DIVISION 31: EARTHWORK

SECTION 31 0501

COMMON EARTHWORK REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited to:
   1. General procedures and requirements for earthwork.

PART 2 - PRODUCTS: Not Used

PART 3 - EXECUTION

3.1 EXAMINATION

A. Site Verification Of Conditions:
   1. 72 hours minimum before performing any work on site, contact Utilities Protection Center (1-800-282-7411 or 811) to arrange for utility location services.
   2. Perform minor, investigative excavations to verify location of various existing underground facilities at sufficient locations to assure that no conflict with the proposed work exists and sufficient clearance is available to avoid damage to existing facilities.
   3. Perform investigative excavating 10 days minimum in advance of performing any excavation or underground work.
   4. Upon discovery of conflicts or problems with existing facilities, notify Architect by phone or fax within 24 hours. Follow telephone or fax notification with letter and diagrams indicating conflict or problem and sufficient measurements and details to evaluate problem.

3.2 PREPARATION

A. Protection:
   1. Spillage:
      a. Avoid spillage by covering and securing loads when hauling on or adjacent to public streets or highways.
      b. Remove spillage and sweep, wash, or otherwise clean project, streets, and highways.
   2. Dust Control:
      a. Take precautions necessary to prevent dust nuisance, both on-site and adjacent to public and private properties.
      b. Correct or repair damage caused by dust.
   3. Existing Plants And Features: Do not damage tops, trunks, and roots of existing trees and shrubs on site that are intended to remain. Do not use heavy equipment within branch spread. Interfering branches may be removed only with permission of Architect. Do not damage other plants and features that are to remain.

B. If specified precautions are not taken or corrections and repairs not made promptly, Owner may take such steps as may be deemed necessary and deduct costs of such from monies due to Contractor. Such action or lack of action on Owner's part does not relieve Contractor from responsibility for proper protection of The Work.

3.3 REPAIR / RESTORATION

A. Adjust existing covers, boxes, and vaults to grade.

B. Replace broken or damaged covers, boxes, and vaults.

C. Independently confirm size, location, and number of covers, boxes, and vaults that require adjustment.

3.4 FIELD QUALITY CONTROL

A. Field Inspections:
   1. Notify Architect 48 hours before performing excavation or fill work.
   2. If weather, scheduling, or any other circumstance has interrupted work, notify Architect 24 hours minimum before intended resumption of grading or compacting.

B. Field Tests: Owner reserves right to require additional testing to re-affirm suitability of completed work including compacted soils that have been exposed to adverse weather conditions.

C. All testing including NPDES Testing (see Drawing Sheet C16), Filing and Monitoring shall be the responsibility of the Contractor. Contractor shall hire and pay for a qualified Geotechnical and Testing Firm. The Geotechnical and Testing Firm hired by the Contractor shall be approved by the Owner and the Architect.

D. Contractor shall be responsible for all layout work using coordinate geometry established on plans. Contractor shall have all site and building layout work performed by a licensed surveyor registered in the State of Georgia.
   1. Contractor may obtain electronic data for site layout upon completion of an Electronic File Transfer and “hold harmless” agreement from Carter & Sloope, Inc.
   2. Only successful Bidder will be issued the electronic file.
   3. No electronic files will be issued for bidding purposes.

END OF SECTION

SECTION 31 1100

CLEARING AND GRUBBING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Perform clearing and grubbing as necessary to prepare site for rough grading and structure excavation as described in Contract Documents.

B. Related Requirements:
   1. Section 31 0501: Common Earthwork Requirements.

PART 2 - PRODUCTS: Not Used

PART 3 - EXECUTION

3.1 PERFORMANCE

A. Tree And Brush Removal:
   1. Cut off trees, shrubs, brush, and vegetative growth 12 inches maximum above ground.
   2. Do not pull up or rip out roots of trees and shrubs that are to remain. If excavation through roots is required, excavate by hand and cut roots with sharp axe. Make clean, smooth, sloping cuts.
   3. Cut roots 6 inches or larger in diameter only with Architect's written permission.

B. Grubbing:
   1. Grub out stumps and roots 12 inches minimum below original ground surface, except as follows:
      a. Under buildings, remove roots one inch and larger entirely.
      b. Entirely remove roots of plants that normally sprout from roots, as identified by Architect.

3.2 CLEANING

A. Remove from site trees, shrubs, uprooted stumps, vegetative layer, and surface debris and dispose of legally.

B. Do not bury cuttings, stumps, roots, and other vegetative matter or burnt waste material on site.

END OF SECTION

SECTION 31 1413

TOPSOIL STRIPPING AND STOCKPILING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Strip and stockpile acceptable topsoil as described in Contract Documents.

B. Related Requirements:
   1. Section 31 0501: Common Earthwork Requirements.
   2. Section 32 9113: Finish grading of existing topsoil stored on site and addition of imported topsoil.

1.2 REFERENCES

A. Definitions: Existing topsoil is defined as total amount of soil stripped and stored for reuse, less vegetation layer stripped and disposed of as specified in Paragraphs below.

PART 2 - PRODUCTS: Not Used

PART 3 - EXECUTION

3.1 PERFORMANCE

A. Strip existing vegetation layer to the extent that it exists from areas of site to receive buildings, landscaping, and paving and remove from site before stripping topsoil for storage and reuse.

B. After stripping vegetation layer, strip existing topsoil completely from areas of site to receive buildings and paving and store on site for later use.
   1. Existing topsoil is property of Contractor with restriction that topsoil is to be used first for Project landscape topsoil requirements and second for non-structural fill and backfill.
   2. After Project fill, backfill, and landscape topsoil requirements are satisfied, remove excess existing topsoil from site. Do not remove existing topsoil from site without Architect's written approval.

END OF SECTION

SECTION 31 2213

ROUGH GRADING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Perform rough grading work required to prepare site for construction as described in Contract Documents.

B. Related Requirements:
   1. Section 31 0501: Common Earthwork Requirements

1.2 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference:
   1. Schedule conference after completion of site clearing but before beginning grading work.
   2. Identify benchmark to be used in establishing grades and review Contract Document requirements for grades, fill materials, and topsoil.
   3. Examine site to pre-plan procedures for making cuts, placing fills, and other necessary work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials used for fill shall be as specified for backfill in Section 31 2323.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before making cuts, remove topsoil over areas to be cut and filled that was not previously removed by stripping specified in Section 31 1413. Stockpile this additional topsoil with previously stripped topsoil.

3.2 PERFORMANCE

A. Tolerances: Maximum variation from required grades shall be 1/10 of one foot.

B. When existing grade around existing plants to remain is higher than new finish grade, perform regrading by hand. Do not expose or damage shrub or tree roots.

C. Compact fills as specified in Section 31 2323.

D. If soft spots, water, or other unusual and unforeseen conditions affecting grading requirements are encountered, stop work and notify Architect.

END OF SECTION

SECTION 31 2216

FINE GRADING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Perform fine grading work required to prepare site for paving finish grading and for landscape finish grading and soil preparation as described in Contract Documents.

B. Related Requirements:
   1. Section 31 0501: Common Site Construction Requirements.
   2. Section 31 1413: Stripping and storing of existing topsoil.
   3. Section 32 1216: Finish grading for asphalt paving.
   4. Section 32 1313: Finish grading for concrete paving.
   5. Section 32 9113: Soil preparation for landscaping.
   6. Section 32 9120: Topsoil Placement and grading

1.2 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference: Participate in pre-installation conference specified in Section 31 2213.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION

3.1 PREPARATION

A. Protection: Protect utilities and site elements from damage.

B. Surface Preparation:
   1. Before grading, dig out weeds from planting areas by their roots and remove from site. Remove rocks larger than 1-1/2 inches in size and foreign matter such as building rubble, wire, cans, sticks, concrete, etc.
   2. Remove imported paving base material present in planting areas down to natural subgrade or other material acceptable to Architect.
   3. Limit use of heavy equipment to areas no closer than 6 feet from building or other permanent structures

3.2 PERFORMANCE

A. Interface With Other Work: Do not commence work of this Section until grading tolerances specified in Section 31 2213 are met.

B. Site Tolerances:
   1. Maximum variation from required grades shall be 1/10 of one foot.
   2. To allow for final finish grades of parking lot and planting areas, fine grade elevations before placing topsoil are:
      a. Sod Areas: 7 inches below top of walk or curb.
      b. Seeded Areas And Ground Cover Areas: 6 inches below top of walk or curb.

c. Tree And Shrub Areas: 4 inches below top of walk or curb. No topsoil as defined in Section 32 9120 required.

C. Do not expose or damage existing shrub or tree roots.

D. Redistribute approved existing topsoil stored on site as a result of work of Section 31 1413. Remove organic material, rocks and clods greater than 1-1/2 inch in any dimension, and other objectionable materials.

E. Slope grade away from building for 12 feet minimum from walls at slope of 1/2 inch in 12 inches minimum unless otherwise noted. Direct surface drainage in manner indicated on Drawings by molding surface to facilitate natural run-off of water. Fill low spots and pockets with specified fill material and grade to drain properly.

END OF SECTION

SECTION 31 2316

EXCAVATION

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Perform Project excavating and trenching as described in Contract Documents, except as specified below.
   2. Procedure and quality for excavating and trenching performed on Project under other Sections unless specifically specified otherwise.

B. Related Requirements:
   1. Section 31 0501: Common Earthwork Requirements.
   2. Section 31 1100: Clearing and Grubbing.
   3. Performance of excavating inside and outside of building required for electrical and mechanical work is responsibility of respective Section doing work unless arranged differently by Contractor.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference: Participate in pre-installation conference specified in Section 31 2213.

PART 2 - PRODUCTS: Not Used

PART 3 - EXECUTION

3.1 EXAMINATION

A. Carefully examine site and available information to determine type soil to be encountered. Discuss problems with Architect before proceeding with work.

3.2 PREPARATION

A. Protection of Existing Utilities:
   1. Protect existing utilities identified in Contract Documents during excavation.
   2. If existing utility lines not identified in Contract Documents are encountered, contact Architect before proceeding.

3.3 PERFORMANCE

A. Excavation:
   1. Building Footings And Foundations:
      a. Excavate as necessary for proper placement and forming of footings and foundations.
      b. Bottom of excavations to receive footings shall be undisturbed soil.
      c. Excavation Carried Deeper Than Required:
         1) Under Footings: Fill with concrete specified for footings.
         2) Under Slabs: Use specified compacted backfill material.
   2. Pavement And Miscellaneous Cast-In-Place Concrete:

a. Excavate as necessary for proper placement and forming of concrete site elements and pavement structure. Remove vegetation and deleterious material and remove from site.
b. Backfill over-excavated areas with compacted base material specified in Section 31 2324.
c. Remove and replace exposed material that becomes soft or unstable.

3. Utility Trenches:
   a. Unless otherwise indicated, excavation shall be open cut. Short sections of trench may be tunneled if pipe or duct can be safely and properly installed and backfill can be properly tamped in tunnel sections and if approved by Architect.
   b. Excavate to proper alignment, depth, and grade. Excavate to sufficient width to allow adequate space for proper installation and inspection of utility piping.
   c. If trenches are excavated deeper than required, backfill until trench bottom is proper depth with properly compacted native material.
   d. Pipe 4 Inches In Diameter Or Larger:
      1) Grade bottom of trenches to provide uniform bearing and support for each section of pipe on undisturbed soil at every point along its length.
      2) Except where rock is encountered, take care not to excavate below depths indicated.
         a) Where rock excavations are required, excavate rock with minimum over-depth of 4 inches below required trench depths.
         b) Backfill over-depths in rock excavation and unauthorized over-depths with loose, granular, moist earth, thoroughly compacted.
      3) Whenever wet or unstable soil incapable of properly supporting pipe, as determined by Architect, occurs in bottom of trench, remove soil to depth required and backfill trench to proper grade with coarse sand, fine gravel, or other suitable material acceptable to Architect.
4. If unusual excavating conditions are encountered, stop work and notify Architect.

3.4 REPAIR / RESTORATION

A. Repair damage to other portions of the Work resulting from work of this Section at no additional cost to Owner. On new work, arrange for damage to be repaired by original installer.

3.5 CLEANING

A. Debris and material not necessary for Project are property of Contractor and are to be removed before completion of Project. However, if material necessary for Project is hauled away, replace with specified fill / backfill material.

END OF SECTION

SECTION 31 2323

FILL

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Perform Project backfilling and compacting as described in Contract Documents, except as specified below.
   2. Procedure and quality for backfilling and compacting performed on Project under other Sections unless specifically specified otherwise.

B. Related Requirements:
   1. Section 31 0501: Common Earthwork Requirements.
   2. Division 32: Compaction of sub-grade under walks and paving.
   3. Performance of backfilling and compacting inside and outside of building required for electrical and mechanical work is responsibility of respective Section doing work unless arranged differently by Contractor.

1.2 REFERENCES

A. Reference Standards:
   1. ASTM International:
      a. ASTM D 1557-02, 'Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort.'
      b. ASTM D 2216-98, 'Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.'
      c. ASTM D 2487-00, 'Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).'
      d. ASTM D 2922-05, 'Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).'
      e. ASTM D 3017-05, 'Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).'

B. Definitions:
   1. Relative Compaction: Ratio of field dry density as determined by ASTM D 2922 and ASTM D 3017 or 2216, and laboratory maximum dry density as determined by ASTM D 1557.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference: Participate in pre-installation conference specified in Section 31 2213.

B. Sequencing:
   1. Do not backfill against bituminous dampproofing for 24 hours after application of dampproofing.
   2. Before backfilling, show utility and service lines being covered on record set of Drawings. Do not backfill until utilities involved have been tested and approved by Architect and until instructed by Architect.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Site Material: Existing excavated material on site is suitable for use as fill and backfill to meet Project requirements.

B. Imported Fill / Backfill:
   1. Well graded material conforming to ASTM D 2487 free from debris, organic material, frozen materials, brick, lime, concrete, and other material which would prevent adequate performance of backfill.
      a. Under Building Footprint And Paved Areas: Fill shall comply with soil classification groups GW, GP, GM, SW, SP, or SM. Fill may not contain stones over 6 inches diameter and 90 percent minimum of fill shall be smaller than 1-1/2 inch in any direction.
      b. Under Landscaped Areas:
         1) Fill more than 36 inches below finish grade shall comply with soil classification groups GW, GP, GM, SW, SP, or SM. Fill may not contain stones over 6 inches diameter and 90 percent minimum of fill shall be smaller than 1-1/2 inch in any direction.
         2) Fill less than 36 inches below finish grade shall comply with soil classification groups SW, SP, SM, or SC. Fill may not contain stones larger than 1-1/2 inches in any direction and 90 percent minimum of fill shall be smaller than 3/8 inch in any direction.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before placing fill, base, or finish work, prepare sub-grade as follows:
   1. Do not place fill or base over frozen sub-grade.
   2. Under Building Slabs / Pads, Concrete Site Elements, And Concrete Driveways And Parking Areas: Scarify sub-grade 6 inches deep, moisture condition to uniform moisture content of between optimum and 4 percent over optimum, and mechanically tamp 6 inches deep to 90 percent minimum of relative compaction.
   3. Under Asphalt Driveways And Parking Areas: Scarify sub-grade 6 inches deep, moisture condition to uniform moisture content between optimum and 4 percent over optimum, and mechanically tamp to 95 percent minimum of relative compaction.
   4. Landscape Areas: Compact sub-grade to 90 percent relative compaction.

3.2 PERFORMANCE

A. Fill / Backfill:
   1. General:
      a. Around Buildings And Structures: Slope grade away from building as specified in Section 31 2216. Hand backfill when close to building or where damage to building might result.
      b. Site Utilities:
         1) In Landscape Areas: Use backfill consisting of on-site soil.
         2) Under Pavement And Concrete Site Elements: Extend excavatable slurry fill / backfill to elevation of subgrade. Do not place base material until excavatable slurry fill / backfill has cured 72 hours.
      c. Do not use puddling or jetting to consolidate fill areas.
   2. Compacting:
      a. Fill / Backfill And Base:
         1) Under Building Slabs or Pads, Driveways, And Parking Areas: Place in 8 inch maximum layers, moisture condition to plus or minus 2 percent of optimum moisture content, and mechanically tamp to 95 percent minimum of maximum density as established by ASTM D 1557.

2) Under Concrete Site Elements And Around Foundation Walls: Place in 8 inch maximum layers, dampen but do not soak, and mechanically tamp to 95 percent minimum of maximum density as established by ASTM D 1557.
3) Utility Trenches:
   a) Site: Place fill in 12 inch layers and moisture condition to plus or minus 2 percent of optimum moisture content. Compact fill to 95 percent minimum relative compaction to within 12 inches of finish grade. Compact fill above 12 inches to 95 percent relative compaction.
   b) Under Slabs: Place fill in 6 inch layers, moisture condition to plus or minus 2 percent of optimum moisture content, and compact to 95 percent minimum relative compaction to within 4 inches of finish grade. Final 4 inches of fill shall be granular base as specified in Section 31 2324.
4) Fill Slopes: Compact by rolling or using sheepsfoot roller.
5) Backfill Under Footings: Not allowed.
6) Other Backfills: Place other fills in 12 inch layers and compact to 90 percent relative compaction.
7) Asphalt Base Course: Compact to 100% minimum of maximum density as established by ASTM D 1557.

3.3 REPAIR / RESTORATION

A. Repair damage to other portions of the Work resulting from work of this Section at no additional cost to Owner. On new work, arrange for damage to be repaired by original installer.

3.4 CLEANING

A. Debris and material not necessary for Project are property of Contractor and are to be removed before completion of Project. However, if material necessary for Project is hauled away, replace with specified fill / backfill material.

END OF SECTION

SECTION 31 2324

GRANULAR BASE

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install granular base under interior slabs-on-grade as described in Contract Documents.

B. Products Installed But Not Furnished Under This Section:
   1. Under-slab vapor retarder and seam tape.

C. Related Requirements:
   1. Section 03 3053: Granular base under miscellaneous cast-in-place concrete.
   2. Section 07 2616: Furnishing of vapor retarder and seam tape.
   3. Section 31 0501: Common Earthwork Requirements.
   4. Section 32 1216: Base course under asphalt paving.
   5. Section 32 1313: Base course under concrete paving.

1.2 REFERENCES

A. Reference Standards:
   1. ASTM International:
      a. ASTM E 1643-98 (2005), 'Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.'

1.3 ADMINISTRATIVE REQUIREMENTS

A. Sequencing: Install vapor retarder and granular base system after application of termite control and before placing concrete. If termite control is disturbed or receives precipitation before being covered with vapor retarder, re-apply termite control.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Granular Base:
   1. Gravel: 1/4 inch minimum to one inch maximum well-graded, clean gravel or crushed rock.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install vapor retarder in accordance with ASTM E 1643 and following instructions:
   1. Install vapor retarder over compacted sub-grade and tops of interior stem walls so entire area under slab is covered.
   2. Lap joints 3 inches minimum and seal with specified seam tape.

3. Seal vapor retarder around pipes, conduits, and other utility items that penetrate vapor retarder using factory-fabricated boot installed as recommended by Manufacturer.
4. Except for punctures required for reinforcing and anchor bolts at top of stem walls, seal tears and punctures before placing granular base.

B. Place 4 inches minimum of granular base over vapor retarder, level, and compact with two passes of 2-1/2 ton minimum roller.

