



Facilities Planning and Construction Design and Construction Standards

DIVISION 03 - Concrete

Preface

The Texas Tech University System's ' _____ , as administrated by Facilities Planning and Construction, are intended to serve as guidelines to the Design Professional and Construction Management teams for design development and construction administration of Texas Tech University System \$TTUS% Capital Projects'. They communicate the minimum expectations and requirements relative to specific building systems, design provisions, general specification requirements, and administrative procedures for facilities being constructed on Texas Tech University System \$*SU, " SU, TTU, TTU+SC, and TTU+SC , I Paso% campuses'. Several, but not all requirements for each component -institution or agency within the TTU System are covered'. Design Professionals, Construction Managers at .is/ and/or Design/Build Firms shall also refer to provisions covered in their service agreements, as well as within the project's Basis of Design \$23 % document'

In addition, the ' Design and Construction Standards' shall also be utilized in conjunction with the approved project specific Program and Schematic Design development'. In the event of conflict between this document and specific project requirements, Design Professionals, Construction Managers at .is/ and/or Design/Build Firms shall contact Facilities Planning & Construction for clarification'

The guidelines within the ' _____ are not intended to prohibit the use of alternative design solutions, methods, systems, products or devices not covered in this document'. Considered alternatives deviating from or not covered in these standards shall be documented by the Design Professional and/or Construction Management teams and submitted to Facilities Planning & Construction for approval prior to implementation'

Throughout the ' _____ there are references to manufacturer specific products'. These are to be considered the 'Basis of Design' to establish the expected

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minimum (uality re(uirements' esign Professionals are encouraged to identify and include e(uivalent #roducts and/or manu!acturers o!!ering com#arable #roducts to !acilitate o#en bidding environments'

General Requirements for Concrete

Concrete construction shall be designed, !ormed, #laced, !inished, and tested in strict accordance)ith the *merican Society !or Testing and "aterials \$*ST " % and the *merican Concrete -nstitute's \$*C-% re(uirements'

Concrete #roducts and materials \$mix designs, rein!orcement, and strength re(uirements%)ill be s#ecified by the Project esign Professionals' Pre!installation meetings are re(uired #rior to commencement o! the 7 or/ to determine the acce#table)or/ing restrictions concerning)ater added at site, use o! admixtures, trans#ortation and delivery methods, conditional)eather re(uirements, concrete curing, materials testing and ins#ections, etc'

"anu!acturer must be certified according to the 8ational .eady "ixed Concrete *ssociation's Certification o! .eady "ixed Concrete Production Facilities' elivery tic/ets shall be !urnished)ith each load o! concrete delivered to the #roject' Tic/et shall sho) class and strength o! concrete, number o! #ounds o! cementitious material, si4e o! coarse aggregate, batching time, slum# ordered and amount o! admixture' -ndicate amounts o! mix)ater to be)ithheld !or later addition at #roject site'

2atch design mixes)ill be s#ecified by the esign Professional' "anu!acturer's batching mixture and rein!orcement certificate \$)hen a##licable% must be a##roved by the esign Professional #rior to installation'

The esign Professional must s#ecify that the 3)ner reserves the right to ins#ect the batching #lant and the mixing #rocesses' *dmixtures may be added to the concrete design mix as #er esign Professional's recommendation to im#rove strength,)or/ability, or to meet #roject needs' o not add)ater to concrete alter adding high!range)ater!reducing admixtures to mix' o not add)ater to concrete beyond the limit o!)ater)ithheld !rom the #lant'

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The Design Professional shall specify to protect freshly placed concrete from premature drying and excessive cold or hot temperatures' Concrete slabs-on-grade, elevated concrete slabs and concrete roof decks associated with the building footprint are required to be quality controlled from excessive shrinkage cracking by active curing methods implementing wet curing blankets. The Design Professional is to specify the use of Mika UltraCure %C&, Mika UltraCure ! ' , or a comparable wet cure blanket in " (R)* +execution portion of ,))) , , Concrete specification.

