SECTION E

SHELBY COUNTY GOVERNMENT

ENGINEERING DEPARTMENT

TECHNICAL SPECIFICATIONS

TECHNICAL SPECIFICATIONS
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DIVISION 1

SECTION 01037 – WEATHER DELAYS

PART 1 – GENERAL

1.1 REQUIREMENTS

A. Applicable provisions of the General Conditions govern all work specified in this section.

1.2 SUMMARY

A. Extensions of Contract Time:

1. In the event that progress of the work is delayed by adverse weather conditions, the Contractor shall notify the Consultant in writing, at the end of each month in which delay occurs. Requests must be made in writing within (25) days after the end of the month the Contractor believes a weather delay has occurred.

B. Standard Baseline for Average Climate Range:

1. Standard Baseline represents the normal number of calendar days each month during which construction activity is expected to be prevented due to adverse weather. Suspension of construction activity for the number of days each month listed in Standard Baseline is included in the work and is not eligible for extension of Contract Time.

2. City of Memphis Standard Baseline:

a. Baseline is based on the most recent five (5) year average (from 2001 through 2006) from the Memphis office of the National Weather Service.

January	8 (inclement weather days)
February	5
March	9
April	7
May	5
June	5
July	6
August	3
September	4
October	5
November	5
December	7

1.3 ADVERSE WEATHER AND WEATHER DELAY DAYS:

A. Adverse weather is defined as the occurrence of one or more of the following conditions which prevents exterior construction activity or access to the site within twenty-four (24) hours:

1. Precipitation (rain, snow, or ice) in excess of one-tenth (0.10) liquid measure.

2. Temperatures which do not rise above 32 degrees F. by 10:00 a.m.

3. Standing snow in excess of one-inch (1.00")

B. Adverse Weather may include, if appropriate, "dry-out" days when the following conditions are met:

1. Only if there is a hindrance: site access of for work on the envelope of the building such as masonry or roofing; site work such as excavation, backfilling, or footings; site improvements such as paving.

2. At a rate no greater than one (1) make-up day for each day or consecutive days of rain beyond the Standard Baseline that total one-inch (1.0") or more, liquid measure.

C. A Weather Delay Day may be counted if adverse weather prevents work on the project for fifty percent (50%) or more of the Contractor's scheduled work day.

1.4 DOCUMENTATION AND SUBMITTALS:

A. Submit daily job site work logs showing which and to what extent construction activities have been affected by weather on a monthly basis.

B. Submit actual weather data to support claim for time extension obtained from the Memphis Office of the National Weather Service.

C. Use Standard Baseline data provided herein when documenting actual delays due to weather in excess of the average climatic range.

D. Organize claim and documentation to facilitate evaluation on a basis of calendar month periods. The Contractor shall notify the Consultant in writing, at the end of each month in which delays occur. Request must be made in writing within twenty-five (25) days after the end of each calendar month the Contractor believes a weather delay has occurred.

E. If an extension of the Contract time is appropriate, it shall be effected in accordance with the provision of Article 7 of the Conditions, and the applicable General Requirements.

PART 2 – PRODUCTS

N/A

PART 3 – EXECUTION

N/A

END OF SECTION 01037

TECHNICAL SPECIFICATIONS

DIVISION 2

SECTION 02000 - SITE WORK

PART 1 - GENERAL

1.1 DESCRIPTION

A. These general site work requirements apply to all site work operations. Refer to Division 2 specification sections for specific general, product, and execution requirements.

1.2 QUALITY ASSURANCE

A. Comply with all applicable local, state and federal requirements regarding materials, methods of work, and disposal of excess and waste materials.

B. Obtain and pay for all required inspections, permits and fees. Provide notices required by governmental authorities

1.3 PROJECT CONDITIONS

A. Locate and identify existing underground and overhead services and utilities within contract limit work areas. Provide adequate means of protection of utilities and services designated to remain. Repair utilities damaged during site work operations at Contractor's expense.

B. Arrange for disconnection of utilities and services. Disconnect and seal or cap all utilities and services designated to be removed before start of site work operations. Perform all work in accordance with the requirements of the applicable utility company or agency involved.

C. When uncharted or incorrectly charted underground piping or other utilities and services are encountered during site work operations, notify the applicable utility company immediately to obtain procedure directions. Cooperate with the applicable utility company in maintaining active services in operation.

D. Locate, protect, and maintain bench marks, monuments, control points and project engineering reference points. Reestablish disturbed or destroyed items at Contractor's expense.

E. Perform site work operations and the removal of debris and waste materials to assure minimum interference with streets, walks, and other adjacent facilities.

F. Obtain written permission from governing authorities when required to close or obstruct street, walks and adjacent facilities. Provide alternate routes around closed or obstructed traffic ways when required by governing authorities.

G. Control dust caused by the work. Dampen surfaces as required. Comply with pollution control regulations of governing authorities.

H. Protect existing buildings, paving, and other services or facilities on site and adjacent to the site from damage caused by site work operations. Cost of repair and restoration of damaged items at Contractor's expense.

I. Protect and maintain street lights, utility poles and services, traffic signal control boxes, curb boxes, valves and other services, except items designated for removal. Remove or coordinate the removal of traffic signs, parking meters and postal mail boxes with the applicable governmental agency. Provide for temporary relocation when required to maintain facilities and services in operation during construction work.