C. Do not allow water onto vapor retarder or granular base before placing concrete.

3.2 FIELD QUALITY CONTROL

A. Notify Architect 2 days before installation of concrete to allow inspection of vapor retarder and granular base installation.

END OF SECTION

SECTION 31 3116

TERMITE CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install complete soils treatment under and adjacent to building to provide uniform toxic barrier in all routes of termite entry.

B. Related Requirements:
   1. Section 31 2324: Installation of vapor retarder.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Conference: In addition to requirements of Section 01 3100, mix first batch of chemical solution and demonstrate application techniques to be used.

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data: Submit Chemical Manufacturer's printed literature regarding chemical composition, concentration, and rates and method of application.
   2. Samples: Provide one sample of approximately one cup from each batch of mix solution. Label each sample with Project name, date of application, chemical composition, and mix concentration. Draw off each sample in Architect's presence.

B. Informational Submittals:
   1. Manufacturer Reports:
      a. Submit statement indicating total amount of chemical required for Project to provide required amount of mix solution at specified concentration and application rates.
      b. Submit take-off showing amounts of square foot and lineal foot application at specified application rate. Also indicate total amount of mix solution required for Project.
   2. Qualification Submittals: Provide BASF Partner Number and evidence of license from AHJ.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Requirements for application by certified applicator presumes that Manufacturer's requirements and those of federal, state, and local regulatory agencies shall be met.
   2. Nothing in Contract Documents shall be construed as allowing circumvention of above requirements.

B. Qualifications: Applicator shall be BASF Partner for application of specified Termiticide.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver total amount of chemical for Project to site before beginning application.

B. Keep containers closed when not in use. Do not store near food or feed. Protect from freezing. In case of spill or leak on floor or paved surfaces, soak up with sand, earth, or synthetic absorbent. Remove residue to chemical waste area.

C. Dispose of empty containers in accordance with Manufacturer's and regulatory agency's requirements.

1.6 WARRANTY

A. Furnish written warranty that includes chemical concentration and application rates showing compliance with Contract Documents, Chemical Manufacturer's recommendations, and applicable governmental regulations. Warranty shall state concentrations and rates of application used.

B. Warranty shall guarantee effectiveness of treatment against subterranean termite infestation for five years minimum from acceptance date of Project and be signed by applicator and Contractor as co-guarantors.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Category Four Approved Product. See Section 01 6200 for definitions of Categories.
   1. Termidor by BASF Professional Pest Control, Research Triangle Park, NC www.termidoronline.com and www.pestcontrolfacts.org.

2.2 MIXES

A. Mix chemicals and water at Manufacturer's full labeled rate per 100 gallons of finished emulsion.

PART 3 - EXECUTION

3.1 PREPARATION

A. Do not apply emulsion until location of air ducts, vents, water, and sewer lines are known and identified. Take extreme caution to avoid contamination of these structural elements and airways.

B. Protection:
   1. Allow no disturbance of treated soil between application of solution and placing of concrete.
   2. Protect neighboring property, water sources, and personnel on site from contamination.
      a. Use anti-backflow equipment or procedures.
      b. Do not treat soil beneath structures that contain wells or cisterns.
      c. Take extreme care to avoid runoff. Do not treat soil that is water-saturated or frozen.
   3. Maintain, on job site, empirical name of chemical, Manufacturer's precautions, and phone numbers of proper authorities to notify in case of spillage or other accident.

3.2 APPLICATION

A. Interface With Other Work:
   1. Coordinate work so vapor retarder can be installed as soon as possible after application of termite protection and before any precipitation or soil disturbance. Reapply solution to areas disturbed by subsequent excavation or other construction activities following application.

B. Apply chemicals as water emulsion at concentrations and rates specified. If impervious soils make reduction in volume of solution necessary, increase percentage of toxicant used in proportion to insure same amount of insecticide be used per linear or square foot.

C. Pre-Construction Treatment:
   1. Provide unbroken vertical and horizontal chemical barrier to termite entry.
   2. For Slab-on-Grade Construction:
      a. 4 gals per 10 lin ft along outside of exterior foundation.
      b. 2 gals per 10 lin ft in voids of unit masonry foundation walls or piers.
      c. One gal per 10 sq ft as overall treatment under slab and attached porches.
      d. 1 gal per 10 lin ft along inside of exterior foundation walls, both sides of interior partition foundation walls, and around utility services and other features that will penetrate slab.

3.3 FIELD QUALITY CONTROL

A. Inspection:
   1. Notify Architect two working days before application of chemicals.
   2. Mix chemicals to specified concentration in Architect's presence.

B. Site Tests:
   1. Have applicable governmental agency test application for amount of chemical applied. Submit test results to Architect.
   2. Samples provided under paragraph 1.2,C,3 above will be submitted to laboratory analysis by Architect if requested by Owner in accordance with General Conditions Paragraph 15.4.

3.4 PROTECTION

A. Allow 12 hours for drying after application before resuming construction activities. Do not allow workers or other personnel to enter treatment area until chemical has been absorbed into soil. Protect application areas from precipitation as recommended by Manufacturer.

B. Post signs in areas of application warning of poison application. Remove signs when areas with application are covered by other construction.

END OF SECTION

DIVISION 32: EXTERIOR IMPROVEMENTS

SECTION 32 1216

ASPHALT PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Prepare pavement sub-grade as described in Contract Documents to receive pavement base and paving.
   2. Furnish and install pavement base and asphaltic concrete paving in driveways and parking areas as described in Contract Documents.

B. Related Requirements:
   1. Section 31 2323: Compaction procedures and tolerances for fill.

1.2 REFERENCES

A. Reference Standards:
   1. ASTM International:
      a. ASTM C 131-03, 'Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.'
      b. ASTM D 977-05, 'Standard Specification for Emulsified Asphalt.'
      c. ASTM D 1075-96 (2005), 'Standard Test Method for the Effect of Water on Compressive Strength of Compacted Bituminous Mixtures.'
      d. ASTM D 1188-96 (2002), 'Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Specimens.'
      e. ASTM D 2027-97 (2004), 'Standard Specification for Cutback Asphalt (Medium-Curing Type).'
      f. ASTM D 2041-03a, 'Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures.'
      g. ASTM D 2397-05, 'Standard Specification for Cationic-Emulsified Asphalt.'
      h. ASTM D 2726-05a, 'Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Saturated Surface-Dry Specimens.'
      i. ASTM D 3381-05, 'Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction.'

1.3 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conferences:
   1. Participate in pre-installation conference specified in Section 31 2213.
   2. Schedule paving pre-installation conference after staking of parking areas and installation of sleeves, but before installation of base and paving.

1.4 SUBMITTALS

A. Action Submittals:
   1. Product Data: Manufacturer's published product data on pre-emergent herbicide.

B. Informational Submittals:
   1. Design Data: Mix design of asphalt concrete mixture.
   2. Test And Evaluation Reports: Copies of test results from tests conducted to assure compliance to Contract Document requirements.

3. Manufacturer Instructions: Application instructions for pre-emergent herbicide.

1.5 QUALITY ASSURANCE

A. Qualifications: Pre-emergent herbicide shall be applied by applicator certified by State in which Project is located as an applicator of agricultural chemicals.

1.6 FIELD CONDITIONS

A. Ambient Conditions:
   1. Do not perform work during following conditions:
      a. Ambient temperature or temperature of base below 50 deg F.
      b. Presence of free surface water.
      c. Over-saturated base and sub-grade materials.

PART 2 - PRODUCTS

2.1 MATERIAL

A. Pre-emergent herbicide:
   1. Selective type pre-emergence control chemical containing 40 percent Trifluralin minimum.
   2. Labeled for under-pavement use.
   3. Type Two Acceptable Products:
      a. Treflan or Spike 80W by Dow AgroSciences, Indianapolis, IN www.dowagro.com.
      b. Trust 4EC by Agriliance LLC, St Paul, MN www.agriliance.com.
      c. Equal as approved by Architect before installation. See Section 01 6200.

B. Base:
   1. New Aggregate Base:
      a. Road Base type gravel or crushed stone, graded as follows: In accordance with Georgia Department of Transportation Specification Section 400.

C. Asphalt Cement Primer: Meet requirements of ASTM D 2027, MC 70, plus or minus one grade.

D. Tack Coat: Emulsified asphalt meeting requirements of either ASTM D 977, Grade SS-1H, or ASTM D 2397, Grade CSS-1H.

E. Pavement:
   1. Asphalt Cement: Per Georgia Department of Transportation Specification Section 400.
   2. Aggregates: Per Georgia Department of Transportation Specification Section 400.

2.2 MIXES

A. Central plant hot mix.

B. Develop mix design according to Marshall Method to achieve optimum asphalt content as shown by test data curves based on testing samples containing 1/2 percent increments of asphalt content. Samples shall include minimum of two with asphalt content above optimum and two with asphalt content below optimum.
   1. Make tests in accordance with ASTM D 1559 and ASTM D 1075 (50 blow count Marshall).
   2. Final design shall meet following criteria:
      a. Stability: 1200 pounds minimum.
      b. Flow: 8 minimum, 18 maximum.
      c. Air voids: 2 percent minimum, 4 percent maximum.

d. Voids in mineral aggregate: 15 percent minimum.
e. Asphalt cement by weight of total: 5 percent minimum.
f. Dry Strength: 200 psi.
g. Index of Retained Strength: 75 percent.

PART 3 - EXECUTION

3.1 INSTALLERS

A. Approved Applicators:
1. Shall be pre-qualified to work on Georgia Department of Transportation Projects.
2. Paving companies shall be pre-approved and include proof of prequalification with Pavement Design Submittal.

3.2 PREPARATION

A. Survey and stake parking surfaces to show grading required by Contract Documents.

B. Sub-Grade:
1. Finish grade parking surface area to grades required by Contract Documents.
2. Compact sub-grade as specified in Section 31 2323.

C. Pre-emergent Herbicide:
1. Apply to prepared subgrade dispersed in liquid. Concentrate shall be such that Manufacturer's full recommended rate of chemical will be applied to every 1000 sq ft and liquid will penetrate a minimum of 2 inches.
2. Application shall be no more than one day before installation of base.
3. Take necessary precautions to protect adjoining property and areas designated for planting on building site.

3.3 INSTALLATION

A. Tolerances:
1. Sub-Grade: 0.00 inches high. Measure using string line from curb to curb, gutter, flat drainage structure, or grade break.
2. Base:
a. Base shall be 6 inches thick minimum after compaction, except where shown thicker on Drawings.
b. Measure using string line from curb to curb, gutter, flat drainage structure, or grade break.
3. Paving:
a. Apply asphaltic concrete paving in single lift 2 inches thick minimum after compaction, except where shown thicker on Drawings. Paving thicker than 3 inches may be applied in two lifts, the first 2 inches thick minimum and the second 1-1/2 inches thick minimum.
b. Paving adjacent to cast-in-place concrete site elements shall be between 1/4 inch higher than concrete and flush with concrete.
c. Surface texture of hand worked areas shall match texture of machine-laid areas.

B. Base:
1. If roller is smaller than 8 ton, lay gravel and compact in two courses.
2. Compact as specified in Section 31 2323.
3. Priming: Prime base with application of 0.2 to 0.5 gallons of asphalt cement primer per square yard if pavement will be laid more than three days after compaction of base, or if precipitation is anticipated between completion of compaction of base and laying of pavement.
4. Recompact unprimed base if it receives precipitation before pavement is laid.
5. Remove or repair improperly prepared areas as directed by Architect.

C. Asphalt Paving:
   1. Tack coat vertical concrete surfaces that will be in contact with paving.
   2. Uniformly mix materials so aggregate is thoroughly coated with asphalt.
   3. Place at temperatures between 250 and 325 deg F with a self-propelled laydown machine.
   4. Longitudinal bituminous joints shall be vertical and properly tack coated if cold. Transverse joints shall always be tack coated.
   5. Compaction:
      a. Compact asphalt paving to 96 percent minimum. Determine percent compaction by dividing density of test cores as determined by either ASTM D 1188 or ASTM D 2726 by laboratory compacted density as determined by ASTM D 1559. Maximum total air voids in completed asphaltic concrete shall be 8 percent as determined by ASTM D 2041.
      b. Roll with powered equipment capable of obtaining specified density.
      c. Begin breakdown rolling immediately after asphalt is placed when asphalt temperature is at maximum. Complete breakdown rolling before mix temperature drops below 240 deg F. Complete handwork compaction concurrently with breakdown rolling.
      d. Complete intermediate rolling as soon as possible after breakdown rolling and before mix temperature drops below 185 deg F. Do not roll paving for compaction purposes after asphalt temperature falls below 185 deg F.
      e. Execute compaction so visibility of joints is minimized. Complete finish rolling to improve asphalt surface as soon as possible after intermediate rolling and while asphalt paving is still warm. Do not use vibration for finish rolling.
   6. Surface shall be uniform with no 'birdbaths.' Leave finished surfaces clean and smooth. Variations from specified grades shall not exceed 1/2 inch.

3.4 FIELD QUALITY CONTROL

A. Field Tests: When tested with 10 foot straight edge, surface of completed work shall not contain irregularities in excess of 1/4 inch.

END OF SECTION

SECTION 32 1313

CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Prepare pavement sub-base as described in Contract Documents to receive pavement base and paving.
   2. Furnish and install pavement base as described in Contract Documents.
   3. Furnish and install Portland cement concrete paving as described in Contract Documents.

B. Related Requirements:
   1. Section 31 2323: Compaction procedures and tolerances.
   2. Section 03 3923: Membrane Concrete Curing.
   3. Section 07 9213: Quality of joint sealants including other contractual and installation requirements.

1.2 REFERENCES

A. Reference Standards:
   1. ASTM International:
      a. ASTM D 1557-02, 'Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort.'

1.3 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conferences:
   1. Participate in pre-installation conference specified in Section 31 2213.
   2. Schedule paving pre-installation conference after surveying and staking of parking areas and installation of sleeves, but before installation of base and paving.

1.4 SUBMITTALS

A. Action Submittals:
   1. Shop Drawings: Joint layout plan for written approval before starting work on this Section.

1.5 FIELD CONDITIONS

A. Ambient Conditions:
   1. Do not perform work during unfavorable conditions as specified below:
      a. Temperature below 50 deg F.
      b. Presence of free surface water.
      c. Over-saturated base and sub-base materials.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Base:
1. Road base type gravel or crushed rock, graded as follows:
   a. Sieve — Percent by Weight Passing Sieve
      1) 1 inch — 100
      2) 3/4 inch — 85 - 100
      3) No. 4 — 45 - 60
      4) No. 10 — 30 - 50
      5) No. 200 — 5 - 10 (non-plastic)

B. Concrete:
1. Conform to applicable requirements specified in Section 03 3111 for Type 2 concrete mix with following modifications and additions:
   a. Air Entrainment: 6-1/2 percent, plus or minus one percent.
   b. Water-Cement Ratio: 0.49 maximum by weight.
   c. Curing: Curing compounds may be used instead of moist curing.

PART 3 - EXECUTION

3.1 PREPARATION

A. Survey and stake parking surfaces to show grading required by Contract Documents.

B. Sub-Base:
1. Fine grade parking surface area to grades required by Contract Documents.
2. Compact as specified in Section 31 2323.

3.2 INSTALLATION

A. Site Tolerances:
1. Finished base course shall be 4 inches thick minimum after compaction and true to line and grade within plus or minus 1/4 inch in 10 feet.
2. Paving shall be 5 inches thick minimum.

B. Base:
1. Compact to 95 percent minimum density as determined by ASTM D 1557.
2. Remove or repair improperly prepared areas as directed by Architect.

C. Paving Placement:
1. Place, strike off, and consolidate concrete with mechanical finishing machine or vibrating screed.
   a. Hand finishing methods may be used if approved by Architect.
   b. If screed is used, carry 2 inches of concrete minimum in front of screed for full width of pavement.
   c. Concrete may also be placed with slipform paver designed to spread, consolidate, screed, and float-finish concrete in one pass.
2. Finish: Skid-resistant finish made with burlap drag or broom.
3. Curing: Apply specified curing compound.
4. Joints:
   a. Control:
      1) Depth shall be 1/4 slab thickness.
      2) Complete before shrinkage cracking occurs.

3) Make continuous across slab unless interrupted by expansion or isolation joint. Extend through adjoining curbs, gutters, and sidewalks.
4) Space not more than 12-1/2 feet apart in any direction.
5) Control Jointing Methods:
   a) Sawing: Begin sawing joints as soon as concrete has hardened enough to permit sawing without raveling.
   b) Hand-Formed: Maximum edge radius shall be 1/4 inch.
   c) Pre-molded joint former.
6) Do not seal control joints unless detailed on Drawings.

b. Expansion Or Isolation:
   1) Use to isolate fixed objects abutting or within paved area. Joints shall contain pre-molded joint filler for full depth of slab.
   2) Space not more than 65 feet apart in any direction.
   3) Clean and seal before opening parking area to traffic.

3.3 PROTECTION

A. Do not open pavement to traffic for three days or until concrete reaches compressive strength of 1800 psi minimum, whichever is longer. Restrict traffic to passenger cars and light trucks for seven days. In all cases, obtain approval from Architect before allowing access to parking area by traffic.

END OF SECTION

SECTION 32 1723

PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish material and apply pavement and curb markings as described in Contract Documents.

1.2 QUALITY ASSURANCE

A. Regulatory Requirements: Paint handicap spaces to conform to ADA Standards and local code requirements.

1.3 FIELD CONDITIONS

A. Ambient Conditions:
   1. Apply only on dry surfaces, during favorable weather, and when damage by rain, fog, or condensation not anticipated.
   2. Latex Paint:
      a. Atmospheric temperature above 50 deg F.
      b. When temperature is not anticipated to drop below 50 deg F during drying period.
   3. Alkyd or Chlorinated Rubber Paint:
      a. Atmospheric temperature above 40 deg F.
      b. When temperature is not anticipated to drop below 40 deg F during drying period.

PART 2 - PRODUCTS

2.1 MATERIAL

A. Paint:
   1. Non-reflectorized.
   2. Types:
      a. Acrylic Latex for uncured paving.
      b. Alkyd or chlorinated rubber for cured paving.
   3. Colors:
      a. Yellow: Parking stripes, crosswalk stripes, and safety markings.
      b. Blue And White: Handicapped markings.
      c. Red: Fire lanes and no parking zones.
   4. Type Two Acceptable Products:
      a. 442XX Traffic Marking Paint by ICI Devoe, Cleveland, OH www.devoepaint.com.
      b. Set-Fast Traffic Marking Paint by Sherwin-Williams, Cleveland, OH www.sherwin-williams.com
      c. Equal as approved by Architect before application. See Section 01 6200.

B. Thermoplastic: Shall be used in all areas within D.O.T. Right-of-Way.
   1. Reflectorized.
   2. Colors:
      a. Yellow: Parking stripes, crosswalk stripes, and safety markings.
      b. Blue And White: Handicapped markings.
      c. Red: Fire lanes and no parking zones.

3. Category Four Approved Product. See Section 01 6200 for definitions of Categories.
   a. Premark Plus by Flint Trading Inc, Thomasville, NC www.flinttrading.com.

PART 3 - EXECUTION

3.1 PREPARATION

A. Do not apply acrylic latex system until paving has cured 7 days minimum. Do not apply alkyd or chlorinated rubber systems until paving has cured 3 months minimum.

B. Surfaces shall be dry and free of grease and loose dirt particles. Scrape and wire brush chipped or damaged paint on existing curbs.

