03 20 00  Concrete Reinforcing

1.0 General

A. Avoid steel reinforcement in exterior non-structural slabs-on-grade. Use fiber mesh reinforcing.

2.0 Manhole/Vault Adjustment

A. Contractor must adjust the existing manholes/vaults as required to be flush with the finish grade, as identified at pre-bid.

3.0 Concrete Sidewalks

A. Sidewalks shall be built of 4,000 psi fiber mesh reinforced concrete to dimensions and at locations shown on the drawings. Maximum size of course aggregate shall be 1 1/2 inch. Concrete shall have a slump of between 1 1/2 and 4 inches. The concrete mixtures shall have air content by volume of concrete, based on measurements made immediately after discharge from the mixer of five to seven percent. Air content shall be determined in accordance with ASTM C 231. Compounds containing calcium chloride shall not be used. Sidewalks shall be six inches thick and reinforced with fiber mesh at all locations.

1. Special care must be given to see that fiber mesh is fully incorporated into concrete prior to placement.
2. Fiber mesh found not to be incorporated at time of placement may cause rejection of the entire concrete load.
3. Concrete after placement that is found to have pockets of fiber-mesh may cause the contractor to remove and replace concrete at the Contractor’s expense.

B. Subgrade shall be maintained in a smooth, compacted condition in conformity with required section and established grade until concrete is in place. Subgrades and forms shall be wet down sufficiently in advance of the placing of concrete to insure a firm and moist condition.

C. Sidewalks shall be grooved at right angles to sidewalks at intervals equal to width of sidewalks, unless otherwise specified.

1. The grooves shall not exceed one inch deep.
2. One half inch preformed bituminous expansion shall be installed where sidewalks abut against curbing or other concrete construction.
3. Expansion joints shall be installed in the straight run of sidewalks at intervals of not more than 50 feet.
4. Joint material shall extend from a level 1/4 inch below the surface of the sidewalk to the underside of concrete.
5. University standard sidewalk dimensions at 5 feet by 5 feet modules (unless identified at pre-bid to be a different dimension).

D. Sidewalks shall have a brushed surface with a 4 inch troweled edge as a finish.

1. Dusting to absorb surface water will not be permitted.
2. Joints and edges shall be rounded with an approved edging tool.

E. Contractor is responsible for protecting all concrete until fully cured. Contractor is responsible for replacing damaged section(s) at his own expense if vandalism occurs during the curing process.

4.0 Curbs and Gutters

A. All concrete curbs, sidewalks and drives shall meet the standards of the current Illinois Department of Transportation Standard Specification for Road and Bridge Construction.

B. All materials shall conform to these specifications except as modified herein, conform to ACI 318-71.

C. Concrete (hardrock) shall be ready-mixed and delivered in accordance with specifications for Ready-mixed Concrete, ASTM c-94.

D. Coarse and fine aggregates shall conform to the requirement of ASTM C-33-67.

1. Shall be well graded within the prescribed limits.
2. The gradation of the coarse aggregate shall be one (1) inch to No. Four (4).

E. Cement shall be a uniform product of Portland Cement of a single manufacturer throughout all work. For air-entrained concrete use ASTM C-175, Type I-A, Type II-A or Type III-A cement.

F. Reinforcing materials shall be fiber reinforcement of polypropylene fibers engineered and designed for secondary reinforcement of concrete slabs, complying with ASTM C 1116 Type III. Manufacturers:

2. Forta CR, Forta Corp.
G. Admixtures:

1. Air entrained agents may be used where specified and shall conform to ASTM C-260.
2. Other admixtures, such as set-retarding admixtures during hot weather shall only be used after specific approval of the University Representative.

H. Curing Materials

1. Polyethylene Film shall conform to ASTM D
2. Liquid Membrane Curing Compounds shall conform to ASTM C 309, Type I for all concrete surfaces.
3. Acceptable products:
   a. W.R. Grace & Co. – Horn Clear Seal
   b. Sonneborn-Contech – Kure-N-Seal
   c. Toch Brothers, Div. Carboine Co. – Acri-Seal “S”

I. Work Forms

1. Unexposed concrete surfaces shall have wood forms for concrete surfaces against which backfill shall be placed and shall be No. 2 common or better.
2. Wood forms for all exposed concrete surfaces shall be moisture resistant concrete form plywood, 3 ply, minimum of 9/16” inch thick.

J. Steel forms shall be capable of shaping the concrete to the required dimensions and shall be approved by the University’s Grounds Superintendent.

K. Expansion joint filler strips shall conform to ASTM Designation D-1751-65 and shall be of the size required for full cross sectional thickness.

5.0 Concrete Quality

A. Determination of the design mixes within the requirements of these specifications is solely the responsibility of the Contractor using tested materials and trial mixes.

1. Contractor shall submit a copy of the proposed design mix to the University’s Grounds Superintendent prior to beginning the concrete work.
2. All concrete to be working strength concrete in accordance with ACI-301-66.

B. Exposed concrete for walks, driveways, curbs, gutters and other concrete exposed to freezing temperatures during wet weather shall have a water-cement ratio not exceeding six (6) gallons per sack and shall be air entrained.
C. Strengths of all air entrained concrete shall have:
1. A minimum compressive strength of 4000 psi at 28 days and a maximum water-cement ratio of .65.
2. Seven (7) day strengths for Type I and II cement and three (3) day strengths for Type III cements shall be a minimum of two-thirds of the 28 day design strengths.