J. Protect existing trees and vegetation as required.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment: As selected by Contractor, except as indicated.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine the areas and conditions under which site work is performed. Do not proceed with the work until unsatisfactory conditions are corrected.

B. Consult the records and drawings of adjacent work and of existing services and utilities which may affect site work operations.

END OF SECTION 02000

SECTION 02200 - EARTHWORK

PART 1 - GENERAL

1.1 DESCRIPTION

A. Perform earthwork as shown and specified. The work includes:

1. Limited site grading and filling to indicated elevations, profiles and contours.
2. Excavating and backfilling structure footings and foundations.
3. Subgrade preparation for walks and paving.
4. Soil compaction testing.
5. Protection of existing trees and vegetation, as required.
6. Topsoil distribution and finish grading.

B. Related work:

1. Section 02513 Asphalt Concrete Paving
2. Section 02515 Concrete Curbs, Walks, and Paving
3. Section 03300 Cast-In-Place Concrete

1.2 QUALITY ASSURANCE

A. Comply with Section 02000 requirements.

B. Submit soil compaction test results as required herein.

1.3 PROJECT CONDITIONS

A. Known underground and surface utility lines are indicated on the drawings.

B. Protect existing features designated to remain as part of the landscaping work.

C. Protect excavations by shoring, bracing, sheeting, underpinning, or other methods, as required to prevent cave-ins or loose dirt from entering excavations. Barricade open excavations and post warning lights at work adjacent to public streets and walks.

D. Underpin adjacent structure(s), including utility service lines, which may be damaged by excavation operations.

E. Promptly repair damage to adjacent facilities caused by earthwork operations. Cost of repair at

Contractor's expense.

F. Promptly notify the Landscape Architect of unexpected sub-surface conditions.

G. Protect bottoms of excavations and soil beneath and around foundation from frost and freezing.

H. Grade at excavations to prevent surface water from draining into excavated areas.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Fill materials: Inert subsoil material free of organic matter, rubbish, debris, and rocks greater than 4" diameter and meeting the following requirements:

1. Plasticity index of not more than 20 - ASTM D424.

2. Minimum laboratory dry weight at optimum moisture content of 105 pounds per cu. ft.

3. Provide imported fill material as required to complete the work. Obtain rights and pay all cost for imported materials.

4. Suitable excavated materials removed to accommodate new construction may be used as fill material subject to Landscape Architect's inspection and approval.

B. Granular base: AASHTO M43, #6, (3/8" to 3/4") clean uniformly graded stone or gravel.

C. Granular fill:

1. ASSHTO M43, #6, (3/8" to 3/4") clean uniformly graded stone or gravel.

D. Topsoil: Natural, friable, fertile soil characteristic of productive soil in the vicinity, reasonably free of stones, clay lumps, roots, and other foreign matter.

1. Provide imported topsoil material as required to complete the work. Obtain rights and pay all costs for imported materials.

2. Proposed topsoil material shall be acceptable to the Landscape Architect.

E. Other materials required for proper completion of work: As selected by Contractor and acceptable to Landscape Architect.

PART 3 - EXECUTION

3.1 PREPARATION

A. Establish extent of grading and excavation by area and elevation. Designate and identify datum elevation and project engineering reference points. Set required lines, levels, and elevations.

B. Do not cover or enclose work of this Section before obtaining required inspections and approvals.

3.2 EXISTING UTILITIES

A. Before starting grading and excavation, establish the location and extent of underground utilities in the work area. Exercise care to protect existing utilities during earthwork operations. Perform excavation work near utilities by hand and provide necessary shoring, sheeting, and supports as the work progresses.

B. Maintain, protect, relocate, or extend as required existing utility lines to remain which pass through the work area. Pay costs for this work, except as covered by the applicable utility companies.

C. Protect active utility services uncovered by excavation.

D. Remove abandoned utility service lines from areas of excavation. Cap, plug, or seal abandoned lines and identify termination points at grade level with markers.

E. Accurately locate and record abandoned and active utility lines rerouted or extended on project record documents.

3.3 SITE GRADING

A. Perform grading within contract limits, including adjacent transition areas, to new elevations, levels, profiles, and contours indicated. Provide subgrade surfaces parallel to finished surface grades. Provide uniform levels and slopes between new elevations and existing grades.

B. Grade surfaces to assure areas drain away from structures and to prevent ponding and pockets of surface drainage. Provide subgrade surfaces free from irregular surface changes and as follows:

1. Rough grading: Plus or minus 0.10 ft. subgrade tolerance. Finish required will be that ordinarily obtained from either blade-grader or scraper operations.

2. Provide subgrade surface free of exposed boulders or stones exceeding 4" in greatest dimension in paved areas; 2" in lawn and planting areas.

3. Lawn and planting areas: Allow for 4" average depth of topsoil at lawn areas, and12" depth of soil mix at planting areas, except as otherwise indicated on the drawings.

4. Paved areas: Shape surface of subgrade areas to line, grade, and cross-section indicated. Provide compacted subgrade suitable to receive paving base materials. Subgrade tolerance plus 0, minus 1/2".

5. Granular base (as required): Grade subgrade surface smooth and even, free of voids to the required subgrade elevation. Provide compacted subgrade suitable to receive granular base materials. Tolerance 1/2" in 10'-0".

