in defining responsibilities.

Design of units shall be performed by structural analysis in accordance with **ACI 318M ACI 318** or **PCI MNL-120** whichever is customary with the fabricator. Structural analysis shall include evaluations of the effects of connections, holes, discontinuities, concentrated loads, and joints. Units shall be designed for the load conditions and spans indicated and any additional loads imposed by openings; work of other trades; concrete topping indicated; and all loading and restraining conditions from fabrication, handling, and erection. The sum of the immediate deflection due to live load and additional long-term deflection shall not exceed the deflection limitations indicated. The design shall compensate for the weight of the additional topping required by the camber in order to achieve the minimum topping thickness used in the design.

1.5 HANDLING AND STORAGE

Units shall be cured prior to delivery to the jobsite. Units shall be stored off the ground and protected from soilage, marring, damage, or overload. Stacked members shall be separated by battens across the full width at bearing points.

PART 2 PRODUCTS

2.1 FABRICATION

NOTE: Drawings will show shape and span of units and openings for mechanical and utility systems, and for architectural purpose. To the maximum extent possible, location of inserts, anchors, conduits, etc., will be indicated.

In order to resist seismic forces, the concrete topping must act as a diaphragm and the top of the units must be roughened to achieve a bonded surface.

Roughening equivalent to the shear friction requirements in AIC 318M (ACI 318) to achieve a friction factor of 1.0 is needed. The designer, depending on the job geographical location and following the guidance provided in UFC 3-310-03A SEISMIC DESIGN FOR BUILDINGS, must determine when to delete the last sentence.

Fabrication of the units shall be in accordance with the requirements of [PCI MNL-116](#). Units shall be made available for inspection by the Contracting Officer at the manufacturer's plant. Shape of units shall be [single tees] [double tees] [hollow-core slabs] [solid flat slabs] as indicated. Unit spans shall be as shown. Units shall be fabricated within the dimensional tolerances given in [PCI MNL-116](#). Inserts, anchor bolts, bearing plates, and other embedded items shall be located as required or indicated. Where required, units shall be marked to facilitate sequential erection. Openings for mechanical and utility systems and for architectural purpose shall be as shown. Prestressing eccentricity and force applied shall be adjusted to the extent possible so that the camber provided is the minimum amount needed to produce an approximate level slab after dead loads are applied. Surfaces that will be concealed from view shall be free of surface holes over [13 mm 1/2 inch](#) in diameter. Surfaces to receive subsequent applications other than painting shall be suitable for the purpose intended and free of any coatings that would interfere with adhesion or bond. Surfaces that will be painted or exposed to view shall be smooth, free of form marks, and shall have surface blemishes filled and finished to match adjoining concrete in color and texture. Top surfaces which are to receive concrete topping shall be roughened to a full amplitude of approximately [6 mm 1/4 inch](#).

2.2 TESTS

Tests, as required by [PCI MNL-116](#), shall be performed by an independent testing laboratory or in the manufacturer's approved laboratory if the manufacturer has a PCI certified plant with proof of current certification.

PART 3 EXECUTION

3.1 ERECTION

Erection shall be in accordance with the approved detail drawings. Field welding shall be in accordance with AWS D1.1/D1.1M. Installation of equipment required by other trades shall be accomplished as the work progresses if required by design. Field-cut openings for utilities penetrations will not be permitted unless recommended by the manufacturer and approved by the Contracting Officer. Bearing surfaces shall be level and free from irregularities. Irregularities in masonry bearing surfaces shall be leveled as recommended by the manufacturer or with a stiff cement grout. Grout shall be allowed to harden before installing the units. Units shall be installed at right angles to bearings, drawn up tight without forcing or distortion, and with sides plumb. Slab ends shall be aligned. Underside of slabs shall present true ceiling surface when the ceiling is exposed to view. Where shown on approved detail drawings, the keyways between units and other spaces shall be cleaned and filled solid with grout. Grout that may have seeped through to surfaces in spaces below shall be removed before hardening. Joints in ceilings that will be exposed to view or painted shall be caulked as specified in Section 07 92 00 JOINT SEALANTS. Erected units shall be temporarily covered until finish roofing is applied.

3.2 CONCRETE TOPPING

NOTE: For structures in seismic zones 2 and above, the minimum thickness of 63 mm (2-1/2 inches) must be selected.

If topping is not required, delete this paragraph.

Concrete topping reinforced with welded wire fabric shall be applied to tops of units continuous over the entire span. Welded wire fabric of the size indicated shall be as specified in Section 03 20 01.00 10 CONCRETE REINFORCEMENT. Tops of units shall be clean and free of any material that would reduce adhesion or bond. The concrete topping shall be a minimum of [63] [50] mm [2-1/2] [2] inches thick of 21 MPa 3,000 psi minimum compressive strength at 28 days. Concrete materials, quality, placing, curing, and finishing shall be as specified in Section 03 31 00.00 10 CAST-IN-PLACE STRUCTURAL CONCRETE.

3.3 SPECIAL INSPECTION AND TESTING FOR SEISMIC-RESISTING SYSTEMS

NOTE: Include this paragraph only when special inspection and testing for seismic-resisting systems is required by paragraph 3.2 of FEMA 302, NEHRP RECOMMENDED PROVISIONS FOR SEISMIC REGULATIONS FOR NEW BUILDINGS AND OTHER STRUCTURES.

This paragraph will be applicable to both new buildings designed according to UFC 3-310-03A SEISMIC DESIGN FOR BUILDINGS, and to existing building seismic rehabilitation designs done according to UFC 3-301-05A SEISMIC EVALUATION AND REHABILITATION FOR BUILDINGS.

The designer must indicate on the drawings all locations and all features for which special inspection and testing is required in accordance with Chapter 3 of FEMA 302. This includes indicating the locations of all structural components and connections requiring inspection.

Add any additional requirements as necessary.

Special inspections and testing for seismic-resisting systems and components shall be done in accordance with Section 01 45 35 SPECIAL INSPECTION FOR SEISMIC-RESISTING SYSTEMS.

-- End of Section --