Comply with *C- : ; < 1 (or cold) either protection and) with recommendations in *C- : ; = . (or hot) either protection during curing' Minimum actual concrete temperature shall never be less than = ; degrees F from the truck/ at time of placement, and maximum concrete temperature shall never exceed >= degrees F from the truck/ at time of placement' Contractor shall develop a cold) either concreting plan and a hot) either concrete plan prior to placement of any concrete'

3)ner) will engage a (qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement'

*c (cure composite fresh concrete specimens for the purpose of strength confirmation shall be obtained and field cured according to *ST " C : 1' Sampling of fresh concrete for slump, temperature and air content shall be performed in accordance) with *ST " C 1?6 shall be performed according to the following requirements

1' Testing Frequency Obtain one composite sample for each day's pour of each concrete mix exceeding = cu' yd', but less than 6= cu' yd', plus one set for each additional = ; cu' yd' or fraction thereof'

6' Slump *ST " C 1A: one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix' Perform additional tests when concrete consistency appears to change 33 () -81 . 2TJc-243 . 466 -18 . -5 . 15

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- A' Concrete Temperature *ST " C 1; <A> one test hourly when air temperature is A; deg F and below and when C; deg F and above, and one test for each composite sample'
- = ' Unit weight *ST " C =<?, fresh unit weight of structural lightweight concrete one test for each composite sample, but not less than one test for each day's pour of each concrete mix'
- <' Compression Test Specimens *ST " C :> cast, mold and cure one set of four standard <D>E16D test cylinder specimens or five ADECD test cylinder specimens for each composite sample'
- ? ' Compressive Strength Tests *ST " C :> for <D>E16D cylinders test one cured specimen at ? days for information only and two at 60 days to average compressive strength' + add one sample for retesting if required For ADE CD cylinders test one cured specimen at ? days for information only and three at 60 days to average compressive strength' + add one sample for retesting if required'
- a' * compressive strength test shall be the average of the strengths of at least two <D>E16D cylinders or at least three ADECD cylinders made from the same sample of concrete and tested at 60 days'
- C' Testing specimens are to be taken after all admixtures and/or field added water has been added and incorporated into concrete'

Fiber-Reinforced Concrete for Site Work (Type III, III and IV " #1000psi)

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<' Color Pigment§ *ST " C >?>, synthetic mineral oxide pigments or colored) ater/
reducing admixtures§ color stable !ree o! carbon black/, non!ading, and resistant to
lime and other al/alis'

La#or barrier shall conform to *ST " , 1=A #olyethylene sheet not less than 1= mils thic/'
Place, #rotect, and re#air va#or!retarder sheets according to manu!acturer's) ritten instructions'

Floor Flatness \$FF% and Jlevelness \$FJ% Tolerances !or !inish !loors or sub!loors shall be
determined in accordance) ith *ST " , 11=='. The esign Professional shall s#eci!y the
Flatness and Jlevelness tolerances to meet Project re(uiirements'

Concrete finishes to be determined by the esign Professional and the 3) ner's . e#resentvter33(o)0.5915 r n

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Qualification of Manufacturer (qualified manufacturer that participates in PC's Plant Certification Program and is designated a PC-Certified Plant for Group G, Glass Fiber Reinforced Concrete) Certification shall be maintained throughout the production of the glass fiber reinforced concrete units. Production shall immediately stop if at any time the fabricator's certification is revoked, regardless of the status of completion of contracted (or) Production (or) will not be allowed to restart until the necessary corrections are made and certification has been reestablished. In the event certification cannot be reestablished in a timely manner, causing project delays, the fabricator, at no additional cost, will contract out the remainder of the units to be manufactured at a PC-certified plant.

Mockups Build mockups to demonstrate aesthetic effects and establish the required quality acceptance standards for fabrication and installation of the project.

GFRC Material Standards

- Portland Cement (ASTM C150, Type I, II, or III)
- Water (ASTM C110, Class 8)
- Glass Fibers (alkali resistant, with a minimum silica content of 16 percent, 1 to 6 inches long, specifically produced for use in GFRC, and complying with ASTM C1490-14)
- Sand for GFRC (washed and dried silica, complying with composition requirements of ASTM C1363 (passing 80µm; 100µm sieve) with a maximum of 6 percent passing 425µm; 1mm sieve)
- Color (mixes of synthetic mineral oxide pigments or colored) after reducing admixtures, temperature stable, non-leaching, and alkali resistant
- Water (Potable) free from deleterious material that may affect color stability, setting, or strength of GFRC and complying with chemical limits of PC-8J1.1
- Polymer Curing (mixture of acrylic thermoelastic copolymer dispersion complying with PC-8J1.1)
- Reinforcing (mixture) (ASTM C660), containing not more than 0.1 percent chloride ions

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