6. Provide landforms as indicated on Drawings, with smooth transitional slopes. Basic layout of major landforms to be field staked by Contractor before construction. Landscape Architect may make refinements during stake-out or construction.

7. Drainage swales: Grade to profiles indicated with positive drainage and smooth transitional slopes.

3.4 EXCAVATING

A. Excavate for structures to elevations and dimensions shown. Extend excavation a sufficient distance from foundations to permit placing and removal of formwork, installation of materials, services, and inspection. Hand trim foundation excavations to final grade just before concrete is placed. Remove loose, soft materials, and all organic matter. Footings shall bear on approved undisturbed bearing soil.

B. Obtain inspection of foundation excavations by Landscape Architect before concrete is placed.

C. Excavate for curbs, walks, and paving to cross-sections, elevations, and grades indicated. Allow for base material.

D. Earth excavation shall include the satisfactory removal and disposal of all materials encountered, regardless of the nature of the materials, the condition of the materials at the time they are excavated, or the manner in which they were excavated, except existing and active utilities.

E. If unstable or unsatisfactory materials are encountered during excavation or grading work, Contractor shall cease operations and immediately contact Landscape Architect.

F. Unauthorized excavation: Backfill and fill all over excavation to proper grades. Fill over excavation at footings with 1,500 psi concrete. Additional labor and material for unauthorized excavation and remedial work at Contractor's expense.

G. Shore, sheet, or brace excavations as required to maintain them secure. Remove shoring and bracing as backfilling progresses, when banks are safe against caving.

H. Do not excavate footings or slabs to the full depth when freezing temperature may be expected, unless footings or slabs are placed immediately after the excavation has been completed. Protect excavation bottoms from freezing when the placing of concrete is delayed.

I. Existing sewers: Where existing sewers pass beneath new paving, remove existing earth fill to the top of the sewer pipe or to a depth as directed by the Landscape Architect. Install an approved backfill material compacted in maximum 8" layers. Extend compacted fill from top of sewer pipe to proposed paving subgrade elevation.

3.5 SITE DRAINAGE AND UTILITIES EXCAVATING AND BACKFILLING

A. Refer to general and specific requirements in this section.

3.6 DRAINAGE

A. Provide necessary pumps and drainage lines and maintain excavations, including footings and

pits, free from water, ice and snow during excavating and subsequent work operations.

B. Provide drainage of the working area at all times.

3.7 FILLING, BACKFILLING, AND COMPACTING

A. Obtain inspection and approval of subgrade surfaces by Landscape Architect prior to filling operations. Scarify, dry, and compact soft and wet areas; remove and replace unsuitable subgrade materials with an approved compacted fill material. Take corrective measures before placing fill materials.

1. Topsoil not permitted as fill or backfill material within structure limits or under paved areas.

B. Spread approved fill material uniformly in layers not greater than 8" of loose thickness over entire fill area.

1. Lift thickness requirements may be modified by Landscape Architect to suit equipment and materials or other conditions when required to assure satisfactory compaction.

2. Moisture-condition fill material by aerating or watering and thoroughly mix material to obtain moisture content permitting proper compaction.

3. Place and compact each layer of fill to indicated density before placing additional fill material. Repeat filling until proposed grade, profile, or contour is attained.

4. Suspend fill operations when satisfactory results can not be obtained because of environmental or other unsatisfactory site conditions. Do not use muddy or frozen fill materials. Do not place fill material on muddy or frozen subgrade surface.

5. Maintain surface conditions which permit adequate drainage of rain water and prevent ponding of surface water in pockets. When fill placement is interrupted by rain, remove wet surface materials or permit to dry before placing additional fill material.

C. Place backfill materials in uniform layers not greater than 8" loose thickness over entire backfill area.

1. Use hand tampers or vibrating compactors at foundation walls, retaining walls, and similar locations. Do not use large rolling equipment adjacent to foundation walls and retaining walls.

2. Do not backfill against foundation walls until walls for bearing surfaces have reached design strength or are properly braced, and backfilling operations approved. Provide clean backfill materials, except where granular materials are indicated. Compact in maximum 8" layers.

D. Fill and compact all areas of settlement to proper grade before subsequent construction operations are performed.

E. Compaction:

1. Provide compaction control for all fill and backfill.

2. Compact top 12" of subgrade and each layer of fill or backfill material at foundations and paved areas to 96% of maximum dry density at optimum moisture content in accordance with ASTM D698 Standard Proctor Method. Extend compaction at least 5'-0" at both sides of foundations and at least 1-0" beyond slabs-on-grade and paving.

3. Compact top 6" of subgrade and each layer of fill material at lawns and unpaved areas to 90% of maximum dry density at optimum moisture content in accordance with ASTM D698 Standard Proctor Method.

4. Water settling, puddling, and jetting of fill and backfill materials as a compaction method are not acceptable.

5. Maintain moisture content of materials, during compaction operations within required moisture range to obtain indicated compaction density.

6. Provide adequate equipment to achieve consistent and uniform compaction of fill backfill materials.

F. Soil Compaction Testing:

1. Conduct soil compaction testing as needed within project area to ensure that entire project area will have proper compaction and stability. If test results indicate unsuitable soil conditions, such areas shall undergo remedial soil work and retesting.

a. Submit (1) copy of initial test report and any subsequent test reports to Landscape Architect.