D. Components of concrete shall be proportioned by weight and shall contain not less than six (6) sacks of cement per cubic yard.
1. Proportions shall be such as to produce a mixture that will work readily with the placement method used around the reinforcement and into corners and angles of the forms.
2. Use Air entrained concrete where specified and elsewhere and shall conform to the following limits:

<table>
<thead>
<tr>
<th>Maximum Size</th>
<th>Total Air Content Percent</th>
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<tbody>
<tr>
<td>Aggregate</td>
<td></td>
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<tr>
<td>1-1/2”</td>
<td>5 +/- 1</td>
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<tr>
<td>1”</td>
<td>6 +/- 1</td>
</tr>
<tr>
<td>3/4”</td>
<td>6-1/2 +/- 1</td>
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</tbody>
</table>

6.0 Preparation for Placing

A. Assure that all reinforcing is properly and securely positioned and tied.
1. Verify that all required sleeves, anchors, slots, inserts and similar items have been properly located and secured to prevent displacement during concrete placement.
2. Determine that all expansion joints, felt strips, construction and control joints are properly located and formed.
3. Assure that equipment is clean and that all debris is removed from the forms or other places receiving concrete.
4. Reinforcing to be free of ice and snow.
5. Assure that forms are lined, oiled or wetted as specified for the particular usage.

B. Form or construct all joints in concrete work true-to-line and accurately placed.
1. Unless otherwise detailed, make expansion joints one-half (1/2) inch thick, using pre-modeled asphalt impregnated fiberboard, full cross sectional thickness.
2. Finish the edges of the slabs at expansion joints with ¾” radius rounded edging tool.
3. In no case shall the reinforcement or other fixed metal items which are embedded in or bonded to the concrete be run continuous through an expansion joint.

7.0 Mixing and Placement of Concrete

A. Mix and deliver in accordance with specifications for Ready-Mixed Concrete, ASTM C-94.

B. Old concrete that has attained an initial set or which has held its water content more than five (5) minutes shall not be deposited.

C. Deposit concrete as nearly as practicable in final position.
   1. Excessive “pushing” of concrete from one area to another is prohibited.
   2. Place concrete at such a rate that it is plastic, flows readily and mixes well with previous layers.
   3. When placing has started, carry on a continuous operation until the pour of a full panel or section is completed.
   4. Concrete shall not be allowed to drop freely more than five (5) feet.

D. Consolidate all concrete by suitable mechanical vibrating equipment where practical, supplemented by manual rodding or tamping.
   1. Do not vibrate excessively in one spot.
   2. Do not use the vibrator to transport concrete inside the forms.

E. Cold weather placement of concrete
   1. Concrete shall be mixed and placed only when the temperature is at least 40 degrees F. and rising unless prior approval by the University is secured.
   2. Concrete shall not be poured when snow, rain or blowing sand and dust is expected.

F. Hot weather placement of concrete
   1. Take suitable precautions to avoid drying of concrete prior to finishing operations during low humidity, high temperature or windy conditions.
   2. Use of windbreaks, sunshades, sprays or other devices shall be acceptable when needed.
   3. Concrete deposited in hot weather shall not have a new placing temperature that will cause difficulty from loss of slump, flash set or cold joints – not more than 90 degrees F. unless otherwise approved.
G. Concrete surfaces not covered by forms shall be protected for moisture loss during curing. Such protection shall be maintained for a period of at least seven (7) days for normal conditions.

H. Cover surfaces completely with polyethylene film or waterproof paper by lapping sheet ends and edges approximately four (4) inches.
   1. Sealing laps with adhesive tape or other suitable means.
   2. The film shall be held in full contact with the adjacent soil with a layer of sand, soil or similar material when this method is used to cure concrete slabs that are exposed finished.

8.0 Cleaning and Repairing Concrete

A. Voids and gravel pockets shall be repaired as directed by the University’s Grounds Superintendent.

B. Contractor is responsible for protecting all concrete until fully cured. Contractor is responsible for replacing damaged sections at their own expense if vandalism occurs during the curing process.

9.0 Concrete Finishes

A. Slab surfaces shall be finished by tamping the concrete with suitable tools to force the coarse aggregate from the surface.
   1. Slabs shall be screeded with straight edges and floated to the required finish level.
   2. When free of tool marks the slabs shall be given the specified finish.
   3. Finished slabs shall be level with a true plane surface, 5 feet by 5 feet (typical) with a tolerance of 1/8 inch in 10 feet.

B. Concrete sidewalks, curbs and gutters shall be given a broomed finish.
   1. Surface shall be troweled smooth, then finished with a stiff bristle broom drawn over the surface in parallel passes transverse to the flow of traffic.
   2. Slab edges and joint edges shall be rounded with an edging tool having 1/4 inch radius immediately following the brooming.
   3. Sidewalks shall have a 4 inch smooth troweled edge as finish.
   4. University standard sidewalk dimensions are 5 feet by 5 feet modules.
03 30 00 Cast-In-Place Concrete

1.0 General
   A. Exterior sidewalks shall be constructed of concrete paving.

2.0 Products
   A. Aggregate Base Course – Type A gradation CA-6
   B. Portland Cement – ASTM C150, Type 1
   C. Aggregate – ASTM C33, Class 4, max. aggregate size 1 ½”

3.0 Execution
   A. Concrete sidewalks shall be constructed in 5' x 5' squares, with each 5’ by 5’ element having a brushed surface and a 4” troweled edge.
   B. Minor sidewalks may be 5' wide and the progressively major sidewalks shall be 10' and 15' wide. Pedestrian mall work may be 15' to 20' wide.
   C. All Sidewalks shall be 6" thick and have a 28 day test of 4,000 psi. The concrete shall be 6" thick and reinforced with fiber mesh for all grade slabs.
   D. All intersecting sidewalks shall have an inside radius.