

SECTION 32 13 14

POST-TENSIONED CONCRETE TENNIS COURT

PART 1 – GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Post-tensioned Concrete Tennis Court.
- B. Related Sections:
 - 1. Division 31 "Earth Moving"
 - 2. Division 32 "Concrete Paving".
 - 3. Division 32 "Court Surfacing"

1.2 SUBMITTALS

- A. See Division 01 for submittal procedures.
- B. Product Data: For each type of product indicated include construction details, material descriptions, dimensions of components and finishes.
- C. Shop Drawings: Detail fabrication and erection of each component indicated. Include plans, elevations, sections and details. Show anchorage and accessory items.
- D. Samples for Verification: For each type of product or exposed finish, prepared as Samples of size indicated below:
- E. Other Action Submittals:
 - 1. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 2. As-Built Survey of Court Surface.
- F. Qualification Data: refer to Division 1.
- G. Material Certificates: For the following, from manufacturer:
 - 1. Cementitious materials.
 - 2. Steel reinforcement and reinforcement accessories.
 - 3. Admixtures.
 - 4. Curing compounds.
 - 5. Applied finish materials.
 - 6. Bonding agent or epoxy adhesive.
 - 7. Joint fillers.
 - 8. Tensioning cables.
 - 9. Fiber Mesh.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: A firm experienced in producing post-tensioned concrete slabs similar to those indicated for this Project and with a record of successful performance, as well as sufficient production capacity to produce required work.
 - 1. The work shall be done in a thorough, workmanlike manner by experienced contractors and shall conform to the standards of the American Sports Builders Association for tennis court construction.
 - 2. All steel tendon installation, concrete work and stressing of tendons shall be done by selected contractor. This provision intent is to provide continuity and one source responsibility for the integrity of the post-tensioned slabs.
- B. Pre-Installation Conference: Conduct conference at Project site to comply with

requirements in Division 1. Review methods and procedures related to the following;

1. Inspect and discuss condition of preparatory work, if any, performed by other trades.
 2. Review and finalize construction schedule and verify availability of materials, Erector's personnel, equipment, and facilities needed to make progress and avoid delays.
 3. Review required testing, inspecting and certifying procedures.
 4. Review weather and forecasted weather conditions and procedures for unfavorable conditions.
- C. ACI Publications: Comply with ACI 318-08 unless otherwise indicated.

1.4 PROJECT CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

1.5 WARRANTY

- A. Contractor shall warrant work as provided by the General and Supplementary Conditions and Division 01 Specifications.

1.6 EXTENDED WARRANTY

- A. Special Warranty on court slab. Installers standard form in which installer agrees to repair court slab structures that show evidence of deterioration within the warranty period of 2 years.

PART 2 – PRODUCTS

2.1 COURT PAVING

- A. The contract work to be performed under this section consists of furnishing all required labor, materials, equipment, implements, parts and supplies necessary for, or appurtenant to, the construction of a five inch (5") thick post-tensioned concrete slab.
- B. Concrete shall meet requirements of section 321313.
- C. Tensioning Cables and Anchors;
1. Post-tensioning strands and anchorages shall conform to the "PTI Guide Specifications for Post-tensioning Materials".
 2. The tensioning strands shall consist of one-half inch (1/2") diameter, 7-wire, stress relieved strands, having a guaranteed ultimate tensile strength of 270,000 PSI (270 Kips). Strands shall conform to ASTM-416. Cables shall be fabricated to proper length for each slab, coated with a permanent rust preventative lubricant and encased in sheathing. Any damage to sheathing shall be repaired with tape prior to concrete placement. A maximum of six inches (6") of exposed strands is permitted at the dead-end anchor.
 3. Any damaged cables shall be removed and replaced prior to concrete pour.
 4. Contractor shall submit shop drawings of cable layout, spacing and anchoring for approval prior to construction.
- D. Concrete Compressive Strength;
1. The concrete shall have a compressive strength of not less than 4,000 PSI after twenty-eight (28) days. Ready-mixed concrete shall be mixed with fiber mesh and delivered according to ASTM c-94 specifications for ready-mixed concrete with fiber mesh with a four-inch (4") maximum slump. Mix design shall be submitted