C. Perform layout with chalk or lumber crayon only.

3.2 APPLICATION

A. Tolerances:
   1. General: Make lines parallel, evenly spaced, and with sharply defined edges.
   2. Line Widths:
      a. Plus or minus 1/4 inch variance on straight segments.
      b. Plus or minus 1/2 inch variance on curved alignments.

B. Provide two coat application, each coat applied at 150 sq ft per gal. Apply second coat after three hours minimum or when first coat is thoroughly dried, whichever is longer.

3.3 CLEANING

A. Remove drips, overspray, improper markings, and paint material tracked by traffic by sand blasting, wire brushing, or other method approved by Architect before performance.

END OF SECTION

SECTION 32 3113

CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install complete fence and gates as described in Contract Documents.

B. Related Requirements:
   1. Section 03 3053: Mow strips at fencing and setting sleeves in retaining walls.
   2. Section 05 0503: Priming and galvanizing repair.
   3. Section 05 0523: Welding requirements.

1.2 REFERENCES

A. Reference Standards:
   1. ASTM International:
      a. ASTM A 123-02, 'Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.'
      b. ASTM A 153-05, 'Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.'
      c. ASTM A 392-03, 'Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric.'
      d. ASTM A 1011-05, 'Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.'
      e. ASTM C 1107-05, 'Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).'
      f. ASTM F 1043-04, 'Standard Specification for Strength and Protective Coatings on Steel Industrial Chain Link Fence Framework.'
      g. ASTM F 04, 'Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.'

1.3 SUBMITTALS

A. Action Submittals:
   1. Samples: Types of vision slats and colors for Architect's selection.

PART 2 - PRODUCTS

2.1 ASSEMBLIES

A. Materials:
   1. Fabric:
      a. Chain link fabric of 9 wire, galvanized before or after weaving with 1.2 ounce zinc coating conforming to requirements of ASTM A 392, Class I
      b. 2 inch square or 3-1/2 inch by 5 inch mesh as selected by Architect or as required by specified vision slat.
      c. Knuckle both selvages.
   2. Framework:

a. Posts and rails shall be roll-formed, self-draining shapes meeting strength requirements of ASTM F 669, Table 3, and with 2 ounce zinc coating per sq ft of surface area conforming to ASTM A 123.
b. Line Posts:
   1) 1.875 by 1.625 inch C-section roll formed from steel conforming to ASTM A 570, Grade 45, with minimum theoretical bending strength of 247 pounds under 6 foot cantilever load.
   2) 2.375 inch outside diameter Schedule 40 tubular section weighing 3.65 lbs/lin ft meeting requirements of ASTM F 1083.
   3) 2.375 inch outside diameter Schedule 40 tubular section weighing 3.12 lbs/lin ft formed from steel meeting requirements of ASTM A 1011.
   4) 2.25 by 1.70 inch C-section meeting other requirements given above.
   5) 2.875 inch outside diameter Schedule 40 tubular section weighing 5.79 lbs/lin ft meeting requirements of ASTM F 1083.
   6) 2.875 inch outside diameter Schedule 40 tubular section weighing 4.64 lbs/lin ft formed from steel meeting requirements of ASTM A 1011.
c. Terminal And Gate Posts:
   1) 3.5 by 3.5 inch roll formed section with minimum theoretical bending strength of 486 pounds under 6 foot cantilever load.
   2) 3 inch outside diameter Schedule 40 pipe weighing 5.79 pounds per lineal foot meeting requirements of ASTM F 1083.
   3) 3 inch outside diameter Schedule 40 tubular section weighing 4.64 pound per lineal foot formed from steel meeting requirements of ASTM A 1011.
   4) Gate Posts for supporting single gate leaf, or one leaf of a double gate installation, for nominal gate widths over 6 feet:

Leaf Width	Post Outside Diameter	Lbs / lin ft
Over 6 Ft to 13 Ft	4 Inches	9.11
Over 13 Ft to 18 Ft	6.625 Inches	18.97
Over 18 Ft	8.925 Inches	28.55

d. Top And Brace Rail:
   1) 1.625 by 1.25 inch roll formed section of 45,000 psi yield strength channel shaped rail with minimum theoretical bending strength of 247 pounds on 10 foot midpoint load.
   2) 1.660 inch outside diameter Schedule 40 pipe weighing 2.27 lbs/lin ft meeting requirements of ASTM F 1083.
   3) 1.660 inch outside diameter Schedule 40 tubular section weighing 1.84 lbs/lin ft formed from steel meeting requirements of ASTM A 1011.
e. Fittings: Pressed steel or malleable iron, hot-dip galvanized conforming to ASTM A 153. Tie wires shall be 12 ga minimum galvanized steel or 9 ga minimum aluminum wire.
f. Tension Wire: 7 ga minimum galvanized spring steel.

3. Gate Leafs Wider Than 6 Feet:
   a. Fabricate perimeter frames from metal and finish to match fence framework. Assemble frames by welding or with special fittings and rivets, for rigid connections, providing security against removal or breakage connections.
      1) Provide same fabric as for fence. Install fabric with stretcher bars at vertical edges and at top and bottom edges. Attach stretchers bars to frame at not more than 15 inches on center.
      2) Install diagonal cross-bracing consisting of 3/8 inch diameter adjustable length truss rods to ensure frame rigidity without sag or twist.
      3) Where barbed wire is indicated above gates, extend end members of gate frames one foot above to member and prepare to receive three strands of wire. Provide necessary clips for securing wire to extensions.
   b. Swing Gates: Fabricate perimeter frames of minimum 1.90 inch OD pipe.
   c. Gate Hardware: Provide hardware and accessories for each gate, galvanized per ASTM A 153, and in accordance with following:
      1) Hinges: Size and material to suit gate size, non-lift-off type, offset to permit 180 degree gate opening. Provide 1-1/2 pair of hinges for each leaf over 6 foot nominal height.
      2) Latch At Paving: Forked type or plunger-bar type to permit operation from either side of gate, with padlock eye as integral part of latch.
   d. Keeper: Provide keeper for vehicle gates, which automatically engages gate leaf and holds it in open position until manually released.

e. Double Gates: Provide gate stops for double gates, consisting of mushroom type flush plate with anchors, set in concrete, and designed to engage center drop rod or plunger bar. Include locking device and padlock eyes as integral part of latch, permitting both gate leaves to be locked with single padlock.
f. Sliding Gates: Provide Manufacturer's standard heavy-duty inverted channel track, ball-bearing hanger sheaves, overhead framing and supports, guides, stays, bracing, hardware, and accessories as required.

B. Mixes:
1. Post Foundation Concrete:
a. One cu ft cement, 2 cu ft sand, 4 cu ft gravel, and 5 gallons minimum to 6 gallons maximum water.
b. Mix thoroughly before placing.

2.2 ACCESSORY PRODUCTS

A. Post Setting Grout at Sleeves:
1. Commercial nonshrink grout conforming to requirements of ASTM C 1107, Type B or C.
2. Type Two Approved Products:
a. Normal Construction Grout A by W R Bonsal, Charlotte, NC www.bonsal.com.
b. Advantage 1107 Grout by Dayton Superior, Miamisburg, OH www.daytonrichmond.com.
c. NS Grout by Euclid Chemical Co, Cleveland, OH www.euclidchemical.com.
d. 5 Star Special Grout 110 by Five Star Products Inc, Fairfield, CT www.fivestarproducts.com.
e. Duragrout by L&M Construction Chemicals Inc, Omaha, NE www.lmcc.com.
f. Masterflow 713 Pre-mixed Grout by Master Builders, Cleveland, OH www.masterbuilders.com.
g. Tamms Grout 621 by TAMMS Industries, Mentor, OH www.tamms.com.
h. U S Spec MP Grout by U S Mix Products Co www.usspec.com.
i. CG-86 Grout by W R Meadows, Elgin, IL www.wrmeadows.com.
j. Equal as approved by Architect before use. See Section 01 6200.

B. Vision Slats:
1. High-density polyethylene (HDPE), double-walled, self-locking or with locking feature that prevents slats from being removed.
2. Color: As selected by Architect from Manufacturer's standard colors
3. When installed, slats will provide 75 percent minimum visual privacy / security.
4. Approved Products:
a. Winged Slat.
b. Top-Locking Slat.
c. Bottom-Locking Slat.
d. FeatherLock Slat.
e. Fin 2000 Slat.
5. Color: As selected by Architect from Manufacturer's standard colors
6. When installed, slats will provide 98 percent minimum visual privacy / security.
7. Category Four Approved Product. See Section 01 6200 for definitions of Categories.
a. Fin 2000.
8. Type Two Acceptable Manufacturers:
a. Slats: SlatSource, Hyde Park, UT www.eprivacylink.com.
b. Fabric with Pre-Inserted Slats: *Privacy*Link, Hyde Park, UT www.eprivacylink.com.
c. Equal as approved by Architect before installation. See Section 01 6200.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fence shall be installed by mechanics skilled and experienced in erecting fences of this type and in accordance with Contract Documents.
   1. When general ground contour is to be followed, make changes of grade in gradual, rolling manner.
   2. Evenly space posts in line of fence a maximum of 10 feet center to center.

B. Post Foundations:
   1. Except atop retaining walls, set posts with concrete post foundations as specified below:
      a. Line Posts — Diameter 8 inches — Depth 36 inches
      b. Gate, End, And Corner Posts — Diameter 12 inches — Depth 42 inches
      c. At mow strips, set top of post foundation below grade sufficient to allow for placing of mow strip. Measure post foundation depth from top of mow strip.
      d. Where fences are incorporated into slabs, measure post foundation depth from top of slab. Extend bottom of slab footing sufficient to allow specified amount of concrete around post. At existing slabs, install fence outside perimeter of slab.
      e. For fences on retaining walls, provide 12 inch long sleeves to be cast into retaining wall. Set pipe in sleeve and grout space between sleeve and post full.

C. Fence:
   1. After posts have been permanently positioned and concrete cured for one week minimum, install framework, braces, and top rail. Join top rail with 6 inch minimum couplings at not more than 21 foot centers.
   2. Stretch fabric by attaching one end to terminal post and supplying sufficient tension to other end of stretch so slack is removed.
      a. Fasten fabric to line posts with tie wires. Pass ties over one strand of fabric and hook under line post flange.
      b. Place one tie as close to bottom of fabric as is possible with additional ties equally spaced between top and bottom band on approximately equal spacing not to exceed 14 inches on center.
      c. Attach fabric to roll formed terminals by weaving fabric into integral lock loops formed in post. Attach fabric to tubular terminals with tension bars and bands.
      d. Hold fabric approximately 2 inches above finish grade line.
      e. On top rail, space tie wires at no more than 24 inches on center.
      f. Securely attach fittings and firmly tighten nuts.
   3. Slats may either be installed by hand, or pre-inserted in fabric during manufacture.

D. Gates:
   1. Weld gate frames and provide for free and easy operation.
   2. Provide gate latching device with padlocking capabilities. Provide cane bolt to engage sleeve set in concrete at double gates.
   3. Align top bar of gates with top rail of fence.
   4. Gates shall be plumb and on same plane as fence, both vertically and horizontally.
   5. Set gate stops and other catches in concrete.

3.2 CLEANING

A. Spread dirt from foundation excavations evenly around surrounding area unless otherwise directed. Leave area free of excess dribbles of concrete, pieces of wire, and other scrap materials.

END OF SECTION

SECTION 32 3123

PLASTIC FENCES AND GATES

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install complete fence at mechanical enclosures as described in Contract Documents.

B. Related Requirements:
   1. Section 03 3111: Sleeved block-outs for fence post foundations in slabs.

1.2 REFERENCES

A. Reference Standards:
   1. ASTM International:
      a. ASTM D 1784-03, 'Standard Specification for Rigid Poly (Vinyl Chloride)(PVC) Compounds and Chlorinated Poly (Vinyl Chloride)(CPVC) Compounds.'

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data: Manufacturer's literature including material compliance, selected style, and options.

B. Informational Submittals:
   1. Manufacturer Instructions: Printed installation instructions. Indicate post reinforcing method used.

C. Closeout Submittals:
   1. Warranty Documentation: Include final, executed Warranty in Operations And Maintenance Manual specified in Section 01 7800.

1.4 QUALITY ASSURANCE

A. Qualifications: Fence shall be installed by mechanics skilled and experienced in erecting fences of this type. Installers shall have been trained by Fence Manufacturer.

1.5 WARRANTY

A. Manufacturer's standard lifetime non-prorated limited warranty.

PART 2 - PRODUCTS

2.1 ASSEMBLIES

A. Manufacturers:

1. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories.
   a. Bufftech, Buffalo, NY www.certainteed.com.
   b. Homeland Vinyl Products Inc, Birmingham, AL www.homelandvinyl.com.
   c. Kroy Building Products Inc, York, NE www.kroybp.com.
   d. Westech, Houston, TX www.westechbp.com.

B. Performance;
   1. Design Criteria:
      a. Posts:
         1) 5 Feet And Higher: 5 inches square with wall thickness of 0.160 inch minimum.
         2) Less Than 5 Feet: 4 inches square with wall thickness of 0.190 inch minimum.
      b. Rails: 6 inches by 2 inches actual dimension. Reinforce top and bottom rail with galvanized or corrosive-resistant metal.

C. Components:
   1. Vinyl:
      a. Extrusions shall comply with ASTM D 1784, Class 14344B.
      b. PVC formulated to resist impact and to be UV stable.
      c. Fence panels shall be tongue and groove.
      d. Color as selected by Architect from Manufacturer's standard colors.
      e. Style Quality Standard: Privacy Fencing.
   2. Hardware And Fasteners: Stainless steel.

D. Mixes:
   1. Post Foundation And Post Reinforcement Concrete:
      a. One cu ft cement, 2 cu ft sand, 4 cu ft gravel, and 5 gallons minimum to 6 gallons maximum water.
      b. Mix thoroughly before placing.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fence:
   1. Equally space posts 6 foot on center maximum. Measure height of posts from top of concrete foundation to top of post.
   2. Reinforce corner posts, end posts, gate posts, and alternating line posts by one of following methods:
      a. Ungrouted: Full height hot-dip galvanized or corrosion-resistant metal.
      b. Grouted: Two No. 4 bars placed at diagonal corners of post.
   3. Set posts and metal reinforcing in concrete post foundations measuring 10 inches minimum in diameter and 30 inches deep. For fences installed in slabs, measure post foundation depth from top of slab.
   4. After posts have been permanently positioned and concrete cured for one week minimum, install rails and pickets. Rout rails into posts and mechanically secure against pull-out from posts.
   5. Semi-permanently install caps.

3.2 CLEANING

A. Spread dirt from foundation excavations evenly around surrounding area unless otherwise directed. Leave area free of excess dribbles of concrete and other scrap materials.

END OF SECTION

SECTION 32 8423

UNDERGROUND SPRINKLERS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install planting irrigation system as described in Contract Documents complete with accessories necessary for proper function.

B. Related Requirements:
   1. Section 22 1116: Stop and waste valve.
   2. Division 26: Controller conduit and power to controller.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference: Schedule pre-installation conference before irrigation system installation begins. In addition to items listed in Division 01, demonstrate or describe method to be used to maintain head spacing from concrete and to stabilize heads.

B. Sequencing: Install sleeves before installation of cast-in-place concrete site elements and paving.

1.3 SUBMITTALS

A. Informational Submittals:
   1. Test And Evaluation Reports: Results of service pressure test before beginning work on system.

B. Closeout Submittals:
   1. Record Drawings:
      a. As installation occurs, prepare accurate record drawing to be submitted before final inspection, including:
         1) Detail and dimension changes made during construction.
         2) Significant details and dimensions not shown in original Contract Documents.
         3) Field dimensioned locations of valve boxes, manual drains, quick-coupler valves, control wire runs not in mainline ditch, and both ends of sleeves.
         4) Take dimensions from permanent constructed surfaces or edges located at or above finish grade.
         5) Take and record dimensions at time of installation.
         6) Contractor shall produce as-built drawings in Autocad 2004 format
         7) These drawings shall have dimensions from easily located stationary points (cross measured) as they relate to all valves, mainlines, and wire.
      b. Reduce copy of record drawing to 11 by 17 inches, color key circuits, and laminate both sides with 5 mil thick or heavier plastic. Mount on 1/4 inch plywood board. Drill two 1/2 inch holes at top of board and hang on hooks in Custodial Room.
   2. Operations And Maintenance Manual Data:
      a. Modify and add to requirements of Section 01 7800 as follows:
         1) Instruction manual that contains complete instructions for system operation and maintenance, including winterizing and first year's scheduling.
         2) Complete instructions on how to drain entire backflow preventer to prevent freezing.
         3) Manufacturer's cut sheets for each element of system.
         4) Parts lists for operating elements of system.
         5) Manufacturer's printed literature on operation and maintenance of operating elements of system.

3. Final payment for system will not be authorized until Closeout Submittals are received and accepted by Architect.

C. Maintenance Material Submittals:
   1. Tools:
      a. Furnish following items before Final Closeout Review:
         1) One heavy-duty key for stop and waste or main shut-off valve.
         2) One quick coupler key with brass hose swivel.
   2. Spare Parts
      b. Refer to plans/legend for reference of all spare parts/equipment

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Work and materials shall be in accordance with latest rules and regulations, and other applicable state or local laws. Nothing in Contract Documents is to be construed to permit work not conforming to these codes.

B. Qualifications:
   1. Installers:
      a. Use only trained personnel familiar with required irrigation system installation procedures.
      b. Perform installation under direction of foreman or supervisor with five years minimum experience in sprinkling system installations.

1.5 DELIVERY, STORAGE, AND HANDLING

A. During delivery, installation, and storage, protect materials from damage and prolonged exposure to sunlight.

1.6 WARRANTY

A. Standard one year guarantee stipulated in General Conditions Article 12.2 shall include:
   1. Filling and repairing depressions and replacing plantings due to settlement of irrigation system trenches.
   2. Adjusting system to supply proper coverage of areas to receive water.
   3. Ensuring system can be adequately drained.

PART 2 - PRODUCTS ***Refer to plans for more project specific equipment***

2.1 SYSTEM

A. Manufacturers:
   1. Manufacturer List:
      a. Action Machining Inc, Bountiful, UT www.actionfilters.com.
      b. Carson Industries LLC, Glendora, CA www.carsonind.com.
      c. Hunter Industries, San Marcos, CA www.hunterindustries.com.
      d. King Inovation, St Charles, MO www.kinginovation.com.
      e. Nibco Inc, Elkhart, IN www.nibco.com.
      f. Orbit Irrigation Products, Bountiful, UT www.orbitonline.com.
      g. Rain Bird Sprinkler Manufacturing Corp, Glendora, CA www.rainbird.com.
      h. Salco Products, Fontana, CA www.salcodrip.com.
      i. 3M, Austin, TX www.3m.com/elpd.
      j. Toro Company, Irrigation Div, Riverside, CA www.toro.com.
      k. Weathermatic Irrigation Products, Garland, TX www.weathermatic.com.