G. Refer to Drawings and Section 03300 for cast-in-place concrete work.

3.8 FINISH GRADING

A. Uniformly distribute and spread stockpiled topsoil. Provide 4" average depth at lawn areas,12" of planting soil mix (or as required) at planting areas. Provide additional imported topsoil as required to complete the work. Use loose, dry topsoil. Do not use frozen or muddy topsoil. Place during dry weather.

B. Fine grade topsoil eliminating rough and low areas to ensure positive drainage. Maintain levels, profiles, and contours of subgrades.

C. Remove stones, roots, weeds, and debris while spreading topsoil materials. Rake surface clean of stones 1" or larger in any dimension and all debris. Provide surfaces suitable for soil preparation provided under lawn and planting work.

D. Maintenance:

1. Protect finished graded areas from traffic and erosion. Keep free of trash and debris. Repair and reestablish grades in settled, eroded, and damaged areas.

2. Where completed areas are disturbed by construction operations or adverse weather, scarify, reshape, and compact to required density.

3.9 CLEANING

A. Upon completion of earthwork operations, clean areas within contract limits, remove tools, and equipment. Provide site clear, clean, free of debris, and suitable for site work operations.

END OF SECTION 02200

SECTION 02487 - SODDING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide sodded lawns as shown and specified. The work includes:

1. Soil testing and preparation.

2. Sodding lawns and other indicated areas.

3. Maintenance.

1.2 QUALITY ASSURANCE

A. Comply with relevant specifications in Division 2, as well as other divisions.

B. Sod: Comply with American Sod Producers Association (ASPA) classes of sod materials.

1.3 SUBMITTALS

A. Submit sod grower's certification of grass species. Identify source location.

B. Submit soil test report(s) indicating available nutrients in soil and laboratory recommendations for soil amendments, including application rates and formulas for limestone and fertilizer. Application rates and formulas shall be appropriate to actual time of sodding.

C. Submit data on topsoil and fertilizer.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Cut, deliver, and install sod within a 24-hour period.

1. Do not harvest or transport sod when moisture content may adversely affect sod survival.

2. Protect sod from sun, wind, and dehydration prior to installation.

3. Do not tear, stretch, or drop sod during handling and installation.

1.5 PROJECT CONDITIONS

A. Work notification: Notify Landscape Architect at least 7 working days prior to start of sodding operations.

B. Protect existing grades, utilities, paving, and other facilities from damage caused by sodding

operations.

C. Perform sodding work only after planting and other work affecting ground surface has been completed.

D. Restrict traffic from lawn areas until grass is established. Erect signs and barriers as required.

E. Provide hose and lawn watering equipment, including water, as required.

1.6 WARRANTY

A. Provide a uniform stand of grass by watering, mowing, and maintaining lawn areas until Substantial Completion and subsequently, until the end of the Contractor's required maintenance period. Resod areas, with specified materials, which fail to provide a uniform stand of grass until all affected areas are accepted by the Landscape Architect.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Sod Type: Certified nursery grade Tifway 419 Bermuda Grass.

B. Provide well-rooted, healthy sod, free of diseases, nematodes and soil borne insects. Provide sod uniform in color, leaf texture, density, and free of weeds, undesirable grasses, stones, roots, thatch, and extraneous material; viable and capable of growth and development when planted.

1. Furnish sod, machine stripped, in square pads or strips not more than 3'-0" long; with uniform soil thickness of 1" to 1 1/2" with clean cut edges. Mow sod before stripping.

C. Topsoil for Lawn Areas: Fertile, friable, natural topsoil of loamy character, without admixture of subsoil material, obtained from a well-drained arable site, reasonably free from clay, lumps, coarse sands, stones, plants, roots, sticks, and other foreign materials, with acidity range of between pH 6.0 and 6.8.

1. Identify source location of topsoil proposed for use on the project.

2. Topsoil which exists on the project site, including that which has been stripped and stockpiles during construction, will be acceptable if it meets the requirements of this specification, and if approved in writing by Landscape Architect.

3. Provide topsoil free of substances harmful to the plants which will be grown in the soil.

D. Fertilizer:

1. Granular, non-burning product composed of not less than 50% organic slow acting, guaranteed analysis professional fertilizer.

a. Type A: Starter Fertilizer, formula in accordance with approved laboratory soil test report(s) and time of application.

b. Type B: Top Dressing Fertilizer, formula in accordance with approved laboratory soil test report(s) and time of application.

E. Ground Limestone: Containing not less than 85% of total carbonates and ground to such fineness that 50% will pass through a 100 mesh sieve and 90% will pass through a 20 mesh sieve.

F. Stakes: Softwood, 3/4" dia. x 8" long (or biodegradable material). Metal stakes not allowed.

G. Water: Free of substance harmful to sod growth. Hoses or other methods of transportation furnished by Contractor.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine finish surfaces, grades, topsoil quality, and depth. Do not start sodding work until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Limit preparation to areas which will be immediately sodded.

B. Topsoil:

1. Add topsoil sufficient to add 4" minimum depth of topsoil cover. Loosen topsoil of lawn areas to a minimum depth of 4". Remove stones over 1" in any dimension and sticks, roots, rubbish and extraneous matter.

