

SECTION 02060

SITE DEMOLITION

PART 1 GENERAL

1.01 SCOPE

The work in this Section consists of furnishing all material and equipment and performing all labor necessary for demolishing and disposing of designated elements indicated on the Drawings.

Scope includes removal of existing asphalt parking lot in one section of the site and milling down the top of the asphalt in another section of the parking lot.

Due to close proximity of utilities on the roadside, some of the demolition should be performed by small lightweight equipment.

Contractor must locate all underground utilities before demolition on excavation.

Utilities: Contractor shall notify and secure permission from utility companies effected by the demolition.

Contractor shall secure permission of City of Brookhaven before working in the ROW of Candler Lake West NE Road or crossing the right-of-way.

Demolition items shall consist of the removal of curb, asphalt, trees, drainage structures, and other items within the limits of construction. Relocation items shall consist of signs, fire hydrants, utility poles, and any other element which may be within the limits of construction.

Code Compliance: Contractor shall comply with all applicable codes, ordinances, rates, regulations, and laws of local, municipal, state, or federal authorities having jurisdiction over the project.

Demolition process and construction procedures shall not interfere with traffic on Redding Road or endanger vehicles or drivers on the street or within the park.

1.02 SUBMITTALS

Traffic Control: The Contractor shall submit a written traffic control and safety plan, to include a detailed demolition procedure, to the Owner's Representative and Landscape Architect for approval at least ten (10) days before demolition begins. The demolition procedure shall include a detailed description of the methods and equipment to be used for each operation and the sequence of work. The demolition procedures shall provide for safe conduct of the work, and protection of the property, which is to remain undisturbed and coordination with other work or operations, which may be in progress.

Traffic Control plan must be approved by the Brookhaven Police Department prior to beginning any work.

Pool Access: The public will have access to the pool if it is open during construction. The contractor shall submit a plan as to how he will phase the work so that the public will still have safe access to the pool facilities.

1.03 PERMITS

Contractor is responsible for securing all permits necessary to demolish and dispose of all demolition items and to use local roadways for access and egress. Contractor shall secure any and all permits to allow work to be executed in the ROW of Candler Lake West NE Road.

1.04 DEFINITIONS

Limits of Disturbance: (LOD) The boundary within which all construction, materials storage, grading, landscaping and related activities shall occur.

Limits of Work: (LOW) The boundary within only maintenance type of work can occur, no new construction shall occur within the LOW.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.01 EXPLORATORY TRENCHING:

- A. In all locations where, underground utilities may exist or are known to exist, the Contractor shall dig exploratory trenches in line with proposed new utilities to discover true depth, size, and location of existing utilities before beginning utility construction.
- B. Contractor shall notify all utility companies of their excavation schedule prior to actual excavation.

3.02 DEMOLITION

- A. All site material shall be removed as necessary for construction.
- B. Utilities: The location of existing utilities is approximate and shall be field verified prior to beginning demolition. If the elevation or location is substantially different from that shown on the plans or if a conflict exists, the Landscape Architect shall be notified. Any damage or unauthorized interruption of existing utilities shall be the sole responsibility of the Contractor and shall be repaired at contractor's expense.
- C. Any element, or part thereof, remaining below grade shall be mechanically fractured so that subsurface water will freely pass through the slab or floor of the structure, and so that no void will remain after backfilling the work site to grade as shown on the Drawings.

- D. The Contractor shall be responsible for removing all existing service connections to the site and permanently plugging the pipes where required in accordance with requirements of the utility companies concerned. The Contractor shall contact all utility companies prior to beginning work to coordinate disconnection of active utilities, removal or relocation of meters and marking existing underground utilities.
- E. The Contractor will be responsible for any damage caused to other site elements and shall be held liable for any and all repairs, replacement of parts or renovations required to restore any structure, portion of structure, equipment or items, not intended for demolition. The Contractor shall restore any damaged elements to their condition prior to demolition provided the damage was result of the demolition. If the Contractor does not repair any such damage immediately, or if the repairs are not suitable to the Owner, the Owner reserves the right to have such repairs made by another party and deduct the cost of required repairs from money due Contractor.
- F. All salvageable materials shall remain the property of the Brookhaven Parks Department and shall be cleaned and stored on the Owner's property as directed by the Owner's Representative.
- G. Any underground fuel, storage, septic or other tanks encountered shall be demolished according to the most recent environmental standards.
- H. Any contaminated soils discovered on site shall be removed at owners' expense. Contractor shall report such conditions to the Landscape Architect immediately.
- I. Any materials left on the site by other construction crews shall be brought to the attention of the Owners Representative and removed per his instructions.
- J. Demolition along Candler Lake West NE ROW lines must be performed carefully and meticulously. Contractor shall protect the existing service utilities from damage.

3.03 DISPOSAL

- A. All materials, which are not delivered to the Owner as specified above, shall become the property of the Contractor, and shall be demolished, moved or otherwise disposed of at the option of the Contractor by a method approved by the Owner. All debris shall be disposed of off-site by the Contractor. No burial, salvage or sale of demolished materials on site will be allowed.
- B. All demolished elements and materials shall be removed from the work site by the Contractor.
- C. All demolished elements and materials, which are either left in place or removed to the disposal site shall be in a non-hazardous condition.

- D. Manhole frames and covers to be removed are the property of the Owner and shall be delivered to a place designated by the Owner's Representative.
- E. Poles, transformers, equipment that belongs to respective utility companies and designated for removal or salvage shall be delivered to the respective utility company.
- F. All items marked salvage shall be removed and delivered to the county parks maintenance facility for storage.
- G. All unusable rock excavated on the site shall be removed and disposed of according to local codes and regulations.

3.04 COORDINATION:

- A. Demolition of curbs and asphalt on Candler Lake West NE and the parking lot shall be carefully coordinated to avoid danger for vehicles on the street.
- B. Traffic Control and Safety: Contractor shall work with City of Brookhaven and local Police officials to prepare a traffic control and safety plan and process for the execution of work along Candler Lake West NE Road. Traffic Control plan may be provided to the Owner after the contractor is selected.

END OF SECTION 02060

SECTION 02100

SITE PREPARATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Conditions of Section 02112 Tree Protection and Clean Up shall apply to this section. Related Sections 02060 Demolition, 02540 Erosion and Sediment Control,

1.2 SCOPE:

- A. This Section describes materials and equipment to be utilized and requirements for their use in preparing the work site for construction. The Contractor shall furnish all materials, equipment and labor necessary to complete the work. Precautionary measures that prevent damage to existing trees and other site features to remain are part of the Work.
- B. Comply with applicable codes, ordinances, rules, regulations and laws of local, municipal, state or federal authorities having jurisdiction. All required permits of a temporary nature shall be obtained for construction operations by the Contractor.
- C. Clearing and grubbing operations shall be coordinated with temporary and permanent erosion and sedimentation control procedures.
- D. Construction Access shall conform to all erosion control protection requirements.
- E. Contractor shall always maintain reasonable access to the park and pool facilities for use of the citizens.
- F. There is a City GIS monument on the North Lot that needs to be protected and preserved. It will end up in a parking lot island. Contractor must locate and protect
- G. Contractor shall coordinate with the Owner's Representative to be aware of special events taking place at the pool and to take reasonable measures to accommodate the events.

1.3 CLEARNG AND GRUBBING:

- A. Tree protection fencing shall comply with the Brookhaven Tree Ordinance regulations and conform to the tree fence detail included on the drawings.
- B. Within the limits schematically identified on the Drawings, the site will be cleared and grubbed to prepare for construction.

- C. The Contractor shall verify existing conditions on the site, and examine all adjoining roadways to the site, which in any way may affect completion of the work. Report to the Landscape Architect or Owner's Representative in writing any condition which will prevent the proper performance of the proposed site construction work. The site premises shall be accepted as found. The Landscape Architect assume no responsibility for conditions of the site.
- C. Clearing:
1. All vegetable growth such as trees, shrubs, brush, logs, upturned stumps and roots of down trees, and all other similar debris shall be removed where shown on the Drawings and disposed of properly by the Contractor as specified below. Cultivated growth shall be removed and trees felled as necessary within the limits of construction work site and as indicated on the drawings.
 2. Any construction activities, including trench excavation and fill compaction, which could detrimentally impact existing trees larger than 10-inch diameter (defined as DBH) or their root systems shall be reviewed by and coordinated with the Landscape Architect and City Arborist.
 3. Where the tree limb structure interferes with utility wires, or where the trees to be felled are in close proximity to utility wires, the tree shall be taken down in sections to eliminate the possibility of damage to the appropriate utility
 4. All buildings, fences, lumber piles, trash and obstructions, except utility poles, shall be removed as noted on the Drawings and disposed of by the Contractor. Any work pertaining to utility poles shall comply with the requirements of the appropriate utility.
 4. All paving and curbs adjoining any excavation area or embankment that may be damaged or buried shall be carefully removed, stored and replaced.
 5. All trees that are designated to be saved but the roots have been damaged shall have their exposed roots carefully cut using a hand-held saw. The exposed end of the roots shall be coated with Orange Shellac and covered with aged hardwood mulch.
- D. Grubbing:
Remove all identified stumps, roots and root clusters having a diameter of one inch or larger to a depth of at least two feet below subgrade elevation for concrete structures and at least one foot below the subgrade under walks, paving and in areas to receive landscape planting.

- E. All stumps, roots, foundations and planking embedded in the ground shall be removed and disposed of properly by the Contractor as specified below. Piling and butts of utility poles shall be removed to a minimum depth of two feet below the limits of excavation for structures, trenches and walkways or two feet below finish grade, whichever is lower. Refer to Section 02112 of the specifications for additional requirements.
- F. Tree Protection fencing shall be kept in good order. See detail on drawings.

1.4 TESTING AND INSPECTION SERVICES:

- A. Soil testing will be performed by an independent testing laboratory approved by the Owner. Payment for soil testing shall be made by the Owner.
- B. The soils testing laboratory is responsible for the following:
 - 1. Compaction tests in accordance with ASTM D 698.
 - 2. Field density tests for each one foot of lift; one test for each 2,500 square feet of fill.
 - 3. Inspecting and testing stripped site, subgrades and proposed fill materials.
- C. The Contractor's duties relative to testing include:
 - 1. Notifying the laboratory of conditions requiring testing.
 - 2. Coordinating with the laboratory for field-testing.
 - 3. Providing representative fill soil samples to laboratory for test purposes. Provide 50-pound samples of each fill soil.
 - 4. Paying costs for additional testing performed beyond the scope of that required and for re-testing where initial tests reveal non-conformance with specified requirements.
- D. Inspection:
 - 1. Earthwork operations, suitability of excavated materials for fill and backfill, and placing and compaction of fill and backfill is subject to inspection. The Geo-Technical Engineer will observe earthwork operations and provide recommendations as necessary for subgrade improvement.
 - 2. Foundations and shallow spread footing foundations are required to be inspected by a geotechnical engineer to verify suitable bearing and construction.

1.5 DEFINITIONS

Limits of Disturbance: (LOD) The boundary within which all construction, materials storage, grading, landscaping and related activities shall occur.