B. Materials:
1. Rock-Free Soil:
   a. Backfill soil around PVC pipe.
   b. Soil having rocks no larger than 1/2 inch in any dimension.
2. Pea Gravel:
   a. For use around drains, valves, and quick couplers.
   b. 1/2 inch maximum dimension, washed rock.
3. Sand: Fine granular material naturally produced by rock disintegration and free from organic material, mica, loam, clay, and other deleterious substances.
4. Native Material: Soil native to project site free of wood and other deleterious materials and rocks over 1-1/2 inches.
5. Topsoil: Remove rocks, roots, sticks, clods, debris, and other foreign matter over 1-1/2 inches longest dimension encountered during trenching.
6. Pipe, Pipe Fittings, And Connections:
   a. Pipe shall be continuously and permanently marked with Manufacturer's name, size, schedule, type, and working pressure.
   b. Pipe sizes shown on Drawings are minimum. Larger sizes may be substituted if at no additional cost to Owner.
   c. Hardiness Zone 5 Through 11 Pipe:
      1) Pressure Lines: Schedule 40 PVC.
      2) Lateral Lines: Schedule 40 PVC.
      3) Backflow Assembly Piping: Galvanized steel.
      4) Quick Coupler Piping: Galvanized steel.
   d. Fittings: Same material as pipe, except where detailed otherwise.
   e. Sleeves:
      1) Under Parking Area And Driveway Paving: Schedule 40 PVC Pipe.
      2) All Other: Class 200 PVC Pipe.
      3) Sleeve diameter shall minimally be two times larger than pipe installed in sleeve.
7. Sprinkler Heads:
   a. Each type of head shall be product of single manufacturer.
   b. Shrub Head Bubblers:
      1) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
         a) Hunter: S-8A, S-16A series (stream spray), PCN, PCB, MSBN series.
         b) Orbit: 5400 series.
         c) Rainbird: 5 Series stream bubbler, FB series (flood bubbler).
         d) Toro: SB series (stream bubbler).
         e) Weathermatic: 102 Series, 106 series.
   c. Spray Heads in Shrub and Ground Cover Areas:
      1) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
         a) Hunter: PROS 12 Series with MPR nozzles or with shrub adapter on Schedule 80 PVC nipple. CV optional.
         b) Orbit: 5400 series with shrub adapter No. 54942
         c) Rainbird: 1812 PRS-SAM Series with MPR nozzles or with PA-8S shrub adapter. SAM optional.
         d) Toro: 570 MPR 12 series with shrub adapter.
         e) Weathermatic: LX series with MPR Nozzle and LXS (shrub adapter)
   d. Spray Heads in Lawn Areas:
      1) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
         a) Hunter: PROS 06, Pro-Spray Series with MPR nozzles, optional with CV; INST 06 Institutional Series with MPR nozzles, optional with CV.
         b) Orbit: 54457, 54459 with check valve, 54462, 54472, with 5400 series MPR nozzle
         c) Rainbird: 1806 PRS-SAM Series with MPR nozzles. SAM optional.
         d) Toro: 570 Z 06 series/ 570PR series with MPR spray nozzles
         e) Weathermatic: LX series with MPR nozzles
   e. Stream Heads, 16 to 22 foot in Shrub Areas:
      1) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
         a) Rainbird: PA-8S, 16F-SLA, 16H-SLA, 16Q-SLA, 22F-SS, 22H-SS, 22Q-SS
         b) Toro: SS series stream spray
         c) Walla Walla Sprinkler: MP Rotator

f. Gear Driven Rotor Pop-ups:
1) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
a) Hunter: I-20 ADS Series (HP for Shrubs).
b) Orbit: 5500 series PR, 5300 series
c) Rainbird: 5000/5000 plus MPR series, 25'-35', R-50 series (21'-50'), 5500 Series (33'-55')
d) Toro: Mini 8 series, Super 700 Series (21'52'), Super 800 (28'-50') series with 5 inch pop, TR50 Series with 5 inch pop.
e) Weathermatic: T3, T3S series (28'-53'), CT-70 series, (49'-74')

8. Sprinkler Risers:
a. Pop-up rotor sprinkler heads shall have adjustable riser assembly, three ell swing joint assembly, unless detailed otherwise on Drawings. These swing joint fittings shall be of schedule 40 PVC plastic and nipples schedule 80 gray PVC unless otherwise designated on Drawings. Horizontal nipple parallel to side of lateral line shall be 8 inches 200 mm long minimum. All other nipples on swing joint riser shall be of length required for proper installation of sprinkler heads.
b. Pop-up sprinkler heads, shrub spray heads, bubbler heads, and stationary spray sprinkler heads shall have risers made up one of the following ways:
1) Three schedule 40 street ells or Marlex street ells connected to lateral tee to form an adjustable riser or pop-up riser as detailed.
2) Risers for sprinkler heads 14 inches long minimum and 24 inches maximum.
a) Type Two Acceptable Products:
b) Rainbird: Swing Pipe with barbed fittings.
c) Hunter: SJ series with barbed fittings.
d) Toro: Super Funny Pipe with barbed fittings, SPFA-5125, SPFA-51275.
e) Equal as approved by Architect before installation. See Section 01 6200.

9. Automatic Irrigation Control Wiring And Controller:
a. Control wire shall be UF-UL listed, color coded PVC insulated copper conductor direct burial size 14 or PE insulated 14 AWG color coded wire. Do not use green color coded wire. Common Wire shall be 12 AWG (White).
b. Waterproof Wire Connectors:
1) Type Two Acceptable Products:
a) DBY or DBR by 3M
b) Equal as approved by Architect before installation. See Section 01 6200.
c. Automatic controllers:
1) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
a) Hunter:
(1) 8 to 32 Stations: ICC Series.
b) Rainbird:
(1) 8 to 40 Stations: ESP-MC Series.
c) Toro: 9 to 48 Stations: TCC Series.
d. Automatic Rain/Freeze Sensors (Wireless if possible):
1) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
a) Hunter: MINI-CLIK, WRFC.
b) Rainbird: WRFC (wireless rain/freeze sensor), RSD-BEx (w/bracket)
c) Toro: TWRFS (wireless)

10. Valves:
a. Manual Drain Valves:
1) PVC ball valve with 'T' handle on main lines and in valve boxes on lateral lines.
b. Automatic Valves:
1) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
a) Hunter: ICV series
b) Rainbird: PEB series
c) Toro: 252E Series, P220 Series
d) Weathermatic: 21000 CR series, 11000 CR series
c. Isolation Valves:
1) PVC ball valves, size to match pipe size.
2) Class Two Quality Standards. See Section 01 6200.
a) Rainbird: BV Series.
b) Salco

d. Backflow Preventer: Make and Model shown on Drawings or as required by local code.
e. Pressure Reducing Valve: Make and model shown on Drawings or as required by local code.
f. Quick Coupling Valves and Keys:
1) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
a) Hunter: HQ-3, HQ4 Series with HK-3, HK-4 key and HS-100 hose swivel.
b) Orbit: 51029 with 51031 brass key.
c) Rainbird: 33DRC, 33DK with SH-O swivel.
d) Toro: 470 Series with single lug key.
e) Weathermatic: QV75 with CH-75 key and 10SHL hose swivel.

11. Valve Accessories:
a. Valve manifolds:
1) Type Two Acceptable Products.
a) Action: 1800 Series, Models 18001, and 18002, 1, 1-1/2, and 2 inch sizes.
b) Orbit: Model 57955/ 2 port.
c) Rainbird: MS Series.
d) Equals as approved by Architect before use. See Section 01 6200.
b. Valve Boxes And Extensions:
1) Lid Colors:
a) Green: Lawn areas.
b) Brown: Bare soil and rock areas.
c) Purple: Secondary water.
2) Type Two Acceptable Products:
a) Rainbird: VB-STD, VB-JMB, VB-STDT or VB-JMT Series, VB-STDP or VB-JMBP Series, VB-MAX series.
b) Carson Industries: Model 1419-12, Model 1419-18, Model 1730-18 Jumbo.
c) Equal as approved by Architect before use. See Section 01 6200.
c. Valve ID tags:
1) Type Two Acceptable Products:
a) Rainbird: VID1Y24, VID24Y48, VID1P24, VID24P48.
b) Christie Manufacturing Valve ID Tags
c) Equal as approved by Architect before use. See Section 01 6200.
d. Valve Box Supports: Standard size fired clay paving bricks without holes.

12. Other Components:
a. Recommended by Manufacturer and subject to Architect's review and acceptance before installation.
b. Provide components necessary to complete system and make operational.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Site Verification Of Conditions: Perform pressure test at stub-out on main water line provided for irrigation system, or at near-by fire hydrant. Notify Architect if pressures over 70 psi or under 65 psi are found to determine if some re-design of system is necessary before beginning work on system.

3.2 PREPARATION

A. Protection:
1. Repair or replace work damaged during course of the Work at no additional cost to Owner. If damaged work is new, installer of original work shall perform repair or replacement.
2. Do not cut existing tree roots measuring over 2 inches in diameter in order to install irrigation lines.

B. Layout of Irrigation Heads:

1. Location of heads and piping shown on Drawings is approximate. Actual placement may vary slightly as is required to achieve full, even coverage without spraying onto buildings, sidewalks, fences, etc.
2. During layout, consult with Architect to verify proper placement and make recommendations, where revisions are advisable.
3. Minor adjustments in system layout will be permitted to avoid existing fixed obstructions and to accommodate actual field adjustments (site and landscape).
4. Make certain changes from Contract Documents are shown on record drawings.

3.3 INSTALLATION

A. Trenching And Backfilling:
1. Pulling of pipe is not permitted.
2. Excavate trenches to specified depth. Remove rocks larger than 1-1/2 inch in any direction from bottom of trench. Separate out rocks larger than 1-1/2 inch in any direction uncovered in trenching operation from excavated material and remove from areas to receive landscaping.
3. Cover pipe both top and sides with 2 inches of rock-free soil as specified under PART 2 PRODUCTS. Remainder of backfill to within 5 inches of finish grade shall be as specified in Section 31 2323. Top 5 inches of backfill shall be topsoil as specified in Section 32 9113.
4. Do not cover pressure main, irrigation pipe, or fittings until Architect has inspected and approved system.

B. Sleeving:
1. Sleeve water lines and control wires under walks and paving. Extend sleeves a minimum of 6 inches beyond walk or pavement edge. Cover sleeve ends until pipes and wires are installed to keep sleeve clean and free of dirt and debris.
2. Position sleeves with respect to buildings and other obstructions so pipe can be easily removed.

C. Grades And Draining:
1. In localities where winterization is required, grade piping so system can be completely drained or blown out with compressed air. If system is not designed to be blown out with compressed air:
   a. Slope pipe to drain to control valve box where possible.
   b. Where this is not possible, slope pipe to a minimum number of low points. At these low points, install:
      1) 3/4 inch brass ball valve for manual drain. Do not use automatic drain valves.
      2) Install 2 inch Class 200 PVC pipe over top of drain and cut at finish grade.
      3) Provide rubber valve cap marker.
      4) Provide one cu ft pea gravel sump at outlet of each drain.
   c. Slope pipes under parking areas or driveways to drain outside these areas.
   d. Provide and install quick-coupling valve or valves in location for easy blowout of entire system. Install quick coupler valves with 4 lineal feet minimum of Schedule 80 PVC pipe between valve and main line.

D. Installation of Pipe:
1. Install pipe in manner to provide for expansion and contraction as recommended by Manufacturer.
2. Unless otherwise indicated on Drawings, install main lines and lateral lines connecting pop-up rotor and impact sprinklers with minimum cover of 18 inches based on finished grade. Install remaining lateral lines, including those connecting drip tubing, with minimum of 12 inches of cover based on finish grade.
3. Install pipe and wires under driveways or parking areas in specified sleeves 18 inches below finish grade or as shown on Drawings.
4. Locate no sprinkler head closer than 12 inches from building foundation. Heads immediately adjacent to mow strips, walks, or curbs shall be one inch below top of mow strip, walk, or curb and have one to 3 inches clearance between head and mow strip, walk, or curb.
5. Cut plastic pipe square. Remove burrs at cut ends before installation so unobstructed flow will result.
6. Make solvent weld joints as follows:
   a. Do not make solvent weld joints if ambient temperature is below 35 deg F

b. Clean mating pipe and fitting with clean, dry cloth and apply one coat of P-70 primer to each.
c. Apply uniform coat of 711 solvent to outside of pipe.
d. Apply solvent to fitting in similar manner.
e. Give pipe or fitting a quarter turn to insure even distribution of solvent and make sure pipe is inserted to full depth of fitting socket.
f. Allow joints to set at least 24 hours before applying pressure to PVC pipe.

7. Tape threaded connections with teflon tape.
8. If pipe is larger than 3 inches, install concrete thrust blocks wherever change of direction occurs on PVC main pressure lines.

E. Control Valves And Controller
1. Install valves in plastic boxes with reinforced heavy duty plastic covers. Locate valve boxes within 12 inches of sidewalks and shrub bed edges with tops at finish grade. Do not install more than two valves in single box.
2. Place 3 inches 5 mm minimum of pea gravel below bricks supporting valve boxes to drain box. Set valve boxes over valve so all parts of valve can be reached for service. Set cover of valve box even with finish grade. Valve box cavity shall be reasonably free from dirt and debris.
3. Wiring:
a. Tape control wire to side of main line every 10 feet Where control wire leaves main or lateral line, enclose it in Class 200 PVC conduit.
b. Use waterproof wire connectors at splices and locate all splices within valve boxes.
c. Use white or gray color for common wire and other colors for all other wire. Each common wire may serve only one controller.
d. Run one spare control wire from panel continuously from valve to valve throughout system similar to common wire for use as a replacement if a wire fails. Spare wire shall be different color than other wires, except use of green wire is not acceptable. Mark spare control wire in control box as an unconnected wire. Extend spare control wires 24 inches and leave coiled in each valve box.

F. Backflow Preventer:
1. Install 24 inches minimum from structures or hardscaping.
2. When installed adjacent to any structure, mount test cocks on side away from structure.
3. After installation, remove handles and turn over to Owner together with extra maintenance materials.

G. Sprinkler Heads:
1. Set sprinkler heads and quick-coupling valves perpendicular to finish grade.
2. Do not install sprinklers using side inlets. Install using base inlets only.
3. Set sprinkler heads at a consistent distance from existing walks, curbs, and other paved areas and to grade by using specified components or other method demonstrated in Pre-Construction Conference.

H. Before installation of sprinkler heads and drip emitters, open control valves and use full head of water to flush out system.

I. Arrange valve stations to operate in an easy-to-view progressive sequence around building. Tag valves with waterproof labels showing final sequence station assignments.

3.4 FIELD QUALITY CONTROL

A. Site Tests: Before backfilling main line, test pressure at 100 psi minimum for 24 hours minimum and make certain there are no leaks. Notify Architect 2 working days minimum before conducting test.

B. Inspections:
1. Architect's irrigation design consultant, or certified water auditor recommended by consultant and approved in writing by Architect, will review irrigation system before substantial completion.
2. Installations completed after water source has been turned off for season, as determined by Architect, will be accepted following spring, after system can be checked for proper operation.

3. Upon acceptance of irrigation system, reviewer will provide signed acceptance certificate to be included in Operations and Maintenance Manual. Certificate will include name and signature of reviewer, reviewer's company, date of review, and reviewer's telephone number.
4. It will be the responsibility of the Irrigation Contractor to provide a reliable communication system (i.e. Two way radios or remote radio control activation system) for Substantial Completion and all periodic inspections.

3.5 ADJUSTING

A. Adjust sprinkler heads to proper grade when turf is sufficiently established to allow walking on it without appreciable harm. Such lowering and raising of sprinkler heads shall be part of original contract with no additional cost to Owner.

B. Adjust sprinkler heads for proper distribution and trim so spray does not fall on building.

C. Adjust watering time of valves to provide proper amounts of water to plants.

3.6 CLOSEOUT ACTIVITIES

A. Instruction of Owner:
   1. After system is installed and approved, instruct Owner's designated personnel in complete operation and maintenance procedures.

3.8 SYSTEM WINTERIZING

A. Contractor’s responsibility to winterize the irrigation system the first winter following Substantial Completion of the Project

PART 4.0 – CODES, PERMITS, WARRANTY, AND GUARANTEE

4.1 CODES AND ORDINANCES

A. All materials, installation parameters, and operations shall conform to all applicable codes and ordinances. It is the Contractor’s responsibility to investigate and follow all regulations. Contractor is responsible to verify applicable codes and ordinances prior to submitting bid. Before bid submittal, it is the Contractor’s responsibility to notify the Irrigation Consultant/Designer at least 5 days before bid submittal, of any changes due to code or ordinance discrepancies. If the Contractor does not comply with this process and notification, the Contractor shall be responsible for the necessary installation change and redesign costs for non-compliance.

4.2 PERMITS AND FEES

A. The Contractor shall obtain, at his expense, all required permits and shall pay all required fees. Any penalties imposed due to failure to obtain any permit or pay any fee shall be the responsibility of the Contractor.

END OF SECTION

SECTION 32 9000

PLANT MAINTENANCE

1.1 PERFORMANCE

A. General:
1. Before beginning maintenance period, plants shall be in at least as sound, healthy, vigorous, and in approved condition as when delivered to site, unless accepted by Architect in writing at final landscape inspection
2. Maintain landscaping from completion of landscape installation to 30 days after Substantial Completion Meeting.
3. Replace landscaping that is dead or appears unhealthy or non-vigorous as directed by Architect at end of maintenance period. Make replacements within 10 days of notification. Lawn that does not live and has to be replaced shall be guaranteed and maintained an additional 30 days from date of replacement.

B. Seeded Lawn:
1. Seeded lawn areas will not be accepted as complete and 30 day maintenance period will not begin until uniform stand of grass at least 3 inches tall has been obtained.
2. After grass is established and 3 inches tall, mow lawn areas at least weekly to a height of 2 inches. During this period, perform work necessary to maintain a full, even stand of grass.
3. At end of 30 days of maintenance period, fertilize lawns with 16-16-8 at rate recommended by Fertilizer Manufacturer.
4. Apply weed killers as necessary in order to obtain weed free lawn. Apply weed killer in accordance with manufacturer's instructions during calm weather when air temperature is between 50 and 80 deg F.

C. Sodded Lawn:
1. Maintain sodded lawn areas until lawn complies with specified requirements and throughout maintenance period.
2. Water sodded areas in sufficient quantities and at required frequency to maintain sub-soil immediately under sod continuously moist 3 to 4 inches deep.
3. Cut grass first time when it reaches 3 inches high. Continue to mow at least once each week throughout maintenance period. Remove clippings.
4. Apply weed killer as necessary to maintain weed-free lawn. Apply weed killer in accordance with manufacturer's instructions during calm weather when air temperature is between 50 and 80 deg F.
5. At end of 30 day maintenance period, fertilize lawns with 16-16-8 at rate recommended by Fertilizer Manufacturer.

D. Trees, Shrubs, And Plants:
1. Maintain by pruning, cultivating, and weeding as required for healthy growth.
2. Restore planting basins.
3. Tighten and repair stake and guy supports and reset trees and shrubs to proper grades or vertical positions as required.
4. Spray as required to keep trees and shrubs free of insects and disease.
5. Provide supplemental water by hand as needed in addition to water from sprinkling system.

END OF SECTION

SECTION 32 9001

COMMON PLANTING REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Common procedures and requirements for landscaping work.
   2. Provide maintenance for new landscaping as described in Contract Documents.

B. Related Requirements:
   1. Section 32 0501: Common Earthwork Requirements.
   2. Section 32 8423: Underground Sprinklers.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conferences:
   1. Participate in pre-installation conference specified in Section 31 2213.
   2. Schedule planting pre-installation conference after completion of Fine Grading specified in Section 31 2216, but before beginning landscape work. In addition to requirements of Section 01 3000:
      a. Establish responsibility for maintenance of new landscaping during all phases of construction period.
      b. Prepare two typical landscape planting excavations and conduct percolation test to verify that water drains away within two hours. Discuss results of percolation tests with Architect and Owner's representative.