2. Note that the use of existing, in-place topsoil for sodding operations will require the approval of Landscape Architect in advance, and will depend in part on soil test report(s).

C. Grade lawn areas to smooth, free draining and even surface with a loose, uniformly fine texture. Roll and rake; remove ridges and fill depressions as required to drain.

D. Apply limestone at recommended rate in soil test report. Ensure that pH of topsoil is not less than 6.0 nor more than 6.8. Distribute evenly by machine and incorporate thoroughly into topsoil.

E. Distribute Type A fertilizer at recommended rate in soil test report.

1. Apply fertilizer by mechanical rotary or drop type distributor, thoroughly and evenly incorporated with soil to a depth of 3" by disking or other approved method. Fertilize areas inaccessible to power equipment with hand tools and incorporate it into soil.

F. Dampen dry soil prior to sodding.

G. Restore prepared areas to specified condition if eroded, settled, or otherwise disturbed after fine grading and prior to sodding.

3.3 INSTALLATION

A. Sodding:

1. Time of Sodding:

a. Anytime except when soil is wet, muddy, or frozen.

2. Lay sod to form a solid mass with tightly-fitted joints. Butt ends and sides of sod strips. Do not overlay edges. Stagger strips to offset joints in adjacent courses. Remove excess sod to avoid smothering of adjacent grass. Provide sod pad top flush with adjacent curbs, walks, drains, and seeded areas.

3. Where sod is installed adjacent to existing lawn areas, new sod shall be recessed so that a level and flush condition exists between existing and new lawn areas.

4. Install initial row of sod in a straight line, beginning at bottom of slopes, perpendicular to direction of the sloped area. Place subsequent rows parallel to and lightly against previously installed rows.

5. Peg sod on slopes steeper than 3 to 1 to prevent slippage. Drive pegs through sod, perpendicular to slope, at the rate of 2 pegs per square yard of sod. Top of peg shall be flush to 1/2" above top of soil pad to facilitate mowing and to prevent any hazardous protrusion of the peg.

6. Water sod thoroughly with a fine spray immediately after laying.

7. Roll with light lawn roller to ensure contact with sub-grade.

B. Sod indicated areas within contract limits and areas adjoining contract limits. Sod additional areas which are disturbed as a result of construction operations.

3.4 MAINTENANCE

A. Maintain sodded lawns until Substantial Completion and for a period of 30 days after Substantial Completion and acceptance of sodding operations.

B. Maintain sodded lawn areas, including watering, spot weeding, mowing, application of herbicides, fungicides and resodding until a full, uniform stand of grass free of weeds, undesirable grass species, disease and insects is achieved and accepted by the Landscape Architect.

1. Water sod thoroughly every 2 to 3 days, as required to establish proper rooting.

2. Repair, rework, and resod all areas that have washed out or eroded. Replace unacceptable or dead areas with new sod.

3. Mow lawn areas as soon as lawn top growth reaches a 3" height. Cut back to 2" height. Repeat mowing as required to maintain specified height. Not more than 40% of grass leaf shall be removed at any single mowing.

4. Apply Type B fertilizer to lawns approximately 30 days after sodding at recommended rate in soil test report. Apply evenly with a mechanical rotary of drop type distributor. Thoroughly water into soil.

5. Apply herbicides as required to control weed growth or undesirable grass species.

6. Apply fungicides and insecticides as required to control diseases and insects.

7. Remove sod pegs.

3.5 ACCEPTANCE / SUBSTANTIAL COMPLETION

A. Inspection to determine acceptance of sodded lawns will be made by the Landscape Architect, at the time of Substantial Completion for the entire project. The Contractor shall provide notification at least 10 working days before requested inspection date.

1. Sodded areas will be acceptable provided all requirements, including maintenance, have been complied with, and a healthy, even-colored viable lawn is established, free of weeds, undesirable grass species, disease, and insects.

2. If the date of Substantial Completion occurs in the dormant season, lawn areas will reviewed at the beginning of the next growing season for compliance with this specification.

B. Upon Substantial Completion and acceptance of lawn areas, and at the end of the Contractor's maintenance period, the Owner will assume lawn maintenance.

3.6 CLEANING

A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, debris, and equipment. Repair damage resulting from sodding operations.

END OF SECTION

SECTION 02515 - CONCRETE CURBS, WALKS, AND PAVING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide concrete curbs, walks, and paving as shown and specified. The work includes:

1. Final subgrade preparation and paving base.

2. Concrete curbs, walks, and paving. Refer to Drawings for finish types.

B. Related work:

1. Section 02200 Earthwork

2. Section 02513 Asphalt Concrete Paving

3. Section 03300 Cast-in-Place Concrete

1.2 QUALITY ASSURANCE

A. Comply with Section 02000 requirements.

B. Testing and inspection: Performed by a qualified independent testing laboratory.

1. Contractor shall provide and pay for testing and inspection during concrete operations. Laboratory shall be acceptable to the Landscape Architect.

C. Concrete finishing: The initial concrete finishing work shall occur under the direct observation of the Landscape Architect, who shall be given 24 hours notice by the Contractor. If the initial finish work is acceptable (for each finish type), this shall be used as a quality standard for subsequent work.