Limits of Work: (LOW) The boundary within only maintenance type of work can occur, no new construction shall occur within the LOW.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 PREPARATION:

- A. Maintain benchmarks, monuments and other reference points. Re-establish, at no cost to the Owner, any such reference points if disturbed or destroyed.
- B. Maintain tree protection fencing and erosion control fencing.

3.2 CLEARING:

- A. Clear areas required for access to site and execution of the work.
- B. Remove trees and shrubs within the area to be cleared. All trees to be saved within the grading limits are shown on the Drawings. Coordinate removal of trees and shrubs with the Landscape Architect or Owner's Representative.

3.3 STAKING:

- A. The Contractor shall stake the entire site, both as to location of major construction items as well as finish grades. This stakeout may be accurate or rough, depending on the Contractor's preference. See Paragraph 1.6 of Section 01010 Supplemental Conditions.
- B. The purpose of the staking, with inspection and adjustment by the Landscape Architect, is to adapt the design to the site rather than allow the design to be forced upon the site. Staking is subject to various degrees of adaptation, which can only be determined by the Landscape Architect. This variation is an aesthetic decision; the amount of adjustment most often is determined by the existing trees, terrain, and soil conditions sub-surface water and by other intangibles, which are impractical to survey in absolute accuracy.
- C. The Contractor shall notify the Landscape Architect and Owners Representative at least three (3) working days before inspection of the stakeout must be made. During the inspection the Landscape Architect will adjust the stakeout as necessary to fit the trees, topography and all other objects and conditions on the site. At this time, the Landscape Architect will clearly mark all perimeter trees and other vegetation to be removed. This staking-inspection process must take place prior to any tree removal, grading, construction, or any other work on the site.
- D. During the inspection, the Contractor shall be at the site along with the person who will superintend the work under this contract.
- E. The staking-inspection process shall be repeated for any work not staked and approved or adjusted during the first site visit. No work shall ever be done

without the stakeout first being adjusted and approved by the Landscape Architect. All alignment, dimensions and elevation of any grading, excavation, construction and planting is subject to adjustment to save trees and other vegetation.

3.4 TOPSOIL REMOVAL:

- A. Topsoil is defined as a friable sandy loam surface soil found at a depth of not less than 4". Satisfactory topsoil is reasonable free of subsoil, clay lumps, stones, roots, debris, and other objects over 2" in diameter.
- B. Topsoil of reusable quality shall be stripped from the site to be cleared, cleaned of objectionable materials and stockpiled on site for reuse in turf and plant bed areas.
- C. Where trees are to remain standing, stop topsoil stripping a sufficient distance from such trees to prevent damage to the main root system.
- D. Topsoil shall be stockpiled in storage piles where directed by the Owner and Landscape Architect. It shall not be stockpiled under trees or over constructed elements. Construct piles to drain freely of surface water. Cover piles, if necessary, to prevent erosion and dust.

3.5 DISPOSAL OF REFUSE:

- A. The refuse resulting from the clearing and grubbing operation shall be hauled to a disposal site secured by the Contractor and shall be disposed of in accordance with all requirements of federal, state, county and municipal regulations. No debris of any kind shall be deposited in any stream, body of water, or in any street or ditch. In no case shall any material be left on the site or shoved onto abutting private properties.
- B. Contractor may not dispose of refuse by burning or burial on site. All refuse must be removed and properly disposed of offsite.
- C. This is an active park and the contractor shall take great care to not damage any of the site outside the construction limits nor dispose of refuse materials on the site.

3.6 STAGING AREA:

Several site locations may be available to the Contractor for use in staging and storage within the Park. These sites must be pre-approved by the Owner prior to utilization.

END OF SECTION 02100

SECTION 02112

TREE PROTECTION AND CLEANUP

PART 1 GENERAL

1.01 SCOPE

- A. Tree Protection, selective site clearing, and pruning shall be accomplished in all areas to be graded or covered by new construction. Operations include but are not limited to the following:
 - 1. Staking of the plan on the site, removal of existing vegetation, selective pruning as directed by the Landscape Architect or City Arborist in the field, removal of miscellaneous structures, topsoil stripping, protection of existing trees designated to remain, erosion control and facilities protection.
 - 2. Woodland pruning and clearing within the limits of work as defined on the construction documents and drawings.
 - 3. Coordination for prescriptive tree care as identified by the city Arborist.
 - 4. See Section 01563.9 – Tree Care and Protection for treating existing trees.
 - 5. Tree Removal Charts. Reference the charts on the clearing plan for trees to be removed.
 - 6. Root removal: Some areas of the South parking lot will have total asphalt and base removed due to deterioration of the paving. Some of these areas are caused by tree roots. In areas where trees along the parking will be removed. These roots can be cut and removed.

1.02 QUALITY ASSURANCE

- A. Code Compliance: The Contractor shall comply with applicable codes, ordinances, rules, regulations and laws of local, municipal, state or federal authorities having jurisdiction over the Project. All required permits of a temporary nature shall be obtained for construction operations by the Contractor.
- B. Qualification of the Workmen: The Contractor shall provide at least one person who shall be present always during tree clearing and grubbing operations and who shall direct the trimming of roots and limbs where required. The Contractor shall provide at least one person who is qualified in the various other trades involved including demolition, protection of property and erosion control.

1.03 JOB CONDITIONS

- A. Dust Control: Use all means necessary to prevent the spread of dust during performance of the work of this Section. Thoroughly moisten all surfaces as required to prevent dust being a nuisance to the work on the site and surrounding areas.
- B. Erosion Control: Install and maintain berms, swales and bales as required to trap waterborne soil particles. As work progresses, relocate and/or add to erosion control

system as necessary.

- C. Protection: Use all means necessary to protect existing objects designated to remain and, in the event of damage, immediately make all repairs and replacements necessary to the approval of the Landscape Architect or Owner's Representative at no additional cost to the Owner.
- D. Tree Protection: Protect existing trees and other vegetation indicated to remain in place with county approved tree protection fencing set to the critical root zone of trees to be saved. Protect existing trees against unnecessary cutting, breaking or skinning of roots, skinning and bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line. Provide temporary fences, barricades, or guards as required to protect trees and vegetation to be left standing.
- F. Water existing trees and other vegetation, which are to remain and are within the limits of the contract work as required to maintain their health during the course of construction operations. Trees should have a minimum of 1" of water per week under the drip line of the trees either by natural rainfall or supplemental watering by the Contractor.
- G. Provide protection for roots over 1 1/2" diameter that are cut during construction operation. Coat any cut faces with emulsified asphalt, or other acceptable coating, especially formulated for horticultural use on cut or damaged plant tissues. Temporarily cover all exposed roots with wet burlap to prevent from drying out; provide earth cover as soon as possible.
- H. Repair or replace trees and vegetation damaged by construction operations, in a manner acceptable to the Landscape Architect. Tree damage repair shall be performed by a qualified tree surgeon. Replace trees, which cannot be repaired and restored to full-growth status, as determined by the tree surgeon.
- I. Protect tree root system from damage due to deleterious materials in solution caused by run-off or spillage during mixing of construction materials or drainage from stored materials. Protect root system from flooding, erosion or excessive wetting resulting from de-watering operations.
- I. Tree Penalty:
The intent of this clause is to emphasize the importance of all trees to be saved on the site. All trees identified to be saved shall be maintained in an undamaged condition. Damage shall be defined as the act of scarring, nailing, cutting, breaking limbs, etc., of any tree or its root system in such a manner as may cause the tree to be permanently lost. Accidental damage due to dead trees falling, equipment breakdown or any act on the part of the operator, which appears to the Landscape Architect as unavoidable, would not warrant a penalty. However, the Contractor will be liable for consistently damaging trees by accidental damage. Damage due to improper location of utility trenches or ditches without prior field adjustment will not be considered accidental. The Contractor will be responsible

for damage on the part of the operator or operators, whether by method of excavation, use of improper equipment, incompetency of the operator, or failure to properly inform the operator as determined by the Landscape Architect.

1. All trees on the site shall be saved except those marked specifically to be removed on the drawings and those marked specifically on the site by the Landscape Architect to be removed. No other tree may be removed from the site prior to the Landscape Architect’s inspection.
2. Penalties for damage to or removal of any healthy tree not specifically approved for removal on the site will be as follows:

TREE PENALTY TABLE					
Large Trees			Small Flowering Evergreen Trees & Shrubs		
Caliper	Height	Penalty	Height	Penalty	
1½" - 2"	14'	235.00	6 - 8'	130.00	
2" - 2½"	16'	250.00	8 - 10'	150.00	
3½" - 3"	16'	280.00	10 - 12'	200.00	
3½" - 4"	16'	300.00	12 - 14'	250.00	
4½" - 6"	20'	400.00	16 - 18'	375.00	
5" - 7½"	22'	450.00	18 - Up	500.00	
6" - 8"	26'	550.00	Follow large tree schedule using caliper of trunk		
8" - 11"		1200.00			
11" - 20"		1500.00			
>12"		2000.00			

3. Trees will be graded by the Landscape Architect as to species, condition and site importance with the above figures acting as maximum penalties with the lowest assessment amounting to no less than one-half of the above penalty figures.
4. Disposal: All materials removed by the clearing operation shall be disposed of off-site. No burning of trees, stumps or other matter shall be conducted on the site, unless permission is obtained from the Owner.

PART 2 PRODUCTS

2.01 TEMPORARY BARRICADES:

- A. Unless otherwise approved by the Landscape Architect or City Arborist, use only new and solid lumber of utility grade or better to construct temporary barricades around trees and areas designated to remain undisturbed.
- B. Tree protection fencing shall comply with the Brookhaven Tree Ordinance requirements and conform to the tree fence detail included on the drawings.

2.02 PRUNING PAINT:

- A. Use only a pruning paint specifically formulated for horticultural application to cut or damaged plant tissue and approved by the Landscape Architect for use on this work. Preferably, use 'Orange Shellac' as pruning paint when available.

2.03 ROOT FABRIC

- A. Root Control Fabric: Typar bio barrier root control fabric.
Typar geos@typar.com 1 800 541-5519

PART 3 EXECUTION

3.01 SITE INSPECTION:

- A. Prior to any work of this section, carefully inspect the entire site and all objects designated to be removed and all objects to be preserved. Locate all existing utility lines traversing the site and determine the requirements for the protection of those designated to remain.

3.02 SCHEDULING:

- A. Schedule all work in a careful manner with all consideration for neighbors and the general public, in conformance with local noise ordinances.
- B. Notify the Landscape Architect at least five (5) full working days prior to commencing any work of this section.

3.03 DISCONNECTION OF UTILITIES:

- A. Before starting site operations, disconnect or arrange for the disconnection of all utility services designated to be removed, performing all such work in accordance with the requirements of the utility company or agency involved.

