

SECTION 02230

SITE CLEARING

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. This Section includes the following:

1. Protecting existing trees and vegetation to remain.
2. Removing trees and other vegetation.
3. Clearing and grubbing.
4. Topsoil stripping.
5. Removing above-grade site improvements.
6. Disconnecting, capping or sealing, and abandoning site utilities in place.
7. Disconnecting, capping or sealing, and removing site utilities.

- B. Related Sections include the following:

1. Division 2 Section "Tree Protection and Pruning" for protecting trees remaining on-site that are affected by site operations.
2. Division 2 Section "Earthwork" for soil materials, excavating, backfilling, and site grading.
3. Division 2 Section "Trees, Shrubs and Ground Cover" for finish grading, including placing and preparing topsoil for lawns and planting.

1.3 DEFINITIONS

- A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches (50 mm) in diameter; and free of weeds, roots, and other deleterious materials.

1.4 MATERIALS OWNERSHIP

- A. Except for materials indicated to be stockpiled or to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from the site.

1.5 SUBMITTALS

- A. Photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.
- B. Record drawings:
 - 1. Identify and accurately locate capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 QUALITY ASSURANCE

- A. Preinstallation Conference: Conduct conference at Project site prior to commencement of work.

1.7 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- B. Improvements on Adjoining Property: Authority for performing indicated removal and alteration work on property adjoining Owner's property will be obtained by Owner before award of Contract.
- C. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises as directed by Owner.
- D. Notify utility locator service for area where Project is located before site clearing.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Division 2 Section "Earthwork."
 - 1. Obtain approved borrow soil materials off-site when satisfactory soil materials are not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Provide erosion-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Locate and clearly flag trees and vegetation to remain or to be relocated.
- D. Protect existing site improvements to remain from damage during construction.
 - 1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TREE PROTECTION

- A. Erect and maintain a temporary fence (refer to drawings) around drip line of individual trees or around perimeter drip line of groups of trees to remain. Remove fence when construction is complete.
 - 1. Do not store construction materials, debris, or excavated material within drip line of remaining trees.
 - 2. Do not permit vehicles, equipment, or foot traffic within drip line of remaining trees.
- B. Do not excavate within drip line of trees, unless otherwise indicated.
- C. Where excavation for new construction is required within drip line of trees, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.
 - 1. Cover exposed roots with burlap and water regularly.
 - 2. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.
 - 3. Coat cut faces of roots more than 1-1/2 inches (38 mm) in diameter with an emulsified asphalt or other approved coating formulated for use on damaged plant tissues.
 - 4. Cover exposed roots with wet burlap to prevent roots from drying out. Backfill with soil as soon as possible.
- D. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Architect.
 - 1. Employ a qualified arborist, licensed in jurisdiction where Project is located, to submit details of proposed repairs and to repair damage to trees and shrubs.
 - 2. Replace trees that cannot be repaired and restored to full-growth status, as determined by the qualified arborist.

3.3 UTILITIES

- A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.
 - 1. Arrange to shut off indicated utilities with utility companies.
- B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Owner not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Owner's written permission.
- C. Excavate for and remove underground utilities indicated to be removed.

3.4 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction. Removal includes digging out stumps and obstructions and grubbing roots.
 - 1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
 - 2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
 - 3. Completely remove stumps, roots, obstructions, and debris extending to a depth of 18 inches (450 mm) below exposed subgrade.
 - 4. Grubbing is not to occur within drip line of remaining trees.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.
 - 1. Place fill material in horizontal layers not exceeding 8-inch (200-mm) loose depth, and compact each layer to a density equal to adjacent original ground.

3.5 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.
 - 1. Strip surface soil of unsuitable topsoil, including trash, debris, weeds, roots, and other waste materials.
- C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 1. Limit height of topsoil stockpiles to 72 inches (1800 mm).
 - 2. Do not stockpile topsoil within drip line of remaining trees.
 - 3. Stockpile surplus topsoil and allow for respreading deeper topsoil.

3.6 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.
- B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
 - 1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.

3.7 DISPOSAL

- A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials, including trash and debris, and legally dispose of them off Owner's property.

END OF SECTION 02230

SECTION 02231

TREE PROTECTION AND PRUNING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the protection and trimming of trees that interfere with, or are affected by, execution of the Work, whether temporary or new construction.
- B. Related Sections include the following:
 - 1. Division 2 Section "Trees, Shrubs and Ground Covers."
 - 2. Division 2 Section "Topsoil."

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- C. Certification: From a qualified arborist that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.
- D. Maintenance Recommendations: From a qualified arborist for care and protection of trees affected by construction during and after completing the Work.

1.3 QUALITY ASSURANCE

- A. Tree Service Qualifications: An experienced tree service firm that has successfully completed tree protection and trimming work similar to that required for this Project and that will assign an experienced, qualified arborist to Project site on a full-time basis during execution of the Work.
- B. Arborist Qualifications: An arborist certified by the International Society of Arboriculture or licensed in the jurisdiction where Project is located.
- C. Tree Pruning Standards: Comply with ANSI A300, "Trees, Shrubs, and Other Woody Plant Maintenance--Standard Practices," unless more stringent requirements are indicated by a qualified arborist.
- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."
 - 1. Before starting tree protection and pruning, meet with representatives of authorities having jurisdiction, Owner, Architect, consultants, and other concerned entities. Review tree protection and trimming procedures and responsibilities. Notify participants at least

three working days before convening conference. Record discussions and agreements and furnish a copy to each participant.

1.4 SITE CONDITIONS

- A. The site presently supports mature vegetation. These plants are considered key landscape features and are to be preserved, maintained and protected throughout the work.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Drainage Fill: Selected crushed stone, or crushed or uncrushed gravel, washed, ASTM D 448, Size 24, with 90 to 100 percent passing a 2-1/2-inch (63-mm) sieve and not more than 10 percent passing a 3/4-inch (19-mm) sieve.
- B. Topsoil: Refer to Division 2 Section "Topsoil"
- C. Filter Fabric: Manufacturer's standard, nonwoven, pervious, geotextile fabric of polypropylene, nylon, or polyester fibers.
- D. Chain Link Fence: Metallic-coated steel chain link fence fabric, 0.120-inch- (3-mm-) diameter wire size; 48 inches (1200 mm) high, minimum; line posts, 1.9 inches (48 mm) in diameter; terminal and corner posts, 2-3/8 inches (60 mm) in diameter; top rail, 1-5/8 inches (41 mm) in diameter; bottom tension wire, 0.177 inch (4.5 mm) in diameter; with tie wires, hog ring ties, and other accessories for a complete fence system.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Erect and maintain a temporary fence around drip line of individual trees or around perimeter drip line of groups of trees to remain. Remove fence when construction is complete after securing written authorization from the Architect.
 - 1. Do not store construction materials, debris or excavated material within drip line of remaining trees.
 - 2. Do not permit vehicles, equipment or foot traffic within drip line of remaining trees.
 - 3. Install chain link fence according to ASTM F 567 and manufacturer's written instructions.
- B. Protect tree root systems from damage due to noxious materials caused by runoff or spillage while mixing, placing, or storing construction materials. Protect root systems from flooding, eroding, or excessive wetting caused by dewatering operations.
- C. Do not store construction materials, debris, or excavated material within the drip line of remaining trees. Do not permit vehicles or foot traffic within the drip line; prevent soil compaction over root systems.

- D. Do not allow fires under or adjacent to remaining trees or other plants.

3.2 EXCAVATION

- A. Install shoring or other protective support systems to minimize sloping or benching of excavations.
- B. Do not excavate within drip line of trees, unless otherwise indicated.
- C. Where excavation or trenching is required within drip line of trees, hand clear and excavate to minimize damage to root systems. Do not excavate with backhoe or similar equipment within drip line. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible. Cut roots cleanly with sharp pruning instruments; do not break or chop. Cut to a lateral root when possible. Perform root pruning by a qualified arborist. Wherever possible, avoid cutting roots, especially main lateral roots or taproots. Leave roots intact and hand dig under and around root.
 - 1. Cover exposed roots with wet burlap and water regularly.
 - 2. Temporarily support and protect roots from damage until they are permanently covered with soil.
 - 3. Coat cut faces of roots more than 1-1/2 inches (38 mm) in diameter with an emulsified asphalt or other approved coating formulated for use on damaged plant tissues.
 - 4. Backfill with soil planting mixture as soon as possible.
- D. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by the Landscape Architect.
 - 1. Employ a qualified arborist, licensed in jurisdiction where project is located, to perform repairs to damaged plant materials.
 - 2. Replace trees that cannot be repaired and restored to full-growth status, as determined by the qualified arborist.

3.3 REGRADING

- A. Grade Lowering: Where new finish grade is indicated below existing grade around trees, slope grade beyond drip line of trees, or as directed by a qualified arborist. Maintain existing grades within drip line of trees.
- B. Minor Fill: Where existing grade is 4 inches (150 mm) or less below elevation of finish grade, fill with topsoil. Place topsoil in a single uncompacted layer and hand grade to required finish elevations. In no case fill greater than four inches.

3.4 TREE PRUNING

- A. Prune remaining trees affected by temporary and new construction, only as directed and approved by the Arborist.
- B. Prune remaining trees to compensate for root loss caused by damaging or cutting root system. Provide subsequent maintenance during Contract period as recommended by qualified arborist.
- C. Pruning Standards: Prune trees according to ANSI A300 as follows:

1. Type of Pruning: Crown cleaning.
2. Type of Pruning: Crown thinning.
3. Type of Pruning: Crown raising.
4. Type of Pruning: Crown reduction.
5. Type of Pruning: Vista pruning.
6. Type of Pruning: Crown restoration.

D. Cut branches with sharp pruning instruments; do not break or chop.

E. Chip branches removed from trees.

3.5 MAINTENANCE OF PROTECTED PLANT MATERIALS AND FENCING

A. All protection shall remain in place throughout the construction period.

B. Do not place excess soil, additional fill, construction equipment, liquids, solvents, construction materials or vehicles within protection fencing.

C. Do not remove any soil from within protection fencing.

D. Do not change finished grades more than three inches within a distance of 6 feet from protection fencing.

E. Maintain all plant materials within protection fencing in a healthy, vigorous condition, including watering, fertilizing, pruning and pest control.

3.6 TREE REPAIR AND REPLACEMENT

A. Promptly repair trees damaged by construction operations within 24 hours. Treat damaged trunks, limbs, and roots by the qualified arborist.

B. Remove and replace dead and damaged trees that the qualified arborist determines to be incapable of restoring to a normal growth pattern.

1. Provide new trees as directed by the Landscape Architect and in compliance with all landscape ordinances, plant and maintain as specified in Division 2 Section "Trees Shrubs and Ground Covers."

C. Aerate surface soil, compacted during construction, 10 feet (3 m) beyond drip line and no closer than 36 inches (900 mm) to tree trunk. Drill 2-inch- (50-mm-) diameter holes a minimum of 12 inches (300 mm) deep at 24 inches (600 mm) o.c. Backfill holes with an equal mix of augered soil and sand.

3.7 REMOVAL OF PROTECTION

- A. All protection shall remain in place throughout the construction period. Remove protection devices only after written permission has been granted by the Architect.

3.8 DISPOSAL OF WASTE MATERIALS

- A. Burning is not permitted.
- B. Disposal: Remove surplus soil material, unsuitable topsoil and subsoil, demolished materials, waste materials including trash and debris, and legally dispose of them off the Owner's property.

END OF SECTION

SECTION 02300

EARTHWORK

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. This Section includes the following:

1. Preparing subgrades for slabs-on-grade, walks, pavements, lawns, and plantings.
2. Excavating and backfilling for buildings and structures.
3. Drainage course for slabs-on-grade.
4. Subbase course for concrete walks and pavements.
5. Base course for asphalt paving.
6. Subsurface drainage backfill for walls and trenches.
7. Excavating and backfilling trenches within building lines.
8. Excavating and backfilling trenches for buried mechanical and electrical utilities and pits for buried utility structures.

- B. Related Sections include the following:

1. Division 2 Section "Site Clearing" for site stripping, grubbing, removing topsoil, and protecting trees to remain.
2. Division 2 Section "Tree Protection and Pruning" for protecting and trimming trees to remain.
3. Division 2 Section "Trees, Shrubs and Ground Covers"
4. Division 2 Section "Topsoil"
5. Division 2 Section "Lawns and Grasses"

1.3 DEFINITIONS

- A. Backfill: Soil materials used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

- B. Base Course: Layer placed between the subbase course and paving.

- C. Bedding Course: Layer placed over the excavated subgrade in a trench before laying pipe.