1.3 SUBMITTALS

A. Closeout Submittals: At completion of landscape work, submit two copies of typewritten instructions recommending procedures to be established by Owner for maintenance of landscape work for one full year after contract maintenance period ends.

1.4 QUALITY ASSURANCE

A. Qualifications:
   1. Installers:
      a. Use trained personnel familiar with required planting procedures and with Contract Documents.
      b. Planting shall be performed under direction of foreman or supervisor with minimum five years experience in landscape installations.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver packaged materials in containers showing weight, analysis, and name of Manufacturer. Protect materials from deterioration during delivery and while stored at site.

B. Deliver sod, plants, trees, and shrubs in healthy and vigorous condition and store in location on site where they will not be endangered and where they can be adequately watered and kept in healthy and vigorous condition.

PART 2 - PRODUCTS: Not Used

PART 3 - EXECUTION

3.1 INSTALLERS

A. Acceptable Installers:
   1. Shall have completed 15 jobs of equal or greater value in the previous two years.
   2. Equal approved by Architect bidding. See Section 01 4300.

3.2 EXAMINATION

A. Inspect site and Contract Documents to become thoroughly acquainted with locations of irrigation, ground lighting, and utilities. Repair damage to these and other items adjacent to landscaping caused by work of this Section or replace at no additional cost to Owner.

3.3 PREPARATION

A. Before proceeding with work, verify dimensions and quantities. Report variations between Drawings and site to Architect before proceeding with landscape work.
   1. Plant totals are for convenience of Contractor only and are not guaranteed. Verify amounts shown on Drawings.
   2. All planting indicated on Drawings is required unless indicated otherwise.

B. Protection:
   1. Take care in performing landscaping work to avoid conditions that will create hazards. Post signs or barriers as required.
   2. Provide adequate means for protection from damage through excessive erosion, flooding, heavy rains, etc. Repair or replace damaged areas.
   3. Keep site well drained and landscape excavations dry.

3.4 INSTALLATION

A. Interface With Other Work: Do not plant trees and shrubs until major construction operations are completed. Do not commence landscaping work until work of Sections 31 2216 and 32 8423 has been completed and approved.

B. Coordinate installation of planting materials during normal planting seasons for each type of plant material required.

C. Hand excavate as required.

D. Maintain grade stakes until parties concerned mutually agree upon removal.

E. When conditions detrimental to plant growth are encountered, such as rubble fill or adverse drainage conditions, notify Architect before planting.

3.5 FIELD QUALITY CONTROL

A. Inspection:
   1. Architect will inspect landscaping installation approximately two weeks before Substantial Completion. Replace landscaping that is dead or appears dead as directed by Architect within 10 days of notification and before Substantial Completion.

3.6 CLEANING

A. Immediately clean up soil or debris spilled onto pavement and dispose of deleterious materials.

3.7 CLOSEOUT ACTIVITIES

A. Replace damaged plantings at no additional cost to Owner.

3.8 PROTECTION

A. Protect planted areas against traffic or other use immediately after planting is completed by placing adequate warning signs and barricades.

B. Provide adequate protection of planted areas against trespassing, erosion, and damage of any kind. Remove this protection after Architect has accepted planted areas.

3.9 MAINTENANCE

A. General:
   1. Before beginning maintenance period, plants shall be in at least as sound, healthy, vigorous, and in approved condition as when delivered to site, unless accepted by Architect in writing at final landscape inspection
   2. Maintain landscaping from completion of landscape installation to 30 days after Substantial Completion Meeting. Areas sodded or seeded after November 1st will accepted following spring approximately one month after start of growing season, May 1st or as determined by Architect, if specified conditions have been met.
   3. Replace landscaping that is dead or appears unhealthy or non-vigorous as directed by Architect before end of maintenance period. Make replacements within 10 days of notification. Lawn that does not live and has to be replaced shall be guaranteed and maintained an additional 30 days from date of replacement.

B. Seeded Lawn:
   1. Seeded lawn areas will not be accepted as complete and 30 day maintenance period will not begin until uniform stand of grass at least 3 inches tall has been obtained.
   2. After grass is established and 3 inches tall, mow lawn areas at least weekly to a height of 2 inches. During this period, perform work necessary to maintain a full, even stand of grass.
   3. At end of 30 days of maintenance period, fertilize lawns as specified in Section 32 9113.
   4. Apply weed killers as necessary in order to obtain weed free lawn. Apply weed killer in accordance with manufacturer's instructions during calm weather when air temperature is between 50 and 80 deg F.

C. Sodded Lawn:
   1. Maintain sodded lawn areas until lawn complies with specified requirements and throughout maintenance period.
   2. Water sodded areas in sufficient quantities and at required frequency to maintain sub-soil immediately under sod continuously moist 3 to 4 inches deep.

3. Cut grass first time when it reaches 3 inches high. Continue to mow at least once each week throughout maintenance period. Remove clippings.
4. Apply weed killer as necessary to maintain weed-free lawn. Apply weed killer in accordance with manufacturer's instructions during calm weather when air temperature is between 50 and 80 deg F.
5. At end of 30 day maintenance period, fertilize lawns as recommended in Section 32 9113.

D. Trees, Shrubs, And Plants:
1. Maintain by pruning, cultivating, and weeding as required for healthy growth.
2. Restore planting basins.
3. Tighten and repair stake and guy supports and reset trees and shrubs to proper grades or vertical positions as required.
4. Spray as required to keep trees and shrubs free of insects and disease.
5. Provide supplemental water by hand as needed in addition to water from sprinkling system.

END OF SECTION

ATTACHMENTS

FORMS: ***Following form should be given to the person or lab doing the testing each time a soils test is requested.***

PROJECT TOP SOIL TESTING FOR LANDSCAPE PURPOSES (SEE ATTACHED)

DTA Area Office		
Ward/Branch Thomaston, GA Branch		Date Requested: 01-08-2009 By Whom: G.E.C.
City Thomaston	State GA	Contact Phone # 478-757-1606 Fax # 478-757-1608
Stake/Mission Jonesboro, GA		Property Number 500-0881-08020101
Site Street Address Highway 36, Thomaston, GA		

1. The architect is to determine, by investigation, the quality and quantity of topsoil on a site before the Owner's review. All information on this form must be provided.
2. A horticultural topsoil test is recommended at each site.
3. The tests should be performed by a reputable laboratory located in the vicinity of the property. Several acceptable alternatives are available for the testing:
   a. A geotechnical laboratory that does horticultural topsoil testing.
   b. A laboratory that specializes in horticultural topsoil testing.
4. The costs for the testing and report will be paid by the Owner.
5. Copies of the report shall be made available to the landscape architect, the DTA Area Office, and the landscape reviewing consultant.
6. Report location where soil is from and a history of its use on the back of this form.

1. At least two test samples shall be made of the topsoil on the project site and each anticipated borrow pit. If the site soil profile or borrow pit are not uniform, additional samples shall be taken. Uniform composite samples may also be used if properly acquired and documented.

2. The soil report must provide interpretation and recommendations for soil amendments, fertilizers, and soil conditioners for use by the architect and the landscape architect.

Test Report on Existing Conditions ("Acceptable Levels" refers to the allowable Import Soil Specifications prior to amending.)

Soil Test Data

Sample No.	PH(1)	EC(1) Mmhos/cm	SAR(1)	% Sand	% Silt	% Clay	Text(2) Class	%(3) OM	NO_3-N(4) ppm	P(5) ppm	K(5) ppm	Fe(5) Ppm
1	6.0	0.059	3.9	56.8	14.8	28.4	Sandy Clay	2.56	13.48	1.21	9.03	14.17
2	5.6	0.047	3.9	60.4	19.2	20.4	Sandy Loam	2.03	1.85	1.18	10.33	14.00
Acceptable Level(s)	5.5-7.7	<2.0	<3.0	-	-	-	(2)	>1.0	>48	>11	>130	>5.0

Documented infiltration rate of test sample(s) based on texture at 90% relative density. *To the nearest 1/10 of an inch.

(1)saturated soil paste 1:1 soil:water method (please Indicate)
(2)hydrometer method
(Acceptable import soil-sand 15-60%, silt 10-60%, clay 5-30%)
(3)potassium dichromate method (Walkey-Black) or loss of ignition
(4)chromotropic acid method
(5)AB-DTPA method
--If other methods are used for NO_3-N, P, K, and Fe, then note.
Changes in acceptable levels shall also be made by the testing laboratory.

Sample No.1 4.00 inches/hour*
Sample No. 2 4.00 inches/hour*
Sample No.___ ____-___inches/hour*
Sample No.___ ____-___inches/hour*

Name of Soil Lab

Waters Agricultural Laboratories, Inc.

Phone # 229-336-7216 Fax # 229-336-7967

Interpretation Statement:

Split application of nitrogen and potassium recommended.

Soil Amendment, Fertilizer and Soil Conditioner – Recommendations:

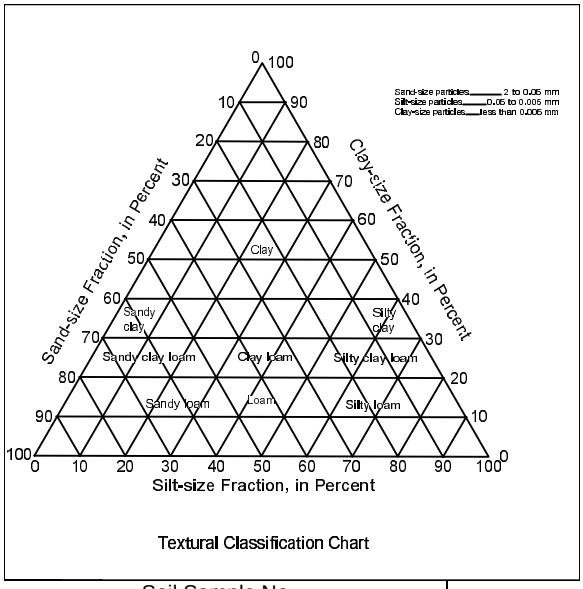
None

Long Term (5 Year) Fertilizer and Soil Conditioner – Recommendations:

None

IMPORT TOP SOIL – DEFINED (Section 31 2216 – Finish Grading)

- Fertile, loose, friable soil, capable of sustaining vigorous plant growth.
- Clean and free from noxious weeds, weed seeds and rock or other objectionable materials. Remove any such objects. (Sand 15-60%, Silt 10-60%, Clay 5-30% with no more than 2% by volume of soil measuring over 2.0mm)

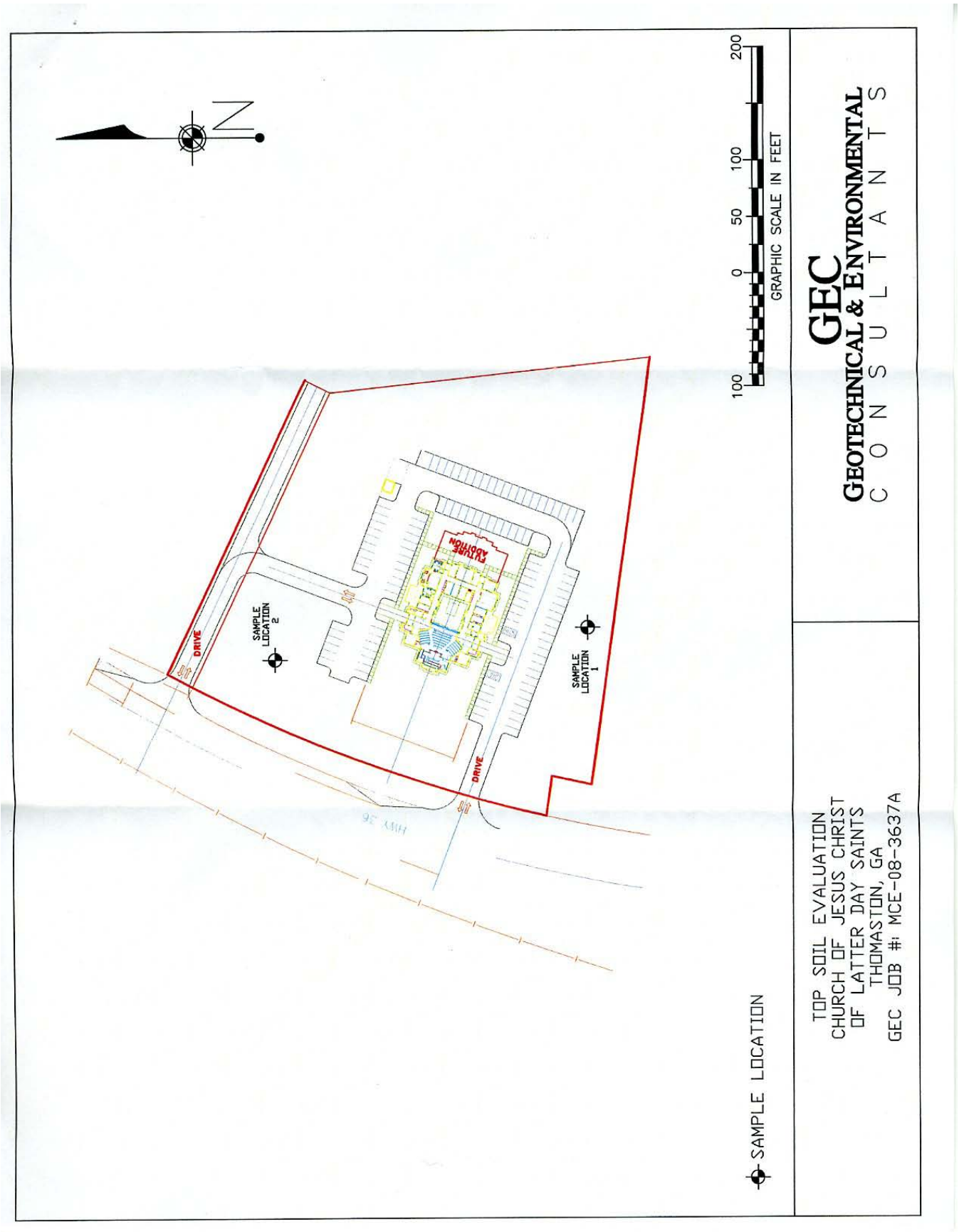


Textural Classification Chart

TEXTURAL CLASSIFICATION OF SOIL BASED ON GRADING

Textural Class	Composition in Percent		
	Sand	Silt	Clay
Sand	80-100	0-20	0-20
Sandy loam	50-80	0-50	0-20
Loam	30-50	30-50	0-20
Silt loam	0-50	50-100	0-20
Sandy clay loam	50-80	0-30	20-30
Clay loam	20-50	20-50	20-30
Silty clay loam	0-30	50-80	20-30
Sandy clay	55-70	0-15	30-45
Silty clay	0-15	55-70	30-45
Clay	0-55	0-55	30-100

Soil Sample No.	Location	History of Use


N
100 0 50 100 200
GRAPHIC SCALE IN FEET
SAMPLE LOCATION
SAMPLE LOCATION 1
SAMPLE LOCATION 2
FUTURE ADDITION
DRIVE
DRIVE
HWY 36
GEC
GEOTECHNICAL & ENVIRONMENTAL
CONSULTANTS
TOP SOIL EVALUATION
CHURCH OF JESUS CHRIST
OF LATTER DAY SAINTS
THOMASTON, GA
GEC JOB #: MCE-08-3637A

SECTION 32 9113

SOIL PREPARATION

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Perform soil preparation work as described in Contract Documents.
   2. Furnish and apply soil additives as described in Contract Documents.

1.2 REFERENCES

A. Reference Standards:
   1. ASTM International:
      a. ASTM 1557-02, 'Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort.'

1.3 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference: Participate in pre-installation conference specified in Section 31 2213.

1.4 SUBMITTALS

A. Action Submittals:
   1. Product Data: Product literature and chemical / nutrient analysis of soil amendments and fertilizers.
   2. Samples: Sample of soil conditioner for approval before delivery to site. Include product analysis list.

B. Informational Submittals:
   1. Installer Reports: Delivery slips indicating amount of soil conditioner delivered to Project site.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Incorporate following soil amendments into topsoil used for Project. Do not apply additional fertilizer if GroPower Plus soil conditioner is used.
   1. Acceptable Soil Amendments, Soil Conditioners, And Application Rates:
      a. GroPower Plus soil conditioner by GroPower Inc, Chino, CA www.gropower.com. Apply as directed on package.
      b. EPA Class 'A' co-compost or compost with SAR less than 3.0, EC less than 4.0, and CN ratio of 15 to 25:1 passing through 1/2 inch mesh screen.
      c. Other amendments and conditioners as specified by topsoil Testing Report, such as lime, gypsum, Axis, etc.: Lime: Natural dolomitic limestone applied at 2000 lbs per acre containing not less than 85% of total carbonates with minimum 30% magnesium carbonates. Lime shall be ground so that not less than 90% will pass a #10 sieve and 50% passes a #100 sieve.
      d. Equals as approved by Architect before use. See Section 01 6200.
   2. Acceptable Fertilizers And Application Rates:

a. All purpose balanced fertilizer supplying a minimum of one pound of nitrogen per 1000 s.f. Fifty percent of nitrogen shall be in organic form.
b. Equal as approved by Architect before installation. See Section 01 6200.

PART 3 - EXECUTION

3.1 PERFORMANCE

A. Add specified soil amendments at specified rates to lawn areas. Roto-till or otherwise mix amendments evenly into top 4 inches of topsoil. Incorporate and leach soil amendments which require leaching, such as gypsum, within such time limits that soil is sufficiently dry to allow proper application of fertilizer and soil conditioners.

END OF SECTION

SECTION 32 9120

TOPSOIL PLACEMENT AND GRADING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Perform topsoil placement and grading work required to prepare site for installation of landscaping as described in Contract Documents.
   2. Furnish and apply soil additives as described in Contract Documents.

B. Related Requirements:
   1. Section 31 1413: Stripping and storing of existing topsoil.

1.2 REFERENCES

A. Reference Standards:
   1. ASTM International:
      a. ASTM 1557-02, 'Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort.'

1.3 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference: Participate in pre-installation conference specified in Section 31 2213.

1.4 SUBMITTALS

A. Action Submittals:
   1. Product Data: Product literature and chemical / nutrient analysis of soil amendments and fertilizers.
   2. Samples: Sample of soil conditioner for approval before delivery to site. Include product analysis list.

B. Informational Submittals:
   1. Field Quality Control Submittals:
      a. Submit tests on imported and site topsoil by licensed laboratory before use, using Owner Form ‘Topsoil Test Report.’
         1) Before use, topsoil shall meet minimum specified requirements and be approved by Architect.
         2) If necessary, submit proposed amendments and application rates necessary to bring topsoil up to minimum specified requirements.
      b. Submit report stating location of source of imported topsoil and account of recent use.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Topsoil:
   1. Topsoil used in landscaped areas, whether imported or from site, shall be fertile, loose, friable soil meeting following criteria:

a. Chemical Characteristics:
   1) Acidity / alkalinity range: pH 5.5 to 8.0.
   2) Soluble Salts: less than 3.0 mmhos/cm.
   3) Sodium Absorption Ratio (SAR): less than 6.0.
   4) Organic Matter: greater than one percent.
b. Physical Characteristics:
   1) Gradation as defined by USDA triangle of physical characteristics as measured by hydrometer.
      a) Sand: 15 to 60 percent.
      b) Silt: 10 to 60 percent.
      c) Clay: 5 to 30 percent.
   2) Clean and free from toxic minerals and chemicals, noxious weeds, rocks larger than 1-1/2 inch in any dimension, and other objectionable materials.
   3) Soil shall not contain more than 2 percent by volume of rocks measuring over 3/32 inch in largest size.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not commence work of this Section until grading tolerances specified in Section 31 2216 are met.

