Subsection 4.09
Miscellaneous Concrete

I. Scope: This item includes Portland cement for but not limited to sidewalks, medians, and islands, with or without reinforcing steel as required, constructed on an approved subgrade, sand, flexible base, or other foundation. The construction shall conform to the lines and grades established on the plans. The project drawings shall provide details of all concrete work.

II. Materials

A. Concrete: Concrete shall conform to the requirements of Subsection "4.07"*.* Concrete shall meet 3000 psi*.*

B. Water: Water usage shall conform to Subsection 3.04 "Requirements for Water Usage."

C. Concrete Mortar: Mortar shall consist of 1 part cement, 2 parts finely graded sand and sufficient water to make the mixture plastic.

D. Curing Materials:

1. Burlap: Burlap shall be made from jute or hemp and, at the time of using shall be in good condition, free from holes, dirt, clay, or any other substance which interferes with its absorptive quality. It shall not contain any substance which would have a deleterious effect on the concrete. Burlap shall be of such quality that it will absorb water readily when dipped or sprayed and shall weigh not less than 7 ounces per square yard when clean and dry. Burlap made into mats may be used if care in handling is exercised to avoid marring the finished surface of the concrete.

2. Cotton Mats: Cotton mats for curing concrete shall conform to the requirements of AASHTO M 73 "Cotton Mats for Curing Concrete."

3. Waterproof Paper: Paper and impermeable sheets for curing concrete shall conform to the requirements of ASTM C 171 "Sheet Materials for Curing Concrete."

4. Liquid Membrane-Forming Compounds: Liquid membrane-forming compounds shall conform to the requirements of DMS-4650 "Hydraulic Cement Concrete Curing Materials and Evaporation Retardants."

E. Steel Reinforcement

1. Welded Wire Fabric: Welded wire fabric shall conform to the

requirements of Subsection 4.12 “Reinforcing Steel.”

2. Bars, Tie Bars, Dowels and Sleeves: All bars shall conform to Subsection 4.12 “Reinforcing Steel.” Joint hook bolts may be used as an alternative to tie bars. Such bolts shall not be less than 1/2 inch in diameter and should be equipped with threaded couplings. Dowel bars shall not be burred, roughened, or deformed out of round in such a manner as to affect slippage in the concrete. When metal sleeves are used, they shall cover the ends of the dowels for not less than 2 inches nor more than 3 inches. The sleeve shall be closed at one end and shall have a suitable stop to hold the end of the bar at least 1 inch from the closed end of the sleeve. It shall be of such rigid design that the closed end will not collapse during construction.

3. Supports: Chairs for holding tie rods, bars, and other structural members in correct position while the concrete is being placed shall be made of material approved by the Engineer prior to use.

F. Fiber Reinforcement:

1. Types:

a) Stainless, alloy, or carbon steel:

b) Alkali resistant glass: and

c) Synthetic fiber.

2. Compliance: All fiber reinforcement shall conform to DMS-4550 “Fibers for Concrete.”

G. Expansion Joint Material: Preformed fiber expansion joint material shall be of the dimensions shown on the plans. The material may be the following types unless specifically noted otherwise on the plans. Preformed bituminous fiber material shall conform to ASTM D 1751 "Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and resilient bituminous types)." Preformed non-bituminous fiber material shall conform to ASTM D 1752 "Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction."

H. Joint Sealing Material: Unless otherwise shown on the plans, joint sealing material shall conform to the requirements of Subsection 4.29 “Crack and Joint Sealing.”

III. Equipment: Contractor shall all equipment including those covered in Subsection 4.07 “Concrete.”

IV. Construction Methods: The Contractor shall design, produce, transport, and place the class of concrete in accordance with requirements of this Subsection. The Contractor will perform quality assurance (QA) testing at the scope and frequency outlined in Table 1. QA testing conducted by the Contractor will be submitted to the ODR for review to determine payment and make acceptance decisions. The Contractor may perform quality control (Q/C)

testing. The Contractor is allowed to submit Q/C testing to the ODR. The ODR reserves the right to take additional Q/A tests.