3.04 STAKING: See Section 01010 Supplemental Conditions paragraph 1.6.

- A. All lines, grades, levels and benchmarks shall be established and maintained by the Contractor.
- B. Before commencing any work, the Contractor shall verify all grades, lines, levels and dimensions as indicated on the Drawings. He shall report any errors or inconsistencies to the Landscape Architect and Owner's Representative before commencing work.
- C. The Contractor shall stake the entire site, both as to location of all construction items as well as finish grades. This stakeout may be accurate or rough, depending on the Contractor's preference. This stakeout may be made early in the construction process and preserved for reference during construction.
- D. The purpose of the staking, with inspection and adjustment by the Landscape Architect, is to adapt the design to the site rather than allow the design to be forced upon the site. Staking is subject to various degrees of adaptation, which can only be determined by the Landscape Architect. This variation is an aesthetic decision, the amount of adjustment most often determined by the existing trees, terrain, soil conditions, sub-surface water and by other intangibles which are impractical to survey in absolute accuracy.
- E. The Contractor shall notify the Landscape Architect at least five (5) working days before inspection of the stakeout must be made. During the inspection the Landscape Architect will adjust the stakeout as necessary to fit the trees, topography and all other objects and conditions on the site. At this time the Landscape Architect will clearly mark all trees and other vegetation to be removed. This staking-inspection process must take place prior to any tree removal, grading, construction, or any other work on the site.
- F. During the inspection, the Contractor shall be at the site along with the person who will superintend the work under this contract.
- G. The staking-inspection process shall be repeated for any work not staked and approved or adjusted during the first site visit. No work shall ever be done without the stakeout first being adjusted and approved by the Landscape Architect. All alignment, dimensions and elevation of any grading, excavation, construction and planting is subject to adjustment to save trees and other vegetation.

3.05 DEMOLITION:
See Section 02060

3.06 MULCH:

- A. 1" topping of pine straw shall be placed as mulch in all disturbed areas within the limits of the work without digging into or breaking up the surface roots of trees.
- B. Trees to be protected shall have a 3" layer of aged hardwood mulch covering their root zones out to the driplines.

3.07 CLEARING:

- A. Clear the site of brush, rubbish, grass, weeds and any other plants designated by the Landscape Architect to be removed. No trees shall be removed, or limbs and roots cut without prior approval of Landscape Architect or Owner's Representative.
- C. Remove all stumps, roots and root clusters having a diameter of one inch or larger to a depth of at least two feet below subgrade elevation for concrete structures and at least one foot below the subgrade under walks, asphalt roadway and in areas to receive heavy grading. Do not remove stumps in areas to remain natural.

3.08 GRADING:

- A. Grading shall be kept at a minimum order to reduce the impact of the construction on the natural systems. All grading work shall be confined to the limits of construction work.
- B. Contractor shall use equipment and tools that do not expand beyond the limits of construction.
- C. Disruption of the existing grade should be kept at a minimum and fill used whenever possible to create uniform surfaces for paved surface materials. No form of root rake shall be used.
- D. Near existing trees, grading work should be kept to hand labor and tools rather than heavy machinery.
- E. Vehicles may not turn or park under the tree preservation areas.
- F. Staging and operations may occur in the open areas where there are no trees. Any damage to existing lawn grasses as a result of construction operations shall be repaired.

3.09 FILL PLACEMENT OVER TREE ROOTS:

- A. Where fill dirt is necessary to establish acceptable finished grades over tree roots, contractor shall use the following method:
 1. Rake away the existing mulch and humus on the surface of the ground.
 2. Lay Tytar root barrier over the roots to cover all disturbed areas over existing roots.
 3. Cover the area with washed #57 stone to within 3" of finish grade or up to bottom of paving.
 4. Lay filter fabric over top of the #57 Stone to prevent siltation.
 5. Lay 3 inches of Topsoil over the filter cloth.
 6. Cover the topsoil with 3 inches of pine straw or aged hardwood mulch.

3.10 EROSION CONTROL:

- A. Install erosion control measures (i.e., silt fencing, rip rap, straw bales, check dams) as necessary during construction to prevent erosion of disturbed areas and prevent damage to downstream property from runoff and silt.

3.11 SILT CONTROL:

- A. Prior to any grading or on-site construction, the Contractor shall install silt barriers in all adjacent locations necessary to prevent eroded material from silting on to paved areas, waterways, lake, and adjacent properties.

3.12 CLEANUP:

- A. Contractor shall be responsible for removing all rubbish, refuse, soil, waste, and other products or elements resulting from the construction effort.
- B. All the natural mulch areas disturbed by the construction activity shall be repaired by raking back to natural grade and covering with 1”-layer pine straw mulch. All pruning rubbish shall be removed from the site or ground and spread as mulch in the natural areas.
- C. Contractor shall remove all tree protection fencing and erosion control measures from the site before exiting the site as completed.

END OF SECTION 02112

SECTION 02125

EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.01 SCOPE:

- A. Work described in this section includes the containment of sediment transport, control of erosion and treatment of pollutants prior to, during and throughout all construction operations; establishment of permanent vegetative cover and continued maintenance of said measures in accordance with Part III, paragraph 3.4 of this section.
- B. This Section also specifies removal of temporary erosion and sedimentation controls.
- C. Temporary and permanent erosion and sedimentation controls include grassing and mulching of disturbed areas and structural barriers at those locations, which will ensure that erosion during construction will be maintained within acceptable limits. Acceptable limits are as established by the Georgia Erosion and Sedimentation Control Act of 1975, as amended, Section 402 of the Federal Clean Water Act, and applicable codes, ordinances, rules, regulations and laws of local, state, and municipal authorities having jurisdiction. All fines imposed for improper erosion and sedimentation control shall be paid by the Contractor.
- D. Land disturbance activity shall not commence until a Land Disturbance Permit has been issued by governing authority and Contractor has obtained NOI coverage as a Secondary Permittee under the General Permit GAR100003 – Common Development for the Murphey Candler Park Projects.
- E. All control measures shown on the Drawings are to be considered the minimum required; additional measures may be required. Provide same as required.
- F. Contractor is solely responsible for protection of downstream properties from encroachment or damage from soil erosion and/or the discharge of pollutants by water or air to any areas off the Project site.
- G. Contractor shall stake the location of the erosion control fences prior to construction and approved by the Landscape Architect prior to construction.

1.02 SUBMITTALS:

- A. Four complete copies of engineering data, including shop drawings, for all products shall be submitted to the Landscape Architect and Engineer for approval.
- B. Schedule of operations: Submit schedule of exact dates operations including program of erosion, sediment and pollution control measures, maintenance of all said measures including control facilities, structures and devices and vegetative practices. Show anticipated starting and completion dates for land-disturbing activities including excavation, filling and rough grading, finished grading, construction of temporary and permanent control measures, and disposition of temporary erosion sediment and pollution control measures.

1.03 PROJECT CONDITIONS:

- A. Furnish and install all control measures prior to or concurrent with any land disturbance activity. The Contractor is responsible for the initial provision and installation of all control measures and then the continued provision and installation of all measures throughout all construction operations and all sequences of construction operations.
- B. Schedule grading operations to allow permanent erosion control to take place in the same construction season. Avoid or minimize exposure of soils to winter weather. Maintain all controls until vegetative cover has been established.
- C. Construct and maintain temporary control measures until such time as permanent measures are effective in control of erosion, sediment and pollution from the site. Extent of measures shall be responsibility of Contractor.
- D. Stop all erosion, sediment or pollution from leaving the site and encroaching on downstream or surrounding properties.
- E. Temporary grassing shall be applied to all disturbed areas left idle for 72 hours.
- F. Contractor is responsible for all quantities of all control measures regardless if shown on the Drawings. The extent of soil erosion control measures shown on the Drawings should be considered minimum.
- G. All expenses related to the removal, relocation, replacement and/or rerouting of any and all existing utilities or other built, stored, stockpiled items of any kind, surface or subsurface is the responsibility of the contractor and will be included in the Contract Sum.

1.04 QUALITY ASSURANCE:

- A. Procedures shall comply with "Manual for Erosion and Sediment Control in Georgia", latest edition published by the Georgia Soil and Water Conservation Committee." Contractor is required to keep a logbook on site documenting his inspection of all control devices (minimum once/week and within 24 hours of any storm event) and noting any corrections or modifications. General Contractor must also file a "Notice of Termination" when the site is finally stabilized, and all stormwater management systems have been constructed and have been proven to be functioning in accordance with the Design Concept(s).
- B. The temporary and permanent erosion and sedimentation control measures shown on the Drawings are minimum requirements. Any additional erosion and sedimentation control measures required by the Contractor's means, methods, techniques and sequence of operation will be installed by the Contractor at no additional cost to the Owner
- C. Reference the Drawings for any other procedural manuals, publications, permits or other field guidelines required for the Contractor to obtain, understand and utilize in the performance of his work. Be reference of same, said materials are made a part of these Specifications.

- D. The temporary and permanent erosion and sedimentation control measures shown on the Drawings are minimum requirements. Any additional erosion and sedimentation control measures required by the Contractor's means, methods, techniques and sequence of operation will be installed by the Contractor at no additional cost to the Owner.
- B. Perform all work under this Section in accordance with all pertinent rules and regulations including, but not necessarily limited to, those stated in these Specifications. Where provisions of pertinent rules and regulations conflict with these Specifications, the more stringent provisions shall govern.
- C. Provide all materials and promptly take all actions necessary to achieve effective erosion and sedimentation control in accordance with the Georgia Erosion and Sedimentation Control Act of 1975 as amended (OCGA §12-7-1, et. seq.), local ordinances, other permits, local enforcing agency guidelines and these Specifications.
- D. Basic Principles:
1. Coordinate the land disturbance activities to fit the topography, soil types and conditions.
 2. Minimize the disturbed area and the duration of exposure to erosive elements.
 3. Provide temporary or permanent stabilization to disturbed areas immediately after rough grading is complete.
 4. Safely convey run-off from the site to a stable outlet to prevent flooding and damage to downstream facilities resulting from increased runoff from the site.
 5. Retain sediment on-site that was generated on-site.
 6. Minimize encroachment upon watercourses.
- E. Implementation:
1. The Contractor is solely responsible for the control of erosion within the Project site and prevention of sedimentation from leaving the Project site or entering waterways.
 2. The Contractor shall install temporary and permanent erosion and sedimentation controls, which will ensure that runoff from the disturbed area of the Project site shall pass through a filter system before exiting the Project site.
 3. The Contractor shall provide temporary and permanent erosion and sedimentation control measures to prevent silt and sediment from entering any waterways and any designated wetland areas.
 4. The Contractor shall limit land disturbance activity to those areas shown on Drawings.
 5. The Contractor shall maintain erosion and sedimentation control measures within disturbed areas on the entire site at no additional cost to the Owner until the final acceptance of the Project. Maintenance shall include mulching, re-seeding, clean out of sediment barriers and sediment/detention ponds, replacement of washed-out or undermined rip rap and erosion control materials, to the satisfaction of the Owner and Landscape Architect.
 6. Trenching; Contractor shall not trench in areas the include root zones of trees to be saved. Trench lines can be adjusted in collaboration with the Landscape Architect.
 7. Contractor may go outside the construction limits to establish erosion control methods that may be more practical than the ones shown on the drawings. Contractor shall get permission from the Owner and Landscape Architect before implementing such plans.
 8. Existing dry swales and storm drainage structures may offer more effective opportunities to control silt runoff and erosion. Contractor is free to explore

alternative options on site for erosion control if the plans are approved by the Landscape Architect and Owner

PART 2 - PRODUCTS

2.01 SEDIMENT BARRIER:

- A. Silt Fence:
 - 1. Type A (NS - Non-Sensitive) silt fence shall meet the requirements of Section 171 of the Georgia Department of Transportation Standard Specifications, latest edition.
 - 2. Type C (S - Sensitive) Silt Fence is a combination of Type A silt Fence with woven wire reinforcement. Type C Silt Fence reinforcement shall meet the requirements of Section 171 of Georgia D.O.T. Specifications. Netting shall be ½ - inch, galvanized steel, chicken wire mesh.
 - 3. Silt fence fabric shall be an approved product on the Georgia DOT Qualified Product List No. 36, latest edition.
- B. Hay Bales: Hay bales shall be clean, seed-free cereal hay, rectangular in shape and contain five cubic feet or more of material.
- C. Concrete Blocks: Concrete blocks shall be hollow, non-load-bearing type.
- D. Plywood shall be 3/4-inch thick exterior type to lay over roots for access.
- E. Filter stone shall be crushed stone conforming to Georgia Dept. of Transportation Table 800.0IH, Size Number 3. Filter stone may be used to build check dams.
- F. Compost Filter socks to be used where tree roots should not be cut by silt fence trencher as shown on the construction documents.
- G. Surge stone may be used to create check dams where necessary to impede silt flow.