- D. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.

- E. Drainage Course: Layer supporting slab-on-grade used to minimize capillary flow of pore water.

- F. Excavation: Removal of material encountered above subgrade elevations.
- G. Fill: Soil materials used to raise existing grades.
- H. Rock: Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material 3/4 cu. yd. (0.57 cu. m) or more in volume that when tested by an independent geotechnical testing agency, according to ASTM D 1586, exceeds a standard penetration resistance of 100 blows/2 inches (97 blows/50 mm).
- I. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- J. Subbase Course: Layer placed between the subgrade and base course for asphalt paving, or layer placed between the subgrade and a concrete pavement or walk.
- K. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.
- L. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.4 SUBMITTALS

- A. Product Data: For the following:
 - 1. Each type of plastic warning tape.
 - 2. Drainage fabric.
 - 3. Separation fabric.
- B. Samples: For the following:
 - 1. 10 lb. samples, sealed in airtight containers, of each proposed soil material from on-site or borrow sources.
 - 2. 12-by-12-inch (300-by-300-mm) sample of drainage fabric.
 - 3. 12-by-12-inch (300-by-300-mm) sample of separation fabric.
- C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
 - 1. Classification according to ASTM D 2487 of each on-site or borrow soil material proposed for fill and backfill.
 - 2. Laboratory compaction curve according to ASTM D 698 for each on-site or borrow soil material proposed for fill and backfill.

1.5 QUALITY ASSURANCE

- A. Preexcavation Conference: Conduct conference at Project site prior to commencement of work.

1.6 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Owner and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Owner not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Owner's written permission.
 - 3. Contact utility-locator service for area where Project is located before excavating.
- B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, and SM, or a combination of these group symbols; free of rock or gravel larger than 3 inches (75 mm) in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Unsatisfactory Soils: ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT, or a combination of these group symbols.
 - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Backfill and Fill: Satisfactory soil materials.
- E. Subbase: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2- inch (38-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.
- F. Base: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch (38-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.
- G. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch (38-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.
- H. Bedding: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch (25-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.
- I. Drainage Fill: Washed, narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2- inch (38-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.

- J. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch (25-mm) sieve and 0 to 5 percent passing a No. 4 (4.75-mm) sieve.
- K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 ACCESSORIES

- A. Drainage Fabric: Nonwoven geotextile, specifically manufactured as a drainage geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:
 - 1. Grab Tensile Strength: 110 lbf (490 N); ASTM D 4632.
 - 2. Tear Strength: 40 lbf (178 N); ASTM D 4533.
 - 3. Puncture Resistance: 50 lbf (222 N); ASTM D 4833.
 - 4. Water Flow Rate: 150 gpm per sq. ft. (100 L/s per sq. m); ASTM D 4491.
 - 5. Apparent Opening Size: No. 50 (0.3 mm); ASTM D 4751.
- B. Separation Fabric: Woven geotextile, specifically manufactured for use as a separation geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:
 - 1. Grab Tensile Strength: 200 lbf (890 N); ASTM D 4632.
 - 2. Tear Strength: 75 lbf (333 N); ASTM D 4533.
 - 3. Puncture Resistance: 90 lbf (400 N); ASTM D 4833.
 - 4. Water Flow Rate: 4 gpm per sq. ft. (2.7 L/s per sq. m); ASTM D 4491.
 - 5. Apparent Opening Size: No. 30 (0.6 mm); ASTM D 4751.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.
- C. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.2 DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

3.3 EXPLOSIVES

- A. Explosives: Do not use explosives.

3.4 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavation to subgrade elevations regardless of the character of surface and subsurface conditions encountered, including rock, soil materials, and obstructions.
 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.5 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated cross sections, elevations, and grades.

3.7 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
 1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
- B. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches (300 mm) higher than top of pipe or conduit, unless otherwise indicated.
 1. Clearance: 12 inches (300 mm) on each side of pipe or conduit.
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

1. For pipes and conduit less than 6 inches (150 mm) in nominal diameter and flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
2. For pipes and conduit 6 inches (150 mm) or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.
3. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.8 APPROVAL OF SUBGRADE

- A. Notify Owner when excavations have reached required subgrade.
- B. If Owner determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- C. Proof roll subgrade with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof roll wet or saturated subgrades.
- D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Owner.

3.9 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill may be used when approved by Owner.
 1. Fill unauthorized excavations under other construction or utility pipe as directed by Owner.

3.10 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow materials and satisfactory excavated soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.11 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
 1. Construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
 2. Surveying locations of underground utilities for record documents.
 3. Inspecting and testing underground utilities.
 4. Removing concrete formwork.

5. Removing trash and debris.
6. Removing temporary shoring and bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

3.12 UTILITY TRENCH BACKFILL

- A. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- B. Backfill trenches excavated under footings and within 18 inches (450 mm) of bottom of footings; fill with concrete to elevation of bottom of footings.
- C. Provide 4-inch- (100-mm-) thick, concrete-base slab support for piping or conduit less than 30 inches (750 mm) below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches (100 mm) of concrete before backfilling or placing roadway subbase.
- D. Place and compact initial backfill of subbase material, free of particles larger than 1 inch (25 mm), to a height of 12 inches (300 mm) over the utility pipe or conduit.
 1. Carefully compact material under pipe haunches and bring backfill evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of utility system.
- E. Coordinate backfilling with utilities testing.
- F. Fill voids with approved backfill materials while shoring and bracing, and as sheeting is removed.
- G. Place and compact final backfill of satisfactory soil material to final subgrade.

3.13 FILL

- A. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing fills.
- B. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- C. Place and compact fill material in layers to required elevations as follows:
 1. Under grass and planted areas, use satisfactory soil material.
 2. Under walks and pavements, use satisfactory soil material.
 3. Under steps and ramps, use engineered fill.
 4. Under building slabs, use engineered fill.

3.14 MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 2 percent of optimum moisture content.
 - 1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
 - 2. Remove and replace, or scarify and air-dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.15 COMPACTION OF BACKFILLS AND FILLS

- A. Place backfill and fill materials in layers not more than 8 inches (200 mm) in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact soil to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:
- D. Compact soil to not less than the following percentages of maximum dry unit weight according to ASTM D 698:
 - 1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches (300 mm) of existing subgrade and each layer of backfill or fill material at 95 percent.
 - 2. Under walkways, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill material at 92 percent.
 - 3. Under lawn or unpaved areas, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill material at 90 percent.

3.16 GRADING

- A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
 - 1. Provide a smooth transition between adjacent existing grades and new grades.
 - 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
 - 1. Lawn or Unpaved Areas: Plus or minus 1 inch (25 mm).
 - 2. Walks: Plus or minus 1/2 inch (13 mm).
 - 3. Pavements: Plus or minus 1/2 inch (13 mm).
- C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch (13 mm) when tested with a 10-foot (3-m) straightedge.

3.17 SUBSURFACE DRAINAGE

- A. Subsurface Drain: Place a layer of drainage fabric around perimeter of drainage trench as indicated. Place a 6-inch (150-mm) course of filter material on drainage fabric to support drainage pipe. Encase drainage pipe in a minimum of 12 inches (300 mm) of filter material and wrap in drainage fabric, overlapping sides and ends at least 6 inches (150 mm).
 - 1. Compact each course of filter material to 95 percent of maximum dry unit weight according to ASTM D 698.
- B. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches (300 mm) of final subgrade. Overlay drainage backfill with one layer of drainage fabric, overlapping sides and ends at least 6 inches (150 mm).
 - 1. Compact each course of filter material to 95 percent of maximum dry density according to ASTM D 698.

3.18 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.
- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.
- C. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:
 - 1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. (186 sq. m) or less of paved area or building slab, but in no case fewer than three tests.
 - 2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for each 100 feet (30 m) or less of wall length, but no fewer than two tests.
 - 3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for each 150 feet (46 m) or less of trench length, but no fewer than two tests.
- D. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

3.19 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Owner; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.
- 3.20 DISPOSAL OF SURPLUS AND WASTE MATERIALS
- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION

SECTION 02361

TERMITE CONTROL

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: General and Supplementary Conditions of the Contract, Division 1 - General Requirements, and Drawings are applicable to this Section.
- B. Section Includes:
 - 1. Soil treatment below slabs-on-grade and at foundation perimeter for subterranean insects.

1.2 QUALITY ASSURANCE

- A. Applicator: Company specializing in soil treatment for termite control with 5 years documented experience.
- B. Materials: Provide certification that toxicants conform to specified requirements and are environmentally safe.
- C. Material Packaging: Manufacturer's labels and seals identifying content.

1.3 REGULATORY REQUIREMENTS

- A. Conform to applicable requirements of authorities having jurisdiction for application licensing and authority to use toxicant chemicals.

1.4 SUBMITTALS

- A. Submit product data and manufacturer's installation instruction under provisions of Section 01330.
- B. Indicate toxicants to be used, composition by percentage, dilution schedule, and intended application rate.

1.5 PROJECT RECORD DOCUMENTS

- A. Submit documents under provisions of Section 01780.
- B. Accurately record moisture content of soil before treatment, date and rate of application, areas of application, diary of meter readings and corresponding soil coverage.

1.6 WARRANTY

- A. Provide 5 year warranty for material and installation under provisions of Section 01780.
- B. Warranty: Cover against invasion or propagation of subterranean termites, damage to building or building contents caused by termites, and repairs to building or building contents so caused.
- C. Inspect work annually and report in writing to Owner.
- D. Owner reserves right to renew warranty for an additional 5 years after the initial 5 year period.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Toxicant Chemical: Water based emulsion, environmentally safe, uniform composition, synthetic dye to permit visual identification of treated soil, of chemical element and concentrations as approved by authorities having jurisdiction.

2.2 MIX DILUTION

- A. Dilute toxicant chemical as recommended by manufacturer.

PART 3 EXECUTION

3.1 INSPECTION/PREPARATION

- A. Verify the soil surfaces are unfrozen, sufficiently dry to absorb toxicant, ready to receive treatment.
- B. Beginning of application means acceptance of soil conditions.
- C. Notify Architect and Owner/PM at least 12 hours prior to beginning work.

3.2 APPLICATION

- A. Apply toxicant no more than 12 hours prior to installation of vapor barrier under slab-on-grade or finish grading outside foundation walls.
- B. Apply toxicant in accordance with manufacturer's instructions.
- C. Apply extra treatment to structure penetrations, pipe, ducts, expansion joints and other soil penetrations.
- D. Apply as a coarse spray to ensure uniform distribution.
- E. Coordinate soil treatment at foundation perimeter with finish grading and landscaping work to avoid disturbance of treated soil. Retreat disturbed treated soil.
- F. Do not apply soil treatment solution until excavating, filling and grading operations are completed, except as otherwise required in construction operations. To insure penetration, do not apply soil treatment to excessively wet soils or during inclement weather.
- G. Post signs in the areas of application, warning workers that soil poisoning has been applied. Remove signs when areas are covered by other construction.

3.3 RE-TREATMENT

- A. If inspection identifies the presence of termites, retreat soil and retest.
- B. Use same toxicant as for original treatment.

END OF SECTION

SECTION 02362

DRILLED PIERS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Perform all work required to complete the Drilled Pier Work indicated by the Contract Documents and furnish all supplementary items necessary for its proper installation.
- B. Related Work Specified Elsewhere:
 - 1. Geotechnical Report referred to on the structural drawings.
 - 2. Testing and Inspection Services – Division 1
 - 3. Unit Price Schedule – Division 1
 - 4. Earthwork for Site Work - Section 02200
 - 5. Excavation, Backfill and Compaction for the Building Pad – Section 02210
 - 6. Concrete Formwork – Section 03100
 - 7. Concrete Reinforcement - Section 03200
 - 8. Cast-in-Place Concrete - Section 03300
- C. Contractor shall study the Geotechnical Investigation Report and the recommendations given therein for the procedures to be followed as they pertain to the work of this Section.

1.2 INSPECTION

- A. The Geotechnical Engineer of Record shall be the Testing Agency for all drilled pier work.

1.3 BASIS FOR BIDS

- A. Contract sum shall be based on the number and base depths of piers as shown on the drawings. The basic contract shall include all work necessary for the completion of the drilled piers, including removal of spoil.
- B. The pier drilling log prepared by the Testing Agency shall be used to adjust the Contract amount for greater and lesser pier depths caused by varying depths to suitable bearing strata.
- C. Adjustments to the Contract shall be based on unit prices and the total linear feet of each pier size and type greater than or less than the sum of the base lengths of each pier size and type.
- D. No payment will be made for extra length when shafts are excavated to a greater depth than required or authorized due to over drilling by the contractor.
- E. Cost of providing and placing casings is not to be included in the base contract. If casings are required, costs for providing, installing, and removing same, will be added to the contract based on unit prices.