3.2 PREPARATION

A. Protection Of In-Place Conditions: Protect utilities and site elements from damage.

B. Surface Preparation:
   1. Disk, till, or aerate with approved agricultural aerator to depth of 6 inches.
   2. Seven days maximum before beginning seeding and planting:
      a. Loosen area 4 inches deep, dampen thoroughly, and cultivate to properly break up clods and lumps.
      b. Rake area to remove clods, rocks, weeds, roots, and debris.
      c. Grade and shape landscape area to bring surface to true uniform planes free from irregularities and to provide drainage and proper slope to catch basins.
   3. Limit use of heavy equipment to areas no closer than 6 feet from building or other permanent structures. Use hand held tillers for preparation of subsoil in areas closer then 6 feet.

3.3 PERFORMANCE

A. Tolerances:
   1. Total topsoil depth of 5 inches minimum in lawn and groundcover planting areas. No topsoil as defined in this Section required over tree and shrub planting areas.
   2. Finish grade of planting areas before planting and after addition of soil additives shall be specified distances below top of adjacent pavement of any kind:
      a. Sodded Areas: 2 inches below.
      b. Seeded Areas: One inch below.
      c. Ground Cover Areas: 4 inches below.

B. Do not expose or damage existing shrub or tree roots.

C. Redistribute approved existing topsoil stored on site as a result of work of Section 31 1413. Remove organic material, rocks and clods greater than 1-1/2 inch in any dimension, and other objectionable materials. Provide additional approved imported topsoil required to bring surface to specified elevation relative to concrete site elements. Do not place topsoil whose moisture content makes it prone to compaction during placement process.

D. Slope grade away from building for 12 feet minimum from walls at slope of 1/2 inch in 12 inches minimum unless otherwise noted. High point of finish grade at building foundation shall be 6 inches minimum below finish floor level. Direct surface drainage in manner indicated on Drawings by molding surface to facilitate natural run-off of water. Fill low spots and pockets with topsoil and grade to drain properly.

E. After landscape areas have been prepared, take no heavy objects over them except lawn rollers. Immediately before planting lawn and with topsoil in semi-dry condition, roll areas that are to receive lawn in two directions at approximately right angles with water ballast roller weighing 100 to 300 lbs, depending on soil type. Rake or scarify and cut or fill irregularities that develop as required until area is true and uniform, free from lumps, depressions, and irregularities.

END OF SECTION

SECTION 32 9219

SEEDING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install seeded lawn as described in Contract Documents.

B. Related Requirements:
   1. Section 32 9001: Common Planting Requirements.

1.2 SUBMITTALS

A. Informational Submittals:
   1. Source Quality Control Submittals: Written certification confirming lawn seed quality and mix.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Delivery And Acceptance Requirements:
   1. Deliver seed in original sealed, labeled, and undamaged containers.
   2. Be certain shelf life or date for seed is shown on label.
   3. Be certain label verifies seed mixture required by Contract Documents.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Seed:
   1. Type and mix shown on Drawings.
   2. Provide three varieties minimum of grass seed as shown on the plans under “Southern Piedmont Vegetative Covers”.
   3. Purchase seeds that bear this season's certification of weight, purity, and germination from reputable seed company.

B. Top Dressing: Hay Mulch.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Interface With Other Work: Do not commence work of this Section until work of Sections 32 9113 and 32 9300 has been completed and approved.

B. Tolerances: Final grade of soil after seeding of lawn areas is complete shall be one inch below top of adjacent pavement of any kind.

C. Seeding: After lawn areas are graded, sow seed evenly at specified rate with adequate equipment at time when little or no wind is blowing.

D. Top Dressing: After seeding, rake or broom seed in gently and roll area to firm in seed. After rolling, cover area evenly with top dressing of peat moss at rate of two 4 cu ft bales per 1000 sq ft of area.

E. After Top Dressing: Thoroughly water seeded areas. Reseed areas that do not show prompt germination at 15 day intervals until an acceptable stand of grass is assured.

3.2 FIELD QUALITY CONTROL

A. Field Inspection:
   1. Seeded areas will be accepted at Project closeout if:
      a. Seeded areas are properly established.
      b. Lawn is free of bare and dead spots and is without weeds.
      c. No surface soil is visible when grass has been cut to height of 2 inches.
      d. Seeded areas have been mowed a minimum of twice.

3.3 CLOSEOUT ACTIVITIES

A. Areas sodded after November 1st will be accepted following spring, approximately May 1st or one month after start of growing season, if specified conditions have been met.

END OF SECTION

SECTION 32 9222

HYDRO-SEEDING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install hydro-seeded lawn as described in Contract Documents.
   2. Furnish and install hydro-seeded specialty seed mixes as described in Contract Documents

1.2 SUBMITTALS

A. Informational Submittals:
   1. Source Quality Control Submittals: Written certification from supplier confirming seed mix, guaranteed analysis, germination rate, and purity rate.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Chemicals used shall meet requirements of latest rules and regulations, and other applicable state or local laws. Nothing in Contract Documents is to be construed to permit use of chemicals not conforming to these codes.
   2. Label seed in accordance with USDA rules and regulations under Federal Seed Act.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Supply wood cellulose fiber mulch compressed in 50 lb packages.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Seed:
   1. Type and mix shown on Drawings.
   2. Seed shall be weed free, fresh, re-cleaned, Grade A, new crop.

B. Hydro-Mulch:
   1. Cellulose wood fiber with no growth or germination inhibiting factors, dyed green. Material shall have equilibrium air-dry moisture content of 12 percent, plus or minus 2 percent, at time of manufacture.
   2. Fiber shall disperse rapidly in water forming homogeneous slurry and remaining in such state when agitated in hydro-mulching equipment.
   3. Quality Standard: SoilGuard by Mat Inc, Floodwood, MN www.matinc.biz.

C. Binders:
   1. Tackifier to bind soil and mulch together to prevent erosion.
   2. Type Two Acceptable Products:
      a. Am-Tac by AZ-TAC Products Inc,
      b. Soil Seal by Trans Western Chemicals Inc, Pico Rivera, CA www.soilseal.com.
      c. Equal as approved by Architect before use. See Section 01 6200.

D. Fungicide:
   1. Type Two Acceptable Products:
      a. Banol by Nor-Am Chemical Co.
      b. Equal as approved by Architect before use. See Section 01 6200.

E. Post-Emergent Weed Control:
   1. Type Two Acceptable Products:
      a. Enide by Upjohn.
      b. Dymid by Elanco.
      c. Treflan or Surflan by Dow Agrosciences.
      d. Eptan by Syngenta.
      e. Equal as approved by Architect before use. See Section 01 6200.

F. Fertilizer: 16-20-0.

2.2 MIXES

A. General:
   1. Amount of hydro-mulch shall be 1800 lbs per acre.
   2. Add water as necessary to provide suitable slurry mixture.
   3. Add fungicide at rates recommended by Manufacturer on installations made between 1st of April and 30 September.

B. Turf / Specialty Seeded Areas:
   1. Amount of seed shall be 40 lbs per acre.
   2. Add fertilizer at 10 lbs per 1000 sq ft, only for areas not receiving fertilizer under Section 02917.
   3. Add binder at rates recommended by Manufacturer always where slopes are 5:1 or over, and all other areas between 1st of October and 31 March.

C. Slope Stabilization Seeded Areas:
   1. Amount of seed shall be 40 lbs per acre.
   2. Add fertilizer at 10 lbs per 1000 sq ft.
   3. Add binder at rates recommended by Manufacturer always on slopes 5:1 and over.

PART 3 - EXECUTION

3.1 APPLICATION

A. Interface With Other Work: Do not commence work of this Section until work of Sections 32 9113 and 32 9300 has been completed and approved.

B. Tolerances: Final grade of soil after seeding of lawn areas is complete shall be one inch below top of adjacent pavement of any kind.

C. After lawn areas are graded, apply specified slurry mix with machine capable of continuously mixing slurry and providing an application meeting Contract Document requirements. Hydro-mulch shall form an absorptive mat, but not a plant inhibiting membrane, which will allow water to percolate into underlying soil.

D. Post Application Watering:
   1. Allow slurry mixture to 'set.'
   2. Water hydro-seeded areas sufficiently to insure proper seed germination, but not cause erosion or slope failure. Repeat watering at regular intervals to keep seed germinating and growing until plantings are established.
   3. After plantings are established, decrease frequency and increase amount of water per application as necessary to meet plant water requirements.

E. If fungicide has been applied with slurry mix, make a second application of fungicide 14 days after initial application.

3.2 FIELD QUALITY CONTROL

A. Inspection:
   1. Seeded areas will be accepted at final inspection if:
      a. Seeded areas are properly established.
      b. Lawn is free of bare and dead spots and is without weeds.
      c. No surface soil is visible when grass has been cut to height of 2 inches.
      d. Seeded areas have been mowed a minimum of twice.

END OF SECTION

SECTION 32 9223

SODDING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install sodded lawn as described in Contract Documents.

B. Related Requirements:
   1. Section 32 9001: Common Planting Requirements.

1.2 SUBMITTALS

A. Informational Submittals:
   1. Source Quality Control Submittals: Written certification confirming lawn seed quality and mix.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Harvest, deliver, store, and handle sod in accordance with requirements of 'American Sod Producers (ASPA) Specifications for Turfgrass Sod Materials and Transplanting / Installing.'

B. Cut sod in pieces approximately 3/4 to one inch thick. Roll or fold sod so it may be lifted and handled without breaking or tearing and without loss of soil.

C. Schedule deliveries to coincide with topsoil operations and laying. Keep storage at job site to minimum without causing delays.
   1. Deliver, unload, and store sod on pallets within 24 hours of being lifted.
   2. Do not deliver small, irregular, or broken pieces of sod.

D. During wet weather, allow sod to dry sufficiently to prevent tearing during lifting and handling. During dry weather, protect sod from drying before installation. Water as necessary to insure vitality and to prevent excess loss of soil in handling. Sod that dries out before installation will be rejected.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Description:
   1. Superior sod grown from certified, high quality, seed of known origin or from plantings of certified grass seedlings or stolons:
      a. Assure satisfactory genetic identity and purity.
      b. Assure over-all high quality and freedom from noxious weeds or an excessive amount of other crop and weedy plants at time of harvest.
   2. Sod shall be composed of centipede grass sod.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Interface With Other Work: Do not commence work of this Section until work of Sections 32 9113 and 32 9300 has been completed and approved.

B. Tolerances: Final grade of soil after sodding of lawn areas is complete shall be one inch below top of adjacent pavement of any kind.

C. Laying of Sod:
1. Lay sod during growing season and within 48 hours of being lifted.
2. Lay sod while top 6 inches of soil is damp, but not muddy. Sodding during freezing temperatures or over frozen soil is not acceptable.
3. Lay sod in rows perpendicular to slope with joints staggered. Butt sections closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections with a sharp knife.
4. Lay sod flush with adjoining existing sodded surfaces.
5. Do not sod slopes steeper than 3:1. Consult with Architect for alternate treatment.

D. After Laying of Sod Is Complete:
1. Roll horizontal surface areas in two directions perpendicular to each other.
2. Repair and re-roll areas with depressions, lumps, or other irregularities. Heavy rolling to correct irregularities in grade will not be permitted.
3. Water sodded areas immediately after laying sod to obtain moisture penetration through sod into top 6 inches of topsoil.

3.2 FIELD QUALITY CONTROL

A. Field Inspection:
1. Sodded areas will be accepted at Project closeout if:
   a. Sodded areas are properly established.
   b. Sod is free of bare and dead spots and is without weeds.
   c. No surface soil is visible when grass has been cut to height of 2 inches.
2. Sodded areas have been mowed a minimum of twice.

3.3 CLOSEOUT ACTIVITIES

A. Areas sodded after November 1st will be accepted following spring, approximately May 1st or one month after start of growing season, if specified conditions have been met.

END OF SECTION

SECTION 32 9300

PLANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install landscaping plants as described in Contract Documents.

B. Related Requirements:
   1. Section 32 9001: Common Planting Requirements.

1.2 REFERENCES

A. Reference Standards:
   1. American Nursery & Landscape Association / American National Standards Institute:
      a. ANLA / ANSI Z60.1-2004, 'American Standard for Nursery Stock.'

1.3 SUBMITTALS

A. Action Submittals:
   1. Samples: Top dressing mulch for approval before delivery to site.

B. Closeout Submittals:
   1. Installer Instructions: Provide written instructions covering maintenance requirements by Owner for one year beyond Contract maintenance period specified in Section 32 0101. Include in Operations And Maintenance Manual specified in Section 01 7800.
   2. Warranty Documentation: Include final, executed copy of warranty in Operations And Maintenance Manual specified in Section 01 7800.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Delivery And Acceptance Requirements:
   1. Deliver trees, shrubs, ground covers, and plants after preparations for planting have been completed and install immediately.
   2. Do not prune before delivery, except as approved by Architect.
   3. Protect bark, branches, and root systems from sun scald, drying, whipping, and other handling and tying damage.
   4. Do not bend or bind-tie trees or shrubs in such a manner as to destroy natural shape.
   5. Provide protective covering during delivery.

B. Storage And Handling Requirements;
   1. Handle balled stock by root ball or container. Do not drop trees and shrubs during delivery.
   2. If planting is delayed more than six hours after delivery, set planting materials in shade and protect from weather and mechanical damage.
   3. Set balled stock on ground and cover ball with soil, saw dust, or other acceptable material approved by Architect. Do not place on pavement.
   4. Do not remove container-grown stock from containers before time of planting.
   5. Water root systems of trees and shrubs stored on site with fine spray. Water as often as necessary to maintain root systems in moist condition. Do not allow plant foliage to dry out.

1.5 WARRANTY

A. Provide written warranties as follows:
   1. Guarantee shrubs, ground covers, and vines to live and remain in strong, vigorous, and healthy condition for 90 days minimum from date landscape installation is accepted as complete.
   2. Guarantee trees to live and remain in strong, vigorous, and healthy condition for one year from date landscape installation is accepted as complete.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Plants:
   1. Conform to requirements of Plant List and Key on Drawings and to ANSI Z60.1.
   2. Nomenclature: Plant names used in Plant List conform to 'Standardized Plant Names' by American Joint Committee on Horticultural Nomenclature except in cases not covered. In these instances, follow custom of nursery trade. Plants shall bear a tag showing the genus, species, and variety of at least 10 percent of each species delivered to site.
   3. Quality:
      a. Plants shall be sound, healthy, vigorous, free from plant disease, insect pests or their eggs, noxious weeds, and have healthy, normal root systems. Container stock shall be well established and free of excessive root-bound conditions.
      b. Do not prune plants or top trees prior to delivery.
      c. Plant materials shall be subject to approval by Architect as to size, health, quality, and character.
      d. Bare root trees are not acceptable.
      e. Provide plant materials from licensed nursery or grower.
   4. Measurements:
      a. Measure height and spread of specimen plant materials with branches in their normal position as indicated on Drawings or Plant List.
      b. Measurement should be average of plant, not greatest diameter. For example, plant measuring 15 inches in widest direction and 9 inches in narrowest would be classified as 12 inch stock.
      c. Plants properly trimmed and transplanted should measure same in every direction.
      d. Measure caliper of trees 6 inches above surface of ground.
      e. Where caliper or other dimensions of plant materials are omitted from Plant List, plant materials shall be normal stock for type listed.
      f. Plant materials larger than those specified may be supplied, with prior written approval of Architect, and:
         1) If complying with Contract Document requirements in all other respects.
         2) If at no additional cost to Owner.
         3) If sizes of roots or balls are increased proportionately.
   5. Shape and Form:
      a. Plant materials shall be symmetrical or typical for variety and species and conform to measurements specified in Plant List.
      b. Well grown material will generally have height equal to or greater than spread. However, spread shall not be less than 2/3's of height.

2.2 ACCESSORY PRODUCTS

A. Planting Mix: Mixture of three parts topsoil mix as specified in Section 32 9113 and one part well rotted composted manure, or approved commercial mix.

B. Planting Tablets: 21 gram Agriform 20-10-5.

C. Tree Stakes:

1. Type Two Acceptable Products:
   a. 2 inch diameter Lodgepole Pine.
   b. Equal as approved by Architect before installation. See Section 01 6200.

D. Tree Staking Ties:
   1. Type Two Acceptable Products:
      a. 32 inch Cinch-Tie tree ties by V.I.T. Products Inc, Escondido, CA www.vitproducts.com.
      b. Flex strap Tree Ties by Aquarius Brands Inc, Ontario, CA www.aquariusbrands.com.
      c. Equal as approved by Architect before installation. See Section 01 6200.

E. Tree Guys:
   1. Type Two Acceptable Products:
      a. Duckbill Model 68DTS guying kit.
      b. Equal as approved by Architect before installation. See Section 01 6200.

F. Pre-Emergent Herbicide:
   1. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
      a. Chipco Dimension Granular by The Andersons Inc, Maumee, IL www.andersonsinc.com.
      b. Elanco XL2G granular by Crop Data Management Systems, Marysville, CA www.cdms.net.
      c. Ronstar G granular by Bayer Crop Science, Monheim, Germany www.bayercropscience.com.
      d. Surflan AS liquid by United Phosphorous Inc, Trenton, NJ www.upi-usa.com.
      e. Oryzalin 4 A.S. liquid by FarmSaver, Seattle, WA www.farmsaver.com.

G. Weed Barrier:
   1. Type Two Acceptable Products:
      a. DeWitt 4.1 oz 20 year woven polypropylene weed barrier.
      b. Western Landscape geotextile Polyspun 3.5 oz polyester fabric.
      c. Equal as approved by Architect before bidding. See Section 01 6200.

H. Bark Or Wood Top Dressing Mulch:
   1. Type Two Acceptable Products:
      a. Medium size Fir bark.
      b. Medium or large size Redwood bark.
      c. Shredded pine bark.
      d. Shredded Cedar.
      e. Equal as approved by Architect before installation. See Section 01 6200.

I. Rock Mulch:
   1. Type Two Acceptable Products:
      a. **[INSERT ROCK TYPE AND SOURCE]**.
      b. Decomposed granite **[INSERT TYPE AND SOURCE]**.
      c. Equal as approved by Architect before installation. See Section 01 6200.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Before proceeding with work, check and verify dimensions and quantities. Report variations between Drawings and site to Architect before proceeding with work of this Section.

B. Plant totals are for convenience only and are not guaranteed. Verify amounts shown on Drawings. All planting indicated on Drawings is required unless indicated otherwise.

3.2 PREPARATION

A. Layout individual tree and shrub locations and areas for multiple plantings. Stake locations and outline areas. Secure Architect's acceptance before planting. Make minor adjustments as may be requested.

3.3 INSTALLATION

A. Interface With Other Work: Do not commence work of this Section until work of Section 32 9113 has been completed and approved.