2.02 CONSTRUCTION EXIT STONE:

- A. Use sound, tough, durable stone resistant to the action of air and water. Slabby or shaley pieces will not be acceptable, aggregate size shall be in accordance with the National Stone Association Size R-2 (1.5 to 3.5-inch stone) or Type 3 riprap stone conforming to Section 805.01 of the Georgia Department of Transportation Standard Specifications.

2.03 CONCRETE:

- A. Concrete shall have a compressive strength of not less than 3,000 psi, with not less than 5.5 bags of cement per cubic yard and a slump between 3 and 5-inches. Ready-mixed concrete shall be mixed and transported in accordance with ASTM C94.

2.04 RIP RAP:

- A. Stone Rip Rap: Use sound, tough, durable stones resistant to the action of air and unless noted otherwise, stone riprap shall be per size indicated on the Plans and individually sized for each outfall.

1. Type 1 Rip Rap: Size and gradation shall conform to Section 805.01 of the Georgia DOT Standard Specification for Type 1 Stone Dumped Rip Rap.
2. Type 3 Rip Rap: size and gradation shall conform to Section 805.01 of the Georgia DOT Standard Specifications for Type 3 Stone Dumped Rip Rap.
3. River Stone: Where designated Contractor shall use river stone comparable to Type 1.
4. Rip Rap may be used to erect Check Dams on dry swales or existing storm structures.

2.05 PLASTIC FILTER FABRIC:

- A. All plastic filter fabric shall conform to the Georgia Department of Transportation Standard Specifications, Section 881.06 for non-woven filter fabrics on most applications for this project, except for underneath riprap areas or stone construction entrances.
- B. A plastic filter fabric shall be an approved product on the Georgia Department of Transportation Qualified Product List No. 28, latest edition.
- C. Filter fabric for silt fences shall be a 36" Georgia DOT approved pervious sheet of synthetic polymer filaments non-woven from continuous filaments with wire fence backing. Filter fabric shall be of type recommended by its manufacturer for the intended application. The filter fabric shall meet the following requirements:
 1. Listed on Georgia DOT QPL-36.
- D. Polymer shall be applied utilizing a hydro seeder mix of appropriate seed, fertilizer, lime and mulch for the same acre or without seed/fertilizer/lime/mulch mix.
- E. Follow all manufacturers' instructions and recommendations. Do not mechanically disturb treated areas after application. (This does not include foot traffic as necessary to install erosion control blanket).
- F. Contractor shall furnish and install as necessary a minimum 200 lbs. of erosion control polymer for incidental "touch-up" or "point source erosion areas".
- G. Furnish two forms of synthetic polymer:
 1. Emulsion polymer for hydro seeder application with 30% active strength.
 2. Powder polymer for hand spreading with an active strength of 95%.

2.06 GRASSING:

- A. Grassing materials shall meet the requirements of the following sections of the Georgia Department of Transportation Standard Specifications, latest edition:

Material	Section
Topsoil	893.01
Seed and Sod	890
Fertilizer	891.01
Agricultural Lime	882.02
Mulch	893.02
Inoculants	893.04

- B. Seed species shall be provided as shown on the Drawings.
- C. Mulch: Seeding (temporary and permanent) on all disturbed areas shall be held in place by the use of a mulch binder, as approved by the Project Landscape Architect. The mulch binder shall be non-toxic to plant and animal life and shall be approved by the Project Landscape Architect.
- D. Rolled Erosion Control Products (RECP): On all slopes exceeding 3 (horizontal) to 1 (vertical) shall be held in place by the use of a RECP blankets/matting, as approved by the Project Landscape Architect.
- E. Water: Water shall be free of excess and harmful chemicals, organisms and substances, which may be harmful to plant growth or obnoxious to traffic. Salt or brackish water shall not be used. Water shall be furnished by the Contractor.

PART 3 - EXECUTION

3.01 GENERAL:

- A. Temporary and permanent erosion and sedimentation control measures shall prevent erosion and sediment from exiting the site. If, in the opinion of the Owner or Project Landscape Architect, the Contractor's temporary erosion and sedimentation control measures are inadequate, Contractor shall provide additional maintenance for existing measures or additional devices to control erosion and sedimentation at no additional cost to Owner.
- B. All erosion and sedimentation control devices and structures shall be inspected by the Contractor at least once a week and immediately after to each rainfall occurrence. Any device or structure found to be damaged shall be repaired or replaced by the end of the day.
- C. All erosion and sedimentation control measures and devices shall be constructed and maintained as indicated on the Drawings or specified herein until adequate permanent disturbed area stabilization has been provided and accepted by the Project Landscape Architect. Once adequate permanent stabilization has been provided and accepted by the Project Landscape Architect, all temporary erosion and sedimentation control structures and devices shall be removed.

3.02 TEMPORARY EROSION CONTROL DEVICES:

- A. Construct temporary sediment barriers of silt fence at all points where surface water flows from construction area bypassing a temporary sediment traps if the area is subject to soil erosion; or as otherwise indicated on Drawings or as deemed necessary by inspectors.
- B. Install temporary sediment traps and temporary sediment basins in accordance with the location and details shown on the Drawings. Remove accumulated sediment when they are one-third full of silt continually until permanent vegetative cover is established.
- C. Install construction exit as indicated on Drawings. Maintain to prevent tracking and flow of mud onto public roads.

- D. Construct diversion berms, dikes (2'-0" wide x 1'-6" tall) or ditches at the tops of all slopes or otherwise indicated on the Drawings. Machine compact these elements and plant temporary seed until permanent vegetative cover can be established.
- E. Maintain temporary barriers until permanent erosion control measures are established. Repair and replace barriers damaged or displaced by construction activity

3.03 SEDIMENT CONTROL:

A. Construction Exit:

- 1. Construction exit(s) shall be placed as shown on the Drawings and as directed by the Project Landscape Architect. A construction exit shall be located at any point traffic will be leaving a disturbed area to a public right-of-way, street, alley, sidewalk, or parking area.
- 2. Placement of Construction Exit Material: The ground surface upon which the construction exit material is to be placed shall be prepared to a smooth condition free from obstructions, depressions or debris. The plastic filter fabric shall be placed to provide a minimum number of overlaps and a minimum width of one foot of overlap at each joint. The stone shall be placed with its top elevation conforming to the surrounding roadway elevations. The stone shall be dropped no more than three feet during construction.
- 3. Construction Exit Maintenance: The Contractor shall regularly maintain the exit with the top dressing of stone to prevent tracking or flow of soil onto public rights-of-way and paved surfaces as directed by the Project Landscape Architect.
- 4. Construction Exit Removal: Construction exit(s) shall be removed and properly disposed of when the disturbed area has been properly stabilized, the tracking or flow of soil onto public rights-of-way or paved surfaces has ceased and as directed by the Project Landscape Architect.

B. Sediment Barriers:

- 1. Sediment barriers shall include, but are not necessarily limited to, silt fences, hay bales, and any device, which prevents sediment from exiting the disturbed area.
- 2. Silt fences and hay bales shall not be used in any flowing stream, creek or river.
- 3. Sediment barriers shall be installed as shown on the Drawings and as directed by the Owner or Project Landscape Architect.
- 5. Sediment barriers shall be maintained to ensure the depth of impounded sediment is no more than one-half of the original height of the barrier or as directed by the Project Landscape Architect. Torn, damaged, destroyed or washed-out barriers shall be repaired, reinforced or replaced with new material and installed as shown on the Drawings and as directed by the Owner or Project Landscape Architect.
- 5. Sediment Barrier Removal:
 - a. Sediment barrier shall be removed once the disturbed area has been stabilized with a permanent vegetative cover and the sediment barrier is no longer required as directed by the Project Landscape Architect.
 - b. Accumulated sediment shall be removed from the barrier and replaced and stabilized on site as directed by the Owner or Project Landscape Architect.
 - c. All non-biodegradable parts of the barrier shall be disposed of properly.
 - d. The disturbed area created by barrier removal shall be permanently stabilized.

- F. Inlet Protection: All storm inlets shall be covered with sediment boxes during grading operations and shall remain so covered until all open areas are permanently stabilized against erosion.

3.4 GROUND COVER

- A. Protect all exposed soils with mulching (temporary measure) and vegetative ground cover (permanent measure).
- B. Ground cover consists of temporary seeding on all graded areas which will not receive final grading or permanent planting within three (3) days.
- C. All grassing, or planting operations shall include mulching as stabilization until ground cover by planting is effective.
- D. Reseed as required until full vegetative coverage is established.

3.5 MAINTENANCE

- A. Inspect all control elements after each rainfall event and a minimum of every two (2) weeks when no rainfall event(s) occur. Clear all debris and accumulated sediment from behind barriers when half full so their functional capacity is not reduced. Repair and replace any and all damaged measures of any kind.
- B. Contractor is expected to maintain the erosion control compliance in accordance with NPDES Standards. See Section 02125B of this Project Manual.
- B. Maintain all erosion, sedimentation, pollution control measures until the site has reached complete stabilization as described in Part VI.A. Termination of Coverage in the General NPDES Permit.

3.6 REMOVAL OF TEMPORARY EROSION CONTROL DEVICES

- A. Remove all debris resulting from temporary erosion control from Project site.
- B. Control dust from disturbed areas by means of mulching, irrigation, calcium chloride or other method subject to the Engineer's review.

3.07 CLEAN-UP:

- A. Dispose of all excess erosion and sedimentation control materials in a manner satisfactory to the Owner and Landscape Architect.
- B. Final clean up shall be performed in accordance with the requirements of these Specifications and to the satisfaction of the Owner and Landscape Architect.