Table 1
Concrete Testing Frequency

Test For	Test Number	Sampling Location	Frequency of Testing	Remarks
Compressive Strength	Tex-418-A	At point of placement	4 cylinders for each 100 CY or fraction thereof for 3000 psi concrete.	Sampling shall be in accordance with Tex-407-A. 2 cylinders shall be tested at 7 days and if the average is below the design strength as defined in Table 1 of Subsection 4.07 "Concrete", the remaining 2 cylinders shall be tested at 28 days. If the average value of the 2 cylinders broken at 7 days the 2 remaining cylinders are not required to be tested.
Slump	Tex-415-A	At point of placement	When cylinders are taken.	Slump shall be 4" maximum.
Entrained Air	Tex-416-A or Tex-414-A	At point of placement	When cylinders are taken.	A minimum of 3% and a maximum of 7% entrained air is required.
Temperature	Tex-422-A	At point of placement	When cylinders are taken.	Maximum temperature at placement is 90˚F.

A. Subgrade Preparation: Subgrade shall be excavated and shaped to line, grade, and cross section. If dry, the subgrade shall be sprinkled lightly immediately before concrete placement.

The subgrade shall be excavated to the correct elevation. Any fill required shall be furnished by the Contractor and approved by the Project Representative. The subgrade in fill areas shall be brought to correct elevation by placing like soil or flexible base in layers not to exceed 4 inches in depth. Each layer shall be brought to ± 2% of optimum moisture and compacted to a density of 95% of Standard Proctor in the upper 6 inches of subgrade. Any damage to an existing improvement caused by the Contractor shall be repaired.

B. Forming: Forms shall be of wood or metal, of a satisfactory section, straight, free from warp, and of a depth equal to the thickness of the finished work. They shall be securely staked to line and grade and maintained in a true position during concrete placement.

Stakes used to support expansion joint fillers shall be channel or U-shaped metal, 3/4 inches wide, 3/8 inches deep, and not less than 16 gauge (Manufacturers' standard gauge for steel sheets) in thickness. They shall be a minimum of 15 inches in length or longer in necessary to provide proper bearing support.

Forms shall remain in place at least 12 hours after placement of concrete. Forms shall be treated with light oil before each use and forms which are to be re-used shall be cleaned immediately after use and maintained in good condition.

C. Reinforcing: The reinforcing steel bars and/or dowels shall be of the correct size and dimension and shall be placed and secured in position as shown on the plans.

Where welded wire mesh reinforcement is specified, the mesh shall lap not less than 7 inches and shall be securely tied. All wire mesh shall be neatly cut to the shape of the construction and to fit around all obstructions. Reinforcing bars at proper spacing may be substituted for welded wire mesh.

D. Concrete: Concrete shall be satisfactorily mixed, placed in the forms to the depth specified, spaded, and tamped until thoroughly compacted. The top surface shall be finished with a wooden float to a gritty texture.

Should a chute be used in placing concrete, the slope of the chute and the delivery end of the chute shall be such that the concrete will flow without separation. The delivery end of the chute shall be as close as possible to the point of deposit. The chute shall be thoroughly flushed with water before and after each run. The flushing shall discharge outside the forms.

All concrete surfaces shall be reasonably true and even, free from pockets, depressions or projections, and given a steel trowel finish and then a light brush finish.

An edging tool with a radius of approximately 1/4 inch shall be used along each edge of a sidewalk, the top back edge of the curb, along the front edge of the gutter, and along each side of each expansion joint.

All concrete shall be properly cured by being kept moist for 3 days with wetted burlap or mats, or by an approved process. Concrete may be cured by applying a liquid membrane coating (curing compound) to all exposed surfaces.

The curb and gutter shall be backfilled to the full height of the concrete, tamped and sloped as directed.

Concrete shall be deposited that requires minimum rehandling and obtain a uniformly dense section, free of honeycombs, and conforming to line, grade, and cross section.

In general, the consistency of the concrete mixture shall be such that:

1. The mortar will cling to the coarse aggregate;

2. The concrete is not sufficiently fluid to segregate when transported to the place of deposit;

3. The concrete, when dropped directly from the discharge chute of the mixer, will flatten out at the center of the pile; but the edges of the pile will stand up and not flow;

4. The mortar will show no free water when removed from the mixer;

5. The concrete will settle into place when deposited in the forms; and when transported in metal chutes at an angle of 30° with the horizontal, it will slide and will not flow into place;

6. The surface of the finished concrete will be free from laitance or a surface film of free water; and

Other concrete placement methods such as a slip form machine for curb and gutter is allowable if the concrete can meet these specifications.