1.4 UNIT PRICES

- A. Piers: Provide unit prices per lineal foot for each diameter and type of pier shown on drawings, complete, including drilling, reinforcing, concreting and removal of spoilage. Prices will be used for both increases and reductions.

- B. Casings: Provide unit price per lineal foot of casing for each diameter of pier shown including installation and removal of steel casings.

1.5 QUALIFICATIONS

- A. Pier Drilling Sub Contractor: Shall have a minimum of 10 years of experience that includes work of similar scope in this area. Upon request submit a list of similar projects and references from those projects.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Concrete: See Section 03300.
- B. Steel Casings: Steel casings shall have sufficient strength to withstand handling stresses, concrete pressure, and earth and surcharge pressure. Diameter of casing in relation to diameter of excavation shall be such that void space outside casing is minimized.
- C. Pier Top Forms: See Section 03100.
- D. Reinforcing Cage Support and Alignment System:
 - 1. Pier Bolster: Unit consisting of a fabricated concrete support, with minimum compressive strength of 8000 psi with integral wires. Nominal 4 inch diameter, nominal 3 inch high with two 9GA wires for attachment to bottom of reinforcing cage to support bottom of cage free of earth.
 - 2. Centering Device: Unit consisting of fabricated concrete support, with minimum compressive strength of 8000 psi with integral tie wires. Nominal 8 inch x 4 inch x 1¼ inch with 8 16GA wires for attachments to vertical and horizontal reinforcing bars of cage to align cage in shaft free of earth.

2.2 PROPORTIONS, MIXING AND PLACING

- A. See Concrete, Section 03300, except that concrete shall have a slump of 6", plus or minus 1".

PART 3 - EXECUTION

3.1 PRE-CONSTRUCTION MEETING

- A. Conduct a pre-construction conference at the site with the drilling sub contractor, the Geotechnical Engineer of Record and the Testing Lab to discuss the installation techniques required for this project. Notify the Architect, Structural Engineer and Owner of the meeting time and place. Attendance by these three will be at their option.

3.2 DRILLING

- A. All piers shall be drilled in true alignment at locations and spacing as shown on the Drawings. A maximum lateral variation not exceeding the lesser of three inches or 4% of the shaft diameter will be acceptable. Should greater variation occur, the Contractor shall notify the Engineer for corrective measures.
- B. All piers shall be drilled plumb. A deviation more than the lesser of ten percent (10%) of the shaft diameter or one percent (1%) of the full height, from the vertical, will be cause for rejection.
- C. Piers shall be drilled using rotary rigs through overburden into and founded in the bearing material.
- E. After shafts are drilled, the holes shall be cleaned of loose dirt, mud, rock, and water. Particular emphasis must be placed on securing a dry shaft excavation. Reference drawings and geotechnical report for soil conditions and recommendations pertaining to the drilling of piers on this site.

3.3 CONCRETING

- A. Provide pier top forms where excavation and construction techniques do not allow the top of pier to be of uniform shape with smooth sides. Do not allow pier tops to mushroom or widen.
- B. Provide and install reinforcing steel as scheduled and required by the Drawings. The provisions of Section 03200 apply to all materials and placement hereunder. Provide and install pier bolsters and centering devices as follows:
 - 1. Pier Bolsters: Use a minimum of two pier bolsters per pier for all piers that are 30" or less in diameter. For greater diameters, use 4 pier bolsters. Assure that tie wires are properly installed so that they do not become displaced during placement of cage in shaft.
 - 2. Centering Devices: Use a minimum of 6 devices for shafts less than 15 feet deep, and 10 devices for shafts greater than 15 feet deep. Uniformly space to properly align cage in shaft. Assure that tie wires are properly installed so that the units do not become displaced during placement of cage in shaft.
- C. Provide and install all concrete to fill holes drilled, as scheduled and required by the Drawings. The provisions of Section 03300 apply to all materials and placement hereunder. Concrete for piers shall have a 28-day strength as noted in the Contract Documents.
- D. Provide adequate runways, chutes, and other means of conveying concrete into place. If a concrete freefall of greater than eight feet will be required, concrete shall contain an adequate plasticizer to prevent segregation of materials. Concrete shall be placed in such a way that it does not come in contact with the rebar cage or side of pier during the freefall placement. The top five feet of concrete in the shaft shall be thoroughly vibrated and excess water removed.
- E. It is necessary that concrete be placed within the shaft excavation as soon as practical after drilling, seating and cleaning out has been completed but in no case should the time lapse exceed 8 hours before placement of the concrete.
- F. Remove temporary steel casing from the hole during the concrete operation. Exercise extreme care to maintain a head of plastic concrete greater than the head of surrounding water at all times. Rotation or jerking of the casing shall not be permitted during the withdrawal process.

END OF SECTION

SECTION 02754

COLOR CONDITIONED CONCRETE

PART ONE - GENERAL

1.01 SUMMARY

A. Work included

1. Providing colored admixture for integrally colored concrete paving and topping slab as indicated on drawings.

1.02 RELATED WORK

- | | | |
|----|----------------------------|---------------|
| A. | Concrete Formwork | Section 03100 |
| B. | Concrete Reinforcing Steel | Section 03200 |
| C. | Cast-in-Place Concrete | Section 03300 |

1.03 QUALITY ASSURANCE

A. The following codes, regulations, reference standards and specifications apply to work included in this section:

1. ACI 305, Hot Weather Concreting; ACI 306, Cold Weather Concreting; ACI 117, Standard Tolerances for Concrete Construction and Materials; ACI 318-63, Building Code Requirements for Reinforced Concrete.
2. ASTM: C94, C260, C309, C494, C979.

B. Testing Agency

1. Testing shall comply with applicable portions of Section 03300.

C. Contractor shall have three to five years experience in placing color conditioned concrete.

1.04 SUBMITTALS

A. Samples:

None required.

B. Certifications:

1. As required by Section 03300
2. Color conditioned concrete ingredients:
 - a. Submit the mix design recommendations of the manufacturer, verifying that the single component admixture contains no calcium chloride, and is compliance with UBC Standard No. 26-12.

1.05 STORAGE AND HANDLING

- A. Deliver packaged admixture to the project site in original sealed packaging labeled with weight, name of manufacturer, brand, color and type.
- B. Store packages in a water tight building.
- C. Do not use admixture which has been contaminated or exposed to moisture.

PART TWO - PRODUCTS

2.01 COLOR CONDITIONED CONCRETE ADMIXTURE

- A. Chromix admixture as manufactured by L.M. Scofield Company, 4155 Scofield Road, Douglasville, Georgia 30134, phone 800.800.9900.
- B. Colors: Dark Gray C 34. Pigments shall consist of pure mineral oxides only and shall comply with ASTM C979.
- C. Single component admixture certified as containing no calcium chloride, and complying with UBC Standard No. 26-12.
- D. Comply with ACI 318-63 and ASTM C494 for water reducing admixture components.
- E. Coordinate mix design with the requirements of Section 03300, Cast in Place Concrete and ensure that the manufacturer of the portland cement is consistent throughout the project. Consult manufacturer's technical data for compliance with recommended water/cement ratio to achieve specified compressive strength.
- F. Use no other admixtures except an air-entraining agent complying with ASTM C260 where required.

2.02 LIQUID MEMBRANE CURING COMPOUNDS FOR CURING

- A. Lithochrome Colorwax as manufactured by L.M. Scofield Company, 4155 Scofield Road, Douglasville, Georgia 30134, phone 800.800.9900.
- B. Colors of product to match custom colors of color conditioned concrete admixture.
- C. Provide products of the same manufacturer as the color conditioned concrete admixture.
- D. Comply with ASTM C309.

2.03 PORTLAND CEMENT

- A. Gray Portland cement

PART THREE - EXECUTION

3.01 CONVEYING AND PLACEMENT

- A. Convey and place color conditioned concrete in accordance with Section 03300, Cast in Place Concrete.
- B. Do not place color conditioned concrete if conditions are not satisfactory.

3.02 FINISHES

- A. Refer to Section 03345.

3.03 CURING AND PROTECTION

- A. Freshly placed concrete shall be protected from premature drying and excessively hot or cold temperatures, and shall be maintained without drying at a relatively constant temperature for the period of time necessary for the hydration of the cement and proper hardening of the concrete. Apply curing compound according to manufacturer's recommendations.
- B. Do not cure with ponded standing water.
- C. Liquid Membrane Curing Compounds for Curing Concrete:
 - 1. Use as recommended by the manufacturer of the color conditioned concrete admixture, in the matching colors.
 - 2. Apply in accordance with manufacturer's instructions.
 - 3. Apply curing compound as soon as concrete surface has sufficiently set so that it can be gently walked on without marring or imprints. Application of liquid membrane curing compound must be by airless sprayer, with pressure and tip size in accordance with manufacturer's recommendations. Coverage rate shall be 300–400 square feet per gallon per application.
 - 4. Do not cover with plastic sheeting or water proof paper. If additional protection is required, the surface should remain uncovered for at least four days, after which time new, water staining reinforced water proof kraft curing paper may be used.
- B. Barricade against pedestrians for twenty four hours and against vehicular traffic for fourteen days. Backfill adjacent to work shall be placed and thoroughly tamped in layers not exceeding 6 inches in depth and left in a neat and workmanlike condition.

3.04 FIELD QUALITY CONTROL

- A. In accordance with Section 03300, Cast in Place Concrete.
- B. Arrange for a representative of L.M. Scofield Co. to be present during placement of color conditioned concrete and liquid membrane curing compound.

3.05 CLEANING

- A. Concrete spilled on the pavement or structures shall be removed and the pavement or structures thoroughly cleaned before the concrete sets. Spilled concrete shall not be washed into sewers or drains. Restore the site of the work to a neat appearance, including removal of excess materials, forms and equipment.

END OF SECTION 02754

SECTION 02795
POROUS PAVEMENT

PART 1 – GENERAL

1.1 GENERAL PROVISIONS:

- A. The Conditions of the Contract and all Sections of Division 1 are hereby made a part of this Section.

1.2 DESCRIPTION OF WORK:

A. Work Included:

1. Provide and install sandy gravel road base as shown on drawings, to provide adequate support for project designs loads. See 2.2 Materials.
2. Provide Gravelpave2 Paving products including Gravelpave2 units, anchors and installation per the manufacturer's instructions furnished under this section.
3. Provide and install fine decorative gravel to fill the Gravelpave2 units.
See 2.2 Materials

B. Related Work:

1. Subgrade preparation under Section 31 20 00 Earth Moving (02200 – Earthwork).

1.3 QUALITY ASSURANCE:

- A. Follow Section 01 33 23 Shop Drawings, Product Data, and Samples (01340 Shop Drawings, Product Data, and Samples) requirements.

- B. Installation: Performed only by skilled work people with satisfactory record of performance on landscaping or paving projects of comparable size and quality.

1.4 SUBMITTALS:

- A. Submit manufacturer's product data and installation instructions.

- B. Submit a 10" x 10" section of Gravelpave2 product for review. Reviewed and accepted samples will be returned to the Contractor.

- C. Submit material certificates for base course and sand fill materials.

1.5 DELIVERY, STORAGE AND HANDLING:

- A. Protect Gravelpave2 material units from damage during delivery and store under tarp when time from delivery to installation exceeds one week.

1.6 PROJECT CONDITIONS:

- A. Review installation procedures and coordinate Gravelpave2 work with other work affected.

- B. All hard surface paving adjacent to Gravelpave2 areas, including concrete walks and asphalt paving, must be completed prior to installation of Gravelpave2.

C. Cold weather:

1. Do not use frozen materials or materials mixed or coated with ice or frost.
2. Do not build on frozen work or wet, saturated or muddy subgrade.

- D. Protect partially completed paving against damage from other construction traffic when work is in progress.
- E. Protect adjacent work from damage during Gravelpave2 installation.

PART 2 – PRODUCTS

2.1 AVAILABILITY:

- A. Manufacturer: (Gravelpave2) Invisible Structures, Inc., 1600 Jackson Street., Suite 310, Golden, CO 80401. Call from USA and Canada 800-233-1510 toll free, (International 303-233-8383), Fax 800-233-1522 (International 303-233-8282).
- B. Contact Manufacturer for Local Sales Representative.

2.2 MATERIALS

- A. Base Course: Sandy Gravel material from local sources commonly used for road base construction, passing the following sieve analysis.