END OF SECTION 02125

SECTION 02125B

**NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
(NPDES) COMPLIANCE**

PART 1 - GENERAL

1.01 SCOPE

- A. The work specified in this Section consists of the following under the requirements for Authorization to Discharge under the National Pollutant Discharge Elimination System (NPDES), Storm Water Discharges Associated with Construction Activities, under the State of Georgia, Department of Natural Resources, Environmental Protection Division (EPD).
- Notice of Intent (N.O.I.) – Electronic submittal to EPD by Owner
 - Updates to the Erosion, Sedimentation, and Pollution Control (ES&PC) Plan – By Landscape Architect
 - Comprehensive Monitoring Plan (CMP) – By Landscape Architect
 - Compliance Inspections and Monitoring – By Contractor
 - Notice of Termination (N.O.T.) – By Owner after appraisal of site by Landscape Architect.

1.03 QUALITY ASSURANCE

- A. Perform all work under this Section in accordance with all pertinent rules and regulations including, but not necessarily limited to, those stated in these Specifications. Where provisions of pertinent rules and regulations conflict with these Specifications, the more stringent provisions shall govern.
- B. Provide all materials and promptly take all actions necessary to monitor, document and achieve effective erosion and sedimentation control in accordance with the National Pollutant Discharge Elimination System (NPDES), Storm Water Discharges Associated with Construction Activities, under the State of Georgia, Department of Natural Resources, Environmental Protection Division (EPD) and these Specifications.
- C. The temporary and permanent erosion and sedimentation control measures shown on the Erosion, Sedimentation, and Pollution Control (ES&PC) Plan are minimum requirements. Any additional erosion and sedimentation control measures required by the Contractor's means, methods, techniques and sequence of operation shall be updated on the ES&PC Plan and submitted to the Designer for approval by the Contractor at no additional cost to the Owner.

PART 2 - EXECUTION

2.01 NOTICE OF INTENT

- A. The contractor shall obtain coverage as a Secondary Permittee under the General Permit GAR1000003– Common Development for the Murphey Candler Park projects. Contractor shall coordinate with the City of Brookhaven Public Works Director to be added as a Plan Preparer in the GEOS system to complete this paperwork.

2.02 EROSION, SEDIMENTATION, AND POLLUTION CONTROL PLAN UPDATES

- A. Project Civil Engineer has prepared the ES&PC Plan for the Murphey Candler Park Improvements in accordance with Georgia’s NPDES Permit for Storm Water Discharges Associated with Construction Activities. To meet the requirements of the permit, the Project Civil Engineer that prepared the ES&PC Plan has provided the required Engineer’s certification on the plans.
- B. Upon direction from the Owner’s Representative, the Project Civil Engineer will conduct the initial inspection of the Best Management Practices (BMPs) for the construction site. The permit requires that the Engineer certifying the ES&PC Plan must also perform the initial BMP inspection.
- C. Per the NPDES regulations, the ES&PC Plan is a dynamic document. The project Civil Engineer is responsible for updating the ES&PC Plan if needed. Major changes and amendments to the ES&PC Plan must be certified by a licensed professional engineer, including changes in design, construction, operation, or maintenance which has a significant effect on the potential for the discharge of pollutants to waters of the state. Appropriate Certification of the ES&PC Plan site change updates shall be the responsibility of the General Contractor and the project Civil Engineer.

2.03 COMPREHENSIVE MONITORING PLAN

- A. The Contractor shall prepare the Comprehensive Monitoring Plan (CMP), as required under the NPDES permit. The purpose of the CMP is to define the methods used to monitor performance of on-site BMPs and storm water runoff. The plan shall include sampling strategies and monitoring locations for the site, along with details of the record keeping and reporting requirements applicable to the site. The plan shall also include example record keeping and reporting forms to assist with the documentation necessary to maintain compliance under the permit. The CMP shall be provided in an oversized 3-ring binder, and all records and inspection logs kept in a central on-site location.
- B. Per the NPDES regulations, the CMP is a dynamic document and major changes and amendments to the Plan, such as changing sampling locations, must be certified by a licensed professional. The Contractor who prepared the CMP will be responsible for updating and certifying the CMP.

2.04 ON-SITE COMPLIANCE INSPECTIONS AND MONITORING

- A. The Contractor shall provide daily, weekly, monthly, and rainfall dependent BMP inspections and associated storm water monitoring, as required under the permit. According to the permit, inspections and monitoring shall be conducted by “Qualified Personnel” under the supervision of the Primary Permittee. For this project, the Contractor is the Operator and shall perform all daily inspections and BMP maintenance. A summary of inspections required under the permit, are as follows.
- B. Daily - Daily inspections must be conducted of petroleum storage usage and handling areas and construction entrances/exits by "Qualified Personnel". In addition, daily rainfall data must be recorded.
- C. Weekly - Qualified personnel shall inspect site BMPs at least once every 7 calendar days and within 24 hours of the end of a storm that is 0.5 inches or greater.
- D. Monthly - Inspections are required monthly until a N.O.T. is submitted for areas that have undergone final stabilization.
- E. Qualifying Rainfall Event - Sampling after each qualifying rainfall event is required until the N.O.T. is submitted with the final sampling data. Qualifying sampling events as measured by the on-site rain gauges provided by the Contractor and monitored by the Owner, are defined under Section 6, subsection d.3. of the General NPDES Permit No. GAR100003, effective August 1, 2018.
- F. All monitoring results will be recorded onto appropriate forms and provided in the CMP binder, so all records and inspection logs can be kept in a central on-site location. All monitoring results shall also be submitted monthly to Georgia Environmental Protection Division (EPD) as required under the permit.

2.05 NOTICE OF TERMINATION

- A. At completion of construction, the Contractor is responsible for preparing and submitting the N.O.T. form. The N.O.T must be approved by the Designer/Landscape Architect before submittal. Final acceptance of this project by the City of Brookhaven will not be issued until the N.O.T. requirements have been satisfied.

END OF SECTION 02125B

SECTION 02200

EARTHWORK

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY OF WORK

- A. This Section includes earthwork as shown on the drawings and specified herein. Included is:
 - 1. Preparation of subgrade for walks and pavement.
 - 2. Preparation of granular base for pavement.
 - 3. Excavation and backfilling for utility systems.
 - 4. Excavation and backfilling for, foundations, and retaining walls.
 - 5. Site grading and filling to indicated elevations.

1.03 SUBMITTALS

- A. Test Reports: Submit copies of following reports directly to the Engineer
 - 1. Test reports on borrow material.
 - 2. Field density test reports.
 - 3. One optimum moisture-maximum density curve for each type of soil encountered.
- B. Based on testing service reports and inspection, subgrade or fills which have been placed at below specified density, provide additional compaction and testing at no additional expense to Owner.

1.04 QUALITY ASSURANCE

- A. Codes and Standards: Perform earthwork and site grading in compliance with applicable requirements of governing authorities having jurisdiction.
- B. Testing and Inspection Services: Owner will engage testing and inspection service, to include testing of soil materials proposed for use in work and field facilities for quality control testing during earthwork and site grading operations. All test reports must be signed by a licensed engineer.
- C. Tests for Proposed Soil Materials: Test soil materials proposed for use in work and promptly submit test result reports. Provide one optimum moisture-maximum density curve for each type of soil encountered in

subgrade fills. Determine the maximum densities in accordance with ASTM D 698. Testing service will determine suitability of materials to be used as fill. For borrow materials, perform a mechanical analysis (ASTM 422), plasticity index (ASTM 424), moisture-density curve (ASTM D 698).

1.05 PROJECT CONDITIONS

- A. Subsoil: Promptly notify soil testing service of unsuitable sub-surface conditions.
- B. Existing Utilities: Locate existing underground utilities in areas of work before starting earthwork operations. Where utilities are to remain in place, provide adequate means of protection during earthwork operations. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with Owner, and public and private utility companies, in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner. Do not interrupt existing utilities serving facilities occupied and used by Owner or others, except when permitted in writing by Engineer and then only after acceptable temporary utilities services have been provided. Demolish and completely remove from site underground utilities indicated to be removed. Coordinate with local utility companies for shut-off of services if lines are active.
- C. Use of Explosives: Use of explosives is not permitted.
- D. Temporary Protection: Barricade open excavations made as part of earthwork operations and post with warning lights. Operate warning lights as recommended by authorities having jurisdiction. Protect bottoms of excavations and soil beneath and around foundations from frost and freezing. Protect excavations by shoring, bracing, sheeting, underpinning, or other methods, as required to prevent cave-ins or loose dirt from entering excavations.

1.06 DEFINITIONS

Limits of Disturbance: (LOD) The boundary within which all construction, materials storage, grading, landscaping and related activities shall occur.

Limits of Work: (LOW) The boundary within only maintenance type of work can occur, no new construction shall occur within the LOW.

PART 2 PRODUCTS

2.01 SOIL MATERIALS

- A. Backfill and Fill Materials: Use satisfactory soil materials, complying with the American Association of State Highway and Transportation Officials (AASHTO) Designation M145, soil classification groups A-1, A-2-4, A-2-5,

and A-3. Fill to be free of rock or gravel larger than 2" in any dimension, debris, waste, frozen materials, vegetable, and other deleterious matter, as determined by the soils testing service.

- B. Granular Base: Properly graded mixture of natural or crushed gravel or crushed stone that will readily compact to required density. Use material complying with applicable sections of the current edition of "Georgia Department of Transportation Standard Specifications for Construction of Roads and Bridges".
- C. Root Control Fabric: Tybar bio barrier root control fabric.
Tybar geos@typar.com 1 800 541-5519

PART 3 EXECUTION

3.01 EXCAVATION

- A. General: Establish extent of grading and excavation by area and elevation. Designate and identify datum elevation and project engineering reference points. Set required lines, levels and elevations. Obtain approval from the Architect.
- B. Excavation Classifications: The following classifications of excavation will be made when unanticipated rock excavation is encountered in work. Do not perform such work until material to be excavated has been cross-sectioned and classified by soils testing laboratory. Rock excavation will be paid for at established unit prices, upon approval of Architect.
- C. Earth excavation includes removal and disposal of pavements and other obstructions visible on ground surface, underground structures and utilities indicated to be demolished and removed, material of any classification indicated in data on subsurface conditions, and other materials encountered that are not classified as rock excavation or unauthorized excavation.
- D. Rock excavation consists of removal and disposal of materials encountered that cannot be excavated with a 3/4 cubic yard capacity power shovel without drilling, or continuous use of a ripper or other special equipment, except such materials that are classified as earth excavation.
- E. Trench rock excavation consists of removal and disposal of material classified as rock where the least horizontal dimension of required excavation is greater than three feet. Intermittent drilling that may be performed to increase production and is not necessary to permit excavation of material encountered will be classified as earth excavation.