D. Materials and methods of construction shall comply with the following standards:

1. American Society for Testing and Materials (ASTM).

2. American Concrete Institute (ACI).

E. Maintain field records of time, date of placing, curing, and removal of forms of concrete in each portion of work.

F. Sample panel:

1. Construct 5' x 5' sample panel for each type of concrete paving and finish.

2. Sample panel shall be made by the Contractor or Subcontractor who will perform concrete

work on this project, in location approved by Landscape Architect.

G. Do not change source or brands of cement and aggregate materials during the course of the work.

H. Construct street and access driveway curb cuts, entrance apron paving, curbs, sidewalks, and wheelchair ramps in accordance with City of Memphis requirements.

1.3 SUBMITTALS

A Submit concrete mix designs. Obtain approval before placing concrete.

B. Product data:

1. Submit complete materials list of items proposed for the work. Identify materials source.

2. Submit material certificates for aggregates and reinforcing.

3. Submit product data and actual color samples for joint fillers and sealants.

C. Submit concrete delivery tickets. Show the following:

1. Batch number.

2. Mix by class or sack content with maximum size aggregate.

3. Admixtures.

4. Air content.

5. Slump.

6. Time of loading.

D. Submit concrete test reports.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver admixtures, curing materials, and retarders in manufacturer's standard unopened containers with labels legible and intact. Store and protect from freezing and damage.

1.5 PROJECT CONDITIONS

A. Work notification: Notify Landscape Architect at least 24 hours prior to installation of concrete.

1. Obtain Landscape Architect's approval of all formwork and steel reinforcing prior to pouring any concrete.

2. Landscape Architect must be present on site during initial concrete finishing work for each finish type.

B. Establish and maintain required lines and grade elevations.

C. Do not install concrete work over wet, saturated, muddy, or frozen subgrade.

D. Do not install concrete when air temperature is below 40 degrees F. Use of calcium chloride, salt, or any other admixture to prevent concrete from freezing is prohibited.

E. Protect adjacent work.

F. Provide temporary barricades and warning lights as required for protection of project work and public safety.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Portland cement: ASTM C150, Type 1, natural color.

B. Aggregate: Provide ASTM C33 normal weight aggregate, 1" maximum size, clean, uncoated crushed limestone. Coarse aggregate free of materials which cause staining or rust spots; fine aggregate shall be clean natural sand.

C. Water: Clean, fresh, and potable.

D. Air-entraining admixture: ASTM C260.

E. Water-reducing admixture: ASTM C494.

2.2 MIXES

A. Provide ASTM C94 ready-mixed concrete. Batch mixing at site not acceptable.

1. Strength: 4,000 psi minimum at 28 days.

2. Slump range: 2" to 4" maximum.

B. Provide an approved water-reducing admixture in all concrete.

C. Provide an air-entraining admixture in all concrete. Air content 4% to 6%.

D. Indicate water added to mix at job site on each delivery ticket. Show quantity of water added. Mixes exceeding specified slump range will be rejected as not complying with specification requirements.

2.3 ACCESSORIES

A. Granular base: AASHTO M43, #6 (3/8" to 3/4") uniformly graded, clean crushed stone or gravel. Provide only where poor subgrade soil conditions exist, as directed by Landscape Architect.

B. Forms: Wood or metal of sufficient strength to resist concrete placement pressure and to maintain precise horizontal and vertical alignment during concrete placement. Provide forms straight, free of defects and distortion, and of a height equal to full depth of concrete work.

1. Provide 2" nominal thickness, surfaced plank wood forms for straight sections. Use flexible metal or 1"wood forms to form radius bends (score as necessary).

C. Joint filler: ASTM D1752 premolded resilient non-extruding non-staining closed cell foam polyethylene, PVC foam or sponge rubber, 25% wider than joint width, thickness indicated.

D. Joint sealant: "Vulkem 227" two-part high performance, low modulus, high elongation, gun grade polyurethane sealant by TREMCO, Inc., Beachwood, Ohio, phone 800-321-7906 or 216-292-5000, or approved equal. Color to match final finish of concrete, as approved by Landscape Architect.

E. Reinforcing steel: ASTM A615, A616, or A617, Grade 40, new domestic deformed steel bars, as required.

F. Welded wire mesh: To be 6" x 6" x #10, as required.

G. Steel supports: Metal and/or plastic supports manufactured specifically for steel reinforcement to prevent contact with bottom of form.

H. Form release agent: Non-staining chemical form release agent free of oils, waxes, and other materials harmful to concrete.

I. Concrete finishing brooms and brushes shall be new, as manufactured by Kraft, Shawnee, Kansas, phone 800-422-2488, or approved equal.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine subgrades and installation conditions. Do not start concrete work until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Proof roll the subgrade and do all necessary rolling and compacting to obtain firm, even subgrade surface. Fill and consolidate depressed areas. Remove uncompactable or unsuitable materials, replace with clean fill and compact to 100% of the maximum dry density in accordance with ASTM D698 Standard Proctor Method.

B. Remove loose material and debris from base surface before placing concrete.

C. Install, align, and level forms. Stake and brace forms in place. Maintain following grade and alignment tolerances:

1. Top of form: Maximum 1/8" in 10'-0".

2. Vertical face: Maximum 1/4" in 10'-0".

D. Coat form surfaces in contact with concrete with form release agent. Clean forms after each use and coat with form release agent as necessary to assure separation from concrete without damage.