Sieve	%Passing
1"	100
3/4"	90-100
3/8"	70-80
#4	55-70
#10	45-55
#40	25-35
#200	3-8

1. Sources of the material can include either "pit run" or "crusher run". Crusher run material will generally require sharp sand (AASHTO M6 or ASTM C-33) to be added to mixture (25 to 35% by volume) to ensure long-term porosity.
 2. Alternative materials such as crushed shell, limerock, and/or crushed lava may be considered for base course use, provided they are mixed with sharp sand (25 - 35%) to ensure long-term porosity, and are brought to proper compaction. (Crushed shell and limerock alone can set up like concrete unless sand is added.)
- B. Gravelpave2 Paving Units: Lightweight injection molded plastic units 0.5x0.5x0.025 m (20"x20"x1" high, 2.7 ft2 each) with hollow rings rising from a strong open grid with a geotextile fabric heat fused to the bottom of the grid. Units will be shipped in pre-assembled rolls of various dimensions. Loading capability is equal to 5700 psi when filled with sand, over appropriate depth of road base. Standard colors are black, gray, terra cotta, and tan, with custom colors available. Unit weight = 535 gr (19 oz.), volume = 8% solid.
 - C. Gravel Fill: Obtain clean, washed, fine decorative granite chip, must be sharp and angular (not rounded) stone, granite hardness, to fill the 25 mm (1") high rings and spaces between the rings, not to be overfilled more than 1" (25 mm). Maximum Size of stone should be: 3/16" to 3/8" (5 mm to 10 mm) and uniform in size - not graded. **Granite Chip: Tejas Black Basalt. Source: Custom Stone, Dallas, Texas 972-243-1144.**
 - D. Anchors: Typical anchors shall be 8" long nails with "fender" type washers 7 x 30 mm od (5/16" id x 1.25") od, all galvanized metal or similar corrosion resistant coating. Supplied anchors may vary in size and type based on source and availability.

PART 3 – EXECUTION

3.1 INSPECTION:

- A. Examine subgrade and base course installed conditions. Do not start Gravelpave2 installation until unsatisfactory conditions are corrected. Check for poor drainage, improperly compacted trenches, debris, and improper gradients.
- B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance. If existing conditions are found unsatisfactory, contact Project Manager for resolution.

3.2 PREPARATION:

(Ensure that subbase materials are structurally adequate to receive designed base course, wearing course, and designed loads. Ensure that grading and soil porosity of the subbase will provide adequate subsurface drainage.)

- A. Place base course material over prepared subbase to grades shown on plans, in lifts not to exceed 150 mm (6"), compacting each lift separately to 95% Modified Proctor. Leave 25 mm (1.0") for Gravelpave2 unit and gravel fill to Final Grade.

3.3 INSTALLATION OF GRAVELPAVE2 UNITS:

- A. Install the Gravelpave2 units by placing units with rings facing up, and using small male/female connectors provided along each edge to maintain proper spacing and interlock the units. Cutting can be performed with pruning shears and knife, or portable power saw. Units shall be anchored to the base course, using anchors described above, as required to secure units in place from movement by traffic, at an average rate of 6 pins per square meter (high speed, heavy vehicles, fast turning movement will require additional anchors). Tops of rings shall be flush with the surface of adjacent hard surfaced pavements.
- B. Install gravel into rings after the units are anchored by "backdumping" directly from a dump truck, or from buckets mounted on tractors, with a minimum depth of 6", then exit the site by driving forward over rings already filled. Sharp turning of vehicles on bare rings must be avoided. The gravel is then spread laterally from the pile using power brooms, blades, flat bottomed shovels and/or wide "asphalt rakes" to fill the rings. A stiff bristled broom should be used for final "finishing". The gravel should be "compacted", if necessary, by using a vibrating plate or small roller, with the finish grade no less than the top of rings and no more than 6 mm (0.25") above top of rings.
- C. If a binder for fill stone is desired (due to traffic speed, concentrated water flow, or other reason), use Portland cement, mixed dry at 10% by weight with fill stone,. Place into rings after thoroughly wetting the base, then lightly mist the surface after fill and compaction. Then, cover with a water resistant tarp, or plastic sheeting material for a minimum period of 3 days, or until the mixture has bonded.

3.6 CLEANING:

- A. Remove and replace segments of Gravelpave2 units where three or more adjacent rings are broken or damaged, reinstalling as specified, with no evidence of replacement.
- B. Perform cleaning during the installation of work and upon completion of the work. Remove all excess materials, debris, and equipment from site. Repair any damage to adjacent materials and surfaces resulting from installation of this work.

END OF SECTION

If you have any questions regarding this specification, please call Invisible Structures, Inc. 1-800-233-1510, overseas call 303-233-8383.

Version 09/2008

SECTION 02810

LANDSCAPE IRRIGATION SYSTEM

PART 1 - GENERAL

- A. Design and installation of the irrigation system shall be by a Texas Licensed Landscape Irrigation contractor. It is intended that the cost of all work incidental to the completion of the system as shown or indicated on the plans or in these specifications, be included in the bid except as specifically noted herein.

1.1 RELATED WORK:

- A. Lawns and Grasses - Section 02920
- B. Trees, Shrubs and Ground Covers - Section 02931
- C. Tree Protection and Pruning – Section 02231

1.2 UNIT PRICES:

- A. Provide unit prices for work and materials. Unit prices will be applied when greater or lesser amount of work is required. Unit prices are to be the cost of work and materials in place including materials, equipment, labor, taxes, overhead, guarantee, maintenance and profit.

1.3 REFERENCES:

ASTM - American Society for Testing Materials
D2241: Polyvinyl Chloride (PVC) Plastic Pipe (SDR-PR).
D2287: Flexible Polyvinyl Chloride (PVC).
D2464: Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Threaded, Schedule 80.
D2466: Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Socket Type, Schedule 40.
D2564: Solvent Cements for Polyvinyl Chloride (PVC) Plastic Pipe and Fittings.
D2855: Making Solvent - Cemented Joints for Polyvinyl Chloride (PVC) Pipe and Fittings.

1.4 DEFINITIONS:

- A. Irrigation Mains: That portion of piping from water source to remote control valves. This portion of piping is subject to surges, being a closed portion of irrigation system. Hydrant lines (QCV) are considered part of main line piping system.
- B. Lateral Piping: That portion of piping from remote control valve to sprinkler heads and tubing.

1.5 SYSTEM DESCRIPTION:

- A. Design and install to provide complete coverage for lawn and planting areas within limits shown on Planting Plans. **Coordinate and integrate new system with existing system.** Furnish and install an operating system complete with electrical connection, backflow preventers, automatic controller, main and lateral lines, sprinkler heads, remote control valves, quick coupler valves, wires and any other items required for a complete and operating system.

1.6 SUBMITTALS:

- A. Irrigation Design and Layout Plans, and Irrigation Details by Texas Licensed Landscape Irrigation contractor.
- B. Product Data: Manufacturer's literature in triplicate, neatly bound with cover titled with name and address of project, date of submission, and name and address of Landscape Architect and Contractor.
- C. Project Record Documents:
 - 1. Maintain at site one copy of Drawings, Specifications, Addenda, approved Change Orders and other modifications in good order and marked to record changes made during construction.
 - 2. Upon completion of work, produce "As-Built" drawing, transposing changes to reproducible provided by Landscape Architect.
 - 3. Deliver "As-Built" to Owner prior to issuance of final acceptance. As-Built to include location, by written dimension, of mainline piping, remote control valves and quick coupler valves, date and signature and license of installer. In addition, provide reduced and laminated copy of As-Built drawing for Owner's use.

1.7 PROJECT/SITE CONDITIONS:

- A. Water Supply: Connect to existing domestic water. Owner will pay for water for required testing, flushing and jetting.
- B. Electrical Supply: Coordinate with Owner as necessary to verify that appropriate power is available at controller location. Make final connection to controller.
- C. Sleeves and Ducts: Installed as necessary under all paved surfaces.
- D. Existing Utilities and Structures: Consult with Owner and appropriate utility companies for location prior to commencing installation. Repair damage due to installation immediately. Make necessary adjustments in the layout as may be required to connect to existing stubouts, should such stubouts not be located or described exactly as shown, and as may be required to work around existing conditions.
- E. Storage: Space will be designated at the site.
- F. Barricades: Barricade streets per local codes and regulations during installation.
- G. Deliver materials in original package, cartons, and containers bearing the name of manufacturer, brand, and model number.
- H. Protect irrigation system materials before, during and after installation. Exercise care in handling, loading, unloading, covering and storing plastic pipe and fittings until ready to install. Handle all material in an approved manner. No damaged materials shall be used.
- I. In the event of damage, immediately make repairs and replacements necessary at no additional cost to Owner.

1.8 SCHEDULING:

- A. Coordinate with Contractor and landscape work.

- B. Prepare a detailed schedule coordinated with the work of other contractors doing work at the site.
- C. Monitor schedules on a regular basis so potential variances can be determined and resolved
- D. Verify all product orders so deliveries are timed to maintain construction schedules.

1.9 GUARANTEE:

- A. Fully guarantee materials and workmanship for one year after issuance of final acceptance.
- B. Limit guarantee to repair and replacement of defective materials or workmanship and repair of backfill settlement. Any such defects shall promptly be repaired or replaced at no cost to the owner. Any after-settling of trenches shall be refilled and compacted within the warranty period at no additional cost to the owner. Repairs required due to abuse, misuse, or neglect of the system are not included in this warranty.
- C. The installation of the irrigation work shall be made by an individual or firm duly licensed under Article No. B751 VTSC, Titled "Licensed Irrigation Act", S.B. No. 259. All irrigators will be required to show their current updated license for the current year.
- D. Comply with local and state laws, codes, and ordinances applicable to this project, as well as the National Electrical Code for Electrical work and materials.

1.10 MAINTENANCE:

- A. Provide maintenance of system including leak repair, cleaning and adjustment of heads, raising and lowering of heads, and flushing lateral lines for one year after final acceptance. Fully test each circuit of the irrigation system monthly. Repair leaks, broken heads or other failures within 24 hours.
- B. Repair backfill settlement of trenches during one year period.
- C. Drain and flush system within one year guarantee period.
- D. Instruct Owner and Owner's personnel in operation and general maintenance of system. Provide Owner with a maintenance manual of materials installed bound in a three ring black vinyl binder.
- E. Repair of damage caused by vandals, other contractors or weather conditions shall be considered extra to the work.
- F. Maintain the entire irrigation system in proper working order and program the controllers in consultation with Landscape Contractor during the installation and maintenance phase of the work prior to final acceptance.
- G. Provide the Owner with letter summarizing warranty stated in specification and date of final acceptance. This letter shall serve as Contractor's written guarantee.

1.11 EXTRA EQUIPMENT

- A. Three (3) quick coupler keys with one hose swivel and one brass boiler drain each.

- B. Three (3) keys to controller.

PART 2 - PRODUCTS

2.1 POLYVINYL CHLORIDE PIPE:

- A. Manufactured in accordance with standards noted herein.
- B. Marking and identification: Continuously and permanently marked with manufacturer's name, pipe size, pipe type and material, SDR number, ASTM standard number and NSF (National Sanitation Foundation) seal.
- C. Pipe Fittings: Of same material as PVC pipe specified and compatible with PVC pipe furnished.
- D. PVC Pipe: Class 200, SDR 21, except one-half inch to be Class 315, SDR 13.5
- E. Flexible PVC Pipe: Heavy duty flexible vinyl pipe as manufactured by Agricultural Products, Inc.
- F. Sleeves: Class 200, SDR 21.

2.2 COPPER TUBING AND FITTINGS:

- A. Hand straight lengths of domestic manufacture, Type "M". Do not use foreign extrusion or irrigation tubing.
- B. Copper Tube Fittings: Cast bronze or wrought copper of sweat-solder type.
- C. Use only 60-40 "no lead" solder on copper joints.

2.3 VALVE WIRING:

- A. Type UF, No. 14 gauge with 4/64 inch insulation, Underwriters Laboratory approved for direct underground burial when used in National Electrical Code, Class II circuit (30 volts AC or less) and sized not less than specified by manufacturer. Color code wire red for lead wire and white for common wire.

2.4 WIRE SPLICES:

- A. "Dri-Splice" as manufactured by Spears Manufacturing Company, "DBY Connectors" as manufactured by 3-M Company or "One Step" as manufactured by King Technology, Inc.

2.5 SOLVENT:

- A. Conform to ASTM D2S64.

2.6 CLEANER AND PRIMER:

- A. PVC Pipe and Fittings: Weld-On #705 solvent and #P-70 Primer.
- B. Flexible PVC Pipe to Schedule 40 Fittings: Weld-On #795 solvent and #P-70 Primer.