B. Excavation:
   1. If underground construction work or obstructions are encountered in excavation of planting holes, Architect will select alternate locations.
   2. Plant Excavation Size:
      a. Diameter: Twice diameter of root ball or container minimum.
      b. Depth: Equal to container or rootball depth.
   3. Unless excavated material meets topsoil requirements as specified in Section 31 9113, remove from landscape areas and do not use for landscaping purposes.
   4. Roughen sides and bottoms of excavations.
   5. With approval of Architect, select five typical planting excavations throughout site for drainage testing.
      a. Fill selected excavations with water and verify that water drains away at rate of 3 inches per hour minimum. Inform Architect in writing of excavations where water does not drain properly.
      b. Select three excavations approximately 5 feet away from each non-draining excavation and repeat tests. Continue testing process until non-draining areas have been identified.
      c. In excavations located in identified non-draining areas, auger 6 inch diameter hole 4 feet deep in low point of each excavation and fill with tamped planting mix.
      d. Do not plant trees or shrubs in holes that do not properly drain.

C. Planting:
   1. Removing Binders And Containers:
      a. Remove top one / third of wire basket and burlap binders.
      b. Remove plastic and twine binders from around root ball and tree trunk.
      c. Remove wood boxes from around root ball. Remove box bottoms before positioning plant in hole. After plant is partially planted, remove remainder of box without injuring root ball.
   2. Plant immediately after removing binding material and containers. Place tree and shrub rootballs on undisturbed soil. After watering and settling, top of tree root balls shall be approximately two inches higher than finished grade and trunk flare is visible. Shrub root balls shall be approximately one inch higher than finished grade
   3. Properly cut off broken or frayed roots.
   4. Center plant in hole, remove remaining wire basket, and backfill with specified planting mix. Except in heavy clay soils, make ring of mounded soil around hole perimeter to form watering basin.
   5. Add planting tablets in plant pit as follows. Place tablets in relation to root ball as recommended by Manufacturer.
      a. One Gallon Shrub: 1 tablet.
      b. 5 Gallon Shrub / Tree: 3 tablets.
      c. 15 Gallon Tree: 4 tablets.
      d. 24 inch Box Tree: 6 Tablets.
   6. Fill landscape excavations tamped planting mix. Settle by firming and watering to ensure top of ball one inch higher than surrounding soil.
   7. Do not use muddy soil for backfilling.
   8. Make adjustments in positions of plants as directed by Architect.
   9. Thoroughly water trees and shrubs immediately after planting.
   10. At base of each tree, leave 36 inch diameter circle free of any grass.

D. Supports for New Trees:
   1. Provide new supports for trees noted on Drawings to be staked.
      a. Remove nursery stakes delivered with and attached to trees.
      b. Support shall consist of at least two tree stakes driven into hole base before backfill so roots are not damaged. Place stakes vertically and run parallel to tree trunk. Install stakes so 3 feet of stake length is below finish grade.
      c. Place tree ties 6 to 12 inches below crotch of main tree canopy. Second set of tree ties may be required 18 to 24 inches above finish grade, if directed by Architect.
      d. Remove tops of tree stakes so top of stake is 6 inches below main tree canopy to prevent damage to tree branches and canopy growth.
   2. Provide root guying kits to support 24 inch box, 3 inch caliper and larger trees.

E. Vines: Remove from stakes, untie, and securely fasten to wall or fence next to which they are planted.

F. Ground Covers: Container-grown unless otherwise specified on Drawings. Space evenly to produce a uniform effect, staggered in rows and intervals shown.

G. Post Planting Weed Control:
   1. Apply specified pre-emergent herbicide to shrub and ground cover planting areas and grass-free areas at tree bases after completion of planting.
   2. Areas shall be free of existing weed growth before application of herbicide.

H. Weed Barrier Fabric:
   1. After planting and application or herbicide in shrub beds, apply covering of specified weed barrier fabric.
   2. Achieve 100 percent coverage over ground areas.
   3. Overlap seams 6 inches minimum.
   4. Staple at 5 feet on center each way and within 3 inches of edge of shrub bed, with two at each corner.

I. Mulching:
   1. After application of herbicide, mulch shrub and ground cover planting areas with 3 inches deep layer of specified top dressing or rock mulch.
   2. Cover grass-free area at tree bases with weed barrier and 3 inches of top dressing mulch or rock mulch.
   3. Place mulch to uniform depth and rake to neat finished appearance.

END OF SECTION

DIVISION 33: UTILITIES

SECTION 33 1116

SITE WATER UTILITY DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Perform trenching and backfilling required for work of this Section.
   2. Furnish and install piping for domestic water supply from water main to within 5 feet of building as described in Contract Documents complete with meter, shut-off valve, and connections.
   3. Furnish and install piping from water main to meter inside of building as described in Contract Documents complete with shut-off valve and connections.

B. Related Requirements:
   1. Section 31 2316: Procedure and quality of excavating.
   2. Section 31 2323: Procedure and quality of backfilling and compacting.

1.2 REFERENCES

A. Reference Standards:
   1. American Welding Society / American National Standards Institute:
      a. AWS / ANSI A5.8-2004, 'Specification for Brazing Filler Metals.'
   2. ASTM International:
      a. ASTM B 88-03, 'Standard Specification for Seamless Copper Water Tube.'

PART 2 - PRODUCTS

2.1 SYSTEM

A. Materials:
   1. Pipe: Type K copper meeting requirements of ASTM B 88 with wrought copper, brazed fittings.
   2. Water Meter: As required by local agency furnishing water.
   3. Connection Material:
      a. Brazing Rods In accordance with ANSI / AWS A5.8:
         1) Classification BCuP-4 Copper Phosphorus (6 percent silver).
         2) Classification BCuP-5 Copper Phosphorus (15 percent silver).
         3) Classification BAg-5 Silver (45 percent silver).
         4) Do not use rods containing Cadmium.
      b. Flux:
         1)
         2) Type Two Acceptable Products:
            a) Stay-Silv white brazing flux by J W Harris Co, Cincinnati, OH www.jwharris.com.
            b) High quality silver solder flux by Handy & Harman, Fairfield, CT www.handyharman.com.
            c) Equal as approved by Architect before use. See Section 01 6200.
   4. Stop And Waste Valves:
      a. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
         1) Mueller: Mark II Oriseal stop and waste valve H10288.
         2) Mueller: Buffalo screw type curb box H-10350 complete with lid and H-10349 enlarged base.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Excavate and backfill as specified in Sections 31 2316 and 31 2323 with following additional requirements:
   1. Runs shall be as close as possible to those shown on Drawings.
   2. Excavate to required depth.
   3. Bottom of trenches shall be hard. Tamp as required.
   4. Remove debris from trench before laying pipe.
   5. Do not cut trenches near footings without consulting Architect.
   6. Excavate trenches so outside pipe will be 12 inches minimum below frost line or 24 inches minimum below finish grade, whichever is deeper.
   7. Backfill only after pipe lines have been tested and inspected, and approved by Architect.

B. Install piping system so it may contract and expand freely. Completely eliminate cross connections, backflow, and water hammer.

C. Install shut-off valve at meter.

3.2 FIELD QUALITY CONTROL

A. Field Tests
   1. Sterilization And Negative Bacteriological Test:
      a. Sterilize potable water system with solution containing 200 parts per million minimum of available chlorine and maintaining a pH of 7.5 minimum. Introduce chlorinating materials into system in manner approved by Architect. Allow sterilization solution to remain for 24 hours and open and close valves and faucets several times during that time.
      b. After sterilization, flush solution from system with clean water until residual chlorine content is less than 0.2 parts per million.
      c. Water system will not be accepted until negative bacteriological test is made on water taken from system. Repeat dosing as necessary until such negative test is accomplished.
   2. Pressure Test: Before covering pipes, test system in presence of Architect or governing agency at 100 psi hydrostatic pressure for two hours and show no leaks.

3.3 CLEANING

A. Remove excess earth from site or place as directed by Architect.

END OF SECTION

SECTION 33 1119

FIRE SUPPRESSION UTILITY WATER DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Perform excavation and backfill required for installation of work of this Section.
   2. Furnish and install fire water system as described in Contract Documents.
   3. Furnish and install connection to water main.

B. Related Requirements:
   1. Section 31 2316: Procedure and quality of excavating.
   2. Section 31 2323: Procedure and quality of backfilling and compacting.
   3. Section 08 7103: Padlock for post indicator valve.

1.2 REFERENCES

A. Reference Standards:
   1. American Water Works Association / American National Standards Institute:
      a. AWWA C110 / ANSI A21.10-2003, 'Ductile-Iron and Gray-Iron Fittings, 3 in through 48 in, for Water and Other Fluids.'
      b. AWWA C 111 / ANSI A21.11-2000, 'Rubber Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.'
      c. AWWA C 150 / ANSI A21.50-2002, 'Thickness Design of Ductile-Iron Pipe.'
      d. AWWA C 151 / ANSI A21.51-2002, 'Ductile-Iron Pipe, Centrifugally Cast, for Water.'
      e. AWWA / ANSI C 502-2005, 'Dry Barrel Fire Hydrants.'
   2. ASTM International:
      a. ASTM A 126-04, 'Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.'
      b. ASTM A 197-00, 'Standard Specification for Cupola Malleable Iron.'
      c. ASTM A 307-04, 'Standard Specification for Carbon Steel Bolts and Studs 60 000 psi Tensile Strength.'
      d. ASTM A 506-04, 'Standard Specification for Alloy and Structural Alloy Steel, Sheet and Strip, Hot-Rolled, and Cold-Rolled.'
      e. ASTM A 575-96 (2002), 'Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades.'
   3. National Fire Protection Association / American National Standards Institute:
      a. NFPA / ANSI 13-2002, ‘Installation of Sprinkler Systems.'
      b. NFPA / ANSI 24-2002, ’Installation of Private Fire Service Mains and Their Appurtenances.'

1.3 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference: Participate in pre-installation conference specified in Section 03 3111.

1.4 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:
   1. Install exterior fire water system according to NFPA 13, NFPA 24, and Cast Iron Pipe Research Institute Procedures unless specified otherwise below.
   2. Install hydrant in accordance with AWWA C 502.

3. Install exterior fire water system up to and including pipe flange 12 inches above floor inside building. Review plumbing drawings for floor and wall penetration details and material.

PART 2 - PRODUCTS

2.1 SYSTEM

A. Manufacturers:
   1. Manufacturer List:
      a. Ipex Inc, Englewood, CO www.ipexinc.com.
      b. Mueller Company, Decatur, IL www.muellerflo.com.
      c. Nibco Inc, Elkhart, IN www.nibco.com.
      d. Potter Electric Signal Company, St Louis, MO www.pottersignal.com.
      e. Potter-Roemer, Santa Ana, CA www.potterroemer.com.

B. Materials:
   1. Pipe:
      a. Pressure Class 350 Ductile iron pipe in accordance with ANSI A21.51 / AWWA C 151 and ANSI A21.50 / AWWA C 150.
   2. Fittings: Ductile iron pipe fitting in accordance with ANSI A21.10 / AWWA C 110 and rubber gaskets joints in accordance with ANSI A21.11 / AWWA C 111.
   3. Hydrants:
      a. Dry-barrel fire hydrant (base valve type) complying with AWWA C 502, with 150 psi working pressure with two 2-1/2 inch hose connections and one 4-1/2 inch pumper connection with caps and chains. Nozzle cap nuts to match operating stem nuts.
      b. Class Two Quality Standard. See Section 01 6200.
         1) Hydrants accepted by authority having jurisdiction are approved.
   4. Gate Valves:
      a. Cast iron body with bolted bonnet.
      b. Indicator post pattern.
      c. Non-rising stem.
      d. 175 psi working pressure.
      e. Approved Products:
         1) Nibco:
            a) Model M-609 with mechanical connection.
            b) Model F-609 with flanged connection.
         2) Mueller:
            a) Model A-2052-5 with mechanical connection.
            b) Model A-2052-6 with flanged connection.
   5. Indicator Post Valve:
      a. UL / ULC / FM Approved.
      b. Adjustable type.
      c. Cast iron body.
      d. Approved Products:
         1) Nibco: Model NIP1A Vertical Post.
         2) Mueller: Model A-20800
   6. Tamper Switch:
      a. UL / ULC / FM Approved.
      b. Weather and tamper resistant.
      c. Single Pole Double Throw Switch.
      d. Approved Product:
         1) Potter Electric Signal: Model PCVS
   7. Anchorages:
      a. Provide anchorages for tees, plugs, caps, bends, and hydrants in accordance with NFPA 24.
      b. Miscellaneous Fittings:
         1) Clamps, Straps, And Washers: Steel, meeting requirements of ASTM A 506.
         2) Rods: Steel, meeting requirements of ASTM A 575.
         3) Rod Couplings: Malleable iron, meeting requirements of ASTM A 197.

4) Bolts: Steel, meeting requirements of ASTM A 307.
5) Cast Iron Washers: Meeting requirements of ASTM A 126, Class A.
6) Thrust Block: 2500 psi concrete. See Details on Plans.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Before installation, inspect pipe for defects and cracks. Do not use defective, damaged, or unsound pipe.

3.2 PREPARATION

A. Excavate and backfill as specified in Sections 31 2316 and 31 2323 with following additional requirements:
   1. Runs shall be as close as possible to those shown on Drawings.
   2. Excavate to required depth.
   3. Grade to obtain fall required.
   4. Bottom of trenches shall be hard. Tamp as required.
   5. Remove debris from trench prior to laying of pipe.
   6. Do not cut trenches near footings without consulting Architect.
   7. Excavate trenches so outside pipe will be 12 inches minimum below frost line or 48 inches minimum below finish grade, whichever is deeper.
   8. Cover pipe only after testing is complete and accepted by Architect.

3.3 INSTALLATION

A. General:
   1. When work is not in progress, close open ends of pipe and fittings so no trench water, soil, or other substances will enter pipes or fittings.
   2. Keep trenches free from water until pipe jointing material has set. Do not lay pipe when condition of trench or weather is unsuitable for such work.

B. Placing And Laying of Underground Pipe:
   1. Deflections from straight line or grade, as required by vertical curves, horizontal curves, or offsets, shall not exceed 6/D inches per linear foot of pipe where D represents nominal diameter of pipe expressed in inches.
   2. Deflections to be determined between center lines extended of two connecting pipes.
   3. If alignment requires deflection in excess of these limitations, provide special bends or sufficient number of shorter lengths of pipe to provide angular deflections within limits approved by Architect.
   4. Laying:
      a. Shape trench bottom to give substantially uniform circumferential support to lower third of each pipe.
      b. Pipe laying shall proceed up-grade with spigot ends of bell-and-spigot pipe pointing in direction of flow.
      c. Lay each pipe true to line and grade and in such manner as to form close concentric joint with adjoining pipe and to prevent sudden offsets of flow line.
      d. Support fittings at bends in pipe line by concrete thrust blocks firmly wedged against vertical face of trench. Blocks shall be at least sized as shown on Plans.
      e. As work progresses, clear interior of pipe of dirt and superfluous materials. Where cleaning after laying is difficult because of small pipe, keep suitable swab or drag in pipe and pull forward past each joint immediately after jointing has been completed.

C. Make joints between ductile iron and cast iron pipe and other types of pipe with standard manufactured cast-iron adapters and fittings.

D. Provide cast iron valve box for valve. Encase valve box in concrete as shown on valve setting detail. Provide concrete vault for 6-inch backflow.

E. Install ductile iron pipe to flange connection 12 inches above floor. Provide 2 inch minimum clearance around pipe at penetration through floor. Fill clearance with mastic.

F. Make joints between ductile iron and other types of pipe with standard manufactured adapters and fittings. Make connections between new work and existing mains using specials fittings to suit actual conditions.

G. Incidental Items of Work:
   1. Valve, plug, or cap, as directed by Architect, where pipe ends are left for future connections.
   2. Make key for unlocking valve handle identical to key used to open doors to building.

3.4 FIELD QUALITY CONTROL

A. Field Tests: Test system according to 'Contractor's Material & Test Certification for Underground Piping' NFPA 13, figure 1-10.1(b).2.

END OF SECTION

SECTION 33 3313

SANITARY UTILITY SEWERAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Perform excavating and backfilling required for work of this Section.
   2. Furnish and install sanitary sewage system as described in Contract Documents beginning at 5 feet from where it enters building and connecting to serving septic system.

B. Related Requirements:
   1. Section 22 1313: Sanitary sewage system within building and within 5 feet of building.
   2. Section 31 2316: Procedure and quality of excavating.
   3. Section 31 2323: Procedure and quality of backfilling and compacting.

1.2 REFERENCES

A. Reference Standards:
   1. ASTM International:
      a. ASTM A 74-05, 'Standard Specification for Cast Iron Soil Pipe and Fittings.'
      b. ASTM C 564-03a, 'Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.'
      c. ASTM D 2235-04, 'Standard Specification for Solvent Cement for Acrylonitrille-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.'
      d. ASTM D 2321-05, 'Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.'
      e. ASTM D 2564-02, 'Standard Specification for Solvent Cements for Poly (Vinyl Chloride)(PVC) Plastic Piping Systems.'
      f. ASTM D 2661-02, 'Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings.'
      g. ASTM D 2665-04a, 'Standard Specification for Poly (Vinyl Chloride)(PVC) Plastic Drain, Waste, and Vent Pipe Fittings.'
      h. ASTM D 3034-04a, 'Standard Specification for Type PSM Poly Vinyl Chloride)(PVC) Sewer Pipe and Fittings.'
      i. ASTM F 656-02, 'Standard Specification for Primers for Use in Solvent Cement Joints of Poly (Vinyl Chloride)(PVC) Plastic Pipe and Fittings.'

1.3 QUALITY ASSURANCE

A. Regulatory Requirements: Install cleanouts in accordance with local governing authority and State codes.

PART 2 - PRODUCTS

2.1 COMPONENTS

A. D.I.P:
   1. Ductile Iron Pipe shall be Pressure Class 350 per AWWA C 151 / AWWA C 150.
   2. Fittings: Fittings shall be compact body mechanical joint fittings with rubber gasketed joints in accordance with ANSI A 21.11 and AWWA C 111.

B. PVC:
   1. Schedule 40 solid wall plastic pipe and fittings meeting requirements of ASTM D 2665 joined using cement primer meeting requirements of ASTM F 656 and pipe cement meeting requirements of ASTM D 2564.
   2. Gasket joint gravity sewer pipe and fittings meeting requirements of ASTM D 3034. Joints shall be integral wall and elastomeric gasket.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Before installation, inspect pipe for defects and cracks. Do not use defective, damaged, or unsound pipe.

3.2 PREPARATION

A. Excavate and backfill as specified in Sections 31 2316 and 2323 with following additional requirements:
   1. Runs shall be as close as possible to those shown on Drawings.
   2. Excavate to required depth and grade to obtain fall required.
   3. Bottom of trenches shall be hard. Tamp as required.
   4. Remove debris from trench before laying pipe.
   5. Do not cut trenches near footings without consulting Architect.
   6. Excavate trenches so outside pipe will be 12 inches minimum below frost line or 18 inches minimum below finish grade, whichever is deeper.

3.3 INSTALLATION

A. General:
   1. When work is not in progress, close open ends of pipe and fittings so no trench water, soil, or other substances will enter pipes or fittings.
   2. Keep trenches free from water until pipe jointing material has set. Do not lay pipe when condition of trench or weather is unsuitable for such work.
   3. Trench width at top of pipe:
      a. Minimum: 18 inches or diameter of pipe plus one foot, whichever is greater.
      b. Maximum: Outside diameter of pipe plus two feet.