- F. Mass rock excavation consists of removal and disposal of material classified as rock where the least horizontal dimension of required excavation is greater than three feet. Intermittent drilling that may be performed to increase production and is not necessary to permit excavation of material encountered will be classified as earth excavation.
- G. Rock payment lines are limited to the following:
1. Two feet outside of concrete work for which forms are required, except footings.
 2. One foot outside perimeters of footings.
 3. In pipe trenches, 6" below invert elevation of pipe and 2' wider than the outside diameter of pipe, but not less than 3' minimum trench width.
 4. Near outside dimensions of concrete work where no forms are required.
 5. Under slabs on grade, 6" below bottom of concrete slab.
- H. Unauthorized excavation consists of removal of materials beyond indicated elevations or side dimensions without the specific direction of the Architect. Replace unauthorized excavation by backfilling and compacting as specified for authorized excavations of same classification, unless otherwise directed by Landscape Architect.
- I. There will be no additional compensation for excavation, backfilling, concrete fill, or other cost due to unauthorized over-excavation in any direction. The Contractor is responsible for all additional testing costs associated with over-excavation.
- J. Quoted unit prices shall include full compensation for labor, materials, tools, equipment, and incidentals required for excavation, trimming, shoring, dewatering, backfilling, compacting, and other necessary items for complete installation.
- K. Unit prices for the following items, as set forth in the form of Proposal and as provided in the General Conditions, will apply in the event additions to the work are required and authorized by a written order from the Architect to the Contractor.
1. Mass Rock Excavation (per cu. yd.)
 2. Trenched Rock Excavation (per cu. yd.)
- L. Additional Excavation: When excavation has reached required subgrade elevations, notify soil testing laboratory to allow for inspection of conditions. If unsuitable materials are encountered at required subgrade elevations, carry

excavations deeper and replace excavated material as directed by soils testing laboratory.

- M. De-watering: Prevent surface water and subsurface or ground water from flowing into excavations, and flooding project site and surrounding area. Do not allow water to accumulate in excavations. Remove water from excavations to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other de-watering system components necessary to convey water away from site. Convey water removed from excavations and rainwater to collecting or run-off areas. Do not use trench excavations for site utilities as temporary drainage ditches.
- N. Material Storage: Stockpile excavated materials classified as satisfactory soil material where directed, until required for fill. Place, grade and shape stockpiles for proper drainage. Maintain excavated soil materials separately from topsoil stockpile. Dispose of excess unsatisfactory soil material, trash and debris, as specified.
- O. Excavation for Pavements: Cut surface under pavements to comply with cross-sections, elevations, and grades as shown.
- P. Excavation for Trenches: Dig trenches to uniform width required for particular item to be installed, sufficiently wide to provide working room. Excavate trenches to depth indicated or required. Carry depth of trenches for piping to establish indicated flow lines and invert elevations.
- Q. Biocarrier Fabric: Install root control fabric in accordance with manufactures specifications and the project details.

3.02 COMPACTION

- A. General: Control soil compaction during construction, providing the minimum percentage of density specified for each area classification.
- B. Percentage of Maximum Density Requirements: Compact soil to not less than following percentages of maximum dry density for soils which exhibit a well-defined moisture density relationship determined in accordance with ASTM D 698; and not less than following percentages of relative density, determined in accordance with ANSI/ASTM D 4318, D 4253 AND D 4254, for soils which will not exhibit well-defined moisture-density relationship:
 - 1. Unpaved Areas: Compact top 6" of subgrade and each layer of backfill or fill material to not less than 90% of the maximum dry density.

2. Pavements: Compact top 12" of subgrade and each layer of backfill or fill material to not less than 95% of the maximum dry density.
- C. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade, or layer of soil material, to prevent free water appearing on surface during or subsequent to compaction operations. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.

3.03 BACKFILL AND FILL

- A. Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow, strip, or break-up sloped surfaces steeper than 1 vertical to 4 horizontals so that fill material will bond with existing surface.
- B. Placement and Compaction: Place backfill and fill materials in layers not more than 8" in loose depth for material compacted by heavy compaction equipment, and not more than 4" loose depth for material compacted by hand-operated equipment. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content of soil material. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice. Backfill excavations as promptly as work permits, but not until completion of inspection, testing, approval, and recording location of underground utilities, as required.

3.04 GRADING

- A. General: Uniformly grade areas within limits of site grading under this section, including adjacent transition areas. Smooth finished surfaces within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades. Degree of finish required will be that ordinarily obtainable from either blade-grader or scraper operations.
- B. Grading Around Trees: Where excavating, filling, or grading is required within branch spread of trees that are to remain, perform work as follows:

When trenching occurs around trees that are to remain, the tree roots shall not be cut but the trench shall be tunneled under or around the roots by careful hand digging and without injury to the roots.
- C. Unpaved Areas: Finish areas to receive topsoil to within not more than 1" above or below required subgrade elevations, compacted as specified, and free from irregular surface changes.

- D. Pavements: Shape surface of areas under pavement to line, grade and cross-section, with finish surface not more than 1/2" above or below required subgrade elevation, compacted as specified, and graded to prevent ponding of water after rains. Include such operations as plowing, dicing, and any moisture or aerating required to provide optimum moisture content for compaction. Fill low areas resulting from removal of unsatisfactory soil materials, obstructions, and other deleterious materials, using satisfactory soil material. Shape to line, grade, and cross-section as indicated.

3.05 PAVEMENT SUBBASE COURSE

- A. General: Subbase course consists of placing subbase course material, in layers of specified thickness, over subgrade surface to support a pavement base or surface course. See other Division - 2 sections for paving specifications.
- B. Grade Control: During construction, maintain lines and grades including crown and cross-slope of subbase course.
- C. Placing: Place subbase course material on prepared subgrade conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting subbase material during placement operations.

3.06 MAINTENANCE

- A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.
- B. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, re-shape, and compact to required density prior to further construction.

3.07 DISPOSAL OF EXCESS AND WASTE MATERIALS

- A. Removal from Owner's Property: Remove waste materials, including excavated material classified as unsatisfactory soil material, trash and debris, and dispose of it off Owner's property.

END OF SECTION 02200

SECTION 02511
ASPHALT PAVING

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Furnish labor, materials and equipment required to complete all paving, patching, crack sealing, overlaying and preparation of subgrade for all areas to receive paving and other items necessary to complete the work.
- B. Streets to be worked on are as shown on the Drawings.

1.02 REFERENCE STANDARDS

- A. Materials and methods of construction of base and pavement shall conform to the requirements of State of Georgia *Standard Specifications Construction of Transportation Systems*, latest edition.

1.03 JOB CONDITIONS

- A. Store materials only in areas designated for Contractor's use.
- B. Paving operations shall not begin until all underground work of other grades has been completed and all storm drainage structures raised as required in areas which are to be paved.
- C. Asphalt paving shall be done in dry weather when subgrade is sufficiently stable to be properly compacted. Ground moisture shall not be sealed under paving. All work shall be in accordance with applicable section of the Reference Standards.

1.04 SUBMITTALS

- A. Contractor shall submit design mix specification sheet for shop drawing review by the engineer.
- B. Contractor to submit example of granite curb to match existing granite curb for approval prior to ordering the material.

PART 2 - MATERIALS

2.01 ASPHALTIC CONCRETE MIXTURES

- A. Asphaltic concrete mixtures shall conform to section 828 – Hot Mix Asphaltic Concrete Mixtures, of the State of Georgia *Standard Specifications*

Construction of Transportation Systems, latest edition.

2.02 GRADED AGGREGATE BASE

- A. Graded aggregate base shall conform to section 815 – Graded Aggregate, of the State of Georgia *Standard Specifications Construction of Transportation Systems, latest edition.*

2.03 PAVEMENT DESIGN

- A. Road Resurfacing - Superpave HMA, measured after compaction. (Per Plan)
- B. Road Patching – One and a half (1.5) inches of 9.5mm Superpave HMA; one (1) inch or more (up to 6 inches, maximum), depending on the depth of the existing pavement section, of 19mm Superpave HMA, measured after compaction

2.04 ROAD STRIPING PAINT

- A. Road striping line paint shall be in accordance with the State of Georgia *Standard Specifications Construction of Transportation Systems, latest edition.* The color shall be yellow or white to match existing color

2.05 GRANITE CURB

- A. Granite curb exists on the site. New curb will be needed in some locations. New curb shall match the existing granite curb in all areas where new or replacement curb is needed.

2.06 CRACK SEALING

- A. Crack sealing shall be in accordance with Georgia DOT Standard Specifications, Section 407 of the State of Georgia *Standard Specifications Construction of Transportation Systems, latest edition,* and any other sections of the State of Georgia *Standard Specifications Construction of Transportation Systems,* that may be referenced in Section 407. \

PART 3 - INSTALLATION

3.01 INSPECTION

- A. The paving sub-contractor shall examine all areas to be repaired. Any defects which may adversely affect proper installation of this work shall be reported to the City Engineer in writing and shall have been corrected before start of this work. Beginning of work shall signify acceptance of surfaces by the paving sub-contractor.

3.02 SUBGRADE STABILIZATION

- A. The subgrade in areas receiving patching and/or edge repair shall be proof rolled as specified in Section 221, of the State of Georgia *Standard Specifications Construction of Transportation Systems*, latest edition. All defective areas that pump or shove, or are found to be soft, shall be removed and satisfactorily repaired, as specified below, and test rolled again as specified in Section 221 of the State of Georgia *Standard Specifications Construction of Transportation Systems*, latest edition. Subgrade shall be stabilized by removing soft soil and replacing with graded aggregate base.

3.03 BASE

- A. Graded aggregate base, after compaction, shall be smooth and true to established profiles and sections and shall be of the average thickness of six eight (8) inches, varying at no point by no more than three-eighths (3/8) inch.

3.04 PATCH AND EDGE REPAIR

- A. After removing damaged existing asphalt, a course of 19mm Superpave HMA shall be constructed to a minimum of the greater of one (1) inch thick or as thick as the depth of existing pavement, but in no case more than 6 inches thick, as identified above. A course of 9.5mm Superpave HMA shall be constructed at the top of the patch to a thickness of one and a half (1.5) inches. Thickness shall be measured after compaction. Top of patch shall be flush with existing pavement before milling.

3.05 BINDER COURSE (NOT USED IN THIS PROJECT)

- A. After removing damaged existing asphalt by milling operation, a binder course of 9.5mm Superpave HMA shall be constructed a minimum of one (1) inch thick or as thick as the depth of existing pavement, but in no case more than 8 inches thick, as identified above. Thickness shall be measured after compaction.

3.06 CRACK SEALING

- A. Crack Seal all longitudinal and transverse cracks.
- B. Crack Sealing shall be performed for the segment(s) of road shown on the Drawings.
- C. Crack Sealing quantities are expressed in road linear feet. Each road has two lanes. Where a road has more than two lanes, an adjustment will be made to the estimated quantity.

3.07 TACK COAT AND PRIMER COAT

- A. The area to be repaired shall be swept clean of all debris. Apply a primer or tack coat of hot tar at the rate of four tenths (0.4) gallon per square yard. Primer coat (RC70) shall be applied to graded aggregate base and tack coat (AC30) shall be applied to existing asphalt.

3.08 TOP COURSE

- A. Following the binder course, and after sufficient time has passed to determine that the binder course and road base are performing properly, apply Superpave HMA, measured after compaction, as identified above and thoroughly roll evenly in place. Thickness shall be measured after compaction. Type and thickness per plan.