2.7 QUICK COUPLER VALVES:

- A. Shall be 3/4" bronze bodied valves with a rubber seat and plated cover. Keys shall be

bronze constructed with 3/4" FIP X 3/4" MIP threaded. Rainbird 3RC and 33DK.

2.8 SWING JOINTS:

- A. One (1") inch unitized "full circle" type LASCO #T12-005. Use Teflon tape on all threaded joints and draw joints up snugly, do not over-tighten.

2.9 SPRAY HEAD:

- A. Grass Spray Heads: ABS body with a 4" spring loaded pop-up nozzle assembly and 1/2" FIP connection in base. Rainbird 1804.
- B. High-Pop Spray Heads: ABS body with a 12" spring loaded pop-up nozzle assembly and 1/2" FIP connection in base. Rainbird 1812.
- C. Nozzles: Precision-milled brass with matched precipitation rates. Rainbird MPR series as noted.
- D. Rotary Heads: Gear driven type constructed of heavy duty, non-corrosive ABS body with four (4") inch pop-up stroke, twelve (12) changeable nozzles and stainless steel adjustment screw. Hunter PGP.

2.10 ELECTRIC VALVES:

- A. Normally closed, globe-type diaphragm, glass-filled nylon body and cover, and Buna N reinforced diaphragm with 24-volt, 1/4 amp solenoid in a waterproofed housing. Rainbird PEB.

2.11 REINFORCEMENT STAKES FOR QUICK COUPLER VALVES:

- A. 1" galvanized pipe long enough to penetrate at least 36" into undisturbed earth. Use two stainless steel worm gear clamps with stainless steel screws to fasten stake to quick coupler.

2.12 BACKFLOW PREVENTER:

- A. Double Check Assembly consisting of two independently operating check valves with an inlet and outlet shutoff valve and four test cocks. Each check valve shall be a "Y" pattern, spring loaded, poppet type. FEBCO #805Y

2.13 VALVE BOXES:

- A. Plastic snap, green lid units, 10" round valve box. Ametek or approved equal.

2.14 VALVE BOX BACKFILL:

- A. Clean, washed gravel graded from 1/2" to 1" diameter.

2.15 ELECTRIC CONTROLLER:

- A. Shall be solid state with 24-hour clock, 14-day dual program calendar, remote sensor circuit and dry indexing. Controller housing shall be rainproof, urethane coated, steel cabinet with U.L. listing and toggle, padded lock hasp and keeper. Rainbird ESP-MC series.

2.16 TEMPERATURE SENSOR:

- A. Johnson Controls Freeze Sensor PENN #A19ANC-1

2.17 RAIN SENSOR:

- A. Mini-Click rain sensor.

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Examine areas and conditions under which system is to be installed.
- B. Notify Landscape Architect in writing of conditions detrimental to proper and timely completion of work.
- C. Do not proceed until conditions are satisfactory.

3.2 PREPARATION:

- A. Coordinate work which is embedded in concrete or masonry and route under paved areas.
- B. Provide timely delivery and installation at job site.
- C. Protect adjacent structures, surfaces, and finishes. Do not move equipment over structures without written approval from Landscape Architect. Provide necessary protection such as board roading, drop cloths, etc., as required.

3.3 INSTALLATION:

- A. Staking: Before installation is started, place a stake where each sprinkler is to be located in accordance with drawings. Receive written approval from Landscape Architect before proceeding.
- B. Excavation: Is unclassified and includes earth, loose rock, rock or any combination thereof, in wet or dry state and no rock clause will be accepted.
- C. Backfill: All excavation in this contract shall be unclassified and is to include earth, loose rock, solid rock, or any combination thereof, in a wet or dry state. All trenches shall be backfilled with the material removed except for rocks larger than 1". Backfill shall be flooded and tamped to prevent settling. Should solid rock be encountered, contractor shall remove such rock within 4" of contact with pipe and bed trenches with clean sand fill. Removal of excavated rock shall be included in the cost of this contract.
- D. Pipe Layout: Is diagrammatic, route around trees and shrubs to avoid damage to root system. Do not dig within root balls of newly planted trees or shrubs. Do not move or damage trees and shrubs. **Irrigation Contractor to meet with General Contractor, Arborist, Landscape Architect and Owner prior to any proposed trenching to review and approve location and method of excavation. Refer to 02231-3.2.**
- E. Pipe Installation:
 - 1. Sprinkler Main: Install in 4-inch wide (minimum) trench with a minimum of 18 inches of cover.

2. Lateral Piping: Install in 4-inch wide (minimum) trench with a minimum of 12-inches of cover.
 3. Trenching: Remove lumber, rubbish and greater than 1 1/2 inches in diameter from trenches. Provide a firm, uniform bearing for entire length of pipe to prevent uneven settlement. Pad trenches with dirt or sand if soil is rocky. Do not wedge nor block pipe. Remove foreign matter or dirt from inside of pipe prior to welding and keep clean during and after installation. Do not lay piping in trenches when water is in trench, temperature is 36 degrees or below nor when rain is eminent.
- F. PVC Pipe and Fitting Assembly:
1. Solvent: Use type and procedures recommended by pipe manufacturer to make solvent-welded joints. Thoroughly clean pipe and fitting of dirt, dust, and moisture before applying solvent.
 2. PVC to Metal Connection: Work metal connection first. Use a non-hardening pipe dope such as Permatex No. 2 on threaded PVC to metal joints. Use only light wrench pressure.
 3. Threaded PVC Connection: Where required, use threaded PVC adapters into which pipe may be welded.
- G. Copper Tubing and Fitting Assembly:
1. Clean pipe and fitting thoroughly and buff connection with sandpaper to remove residue from pipe.
 2. Flux pipe and fittings, solder connection using 60-40 soft solid core leak free solder.
- H. Sprinklers:
1. General: Supply in accordance with equipment list and size according to drawings. Revise nozzle degree and trajectory as required by wind condition as affecting coverage. Firmly tamp grade around head. Allow a 2" to 4" space between all heads and any hardscape edge. Thoroughly flush all debris from lines before installing spray head nozzles or rotary internal assemblies. All heads shall be plumb, level, and flush with grade unless noted otherwise.
 2. Lawn Spray Head: Install with top side of head flush to one-quarter (1/4") inch above finish grade and 4" minimum from back of curb. Attach to lateral piping with a flexible 1/2" X 12" PVC flexible riser. No polyethylene nipples will be allowed.
 3. High-Pop Spray Head: Install with underside of flange flush with finish grade and 4" minimum from back of curb. Attach to lateral piping with a flexible 1/2" X 12" flexible riser. The height of shrub risers shall be adjusted to optimum plant height according to the landscape architect.
 4. Rotary Head: Install with underside of flange flush with finish grade and 4" minimum from back of curb. Attach to lateral piping with a swing joint as detailed on drawings.
- I. Quick Coupler Valve:
1. Install flush with finish grade. Attach to sprinkler mains with swing joint as

detailed on drawings. Install reinforcement stake perpendicular to grade and buried below finish grade two (2") inches minimum from back of curb. Attach to lateral piping with a swing joint as detailed on drawings.

J. Electric Remote Control Valve:

1. Supply in accordance with equipment list and size according to drawings.
2. Install in a level position deep enough so there will be at least 12 inches of cover over valves and in accordance with manufacturer's specifications.
3. Install with a 10-inch green plastic valve box centered over valve. Valves shall be grouped in orderly arrangement. No valves shall be within 18" of another, or within 12" of a curb or sidewalk. Valve boxes shall be grouped in straight lines at the same grade. Hand tamp and fill if necessary around all valve boxes.

K. Wiring:

1. Supply wire from automatic sprinkler controller to valves in accordance to controller manufacturer's specifications. A separate wire is required from controller to each valve. Provide a common neutral wire with white insulation from controller to each valve. Install splices in splice box.
2. Lay wire in trenches provided for piping and tuck under piping taping in bundle every ten (10') feet with plastic electric tape.
3. No conduit is required for wire except under paved areas.
4. Join wires together using water-proof splice kits. All splices shall be located in a valve box. No field splices shall be allowed.
5. Provide 48" expansion coil of valve and ground wire at each remote control valve and splice. Form expansion coil by wrapping firmly and evenly around a piece of one (1") inch PVC pipe. Expansion coils shall be provided every 100', and at all changes in direction.

L. Automatic Irrigation Controller:

1. Install according to manufacturer's recommendation at location shown on drawing.
2. Program controller system setting operation times and duration as directed by Architect and adjust as required. The controller shall be installed level and secure. Wire conduits to controller shall be straight, and secured with appropriate clamps as needed. Controller sensors shall be installed in optimum locations at the direction of the landscape architect within access of the controller location. Assign zone numbers as indicted on the plans. Each valve wire end shall be labeled within the controller with zone number tape markers.

M. Temperature and Rain Sensors:

1. Install in locations approved by Landscape Architect.

3.4 TESTING:

- A. General: Perform required testing under observation of Architect. Give 24 hours notice that tests are to be conducted.

- B. Sprinkler Main: Test for a period of 12 to 14 hours under normal water pressure. If leaks occur, correct defect and repeat test.
- C. Lateral Piping: Test for a period of 1 hour under normal water pressure. If leaks occur, correct defect and repeat test.
- D. Complete testing prior to backfilling. Sufficient backfill must be placed in trenches between fittings to insure stability of line under pressure. In each case, leave fittings and couplings open to visual inspection for full period of test.
- E. Verify sensor operation to shut system down by filling rain sensor with 1/4" of water and then placing temperature sensor in ice.

3.5 ADJUSTMENT:

- A. After system has been installed, make final adjustments preparatory to inspection by Landscape Architect.
- B. Completely flush system to remove debris from lines by removing nozzles from heads and turning on system. Replace nozzles and check operation of system, section by section, to determine that there is no debris left in the heads to obstruct proper operation. If any heads do not now operate properly, repeat operation by removing nozzles of heads not operating properly and reflushing. Repair any leaks. Refill and compact any settled areas.
- C. Check sprinklers for proper operation and proper alignment for direction of throw.
- D. Check each section of heads for operating pressure and balance to other sections by use of flow adjustment on top of each valve.
- E. Check nozzling for proper coverage. Prevailing wind conditions or slopes may indicate that arc of angle or trajectory of spray should be other than as shown on drawings. Change nozzles to provide correct coverage.
- F. After system is thoroughly flushed and ready for operation, each section of sprinklers must be adjusted to control pressure at heads. Use the following method, one section at a time.
 1. Remove last head on section and install temporary riser above grade. Install tee with pressure gauge attached on top of riser and re-install head with nipple onto tee.
 2. Correct operating pressure range at last head of each section shall be as per manufacturer's recommendations.
 3. After replacing heads, at grade, tap thoroughly around head.

3.6 CLEANUP:

- A. During work, keep premises neat and orderly. Remove trash and debris from site daily as work progresses. After completion of work level and rake clean disturbed areas, leaving in an orderly condition acceptable to Landscape Architect.

3.7 ACCEPTANCE:

- A. The date of final acceptance shall be the date when any "punch items" are completed to the satisfaction of the owner's representative. Until the date of final acceptance it shall be the responsibility of the contractor to maintain and protect the system by all means within his control.

END OF SECTION

SECTION 02911

TOPSOIL

PART 1 - GENERAL

1.1 SUMMARY

- A. This section specifies all soil materials designated as "Topsoil" on the drawings or in the specifications.
- B. Topsoil for landscape work may be supplied from on-site and off-site sources.

1.2 SUBMITTALS

- A. Samples
 - 1. Provide 1-quart samples for each soil unit making up the topsoil source.
 - 2. Each sample to be a composite of five to seven (5 - 7) subsamples taken the full depth of proposed source. On stockpiles, discard upper 6 inches of soil before sampling.
 - 3. Place samples in plastic bags, seal, and place in second paper bag, and label.
- B. Test Reports
 - 1. Prior to starting work, submit two certified copies of soil test reports to Landscape Architect for approval.
 - 2. Costs of all testing to be borne by the Contractor.

1.3 QUALITY ASSURANCE

- A. All soil sampling and testing shall comply with procedures specified in:
 - 1. U.S.D.A. Ag. Handbook 60: Diagnosis and Improvement of Saline and Alkali Soils.
- B. Testing Laboratories
 - 1. Certified facilities normally engaged in agronomic soil testing shall be utilized.
 - 2. Approved by the Owner's representative.
- C. Required Topsoil Tests
 - 1. Chemical analysis indicating:
 - a. fertility: pH, nitrate nitrogen, ammonia nitrogen, phosphate phosphorous, potassium, calcium, magnesium, zinc, iron, manganese.
 - b. suitability: total salinity, boron, sodium, potassium, calcium, magnesium, chloride, sulfate.