B. Placing And Laying of Underground Pipe:
   1. Deflections from straight line or grade, as required by vertical curves, horizontal curves, or offsets, shall not exceed 6/D inches per linear foot of pipe where D represents nominal diameter of pipe expressed in inches
   2. Deflections to be determined between center lines extended of two connecting pipes.
   3. If alignment requires deflection in excess of these limitations, provide special bends or sufficient number of shorter lengths of pipe to provide angular deflections within limits approved by Architect.
   4. Laying:
      a. Pipe laying shall proceed up-grade with spigot ends of bell-and-spigot pipe pointing in direction of flow.
      b. Lay each pipe true to line and grade and in such manner as to form close concentric joint with adjoining pipe and to prevent sudden offsets of flow line.
      c. As work progresses, clear interior of pipe of dirt and superfluous materials. Where cleaning after laying is difficult because of small pipe, keep suitable swab or drag in pipe and pull forward past each joint immediately after jointing has been completed.
   5. Make joints between cast iron pipe and other types of pipe with standard manufactured cast-iron adapters and fittings.

6. Valve, plug, or cap, as directed by Architect, where pipe ends are left for future connections.

C. Ductile Iron Pipe And Fittings:
1. Shape trench bottom to give substantially uniform circumferential support to lower third of each pipe. Provide depression under bell of each joint to maintain even bearing of sewer pipe.
2. Connect to street main as required by local authorities.
3. Use jacks to make-up gasketed joints.

D. Thermoplastic Pipe And Fittings:
1. Install in accordance with Manufacturer's recommendations and ASTM D 2321.
2. Stabilize unstable trench bottoms.
3. Bed pipe true to line and grade with continuous support from firm base.
   a. Bedding depth: 4 to 6 inches.
   b. Material and compaction to meet ASTM standard noted above.
4. Excavate bell holes into bedding material so pipe is uniformly supported along its entire length. Blocking to grade pipe is forbidden.
5. Piping and joints shall be clean and installed according to Manufacturer's recommendations. Break down contaminated joints, clean seats and gaskets and reinstall.
6. Do not use back hoe or power equipment to assemble pipe.
7. Initial backfill shall be 12 inches above top of pipe with material specified in referenced ASTM standard.
8. Minimum cover over top of pipe:
   a. 36 inches before allowing vehicular traffic over pipe.
   b. 48 inches before use of compaction equipment other than hand or impact tampers.

3.4 FIELD QUALITY CONTROL

A. Failure to install joints properly shall be cause for rejection and replacement of piping system.

END OF SECTION

SECTION 33 3601

UTILITY SEPTIC TANKS AND DRAIN FIELD

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Perform excavating and backfilling required for work of this Section.
   2. Furnish and install sewage disposal system as described in Contract Documents.

B. Related Requirements:
   1. Section 22 1313: Sanitary sewage system lines within 5 feet of outside building line.
   2. Section 31 2316: Procedure and quality of excavating.
   3. Section 31 2323: Procedure and quality of backfilling and compacting.

1.2 REFERENCES

A. Reference Standards:
   1. ASTM International:
      a. ASTM A 74-05, 'Standard Specification for Cast Iron Soil Pipe and Fittings.'
      b. ASTM A 615-05a, 'Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement.'
      c. ASTM C 564-03a, 'Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.'
      d. ASTM D 2321-05, 'Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.'
      e. ASTM D 3034-04a, 'Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.'
      f. ASTM D 5034-95 (2001), 'Standard Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test).'
      g. ASTM D 5035-06, 'Standard Test Method for Breaking Force and Elongation of Textile Fabrics (Strip Method).'

PART 2 - PRODUCTS

2.1 SYSTEM

A. Components:
   1. Septic Tanks And Distribution Boxes:
      1) Single compartment with wall thickness of 6-inch minimum.
      2) Apply waterproofing coating to septic tanks and distribution boxes inside and out.
      3) Liquid level, measured from tank bottom to invert of outlet pipe, shall be 48 inches 1 minimum. Liquid level greater than 78 inches shall not be considered in determining tank capacity.
      4) Provide access over inlet and outlet piping tees through 24 inch gastight manhole lids equal to Neenah R-1757 series. Bring lids to finish grade with concrete adjusting rings.
      5) Vent septic tank. Venting through inlet pipe to main building stack is acceptable.
      6) Concrete Formwork: Comply with requirements of Section 03 1113.
      7) Concrete: Comply with requirements of Section 03 3111 for Type 2 concrete.
      8) Reinforcing Steel: Comply with requirements of Section 03 2100.
      9) Baffles: Concrete
   2. Sewer Pipe: As specified in Section 33 3313.

3. Drainage Lines: Equal to specified sewer pipe except with perforations.
4. Drain Field Gravel: Washed, hard durable gravel ranging uniformly from 100 percent passing 2-1/2 inch sieve to 0 percent passing 3/4 inch sieve.
5. Cover Fabric:
   a. Designed to retain soil particles larger than No. 70 sieve but allow for unimpeded flow of water through fabric.
   b. Non-biodegradable fabric inert to most soil chemicals, acids, and alkalis over pH range of 3 to 12.
   c. Fabric shall have minimum tensile strength of 200 lbs when tested in accordance with ASTM D 5034 and ASTM D 5035.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Before installation, inspect pipe for defects and cracks. Do not use defective, damaged, or unsound pipe.

3.2 PREPARATION

A. Excavate and backfill as specified in Sections 31 2316 and 2323 with following additional requirements:
   1. Location of system elements shall be as close as possible to locations shown on Drawings.
   2. Excavate to required depth and grade to obtain fall required. Set trenches for perforated drain tile level.
   3. Bottom of trenches for sewer pipe shall be hard. Tamp as required.
   4. Remove debris from excavations before laying pipe or installing tanks and boxes.
   5. Do not excavate near footings without consulting Architect.
   6. Excavate so all elements of system will be 12 inches minimum below frost line or 18 inches minimum below finish grade, whichever is deeper.
   7. Pipe: Width of trench at and below top of pipe shall be such that clear space between barrel of pipe and trench wall shall be between 6 and 12 inches on both sides of pipe.
   8. Tanks And Boxes:
      a. Excavation for tanks and boxes shall be sufficient to leave 12 inches minimum in clear between their outer surfaces and embankment or timber used to hold and protect banks.
      b. Over depth excavation below tanks and boxes that has not been directed by Architect shall be considered unauthorized and be filled with sand, gravel, or concrete, as directed by Architect, and at no additional cost to Owner.

3.3 INSTALLATION

A. General: When work is not in progress, close open ends of pipe and fittings so no trench water, soil, or other substances will enter pipes or fittings.

B. Septic Tanks:
   1. Place on level grade at depth that provides adequate gravity flow to tank. Compact backfill in layers to 95 percent minimum of maximum dry density at optimum.
   2. Cast-in-place Septic Tanks And Distribution Boxes:
      a. Follow specifications for concrete under Section 03 3111.
      b. Follow specifications for reinforcing steel under Section 03 2100.
   3. Do not disturb septic tank from proper alignment nor damage tank's protective coating during backfilling.

C. Distribution Boxes:
   1. Set box on undisturbed soil or compacted gravel to maintain level and stable installation.

2. Provide rubber gasket between box wall and lid.
3. Provide lifting box on lid for distribution inspection.

D. Sewer Lines:
1. Lay sewer line with uniform slope of 1/8 inch per foot towards septic tank.
2. Deflections from straight line or grade, as required by vertical curves, horizontal curves, or offsets, shall not exceed 6/D inches per linear foot of pipe where D represents nominal diameter of pipe expressed in inches.
   a. Determine deflections between extended center lines of two connecting pipes.
   b. If alignment requires deflection in excess of these limitations, provide special bends or sufficient number of shorter lengths of pipe to provide angular deflections within limits approved by Architect.
3. Laying:
   a. Shape trench bottom to give substantially uniform circumferential support to lower third of each pipe.
   b. Pipe laying shall proceed up-grade with spigot ends of bell-and-spigot pipe pointing in direction of flow.
   c. Lay each pipe true to line and grade and in such manner as to form close concentric joint with adjoining pipe and to prevent sudden offsets of flow line.
   d. As work progresses, clear interior of pipe of dirt and superfluous materials. Where cleaning after laying is difficult because of small pipe, keep suitable swab or drag in pipe and pull forward past each joint immediately after jointing has been completed.
4. Make joints between ductile iron pipe and other types of pipe with standard manufactured cast-iron adapters and fittings.
5. Valve, plug, or cap, as directed by Architect, where pipe ends are left for future connections.
6. Ductile Iron Pipe And Fittings:
   a. Provide depression under bell of each joint to maintain even bearing of sewer pipe.
   b. Connect to street main as required by local authorities.
   c. Use jacks to make-up gasketed joints.
7. Thermoplastic Pipe And Fittings:
   a. Install in accordance with Manufacturer's recommendations and ASTM D 2321.
   b. Stabilize unstable trench bottoms.
   c. Bed pipe true to line and grade with continuous support from firm base:
      1) Bedding depth: 4 to 6 inches.
      2) Material and compaction to meet ASTM standard noted above.
   d. Excavate bell holes into bedding material so pipe is uniformly supported along its entire length. Blocking to grade pipe is forbidden.
   e. Trench width at top of pipe:
      1) Minimum: 18 inches.
      2) Maximum: 28 inches.
   f. Piping and joints shall be clean and installed according to Manufacturer's recommendations. Break down contaminated joints, clean seats and gaskets and reinstall.
   g. Do not use back hoe or power equipment to assemble pipe.
   h. Initial backfill shall be 12 inches above top of pipe with material specified in referenced ASTM standard.

E. Drain Field:
1. Lay piping between distribution boxes and drain field on undisturbed soil or soil bedded and compacted as specified for sewer pipe.
2. Do not drive on trench bottoms or beds intended to receive drain piping. Operate equipment only on undisturbed soil.
3. Cover excavation bottoms and sidewalls prior to end of each day's operation. Do not perform trench excavation and installation when soil moisture content is high.
4. Before installing drain piping, rake bottom and sides of trench to break up smeared, compacted surfaces.
5. Set perforated drain tile level and with holes pointing downward. Place cover fabric on top of drain field gravel with 3 inch fabric overlap.
6. Maintain maximum tolerance of 1/4 inch from level for distribution lines out of distribution boxes. Lay drain lines with maximum tolerance from level of plus or minus one inch over total length of drain tile run.

F. Pipe Penetrations Through Structures:
   1. Pipe penetrations through structures shall be watertight. Use PVC waterstop tightly fitted around pipe and grout with non-shrink grout to seal concrete wall penetrations.

3.4 FIELD QUALITY CONTROL

A. Field Tests:
   1. Test watertightness of tanks and boxes before backfilling by plugging inlet and outlet openings and filling with clear water to access holes. Plug leaks.
   2. Failure to install joints properly shall be cause for rejection and replacement of piping system.

3.5 CLEANING

A. Remove excess earth from site or place as directed by Architect.

END OF SECTION

SECTION 33 4116

SITE STORM UTILITY DRAINAGE PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Perform excavating and backfilling required for work of this Section.
   2. Furnish and install storm drainage system as described in Contract Documents from point of water collection to terminating point.

B. Related Requirements:
   1. Section 31 2316: Procedure and quality of excavating.
   2. Section 31 2323: Procedure and quality of backfilling and compacting.

1.2 REFERENCES

A. Reference Standards:
   1. American Association Of State Highway And Transportation Officials:
      a. AASHTO M-252, 4 to 10 inch pipe, 'Specifications for Corrugated Polyethylene Pipe.'
      b. AASHTO M-294, 12 to 48 inch pipe, 'Specifications for Corrugated Polyethylene Pipe.'
   2. ASTM International:
      a. ASTM A 74-05, 'Standard Specification for Cast Iron Soil Pipe and Fittings.'
      b. ASTM A 536-84 (2004), 'Standard Specification for Ductile Iron Castings.'
      c. ASTM A 929-01, 'Standard Specification for Steel Sheet, Metallic-Coated by the Hot-Dip Process for Corrugated Steel Pipe.'
      d. ASTM C 14-05a, 'Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe.'
      e. ASTM C 76-05b, 'Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.'
      f. ASTM C 564-03a, 'Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.'
      g. ASTM D 2321-05, 'Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.'
      h. ASTM D 3034-04a, 'Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.'
      i. ASTM D 3212-96a (2003), 'Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.'
      j. ASTM F 794-03, 'Standard Specification for Poly(Vinyl Chloride)(PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.'
      k. ASTM F 1336-02, 'Standard Specification for Poly(Vinyl Chloride)(PVC) Gasketed Sewer Fittings.'

PART 2 - PRODUCTS

2.1 SYSTEM

A. Materials:
   1. Bedding Material: 3/8 inch crushed gravel.
   2. Catch Basins, Curb Inlets, Etc:
      a. Concrete:
         1) Construct of 4000 psi minimum concrete.

2) Include cover inlet with cast iron frame and grate as shown on Drawings.

b. PVC:
1) Comply with requirements of ASTM D 3212. ASTM F 794, and ASTM F 1336.
2) Metal grates, Frames, and hoods shall comply with ASTM A 536, Grade 70-50-05.
3) Type One Acceptable Products:
a) Nyloplast-ADS, Buford, GA (866) 888-8479. www.nyloplast-us.com.
b) Equal as approved by Architect before bidding. See Section 01 6200.

3. Concrete Pipe: Must be stamped by GA Department of Transportation.
a. Reinforced:
1) Meet requirements of ASTM C 76, plain end.
2) Determine class of pipe by depth of cover over pipe at rough-graded elevations as follows:

a) Depth Of Cover	Class Of Pipe
b) Under 2 feet	V
c) 2 feet to 3 feet	IV
d) 3 feet to 6 feet	III
e) Over 6 feet	II

4. PVC Pipe And Fittings:
a. Meet requirements of ASTM D 3034, SDR 35.
b. Fittings: Slip Joint type with elastomeric seals.
5. Corrugated Polyethylene Pipe And Fittings:
a. Meet requirements of AASHTO M-252 or M-294, Type S.
1) Corrugated, helical or annular, exterior with smooth interior and gasketed connectors.
2) Corrugated, annular, with silt and watertight joints for storm sewers.
6. Corrugated Metal Pipe:
a. Meet requirements of ASTM A 929.
b. 16 gauge, standard round, galvanized with 2 ounces zinc per square foot sheet steel.
c. Corrugations:
1) 15 Inch Pipe: 2-2/3 by 1/2 inch depth helical corrugations.

PART 3 - EXECUTION

3.1 PREPARATION

A. Excavate and backfill as specified in Section 31 2316 and 31 2323 with following additional requirements:
1. Runs shall be as close as possible to those shown on Drawings.
2. Excavate to required depth.
3. Grade to obtain fall required.
4. Remove debris from trench before laying bedding and pipe.
5. Do not cut trenches near footings without consulting Architect.
6. Backfill only after pipe lines have been tested, inspected, and approved by Architect.

3.2 INSTALLATION

A. Concrete Pipe:
1. Provide 3 inches of uncompacted bedding material below pipe.
2. After installation of pipe, provide additional bedding material up to springline of pipe.

B. PVC / Polyethylene Pipe:
1. Install in accordance with ASTM D 2321.
2. Minimum cover for corrugated polyethylene pipe and fittings shall be 12 inches for H-20 load.

C. Use jacks to make-up gasketed joints.

3.3 FIELD QUALITY CONTROL

A. Failure to install joints properly shall be cause for rejection and replacement of piping system.

3.4 CLEANING

A. Remove excess earth from site or place as directed by Architect.

END OF SECTION

SECTION 33 5613

ABOVE-GROUND FUEL STORAGE TANKS: LPG

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Perform excavation and backfill required for work of this Section.
   2. Furnish and install liquefied petroleum (lp) gas piping and fittings from storage tank to secondary regulator valve as described in Contract Documents.
   3. Provide, make necessary arrangements for, and pay necessary fees to local liquefied petroleum gas company for gas service, tanks, and proper size regulator valves. (Contact is listed on plans.)

B. Related Requirements:
   1. Section 01 1200: Owner will arrange for leasing of tank and having it installed on concrete pad provided under Section 03 3053.
   2. Section 03 3053: Concrete base for tank
   3. Section 05 0523: Welding standards and requirements
   4. Section 31 2323: Procedure and quality of backfilling and compacting

1.2 REFERENCES

A. Reference Standards:
   1. ASTM International:
      a. ASTM A 53-05, 'Standard Specification for Pipe, Steel, Black and Hot-Dipped Zinc-Coated Welded and Seamless.'
      b. ASTM A 234-05a, 'Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.'
      c. ASTM D 2513-05, 'Standard Specification for Thermoplastic Gas Pressure Pipe, Tubing, and Fittings.'

1.3 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies: Lay underground pipe in accordance with federal pipeline safety regulations and local gas utility company regulations and specifications.

B. Qualifications:
   1. Welders: Certified and bear evidence of certification 30 days before commencing work on project. If there is doubt as to proficiency of welder, Owner's Representative may require welder to take another test. This shall be done at no cost to Owner. Certification shall be by Pittsburgh Testing Laboratories or other approved authority.
   2. Polyethylene pipe installers: Properly trained and certified in procedure for joining polyethylene pipe.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Do not store polyethylene pipe so it is exposed to sunlight.

PART 2 - PRODUCTS

2.1 COMPONENTS

A. Aboveground Pipe And Fittings: Black carbon steel, butt-welded, Schedule 40 pipe meeting requirements of ASTM A 53. Welded forged steel fittings meeting requirements of ASTM A 234. Provide yellow jacketed gas piping where required by AHJ.

B. Belowground Pipe And Fittings: Polyethylene pipe and fittings meeting requirements of ASTM D 2513 with No. 14 coated copper tracer wire.

C. Storage Tank(s): 1000 gallon Liquefied Petroleum (LPG) storage tank complete with accessories for ready to use gas supply system. Tanks for above ground installation only. Buried LPG tanks are prohibited.

D. Secondary Pressure Reducing Regulator: Sized for pressure reduction from 10 psig to 11 inches WG.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Excavate and backfill as specified in Sections 31 2316 and 31 2323 with following additional requirements:
   1. Runs shall be as close as possible to those shown on Drawings.
   2. Excavate to required depth.
   3. Bottom of trenches shall be hard. Tamp as required.
   4. Remove debris from trench before laying pipe.
   5. Do not cut trenches near footings without consulting Architect.
   6. Place 4 inches of sand around pipe before trench is backfilled.
   7. Bury outside pipe 12 inches minimum below frost line or 18 inches minimum below finish grade, whichever is deeper.
   8. Backfill only after pipe lines have been tested, inspected, and approved by Architect.

B. General installation shall be as specified in Division 23:
   1. Steel pipe 2-1/2 inches and larger shall have welded fittings and joints.
   2. Provide 24 inch minimum steel pipe between vertical rise of riser and end of polyethylene line if anode-less riser is not used. Use plastic-to-steel transition or compression fitting between end of service line and steel meter riser. Provide cathodic protection for steel riser or use anode-less riser.
   3. Place tracer wire along side of polyethylene pipe from meter to main.

C. Set tank on concrete base. Provide seismic protection for tank as described in Contract Documents.

D. Provide necessary protection against damage for tank and accessories.

3.2 FIELD QUALITY CONTROL

A. Field Tests: Before pipes are buried or concealed from view, air test systems in Architect's presence at 60 psig for four hours and show no drop in pressure.

END OF SECTION