3.09 TESTING THICKNESS

- A. The Contractor, at his expense, will core the asphalt every 1,000 linear feet with a minimum of two (2) cores per road to determine the average thickness of the surface course. The core locations shall be approved by the City Engineer after paving prior to coring.
- B. The average thickness of all specimens shall be at least the specified thickness of the surface course. The average thickness of the cores per road shall be within three sixteenths (3/16) inches of the required thickness. No one core shall have a deficiency of one quarter (1/4) inch.
- C. If the core thickness or average thickness is outside the range stated in 3.08.B, the contractor shall pay the Owner Liquidated Damages in the amount using the following formula:
Liquidated Damages (\$) = (LxWxD) x (148/2000) x (\$75/ton), where
L= road length, feet
W= road width, feet
D= depth of deficiency, feet

3.10 CLEAN UP

- A. At the completion of the work, the Contractor shall clean up all scraps, rubbish and surplus materials caused by this work and haul them away from the site.
- B. Remove all asphaltic materials from adjacent surfaces and leave in neat, clean and orderly condition.

3.11 GUARANTEE

- A. Contractor shall provide the Owner with a one (1) year guarantee and maintenance agreement on all asphalt paving.

END OF SECTION 02511

SECTION 02513

PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes painted markings applied to asphalt and concrete pavement.
- B. Related Requirements:
 - 1. Section 071800 "Traffic Coatings" for painting whole areas of pavements with coatings having an integral wearing surface.
 - 2. Section 099113 "Exterior Painting" for painting exterior concrete surfaces other than pavement.
 - 3. Section 099123 "Interior Painting" for painting interior concrete surfaces other than pavement.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site during regular project meeting.
 - 1. Review methods and procedures related to marking pavement including, but not limited to, the following:
 - a. Pavement aging period before application of pavement markings.
 - b. Review requirements for protecting pavement markings, including restriction of traffic during installation period.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include technical data and tested physical and performance properties.
- B. Shop Drawings: For pavement markings.
 - 1. Indicate pavement markings, colors, lane separations, defined parking spaces, and dimensions to adjacent work.
 - 2. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.
- C. Samples: For each exposed product and for each color and texture specified; on rigid backing, 8 inches square.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of Sections 652, 653, and 657 of the Georgia Department of Transportation for pavement-marking work within a State or County ROW.
- B.
 - 1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for alkyd materials, 55 deg F for water-based materials, and not exceeding 95 deg F.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" the ABA standards of the Federal agency having jurisdiction and ICC A117.1.

2.2 PAVEMENT-MARKING PAINT.

- A. Pavement-Marking Paint: Alkyd-resin type, lead and chromate free, ready mixed, complying with AASHTO M 248; colors complying with FS TT-P-1952.
 - 1. Color: As indicated. – White
- B. Pavement-Marking Paint: MPI #32, solvent-borne traffic-marking paint.
 - 1. Color: As indicated. - White
- C. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, Type II, with drying time of less than 45 minutes.
 - 1. Color: As indicated. – White
- D. Pavement-Marking Paint: MPI #97, latex traffic-marking paint.
 - 1. Color: As indicated. - White
- E. Thermoplastic Pavement Marking: In accord with GDOT Standard 653.
- F. Preformed Plastic Pavement Markings: In accord with GDOT Standard 657.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that pavement is dry and in suitable condition to begin pavement marking according to manufacturer's written instructions.
- B. Proceed with pavement marking only after unsatisfactory conditions have been corrected.

3.2 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.
- B. Allow paving to age for a minimum of 30 days before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum
 - 1. Apply graphic symbols and lettering with paint-resistant, die-cut stencils, firmly secured to pavement. Mask an extended area beyond edges of each stencil to prevent paint application beyond stencil. Apply paint so that it cannot run beneath stencil.

3.3 PROTECTING AND CLEANING

- A. Protect pavement markings from damage and wear during remainder of construction period.
- B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 02513

PART 1 - GENERAL

1.01 SCOPE:

- A. This work shall consist of furnishing all labor, materials and equipment necessary for the construction of concrete curb and concrete combined curb and gutter which shall consist of straight curb and monolithic curb and gutter respectively, constructed of Portland cement concrete, at the locations, and to the lines, grades, cross-section, form and dimensions indicated on the Drawings or as directed by the Owner and in conformity with the provisions and requirements set out in these Specifications.
- B. Form, size and shape of replacement curbs shall match the existing curbs to which the new curb will be attached.
- C. Concrete curb and combined curb and gutter shall include all necessary excavation, unless otherwise indicated, and subgrade preparation; backfilling, and final clearing up; and completion of all incidentals thereto, as indicated on the Drawings or as directed by the Landscape Architect.
- D. Staking requirements outlined in Supplemental Conditions shall apply to this section.

1.02 PRODUCT HANDLING:

- A. Protection: Use all means necessary to protect concrete materials before, during and after installation and to protect the installed work and materials of all other trades.
- B. Replacement: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 CONCRETE REINFORCEMENT:

- A. Concrete reinforcement shall conform to the requirements of ASTM A 615, (Grade 60) and applicable criteria within Section 03300 of these specifications.

2.02 CONCRETE AND RELATED MATERIALS:

- A. General: Concrete and related materials including, but not necessarily limited to, joint materials, membranes and curing compounds shall conform to Section 03300 of these Specifications.
- B. Class: All concrete shall be Class "A" (compressive strength at 28 days = 4,000 psi) conforming to applicable requirements of Section 03300 of these specifications.
- C. Water used in mixing concrete shall be fresh, clean, potable water free from injurious amounts of oil, acid, alkali, vegetable, wastewater and/or organic matter. Water shall be considered as weighing 8.33 pounds per gallon.
- D. Admixtures shall meet the following requirements:
 - 1. Except as herein specified, no curative or hardening admixtures shall be used.

2. An air entrainment agent capable of providing three to six percent air shall be used. Air entraining admixtures, which are added to concrete mixtures, shall conform to ASTM C 260 for Air Entraining Admixtures for Concrete.
- E. Sub-base shall be constructed of durable material such as crushed stone, crushed limestone, bank-run gravel, blast furnace slag or steam-boiler cinders. Minimum depth of sub-base below curbing shall be 2-inches.
- F. Joint filler shall be a non-extruding joint material conforming to AASHTO M213 for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (non-extruding and resilient bituminous types). The filler for each joint shall be furnished in a single piece for the full depth and width required for the joint unless otherwise specified by the Owner.

2.03 OTHER MATERIALS:

All other materials, not specifically described, but required for complete and proper installation of the work of this Section shall be as selected by the Contractor subject to the approval of the Project Landscape Architect.

PART 3 - EXECUTION

3.01 EARTHWORK:

- A. General: All earthwork shall be performed in accordance with Section 02200 of these Specifications and as specified in this Section.
- B. Backfilling:
 1. After the concrete has set sufficiently, the spaces on both sides of the gutter and combined curb and gutter shall be backfilled, and the materials compacted and left in a neat condition.
 2. Curbs to be used in the construction of asphalt pavements shall be backfilled prior to placement of base material.

3.02 INSTALLATION:

- A. Concrete Reinforcement: All concrete reinforcement shall be installed in accordance with ASTM A615.
- B. Forming:
 1. Forms shall be metal and of an approved section. They shall be straight, free from distortions, and shall show no vertical variation greater than 1/8-inch in 10 feet and shall show no lateral variation greater than 1/4-inch in 10 feet from the true plane surface on the vertical face of the form.
 2. Forms shall be of the full depth of the structure and be so constructed as to permit the inside forms to be securely fastened to the outside forms.
 3. Securely hold forms in place true to the lines and grades indicated on the Drawings.
 4. Wood forms may be used on sharp turns and for special sections as approved by the Owner.
 5. Where wooden forms are used, they shall be free from warp and the nominal depth of the structure.

6. All mortar and dirt shall be removed from forms and all forms shall be thoroughly oiled or wetted before any concrete is deposited.
 7. The supply of forms shall be sufficient to permit their remaining in place at least 12 hours after the concrete has been placed.
- C. Concrete: Concrete shall be placed in accordance with Section 03300 of these Specifications.
- D. Joints:
1. Joints shall be constructed as indicated on the Drawings and as specified.
 2. Construct joints true to line with their faces perpendicular to the surface of the structure and within 1/4-inch of their designated position.
 3. Thoroughly spade and compact the concrete at the faces of all joints to fill all voids.
 4. Install expansion joint materials at the point of curve at all street returns.
 5. Install expansion joint material behind the curb at abutment to sidewalks and adjacent structures.
 6. Place contraction joints every 10 feet along the length of the curbs and gutters.
 7. Form contraction joints using steel templates or division plates which conform to the cross section of the structure. Leave the templates in place until the concrete has set sufficiently to hold its shape but remove them while the forms are still in place.
 8. Contraction joint templates or plates shall not extend below the top of the steel reinforcement or shall be notched to permit the reinforcement to be continuous through the joint.
 9. Contraction joints shall be a minimum of 1-1/2-inches deep.
- E. Finishing:
1. Strike off the surface with a template and finish the surface with a wood float using heavy pressure, after which contraction joints shall be made and the surface finished with a wood float or steel trowel.
 2. Finish the face of the curbs at the top and bottom with an approved finishing tool of the radius indicated on the Drawings.
 3. Finish edges with an approved finishing tool having a 1/4-inch radius.
 4. Provide a final broom finish by lightly combing with a stiff broom after troweling is complete.
 5. The finished surface shall not vary more than 1/8-inch in 10 feet from the established grade.
- F. Concrete Curing:
1. After finishing operations have been completed and immediately after the free water has left the surface, the surface of the structure shall be completely coated and sealed with a uniform layer of curing compound.
 2. The compound shall be applied in one or two applications as directed by the Owner. When the compound is applied in two increments, the second application shall follow the first application within 30 minutes.
 3. The compound shall be applied continuously by means of an automatic self-propelled, pressure sprayer as approved by the Owner at the rate directed by the Owner, but not less than one gallon per 200 square feet of surface.
 4. The equipment shall provide adequate stirring of the compound during application.
 5. Should the method of applying the compound not produce uniform coverage, its use shall be discontinued, and the curing shall be by another method approved by the Owner.

- G. Protection:
 - 1. Provide and use sufficient coverings for the protection of the concrete in case of rain or breakdown of curing equipment.
 - 2. Provide necessary barricades and lights to protect the work and rebuild or repair to the approval of the Owner. All damage caused by people, vehicles, animals, rain, the Contractor's operations and the like shall be repaired by the Contractor at no additional expense to the Owner.
- H. Driveway and Sidewalk Ramp Openings:
 - 1. Provide driveway openings of the widths and at locations as indicated on the Drawings and directed by the Project Landscape Architect.
 - 2. Provide sidewalk ramp openings as indicated on the Drawings in conformance with the applicable regulations and as directed by the Project Landscape Architect.

3.03 PATCHING:

- A. Inspect, patch and repair all concrete in accordance with the requirements of these Specifications.

3.04 ROAD AND DRAINAGE EXCAVATION:

- A. Site excavation, as indicated on the Drawings or as directed by the Owner, shall be performed in accordance with the requirements of Section 02200 of these Specifications.