2. Physical properties including:
 - a. organic content
 - b. particle size distribution

PART 2 - PRODUCTS

2.1 TOPSOIL

- A. Topsoil for landscape work shall conform to the requirements included in this Section.
 1. A natural, friable, loamy soil, typical of local topsoil which produces heavy vegetative growth, free from subsoil, weeds, sods, stiff clay, stones larger than 1/2 inch, toxic substances, debris, or other substances which may be harmful to plant growth.
 2. The pH range shall be 6.5 to 7.5.
- B. Grading Analysis: Two inch sieve, 100 percent passing. Number 4 sieve, 90 percent minimum passing. Number 10 sieve, 80 percent minimum passing.
- C. Sand, silt and clay content:
 1. Sand: 20 to 75 percent.
 2. Silt: 10 to 60 percent.
 3. Clay: 5 to 30 percent.
- D. All topsoil shall be free from all herbicides and insecticides which may adversely affect growth of lawns or plantings, or which may contain toxic materials.
- E. Do not deliver in muddy condition.
- F. The Contractor shall not use materials which do not conform to these criteria. At the discretion of the Landscape Architect, such material can either be amended to meet these requirements, or will be removed from the site and replaced with suitable material as specified.

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 02920

LAWNS AND GRASSES

PART 1 - GENERAL

1.1 SUMMARY

A Work included:

1. Lawn work shall include seeding, sodding and maintenance operations through the one year warranty period, as indicated on plans and specified herein.
2. Provide all labor, materials, and equipment necessary to perform the seeding, sodding and maintenance work, complete, and throughout the one year warranty period, as indicated on the Drawings and as specified.

1.2 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Topsoil Section 02911

1.3 REFERENCES

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

1. American Society for Testing and Materials (ASTM):D 1557 Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-lb. (4.54-kg) Rammer and 18-in. (457-mm) Drop.

1.4 SUBMITTALS

A. Samples and Product Information: Representative samples or product information of the following materials shall be provided to the Landscape Architect from the supply source being used:

1. Seed type and purity analysis.
2. Sod type, growing conditions, and certification.
3. Fertilizer specifications and guaranteed analysis.
4. Mulch material components, chemical analysis, and manufacturer.
5. Tackifier material components and manufacturer.

B. Certified Test Reports: Submit two copies to the Landscape Architect two weeks prior to beginning work.

1. Topsoil (Top 4 inches).

2. Subsoil (6 to 8 inches below Finish Grade)
- C. Construction Schedule: At least two weeks prior to start of work, submit seeding or sodding schedule.
- D. Maintenance: Submit three copies of typewritten instructions for the maintenance of the lawns for an entire year. Submit prior to Notice of Substantial Completion.

1.5 QUALITY ASSURANCE

- A. Contractor's Qualifications
 1. The work of this section shall be performed by a Contractor specializing in seeding, sodding, maintenance and landscape installations.
 2. The Contractor shall have successfully completed at least 5 installations of this type, size, and complexity in the last four years.
- B. Lawn materials shall comply with all government regulations prevailing at the supply source and the job site.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Digging Sod
 1. Do not dig sod at the nursery or other approved source until ready to transport sod to the project site or approved storage location.
 2. Before stripping, sod shall be mowed at a uniform height of 2 in.
 3. Cut sod to specified thickness and to standard width and length desired.
- B. Transporting Sod
 1. Sod transported to the Project in open vehicles shall be covered with tarpaulins or other suitable covers securely fastened to the body of the vehicle to prevent injury to the sod. Closed vehicles shall be adequately ventilated to prevent overheating of the sod. Evidence of inadequate protection against drying out in transit shall be cause for rejection.
 2. Sod shall be kept moist, fresh, and protected at all times. Such protection shall encompass the entire period during which the sod is in transit, being handled, or in temporary storage.
 3. Upon arrival at the temporary storage location or the site of the work, sod shall be inspected for proper shipping procedures. Should the roots be dried out, the Landscape Architect will reject the sod. When sod has been rejected, the Contractor shall remove it at once from the area of the work and replace it.
 4. Unless otherwise authorized by the Landscape Architect, the Contractor shall notify the Landscape Architect at least 48 hours in advance of the anticipated delivery date of sod. A legible copy of the invoice, showing species and variety of sod included for each shipment shall be submitted to the Landscape Architect. Certificate of Inspection when required must accompany each sod shipment.
- C. Handling and Storage of Sod

1. No sod shall remain in temporary storage over 30 hours.
2. Sod shall be kept moist and shall be stored in a compact group to prevent drying out or freezing.
3. Contractor shall take extreme care in the handling of sod material to avoid breaking or tearing strips. Sod that has been damaged by poor handling may be rejected by the Landscape Architect.

1.7 JOB CONDITIONS

- A. Do not install seed or sod on saturated or frozen soil.
- B. Sod installation shall be subject to suitability of the weather and other conditions affecting sod growth.
- C. Planting season may be extended with the written permission of the Landscape Architect.

1.8 WARRANTY

- A. Warrant all lawns for a period of one year from date of Notice of Substantial Completion, to be at least the quality and conditions as at Final Acceptance. Promptly reseed or resod unacceptable areas during the warranty period as directed by the Landscape Architect. Provide all maintenance including mowing, irrigation, weeding, fertilizing, disease and pest control and all other required maintenance for the one year warranty period.
- B. Lawn shall be uniform in color, leaf texture, leaf and root density, and free from weeds, diseases, and other visible imperfections at acceptance.
- C. Warranty does not cover damage as a result of applications not supervised by the Contractor or as a result of acts of God or vandalism.

1.9 ACCEPTANCE

- A. The Landscape Architect will inspect all work for Substantial Completion upon written request of the Contractor. The request shall be received at least ten calendar days before the anticipated date of inspection.
- B. Acceptance will be based on establishment of a uniform stand of turfgrass, defined as coverage of specified grass at a density of 95 percent coverage, with no bare spots greater than one square foot, free of weeds, undesirable grass species, disease, and insects. For grass varieties selected, allow a minimum of 90 days for establishment of an acceptable stand of grass.
- C. Upon completion and reinspection of all repairs or renewals necessary in the judgment of the Landscape Architect, the Landscape Architect will recommend to the Owner that the work of this Section be accepted.

PART 2 - MATERIALS

2.1 SEED

- A. Lawn seed shall be fresh, clean, dry new-crop seed tested for minimum percentages of purity and germination and label in accordance with the U.S. Department of Agriculture regulations.

- B. Pure Live Seed (PLS) shall not be less than 90 percent.
- C. Maximum weed content shall be 0.30 percent.
- D. Warm season hydromulch seed type shall be hulled common Bermuda at the rate of 4.0 lbs. per 1000 s.f.
- E. Cool season hydromulch seed type shall be annual ryegrass at the rate of 10.0 lbs. per 1000 s.f.

2.2 SOD

- A. Sod shall be nursery grown on cultivated mineral agricultural soils. Sod shall have been mowed regularly and carefully and otherwise maintained from planting to harvest.
- B. Sod shall be of species indicated on Planting Plans.
- C. Thickness of Cut: Sod shall be cut to the supplier's standard width and length. Maximum allowable deviation from standard widths and lengths shall be plus or minus 1/2 in. on width and plus or minus 5% on length. Broken strips and torn or uneven ends will not be accepted.
- D. Strength of Sod Strips: Sod strips shall be strong enough to support their own weight and retain their size and shape if suspended vertically when grasped in the upper 10% of the section.
- E. Moisture Content: Sod shall not be harvested or transplanted when moisture content (excessively wet or dry) may adversely affect its survival.
- F. Time Limitations: Sod shall be harvested, delivered, and transplanted within a 30 hour period unless a suitable preservation method is approved by the Landscape Architect prior to delivery. Sod not transplanted within this period shall be inspected and approved by the Landscape Architect prior to its installation.
- G. Thatch: Sod shall be relatively free of thatch. A maximum on 1/2 in. (uncompressed) thatch will be permitted.
- H. Diseases, Nematodes, and Insects: Sod shall be free of diseases, nematodes, and soil-borne insects.
- I. Weeds: Sod shall be free of objectionable grassy and broadleaf weeds.

2.3 FERTILIZER

- A. Fertilizer shall be a complete fertilizer, part of the elements of which are derived from organic sources. The percentages by weight shall be 17-17-17- N-P205-K20.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Grade Preparation
 - 1. Immediately before seeding or sodding, scarify, loosen, float and drag the upper 1-2 inches of topsoil to bring it to the proper condition. Remove foreign matter larger than one inch in diameter.

2. If the prepared grade is eroded or compacted by rainfall prior to fertilizing, rework the surface to specified condition.

B. Fertilizing

1. Uniformly distribute fertilizer by mechanical means at the rate of 12 pounds per 1,000 square feet.
2. If applying a fertilizer with a percentage by weight not as specified, apply at the rate of 2 pounds actual nitrogen per 1,000 square feet.
3. Work fertilizer into the soil. Cultivating equipment shall be set so the fertilizer will not penetrate into the soil more than 3 inches. Do not apply fertilizer when there is a possibility of rain before lawn areas can be seeded or sodded.

3.2 SPREADING OF TOPSOIL

A. Topsoil and subgrade shall be damp when topsoil is spread.

B. Areas to be seeded or sodded shall be topsoiled to a minimum depth of 4 in., compacted measure. Provide additional topsoil depths as required to construct the grades indicated on the Drawings. Topsoil shall be compacted to 85% completion, determined in accordance with ASTM D 1557.

3.3 SODDING

A. Weather Conditions

1. Schedule work for periods of favorable weather.
2. Sod placement on days which, in the judgment of the Landscape Architect, are too hot, sunny, dry, or windy for optimal installation may be prohibited.

B. Placement Pattern

1. The first row shall be laid in a straight line with subsequent rows parallel to the first row and tightly abutting each other.
2. Lateral joints shall be staggered. Care shall be exercised to insure that the sod is neither stretched nor overlapped. Joints must be butted tightly to prevent voids that could permit air to dry out roots.
3. Immediately after placing, sod shall be pressed firmly into contact with sod bed by tamping or rolling to eliminate air pockets. Following tamping, screened topsoil shall be used to fill all cracks, and excess soil shall be worked into the sod with rakes or other suitable equipment. Sod shall not be smothered with excess fill soil.
4. On slopes steeper than 4 to 1, sod shall be secured by galvanized pins, wood pegs or other methods approved by the Landscape Architect.
5. Immediately after sodding operations have been completed, entire surface shall be compacted with a roller or other approved equipment. The completed area after sodding shall be uniformly even, firm, and true to finished grade lines.

C. Watering

1. Provide an adequate supply of water at the site prior to and during transplanting of the sod.

3.4 SEEDING

- A. Sow seed during the periods indicated below unless otherwise approved by the Landscape Architect. Do not sow seed when weather conditions are unfavorable, such as during drought or high winds.
 - 1. Warm season grasses: Between April 15 and September 1, or when the ground temperature is above 65 degrees Fahrenheit.
 - 2. Cool season grasses: Between September 1 and April 15, when temperatures are above 40° F.
- B. Hydroseeding: Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.
 - 1. Mix slurry with tackifier.
 - 2. Apply slurry uniformly to all areas to be seeded in a one-step process. Apply mulch at a minimum rate of 1500-lb/acre (15.3-kg/92.9 sq. m) dry weight but not less than the rate required to obtain specified seed-sowing rate.
- C. Perform drill seeding using approved equipment such as cultipacker seeders, grass seed drill, or wildflower seeder.
- D. Water thoroughly and immediately with a fine mist until soil is soaked to a depth of 3 inches. Maintain soil in a moist condition until seeds have sprouted and reached a height of one inch. Water thereafter at least once every 7 days unless natural rainfall has provided equivalent watering.

3.5 MAINTENANCE

- A. The maintenance period shall commence when the Notice of Substantial Completion is issued and continue for one year from that date.
- B. Maintenance shall include all mowing, irrigation, weeding, fertilizing, disease and pest control and all other required maintenance for the one year warranty period. Mow to a 2 inch height.
- C. Fill any depressions or settlement that occurs within 90 days following installation. Reseed or resod bare spots that occur during the maintenance period as directed by the Landscape Architect.
- D. Keep lawns clean and protected from damage during the maintenance period. Debris which accumulates shall be removed from the site. Promptly repair damaged lawns except as provided in Paragraph 1.8.
- E. Irrigate as required to supplement natural rainfall so that all lawn areas receive sufficient water for normal plant growth. Furnish all irrigation equipment needed for watering and be responsible for securing adequate supply of water if an automatic irrigation system does not exist or is not operating.
- F. A second fertilizer application shall be made 90 days after installation. The specified fertilizer shall be applied at 6 pounds per 1,000 square feet, or 1 pound actual nitrogen per 1,000 square feet. After establishment, apply 2 pounds of actual nitrogen annually in split applications.