E. Install expansion joints in exact location indicated on Drawings, and as approved on site by Landscape Architect.

F. Locate, place, and support reinforcement as indicated.

1. Provide reinforcing steel at curbs, walks and other locations indicated, adequately supported and secured to prevent displacement. Use proper accessories to elevate steel above bottom of form. Do not use brick fragments, wood blocks, etc.

G. Install, set, and build-in work furnished under other specification sections. Provide adequate notification for installation of necessary items.

3.3 INSTALLATION

A. Concrete placement:

1. Landscape Architect shall inspect and approve all formwork, steel reinforcement, accessories, and expansion joints prior to delivery and placement of any concrete.

2. Comply with ACI 304 "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete", and as specified.

3. Protect concrete from physical damage or reduced strength due to weather extremes during mixing, placing, and curing. In cold weather comply with ACI 306, "Recommended Practice for Cold Weather Concreting". In hot weather comply with ACI 305, "Recommended Practice for Hot Weather Concreting".

4. Moisten base to provide a uniform dampened condition at the time concrete is placed. Verify manholes or other structures are at required finish elevation and alignment before placing concrete.

5. Place and spread concrete to the full depth of the forms. Use only square-end shovels or concrete rakes for hand-spreading and consolidating concrete. Exercise care during spreading and consolidating operations to prevent segregation of aggregate and dislocation of reinforcement.

6. Place concrete in a continuous operation between expansion joints. Upon prior approval of Landscape Architect, provide construction joints when sections cannot be placed continuously.

7. Place concrete in one course, monolithic construction, for the full width and depth of concrete work. Provide minimum 5" thick walks and paving, except as otherwise indicated.

8. Strike-off and bull-float concrete after consolidating. Level ridges and fill voids. Check surface with a 10'-0" straightedge. Fill the depressions and refloat repaired areas. Darby the concrete surface to provide a smooth level surface ready for finishing.

9. Construct concrete steps so that all treads have positive drainage (as required).

B. Joints:

1. Construct control, expansion, and construction joints properly aligned with face perpendicular to concrete surface. All joints shall be straight and shall form a regular and consistent pattern, unless otherwise indicated.

a. Misaligned or crooked score lines or expansion joints shall be cause for removal of concrete section and recasting with proper joint alignment and finish, at Contractor's expense.

2. Provide tooled control joints, sectioning concrete into areas dimensioned or indicated on Drawings. Tool joints to depth equal to not less than one-fifth (1/5) of the concrete thickness. Hand tool control joints in the precise pattern and spacing indicated.

3. Provide expansion joints using premolded joint filler at concrete work abutting curbs, walls, structures, walks, and other fixed objects.

a. Locate expansion joints as indicated on Drawings. When not indicated, provide joints at maximum 30'-0" on center for curbs and walks. Align expansion joints in abutting curbs and walks.

b. Install joint fillers full-width and depth of joint. Recess top edge below finished surface to receive joint sealant.

c. Provide joint fillers in single lengths for the full slab width, whenever possible. Fasten joint filler sections together when multiple lengths are required.

d. Protect the top edge of the joint filler during concrete placement.

C. Concrete finishing:

1. Perform concrete finishing using mechanical or hand methods as required. Refer to Drawings for various finish requirements.

a. Concrete finish shall match approved sample panel(s).

2. Upon completion of floating, and after bleed water has disappeared and concrete can sustain foot pressure with nominal indentation, cut concrete away from forms. Work edges with an edging tool. Round edges to 1/2" radius.

3. Install control joints at indicated locations during edging operations.

D. Joint sealants:

1. Install joint sealants at all visible expansion joints in accordance with manufacturer's installation instructions. Clean and prime joints. Remove dirt and loose coatings.

2. Apply sealants in continuous beads, without open joints, voids, or air pockets. Hand tool and finish all joints.

3. Confine materials to joint areas with masking tape or other precautions.

4. Remove excess compound promptly as work progresses and clean adjoining surfaces.

5. In rough surfaces or joints of uneven widths, install joint sealant well back into joints.

3.4 FIELD QUALITY CONTROL

A. Provide field quality control testing and inspection during concrete operations.

B. Contractor shall provide adequate notice, cooperate with, provide access to the work, obtain samples, and assist test agency and their representatives in execution of their work.

C. Testing:

1. Provide slump test on first load of concrete delivered each day and whenever requested due to changes in consistency or appearance of concrete.

2. Provide air indicator tests and air meter tests for all air-entrained concrete.

a. Perform air indicator test with a "Chase AE 35" or equal air indicator, and air meter test in accordance with ASTM C231 or C173. Test first load of concrete delivered each day.

b. Furnish copies of field records and tests reports as listed for strength tests.

3. Strength testing:

a. Provide 1 set of 3 test specimens for each 15 cu. yd. placed in any one day. Secure samples in accordance with ASTM C172 and mold specimens in accordance with ASTM C31.

b. Test 1 specimen at 7 days and 2 specimens at 28 days in accordance with ASTM C39.

c. Furnish copies of field records and test reports as follows:

1 copy to Owner

1 copy to Landscape Architect

1 copy to Contractor

1 copy to Ready Mix Supplier

4. Record the exact location of the concrete in the work represented by each set of cylinders and show on test reports.

5. Provide an insulated moist box for protection of the test cylinders until shipped to the laboratory.

3.5 PROTECTION

A. Protect concrete work from damage due to construction and vehicular traffic until Substantial Completion and final acceptance. Exclude construction and vehicular traffic from concrete pavements for at least 14 days.