Shrinkage Crack Control: Concrete shall be below the allowable temperature as determined by the Contractor by using (ACI 305 chart modified). The rate of evaporation of water from the concrete shall not exceed 0.15pounds per square foot per hour. The Contractor shall keep a log of air temperatures, relative humidity, wind velocity, and allowable concrete temperature for each day he places concrete. The log shall be readily available for review by the Project Representative. For air temperature, relative humidity and wind speeds other than what is listed, the next highest temperature shown, next lowest relative humidity, and next highest wind velocity interval shall be used to determine acceptable concrete temperature.

Contractor is to inform the concrete supplier of the temperature requirements prior to delivery to the project. The concrete temperature limit shall not be exceeded at least until fifteen minutes after surface finishing. Appropriate curing methods shall be used to prevent shrinkage cracks in conjunction with these concrete temperature requirements.

Concrete shall not be poured when wind or weather conditions are such that dirt, sand, or debris enters the concrete. No concrete will be placed when wind speeds exceed 25 miles per hour. The concrete shall be protected to maintain temperatures of not less than 50°F for 5 days after placement. If aggregate and water are heated, they shall not be heated above 175°F. Concrete shall not be placed when ambient temperature is less than 40°F. It shall be the responsibility of the Contractor to anticipate as nearly as possible changes in weather conditions which would affect the placement and protection of the concrete and to be prepared to protect freshly placed concrete when sudden changes in the weather make such protection necessary.

E. Sidewalks: All sidewalks and step treads shall have a maximum transverse slope of 2%. Care shall be exercised to match the grade of sidewalk to the top of curb (where applicable) and to the grade of driveways, if any. Care shall also be taken to ramp sidewalk to tie flush with alley paving.

All sidewalks constructed at a location designated on the plans shall be not less than 4 feet in width. All ADA requirements will be met.

F. Medians and Islands: Place concrete for each section to the lines, grades, and cross sections. Separate sections from adjacent curbs or adjoining sections using expansion or contraction joints of the type and size shown on the plans. A curb section

may be used for the perimeter of the median or island when shown on the plans. Construct curbs in accordance with Subsection 4.08 "Concrete Curb, and Curb and Gutter." Finish exposed surfaces with a wood or metal float after sufficient concrete set. Round edges as shown on the plans. Cure at least 72 hours.

G. Steps: All steps shall have a tread of not less than 12 inches and a riser of not more than 7 inches. Where more than one step is constructed at a location, the treads and risers for each shall be of equal dimension.

H. Expansion Joints and Scoring: Expansion joints shall be placed at intervals not to exceed 30 feet in the sidewalk. For medians and islands, expansion joints will be shown on the plans. An expansion joint shall be placed at the end of each radius where the radius connects onto concrete curb and gutter. Forethought shall be used in the spacing of expansion joints and also in the spacing of the scoring so as to have approximately equal spacings and so that no short or long spacings will exist.

Where a sidewalk or curb and gutter are being constructed adjacent to or abutting existing concrete construction, an expansion joint shall be placed between the new and the existing concrete. Expansion material shall also be placed around all obstructions protruding through sidewalks or driveways.

All expansion joints shall be ¼ inch below surface of the concrete.

Scoring shall be placed by the use of approved jointing tools. If curb and gutter has been placed and sidewalk abuts the curb and gutter, the joints in the sidewalk will match the joints in the curb.

I. Horizontal and Vertical Control: All forms for concrete work shall be inspected and checked by the Project Representative to insure their compliance with established lines and grades before any concrete is poured. The Contractor shall notify the appropriate department at least four hours prior to pouring of any concrete to have forms checked. No concrete is to be poured until the Project Representative accepts the forms, foundation conditions, amount, size, and location of reinforcement.

J. Protection: The Contractor shall provide and maintain all necessary barricades and sufficient lights, signals, signs, watchmen, and any and all other things necessary for the protection of the work and for the safety of the public.

The Contractor must protect his work against weather, vandals, and any and all things that may mar the finish, surface, or the appearance of the concrete. Any damage to the surface is cause for rejection of all concrete between the expansion joints on either side of the damaged surface.

V. Measurement: Work and accepted material as prescribed for sidewalks, driveways, islands, medians, alleys or similar concrete construction will be measured by a unit of surface area installed complete.

VI. Payment: The work performed and materials furnished as prescribed by this item and measured as provided will be paid for at the unit price bid. The prices shall each be full

compensation for preparing the subgrade; for furnishing, and placing all materials, including all reinforcement and expansion joint materials; for furnishing, placing, testing, shaping and tamping backfill; and for all manipulation, labor, tools, equipment, and incidentals necessary to complete the work.

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