3.6 CLEANING, REMOVAL, AND REPAIR

- A. Paved areas over which hauling operations have been conducted shall be kept clean. Promptly remove materials spilled on pavement.
- B. Upon completion of lawn installation, remove from the site and legally dispose of the following:
 - 1. Surplus subgrade material.
 - 2. Stone and foreign matter.
- C. Excess topsoil not required for lawns or planting shall be stockpiled on site for future use as directed by the Owner's representative.
- D. Repair existing lawns damaged by operations under the contract. Repair shall include finish grading, seeding or sodding as required to match existing grade and lawn, and maintenance of repaired areas.

END OF SECTION

SECTION 02931

TREES, SHRUBS AND GROUND COVER

PART 1 - GENERAL

1.1 SUMMARY

A. Work Includes:

1. Plant materials, installation, soil treatments, and maintenance operations through the one year warranty period of all trees, shrubs, ground covers, annuals, perennials and vines as indicated on drawings and specified herein.

1.2 SUBMITTALS

A. Samples and Product Information: Representative samples or product information of the following materials shall be provided to the Landscape Architect from the supply source being used:

1. Plant material: Samples or photos with growers name, location, and phone number may be requested in lieu of inspection at the nursery. Submit original receipts or invoices for all materials.
2. Mulch: 1 pound sample and product information.
3. Organic matter: 1 pound sample, product information and original delivery tickets or receipts.
4. Fertilizer: Product information and analysis.
5. Decomposed granite: 1 pound sample and product information/source.

B. Test Reports: Submit to the Landscape Architect two copies each of certified test reports for:

1. Topsoil (Top 1 inch to 4 inches).
2. Subsoil (6 to 8 inches below Finish Grade).
3. Organic Matter: 1 pound sample and product information.

C. Certification

1. Phytosanitary certification: All plant material inspection certificates required by federal, state, or other governing authorities will accompany each shipment and be turned over to the Landscape Architect upon delivery.
2. Invoice: Original vendor's or grower's invoice for each shipment of plants, soil amendments, and mulch shall show sizes, quantities, and root treatment of plants, i.e., containerized, balled and burlapped, or bare root.

D. Construction Schedule: Upon authorization to proceed with the work, submit three copies of Construction Schedule indicating dates for the items of work.

E. Maintenance Instructions: Submit three copies of typewritten instructions recommending procedures to be established by the Owner for the maintenance of landscape work for an entire year. Submit prior to Notice of Substantial Completion.

- F. Chemicals: Submit products, rates of application, and anticipated uses of pesticides, herbicides, and fumigants.

1.3 QUALITY ASSURANCE

A. Qualifications

1. The Contractor shall be a company specializing in landscape installation.
2. The Contractor shall have successfully completed at least 5 installations of this type, size, and complexity in the last four years.

B. All materials and work shall comply with applicable sections of the following references:

1. American Association of Nurserymen, Inc., (AAN) Standard: American Standard for Nursery Stock (ANSIZ60.1-1986).
2. Hortus Third, Cornell University, 1976.
3. Fertilizers; Mixed Commercial. Federal Specification: 0-F-241D.

C. Source Quality Control

1. Certification: All landscape materials shall be from stock inspected and certified by authorized governmental agencies. The stock shall comply with governmental regulations prevailing at the supply source and the job site.
2. Analysis and standards: Products packaged in sealed containers shall be labeled with manufacturer's certified analysis. The composition of bulk materials shall be tested by an approved laboratory in accordance with procedures established by the Association of Official Agricultural Chemists, wherever applicable, or as specified by product specifications referenced herein.
3. Plant material selection: Prior to digging and shipment by the nursery, plant materials shall be tagged for inspection and approval by the Landscape Architect. Notify the Landscape Architect of tagged material locations at least four weeks prior to digging. Photos of representative examples may be submitted as allowed for in this Section.

D. Substitutions

1. If specified landscape material is not obtainable, notify the Landscape Architect, who will identify alternate sources or substitutes. Adjustments will be made at no additional cost to the Owner. If replacements are downsized, credits to the Owner will be based on comparable cost differential customary for materials and sizes involved.
2. Plants shall be supplied at the sizes specified. Plants of larger size may be used if acceptable to Landscape Architect and if sizes of roots or balls are increased proportionately.
3. Container plants may be substituted for those designed "B & B" if approved by the Landscape Architect.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Digging Plant Material

1. Plants shall not be dug at the nursery or approved source until the Contractor is ready to transport them from their original locations to the site of the work or acceptable storage location.

B. Transportation of Plant Material

1. Plants transported to the project in open vehicles shall be covered with tarpaulins or other suitable covers securely fastened to the body of the vehicle to prevent overheating of the plants.
2. Plants shall be kept moist, fresh, and protected at all times. Such protection shall encompass the entire period during which the plants are in transit, being handled, or are in temporary storage.
3. The roots of barefoot stock shall be protected from drying out with wet straw or other suitable material while in transit.
4. Unless otherwise authorized by the Landscape Architect, notify the Landscape Architect at least five working days in advance of the anticipated delivery date of any plant material. The original bill of lading, showing the quantities, kinds, and sizes of materials included for each shipment shall be furnished to the Landscape Architect.

C. Storage

1. Unless specific authorization is obtained from the Landscape Architect, plants shall not remain on the site of work longer than three days prior to being planted.
2. Plants that are not planted immediately shall be protected as follows:
 - a. Root balls shall be kept moist and their solidity carefully preserved.
 - b. Plants shall not be allowed to dry out or freeze.
3. Both the duration and method of storage of plant materials shall be subject to the approval of the Landscape Architect.

D. Handling of Plant Materials

1. Exercise care in handling plant materials to avoid damage or stress.

1.5 REJECTION OF MATERIALS

- A. Evidence of inadequate protection following digging, carelessness while in transit, or improper handling or storage, shall be cause for rejection.
- B. Upon arrival at the temporary storage location or site of the work, plants shall be inspected for proper shipping procedures. Should the roots be dried out, large branches be broken, balls of earth broken or loosened, or areas of bark be torn, the Landscape Architect will reject the injured plant.
- C. When a plant has been rejected, remove it from the area of the work and replace it with one of the required size and quality.

1.6 ACCEPTANCE

- A. The Landscape Architect will inspect all work for Substantial Completion upon written notice of completion. The request shall be received at least ten calendar days before the anticipated date of inspection.
- B. Acceptance of plant material by the Landscape Architect will be for general conformance to specified size, character, and quality, and shall not diminish responsibility for full conformance to the Contract Documents.

- C. Upon completion and reinspection of all repairs or renewals necessary in the judgment of the Landscape Architect, the Landscape Architect will recommend to the Owner that acceptance of the work of this Section be given.
- D. Acceptance in Part
 - 1. The work may be accepted in parts when it is determined to be in the Owner's best interest to do so, and when permission is given to the Contractor in writing to complete the work in parts.
 - 2. Acceptance and use of such areas by the Owner shall not waive any other provisions of the Contract.

1.7 MAINTENANCE

- A. Maintain plant material until the completion of guarantee period and Final Acceptance of work, as described in Part 3 of this section.

1.8 GUARANTEE

- A. Plants shall be guaranteed for a period of one year after the date of Acceptance by the Owner.
 - 1. When the work is accepted in parts, the guarantee periods shall extend from each of the partial acceptances to the terminal date of the last guarantee period. Thus, all guarantee periods terminate at one time.
- B. Plants shall be healthy, free of pests and disease, and in flourishing condition at the end of the guarantee period. Plants shall be free of dead and dying branches and branch tips, and shall bear foliage of normal density, size, and color.
- C. Replace dead plants and all plants not in a vigorous, thriving condition, as determined by the Landscape Architect during and at the end of the guarantee period, without cost to the Owner, as soon as weather conditions permit and within the specified planting period.
 - 1. Replacements shall closely match adjacent specimens of the same species. Replacements shall be subject to all requirements state in this Specification.
 - 2. Make all necessary repairs due to plant replacements. Such repairs shall be done at no extra cost to the Owner.
 - 3. The guarantee of all replacement plants shall extend for an additional one year period from the date of their acceptance after replacement. In the event that a replacement plant is not acceptable during or art the end of the said extended guarantee period, the Owner may elect one more replacement or credit for each item.
- D. At the end of the guarantee period, and no less than five days prior to final inspection, staking and guying materials, and tree wrap and ties shall be removed from the site.

1.9 FINAL INSPECTION AND FINAL ACCEPTANCE

- A. At the end of the guarantee period, the Landscape Architect will, upon written notice of end of guarantee period inspect the work for Final Acceptance. Request shall be received at least ten calendar days before the anticipated date for Final Inspection.
- B. Upon completion and reinspection of full repairs or replacements necessary in the judgment of the Landscape Architect at that time, the Landscape Architect will recommend to the Owner that Final Acceptance of the Work of the Section be given.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Plant Materials

1. Name and Variety: Provide plant materials true to name and variety described in "Hortus Third," Cornell University , 1976, or by cultivars generally accepted in the trade.
2. All plant material shall be No. 1 grade nursery stock grown in accordance with good horticultural practice. Plants shall be free of disease, insects, eggs, larvae, and defects such as knots, sunscald, injuries, abrasions, or disfigurement. They shall be sound, healthy and vigorous, of uniform growth, typical of the species and variety, well-formed, free from irregularities, with the minimum quality conforming to American Standard for Nursery Stock.
3. Plants indicated as specimen shall be exceptionally heavy, symmetrical, and tightly knit, cultured, to be unquestionably superior in form, branching, compactness, and symmetry.
4. The minimum acceptable sizes of all plants shall be measured before pruning and with branches in normal position. Unless otherwise designated on the plant list, all plant dimensions shall conform to those listed in ANSI Z60.1, American Standard for Nursery Stock.
5. Branching point is the distance above ground where balanced branching occurs or where a dimension in trunk appears to form the head of the tree.
6. Root Treatment: Root treatments on all plants shall conform to the requirements of ANSIZ60.1. Plants shall be dug and prepared for shipment in a manner that will not cause damage to branches, shape, and future development after planting.
 - a. Balled and burlapped ("B&B") plants shall have a firm, natural ball of earth of sufficient diameter and depth to encompass the fibrous and feeding root systems necessary for full recovery of the plant. Balls shall be securely wrapped with burlap and bound with cord or a wire basket. Ball sizes shall meet the requirements of the ANSI Z60.1, or as indicated on the Drawings.
 - b. Plants furnished in containers shall have the roots well established in the soil mass and shall have growth in the container for at least one growing season. Containers shall be large enough to provide earth-root mass of adequate size to support the plant tops being grown. For container grown trees, container size shall provide a minimum of 9 inches of root mass per caliper inch of trunk. Plants, other than ground covers, over-established in the container, as evidenced by pot-bound root ends, will not be accepted.
7. Plant materials shall be subject to final approval by the Landscape Architect at the job site.

B. Soil Amendments

1. Organic matter shall be "NATURAL T.L.C. COMPOST", supplied by Soil Building Systems, Inc. telephone 972.831.8181.
2. Sand shall be clean, coarse, ungraded, meeting the requirements of ASTM C33 for fine aggregates.