3.6 CLEANING

A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, debris, and equipment. Repair damage resulting from concrete operations.

B. Sweep concrete walks and pavement and wash free of stains, discoloration, dirt, and other foreign material immediately prior to final acceptance.

END OF SECTION 02515

TECHNICAL SPECIFICATIONS

DIVISION 3

SECTION 03301 - MISCELLANEOUS CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes cast-in-place concrete, including reinforcement, concrete materials, mixture design, placement procedures, and finishes.

B. Related Sections:

1. Division 2 Section "Earthwork" for drainage fill.
2. Division 2 Section "Concrete Curbs, Walks, and Paving" for concrete pavement and walks.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Other Action Submittal:

1. Design Mixtures: For each concrete mixture.

1.4 QUALITY ASSURANCE

A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

B. Comply with the following sections of ACI 301 (ACI 301M), unless modified by requirements in the Contract Documents:

1. "General Requirements."
2. "Formwork and Formwork Accessories."
3. "Reinforcement and Reinforcement Supports."
4. "Concrete Mixtures."
5. "Handling, Placing, and Constructing."

C. Comply with ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

PART 2 - PRODUCTS

2.1 FORMWORK

A. Furnish formwork and formwork accessories according to ACI 301 (ACI 301M).

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

B. Plain-Steel Wire: ASTM A 82/A 82M, as drawn.

C. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, fabricated from as-drawn steel wire into flat sheets.

D. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.

2.3 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source throughout Project:

1. Portland Cement: ASTM C 150, Type I.

    a. Fly Ash: ASTM C 618, Class C or F.
    b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

B. Normal-Weight Aggregate: ASTM C 33, graded, 1-1/2-inch (38-mm) nominal maximum aggregate size.

C. Water: ASTM C 94/C 94M.

D. Synthetic Fiber: Monofilament or fibrillated polypropylene fibers engineered and designed for use in concrete, complying with ASTM C 1116/C 1116M, Type III, [1/2 to 1-1/2 inches (13 to 38 mm)] long.

2.4 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.5 RELATED MATERIALS

A. Vapor Retarder: Polyethylene sheet, ASTM D 4397, not less than 10 mils (0.25 mm) thick; or plastic sheet, ASTM E 1745, Class C.

B. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork.

2.6 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth or cotton mats.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

F. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.7 CONCRETE MIXTURES

A. Comply with ACI 301 (ACI 301M) requirements for concrete mixtures.

B. Normal-Weight Concrete: Prepare design mixes, proportioned according to ACI 301 (ACI 301M), as follows:

1. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.
4. Slump Limit: 4 inches (100 mm), plus or minus 1 inch (25 mm).
5. Air Content: Maintain within range permitted by ACI 301 (ACI 301M). Do not allow air content of trowel-finished slabs to exceed 3 percent.

C. Synthetic Fiber: Uniformly disperse in concrete mix at manufacturer's recommended rate but not less than a rate of **1.0 lb/cu. yd. (0.60 kg/cu. M)**.

2.8 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.

1. When air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For mixer capacity of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For mixer capacity larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mix type, mix time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, construct, erect, brace, and maintain formwork according to ACI 301 (ACI 301M).

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.3 VAPOR RETARDERS

A. Install, protect, and repair vapor retarders according to ASTM E 1643; place sheets in position with longest dimension parallel with direction of pour.

1. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended adhesive or joint tape.

3.4 STEEL REINFORCEMENT

A. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.5 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Locate and install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness, as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with groover tool to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints: Install joint-filler strips at junctions with slabs-on-grade and vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint fillers full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.

3.6 CONCRETE PLACEMENT

A. Comply with ACI 301 (ACI 301M) for placing concrete.

B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301 (ACI 301M).

C. Do not add water to concrete during delivery, at Project site, or during placement.

D. Consolidate concrete with mechanical vibrating equipment.

3.7 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched. Remove fins and other projections exceeding 1/2 inch (13 mm).

1. Apply to concrete surfaces not exposed to public view.

B. Rubbed Finish: Apply the following rubbed finish, defined in ACI 301 (ACI 301M), to smooth-formed finished as-cast concrete where indicated:

1. Smooth-rubbed finish.

C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.8 FINISHING UNFORMED SURFACES

A. General: Comply with ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Screed surfaces with a straightedge and strike off. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane before excess moisture or bleedwater appears on surface.

1. Do not further disturb surfaces before starting finishing operations.

C. Nonslip Broom Finish: Apply a nonslip broom finish to surfaces indicated and to exterior concrete platforms, steps, and ramps. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.

3.9 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with ACI 301 (ACI 301M) for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

D. Curing Methods: Cure formed and unformed concrete for at least seven days by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Tests: Perform according to ACI 301 (ACI 301M).

1. Testing Frequency: One composite sample shall be obtained for each day's pour of each concrete mix exceeding 5 cu. yd. (4 cu. m) but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.

3.11 REPAIRS

A. Remove and replace concrete that does not comply with requirements in this Section.

END OF SECTION 03301