- for approval prior to delivery to site.
- E. Forms shall meet requirements of section 321313.
 - F. Fiber Mesh: Fibermesh 300 or approved equal. ¾" synthetic fiber reinforcement at 1.5 lbs. / CY. Submit manufacturer catalog cut sheets for approval. Manufactured by Propex Concrete Systems Corp. 6025 Lee Highway 6, Suite 425, Chattanooga, TN 37422. (800) 621.1273 or www.fibermesh.com.
 - G. Vapor Barrier – 10 MIL. Polyethylene sheets with 6" overlap at joints. Place directly below slab. Manufactured by Americover, or approved equal. Submit product data for approval.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine exposed subgrades and Subbase Course surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.
- B. Proof-roll prepared Subbase surface below concrete paving to identify soft pockets and areas of excess yielding.
 - 1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph.
 - 2. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
 - 3. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch according to requirements in Section 312000.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove loose material from compacted Subbase Course surface prior to placement of Base Course.
- B. Place and compact Base Course per Specification Section 31 20 00.
- C. Place Vapor Barrier.
- D. Install net posts and net tie down strap anchors.
- E. Coordinate with Specification Section 32 13 13 for Isolation Joints at perimeter of slab.

3.3 COURT PAVING

- A. Forming: Forms shall be accurately set to the lines and to plus or minus one-quarter inch ($\pm 1/8"$) of finished grades indicated on drawings and be securely staked to prevent settlement or movement during placement of concrete. Forms shall remain until concrete has taken final set.
- B. Tensioning Cables and Anchors:
 - 1. All cables shall be supported on chairs and loosely tied two inches (2") high at all intersections (too tightly tied, tendon friction will increase when tensioning) to prevent vertical and horizontal movement during concrete placement. Strands shall be placed per approved shop drawings. Cable spacing shall be per approved shop drawings.
 - 2. The perimeter slab beam cross section is 12"x12". The cables are anchored approximately 3" down from the surface of the slab. Two #4 rebar continuous longitudinally around the court beam directly inside the cable anchor on top of the cables. Overlapping should be a minimum of 30 diameters.
 - 3. After the forms are removed and the concrete has set to a minimum of 1,700 PSI, the "half stress" tensioning procedure may begin. Approximately one (1) week later, each tendon may be tensioned to a maximum of eighty percent (80%)

- ultimate breaking strength, and anchored a minimum of seventy percent (70%) ultimate breaking strength.
4. The cable ends shall be cut off and cone holes grouted flush with edge of slab. Grout shall be non-shrink grout.
- C. Concrete Placement: A full court shall be placed in one (1) continuous operation without intervening joints of any kind. The five inch (5") thick slab will be placed with a fourteen and one half foot (14.5') mechanical laser screed capable of providing a surface to + 1/8" in 10' at a 0.83% slope.
1. Finish surface shall not have a water-holding area greater than 1/8" deep (cover a nickel). This is to be determined by flooding the court with water, allowing it to drain for one hour on a 70-degree or warmer day.
 2. Concrete shall have a wood float or light broom finish. DO NOT STEEL TROWEL CONCRETE. DO NOT ALLOW ANY CURING AGENTS OR HARDENERS TO BE USED.
- D. Curing: Immediately after finishing, the concrete shall be kept moist by covering with polyethylene, by sprinkling, by ponding or by curing compound (must be compatible with acrylic tennis surfacing material).

3.4 TOLERANCES

- A. Overall Grade and Planarity – the tennis court surface must be located at the designed elevation and slope. The finished court shall not vary more than +/- 3/8" from designed elevation and grade. Contractor shall provide as built survey of court surface to Landscape Architect for approval to confirm this tolerance is met prior to application of court surfacing materials.
- B. Surface Smoothness – In order to drain properly and to be acceptable for play, the surface must be smooth and regular, lacking humps and dips. The surface shall not vary more than 1/4" in 10' when measured in any direction using a straightedge.
- C. Surface Irregularities – No deviation in the surface greater than 1/8" in 18" when measured in any direction using a straightedge.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
 1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when it is 80 deg F and above, and one test for each composite sample.
 5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
 6. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimen at seven days

and two specimens at 28 days.

- a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.
- C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
- D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
- F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
- G. Concrete paving will be considered defective if it does not pass tests and inspections.
- H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- I. Prepare test and inspection reports.

3.6 REPAIRS AND PROTECTION

- A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.
- B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with Portland cement concrete bonded to paving with epoxy adhesive.
- C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 32 13 14