3. Superphosphate shall be composed of finely ground phosphate rock, as commonly used for agricultural purposes, containing not less than 15 percent available phosphoric acid.
 4. Fertilizer shall be granular fertilizer containing natural ingredients such as, but not limited to, composted manures, leather tankage and/or various meals, with a minimum percentage by weight of 3-1-2 nitrogen, available phosphoric acid, and potash. The following products are approved:
 - a. GreenSense by Ideal Technologies, Inc., Irving, Texas.
 - b. SUSTANE by Sustane Corporation, Chaska, Minnesota.
 - c. Texas - Tee by Maestro-Gro.
 5. Elemental sulphur shall be finely ground horticultural grade material containing at least 95 percent purity. Material shall be delivered in unopened containers containing manufacturer's guaranteed analysis.
- C. Mulch material shall be finely shredded, fibrous hardwood bark, free from other foreign material, passing a 1 1/2 inch screen.
- D. Gravel shall be 1 inch crushed stone, white or light gray in color.
- E. Filter fabric shall be DeWitt Pro5, or approved equal.
- F. Decomposed granite shall be pink to red in color, composed of a mixture of aggregate and clay fines as supplied by Cactus Canyon Quarries, 210.693.4331, meeting the following gradation:
- | | |
|-------------------------|------------|
| retained on 3/4" sieve | 0% to 15% |
| retained on 3/8" sieve | 15% to 25% |
| retained on No. 4 sieve | 40% to 55% |
| passing No. 10 sieve | 20% to 35% |
- G. Staking and Guying Materials
1. Tree support stakes shall be steel T- posts 8 feet in length.
 2. Wire stays for tree supports shall be pliable, No. 12 to 14 gauge galvanized wire.
 3. Hose for chafing guards shall be new or used two-ply fiber-reinforced garden hose of not less than 1/2 inch inside diameter. Factory seconds and rejects are acceptable. Use one color throughout job.
 4. Cable for guying trees shall be 3/16 inch diameter, 7 strand, cadmium-plated steel.
 5. Cable clamps and turnbuckles shall be heavy galvanized, strong forged steel. Turnbuckles shall be 3/8 inch eye with 6-inch opening.
 6. Flags for marking guys shall be 18-inch sections of white 1-inch diameter PVC pipe.
 7. Earth anchor kits may replace guying materials above. Earth anchors shall be cast alloy conforming to ASTM B26-72 with 1/8 inch x 7 x 7 galvanized high strength cable tag line. Holding power in normal soil shall be a minimum 1,100 pounds. Anchor shall be Duckbill Model 68 by Foresight Industries or approved equal.
- H. Tree Wrap

1. Osnaburg Cloth, 4-7/8 in. wide, unbleached, pinked on both edges, manufactured by The Carnegie Texture Co., 1734 Ivanhoe Road, P.O. Box 10276, Cleveland, OH 44110.

Tree Caliper	Twine Type
3 in. or less	2-ply
Greater than 3 in.	3-ply

- I. Tree Paint: Tree paint shall be waterproof, asphalt base paint with antiseptic properties for use on tree wounds and shall be TREE KOTE, Sherwin Williams Pruning Compound, or approved equal.
- J. Herbicide and soil fumigant products and rates of application shall conform with registered uses.

2.2 SOIL MIXES

- A. Tree pit planting mix:
 1. Tree pit back fill shall be 50% finely chopped native soil and 50% NATURAL T.L.C.
 2. Top dress with 1 inch NATURAL T.L.C.
- B. Shrub, ground cover and seasonal color beds shall receive 3 inches (1 cubic yard per 108 square feet) of NATURAL T.L.C. rototilled into the upper 8 inches of soil. Fertilizer shall be incorporated into the mix at a rate of 3 pounds per 100 square feet of bed area, and sulfur at a rate of 1/2 pound per 100 square feet of bed area.
- C. Azalea soil mix shall be reground enriched mulch, NATURAL T.L.C., enriched topsoil, sharp sand, additional composted organic material, pH adjusted to be in the 5.5 - 6.0 range.

2.3 ANTIDESICCANT

- A. Antidesiccant shall be an emulsion specifically manufactured for plant protection which provides a protective film over plant surfaces which is permeable enough to permit transpiration. Antidesiccant shall be delivered in manufacturer's sealed containers and shall contain manufacturer's printed instructions for use.
- B. Antidesiccant shall be equal to the following:

Product	Manufacturer
Wilt-Pruf	Wilt-Pruf Products, Inc. P.O. Box 4280 Greenwich, CT 06830

2.4 FUNGICIDE

- A. Fungicide shall be "Bordeaux Mix," manufactured by Hi-Yield.

2.5 EDGING

- A. Steel edging shall be Ryerson Steel Landscaping Edging, manufactured by Ryerson, an Inland Steel Company, Chicago, IL 60680, or an approved equal. Steel edging shall be shop fabricated, 3/16 in. thick x 4 in. deep, primed and painted green. Edging shall be furnished in 20 ft. lengths.
 1. Steel edging shall have slotted holes for staking steel edging every 30 in. o.c.

2. Steel stakes shall be 16 in. long, tapered.

PART 3 - EXECUTION

3.1 VEGETATION REMOVAL

- A. Strip existing grass and weeds, including roots, from all bed areas, leaving the soil surface one inch below finished grade.
- B. Herbicides: Apply specific herbicide to eradicate vegetation within bed areas.

3.2 PLANTING

A. Excavation

1. Rocks and other underground obstructions shall be removed to a depth necessary to permit proper planting according to plans and specifications. If underground utilities or other structural obstructions are encountered, alternate planting locations will be determined by the Landscape Architect.
2. Plant pits shall be dug only by methods approved by the Landscape Architect.
 - a. Planting pits shall be round, with vertical sides and flat bottoms, and sized in accordance with outlines and dimensions shown on the drawings.
 - b. If rotating augers or other mechanical diggers are used to excavate holes, the vertical sides of the pits shall be scarified, fractured, or otherwise broken down to eliminate impervious surfaces.
 - c. Loosen or scarify in the bottom of all plant pits to a depth of 4 inches.
3. Excavated material that is not conducive to plant growth will not be used for backfill in any planter or planting pit and shall be removed to an area designated by the Landscape Architect.
4. All planting pits suspected of having inadequate drainage shall be tested by filling the pit with water. Drainage time in each pit shall be observed and if, in the opinion of the Landscape Architect, the water does not drain off within 24 hours, the substrate will be drilled and shattered to a minimum depth of 3 feet below the bottom of the pit. The planting pit will be retested; if adequate drainage does not occur, drains will be installed as specified by the Landscape Architect. If drains are required, the cost for additional work shall be negotiated with the Owner.

B. Planting

1. Trees: Place a minimum of 4 inches of compacted planting mixture in the bottom of the pit or to depth necessary to set the plant 2 inches above finished grade. Set the plant in the pit to the proper grade and position, faced to give the best appearance or relationship to one another and adjacent structures. Cut away burlap, rope, wire, or other wrapping materials from the top of the ball and remove. Do not remove burlap or ties from sides or bottom of ball. If plastic wrap or other non-degradable materials are used in lieu of burlap, completely remove them before placing of backfill. Cleanly cut off broken or frayed roots and sever the sides of the root ball of container grown trees in several places. Place planting mixture around the ball and carefully compact to avoid injury to the roots and to fill the voids. After backfilling planting pit approximately two-thirds full, add water and allow planting mixture to settle. After the water has been absorbed, fill the planting pit with planting mixture. Tamp lightly to grade, place a 1 inch

layer of organic matter over planting mixture, and form a watering basin of the size indicated on the drawings.

2. Container-grown shrubs, ground cover, and vines: Remove containers before planting and sever the sides of root ball in several places, loosening the roots on the outside of the ball sufficiently to encourage rapid root extension into the surrounding soil and to prevent girding of root mass. Place planting mixture around the ball and carefully compact to avoid injury to the roots and to fill the voids. After backfilling planting pit approximately two-thirds full, add water and allow planting mixture to settle. After the water has been absorbed, fill the planting pit with planting mixture. Tamp lightly to grade.
- C. Mulching
1. Mulching shall take place within 48 hours after planting.
 2. Mulch plant beds and tree and shrub planting pits to a uniform depth of 3 inches.
 3. Mulch shall be kept out of the crowns of shrubs, away from tree trunks, and off buildings, sidewalks, light standards, and other structures.
- D. Pruning
1. Trees
 - a. Prune trees by removing all dead wood, badly formed crossing limbs, and any other growth to insure healthy and symmetrical growth of new wood. Up to one-third of the branches may be removed. The proportion is, in all cases, subject to the approval of the Landscape Architect.
 - b. In the case of multiple leaders, preserve the one which will best promote the symmetry of the tree, and remove or cut back the remainder so that they will not compete with the selected leader. Cut back surrounding top branches to conform to the leader.
 - c. Paint cut surfaces over one inch in diameter with tree wound dressing.
 2. Shrubs
 - a. Prune shrubs by removing all dead wood and broken branches, thinning out canes and cutting back or removing unsymmetrical branches. Pruning shall result in a loose outline conforming to the general shape of the shrub type. Do not use hedge shears.
- E. Wrapping
1. The trunks of tender barked trees such as Shumard Oak, Live Oak, Lacebark Elm, Ash, etc. planted after October 1 or adjacent to reflective surfaces shall be wrapped immediately after planting.
 2. Trees shall be wrapped beginning at the base and extending to the first branches. The wrap shall be applied in a spiral manner with an overlap of one-half the width of the paper.
 3. The wrapping shall be securely tied at the top and bottom and at 18-inch maximum intervals with twine.
 4. Remove the tree wrap the following spring, but no later than May 1.

F. Guying and Staking

1. Guying and staking operations shall be completed as shown on the drawing details immediately after planting.
2. Stakes and guys shall be removed by and become the property of the Contractor at the end of the warranty period.

G. Edging

1. Steel edging shall be installed at locations indicated on the Drawings. Where required, edging shall be cut square and accurately to required length.
2. Steel edging shall be securely staked in required position. Stakes shall be driven every 30 in. o.c. along length of edging.
3. Adjacent lengths of edging shall overlap 8 in.
4. Edging shall be set plumb and vertical at required line and grade. Straight sections shall not be wavy; curved sections shall be smooth and shall have no kinks or sharp bends.
5. Top of edging shall be set in 3/4 in. above finished grade.
6. All corners shall be of 1 piece. Minimum length of short leg shall be not less than 5 ft.

H. Maintenance

1. The maintenance period shall commence when the Notice of Substantial Completion is issued and shall continue as required until the end of the one year warranty period.
2. Plants shall be inspected at least once per week by the Contractor during the installation period and needed maintenance performed promptly. Monthly inspections should occur during the warranty period.
3. The Contractor shall irrigate all plants adequately to maintain optimum supply of moisture within the root zone; recurring overly dry or wet conditions shall be grounds for rejection of plant material. If the irrigation system is inoperative, hand watering shall be accomplished from a source approved by the Landscape Architect. Water shall not be applied with a force that will displace mulch or cause soil erosion and shall not be applied so quickly that it cannot be absorbed by the mulch and plants.
4. Plants shall be pruned and mulch replaced as required.
5. Stakes and guys shall be adjusted or replaced as required. Repair eroded or damaged plant saucers.
6. Maintain all plant beds and saucers weed free and mulched to specified depth at all times.
7. Keep plants free of insects and disease. All insecticides and fungicides applied to control pests and maintain plants in a healthy growing condition shall be approved by the Landscape Architect.
8. Fertilize plants at least twice during the warranty period. Fertilization shall be applied by topdressing 2 pounds per 100 square feet of bed area, and 3 to 5 pounds each tree. Fertilizer for the application shall be a controlled release type used for the installation.

9. Remove, at no cost to Owner, dead and unacceptable plants as their condition becomes apparent.

3.3 APPLICATION OF FERTILIZER

- A. Organic Fertilizer: Planting beds shall be fertilized two times per year (March and October) with Organic Fertilizer at a minimum rate of 20 lb. per 1,000 square ft. Rate of application shall be varied depending on fertilizer type used, weather conditions, and overall soil conditions to produce a consistent growth and color to the plantings. After application of fertilizer, planting beds shall be thoroughly watered.
- B. Organic Foliar Spray: Planting beds shall be fertilized two times per year (May and June) with Organic Foliar Spray at a minimum of 2 gallons per 1,000 square ft.

3.4 FUNGICIDE SPRAYING

- A. Immediately after planting, all trunks of deciduous trees shall be sprayed with fungicide, applied as directed by manufacturer.

3.5 WRAPPING

- A. Spiral wrap trees to a minimum height of the third branch or two-thirds the height of tree, whichever is higher. Wrap shall be applied from base up and securely tied.

3.6 STAKING AND GUYING

- A. Each tree shall be staked or guyed into undisturbed soil immediately following planting. Plants shall stand plumb after staking or guying.
- B. Duckbill Root Ball Fixing Systems shall be installed in strict conformance with manufacturer's published installation instructions.

3.7 CLEANUP AND PROTECTION

- A. Cleanup
 1. Excess and waste material shall be removed daily.
 2. When planting in an area has been completed, the area shall be cleared of all debris, soil piles, and containers.
 3. At least one paved pedestrian access route and one paved vehicular access route to each building shall be kept clean at all times. Other paving shall be cleaned when work in adjacent areas is completed.
- B. Repairs: Any damage to existing landscape, paving, or other such features as a result of work related to this contract shall be repaired and restored to its original condition.
- C. Protection: Protect landscape work and materials from damage due to landscape operations, operations by other Contractors, trades and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged landscape work as directed.

END OF SECTION