3.05 SUBGRADE PREPARATION:

- A. The subgrade shall be formed by excavating to the required depth below the finished surface of the respective types, in accordance with the dimensions and designs indicated on the Drawings or as directed by the Owner, and shall be of such width as to permit the proper installation and bracing of forms. The subgrade shall be compacted by hand tamping and all soft, yielding or unsuitable material shall be removed and backfilled with satisfactory material and again compacted thoroughly and finished to a smooth and unyielding surface. The finished grade shall be to the dimensions and design indicated on the Drawings or as directed by the Owner for the bottom of the proposed construction.

3.06 CLEANING:

- A. All excess or unsuitable material shall be disposed of in a manner satisfactory to the Owner.
- B. Final clean up shall be performed in accordance with the requirements of these Specifications.
- C. All material becoming the property of the Owner shall be stored in a manner and at locations near or on the Project as directed by the Owner.

END OF SECTION 02521

SECTION 02630

STORM DRAINAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes storm drainage components on the site.
- B. Related Sections include the following:
 - Section 02200 Earthwork
 - Section 02700 Grouthing of Storm Sewer
 - Section 02723 Intlets
 - Section 03300 Cast-in-Place Concrete

1.3 DEFINITIONS

- A. ABS: Acrylonitrile-butadiene-styrene plastic.a
- B. EPDM: Ethylene-propylene-diene-monomer rubber.
- C. PE: Polyethylene plastic.
- D. PVC: Polyvinyl chloride plastic.
- E. RCP: Reinforced Concrete Pipe

1.4 PERFORMANCE REQUIREMENTS

- A. Gravity-Flow, Nonpressure-Piping Pressure Ratings: At least equal to system test pressure.

1.5 SUBMITTALS

- A. Product Data: For the following:
 - 1. Polymer-concrete, channel drainage systems.
 - 3. Backwater valves, cleanouts, and drains.
 - 4. Plastic dry wells.
 - 5. Stormwater disposal systems.
- B. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic structures, pipe, and fittings in direct sunlight.
- B. Protect pipe, pipe fittings, and seals from dirt and damage.
- C. Handle precast concrete manholes and other structures according to manufacturer's written rigging instructions.

1.7 PROJECT CONDITIONS

- A. Site Information: Perform site survey, research public utility records, and verify existing utility locations.
- B. Locate existing structures and piping to be closed and abandoned.
- C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Architect not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Architect's written permission.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products meeting the specifications.

2.2 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe and fitting materials.

2.3 PIPES AND FITTINGS

- A. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C 76, Wall C, for gasketed joints.
 - 1. Gaskets: ASTM C 443, rubber.

2.4 SPECIAL PIPE COUPLINGS AND FITTINGS

- A. Sleeve-Type Pipe Couplings: ASTM C 1173, rubber or elastomeric sleeve and band assembly fabricated to mate with OD of pipes to be joined, for nonpressure joints.
 - 1. Sleeve Material for Concrete Pipe: ASTM C 443, rubber.
- B. Bushing-Type Pipe Couplings: ASTM C 1173, rubber or elastomeric bushing fabricated to mate with OD of smaller pipe and ID of adjoining larger pipe, for nonpressure joints.
 - 1. Material for Concrete Pipe: ASTM C 443, rubber.

2.6 MANHOLES

- A. Normal-Traffic Precast Concrete Manholes: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for rubber gasketed joints.
 - 1. Diameter: 48 inches minimum, unless otherwise indicated.
 - 2. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
 - 3. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
 - 4. Riser Sections: 4-inch minimum thickness, and lengths to provide depth indicated.
 - 5. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
 - 6. Gaskets: ASTM C 443, rubber.
 - 7. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch- diameter frame and cover.
 - 8. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into base, riser, and top section sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.
 - 9. Steps: ASTM C 478, individual steps or ladder. Omit steps for manholes less than 60 inches deep.
 - 10. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
- B. Heavy-Traffic Precast Concrete Manholes: ASTM C 913; designed according to ASTM C 890 for A-16, heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for rubber gasketed joints.
 - 1. Ballast: Increase thickness of one or more precast concrete sections or add concrete to structure, as required to prevent flotation.
 - 2. Gaskets: Rubber.

3. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and cover.
 4. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into base, riser, and top section sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.
 5. Steps: Manufactured from deformed, 1/2-inch steel reinforcement rod complying with ASTM A 615/A 615M and encased in polypropylene complying with ASTM D 4101. Include pattern designed to prevent lateral slippage off step. Cast or anchor into sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.
 6. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
- C. Cast-in-Place Concrete Manholes: Construct of reinforced-concrete bottom, walls, and top; designed according to ASTM C 890 for A-16, heavy-traffic, structural loading; of depth, shape, dimensions, and appurtenances indicated.
1. Ballast: Increase thickness of concrete, as required to prevent flotation.
 2. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch- diameter frame and cover.
 3. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.
 4. Steps: Manufactured from deformed, 1/2-inch steel reinforcement rod complying with ASTM A 615/A 615M and encased in polypropylene complying with ASTM D 4101. Include pattern designed to prevent lateral slippage off step. Cast or anchor into sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.
- E. Manhole Frames and Covers: ASTM A 536, Grade 60-40-18, ductile-iron castings designed for heavy-duty service. Include 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch-diameter cover. Include indented top design with lettering "STORM SEWER" cast into cover.

2.7 CATCH BASINS

- A. Normal-Traffic, Precast Concrete Catch Basins: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for rubber gasketed joints.
1. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
 2. Riser Sections: 4-inch minimum thickness, 48-inch diameter, and lengths to provide depth indicated.

3. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
 4. Gaskets: ASTM C 443, rubber.
 5. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and grate.
 6. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast steps or anchor ladder into base, riser, and top section sidewalls at 12- to 16-inch intervals. Omit steps for catch basins less than 60 inches deep.
 7. Steps: ASTM C 478, individual steps or ladder. Omit steps for catch basins less than 60 inches deep.
 8. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
- B. Heavy-Traffic, Precast Concrete Catch Basins: ASTM C 913, precast, reinforced concrete; designed according to ASTM C 890 for A-16, heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for rubber gasketed joints.
1. Gaskets: Rubber.
 2. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and grate.
 3. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast steps or anchor ladder into base, riser, and top section sidewalls at 12- to 16-inch intervals. Omit steps for catch basins less than 60 inches deep.
 4. Steps: Manufactured from deformed, 1/2-inch steel reinforcement rod complying with ASTM A 615/A 615M and encased in polypropylene complying with ASTM D 4101. Include pattern designed to prevent lateral slippage off step. Cast or anchor into sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.
 5. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
- C. Cast-in-Place Concrete, Catch Basins: Construct of reinforced concrete; designed according to ASTM C 890 for structural loading; of depth, shape, dimensions, and appurtenances indicated.
1. Bottom, Walls, and Top: Reinforced concrete.
 2. Channels and Benches: Concrete.
 3. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast steps or anchor ladder into sidewalls at 12- to 16-inch intervals. Omit steps for catch basins less than 60 inches deep.
 4. Steps: Manufactured from deformed, 1/2-inch steel reinforcement rod complying with ASTM A 615/A 615M and encased in polypropylene complying with

ASTM D 4101. Include pattern designed to prevent lateral slippage off step. Cast or anchor into sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.

- D. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for heavy-duty service. Include flat grate with small square or short-slotted drainage openings.
 - 1. Size: 24 by 24 inches minimum, unless otherwise indicated.
 - 2. Grate Free Area: Approximately 50 percent, unless otherwise indicated.
- E. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for heavy-duty service. Include 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch-diameter flat grate with small square or short-slotted drainage openings.
 - 1. Grate Free Area: Approximately 50 percent, unless otherwise indicated.

2.8 STORMWATER INLETS

- A. Curb Inlets: Made with vertical curb opening, of materials and dimensions according to utility standards.
- B. Gutter Inlets: Made with horizontal gutter opening, of materials and dimensions according to utility standards. Include heavy-duty frames and grates.
- C. Combination Inlets: Made with vertical curb and horizontal gutter openings, of materials and dimensions according to utility standards. Include heavy-duty frames and grates.
- D. Frames and Grates: Heavy-duty frames and grates according to utility standards..
- E. Curb Inlets: Vertical curb opening, of materials and dimensions indicated.
- F. Gutter Inlets: Horizontal gutter opening, of materials and dimensions indicated. Include heavy-duty frames and grates.
- G. Combination Inlets: Vertical curb and horizontal gutter openings, of materials and dimensions indicated. Include heavy-duty frames and grates..
- H. Frames and Grates: Dimensions, opening pattern, free area, and other attributes indicated.
 - 1. Material: ASTM A 536, Grade 60-40-18 minimum, ductile-iron casting.
 - 2. Material: ASTM A 48, Class 30 minimum, gray-iron casting..
 - 3. Grate Free Area: Approximately 50 percent, unless otherwise indicated.

2.10 CONCRETE

A. General: Cast-in-place concrete according to ACI 318, ACI 350R, and the following:

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 3000 psi minimum, with 0.45 maximum water-cementitious ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

C. Structure Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 3000 psi minimum, with 0.45 maximum water-cementitious ratio.

1. Include channels and benches in manholes.
 - a. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
 - 1) Invert Slope: 2 percent through manhole.
 - b. Benches: Concrete, sloped to drain into channel.
 - 1) Slope: 8 percent.
 - 2) Slope: 4 percent.
2. Include channels in catch basins.
 - a. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
 - 1) Invert Slope: 1 percent through catch basin.
 - 2) Invert Slope: 2 percent through catch basin.

D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water-cementitious ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

2.11 PIPE OUTLETS

- A. Head Walls: Cast-in-place reinforced concrete, with apron and tapered sides.
- B. Riprap Basins: Broken, irregular size and shape, graded stone.
 - 1. Average Size: NSA No. R-5, screen opening 5 inches.
- C. Filter Stone: NSA No. FS-2, No. 4 screen opening, average-size, graded stone.
- D. Energy Dissipators: NSA No. A-1, 3-ton average weight armor stone, unless otherwise indicated.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Excavating, trenching, and backfilling are specified in Division 2 Section "Earthwork."

3.2 IDENTIFICATION

- A. Materials and their installation are specified in Division 2 Section "Earthwork." Arrange for installing green warning tapes directly over piping and at outside edges of underground structures.
 - 1. Use warning tape or detectable warning tape over ferrous piping.
 - 2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.3 PIPING APPLICATIONS

- A. General: Include watertight, silttight, or soiltight joints, unless watertight or silttight joints are indicated.
- B. Refer to Part 2 of this Section for detailed specifications for pipe and fitting products listed below. Use pipe, fittings, and joining methods according to applications indicated.
- C. Gravity-Flow Piping: Use the following:
 - 1. NPS 4 and NPS 6: High Density Polyethylene pipe and fittings, connecting bands, and banded joints..
 - 2. NPS 8 to NPS 15: High Density Polyethylene pipe and fittings, connecting bands, and banded joints.
 - 3. NPS 18 to NPS 36: High Density Polyethylene pipe and fittings, connecting bands, and banded joints.

3.4 SPECIAL PIPE COUPLING AND FITTING APPLICATIONS

- A. Special Pipe Couplings: Use where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods.
 - 1. Use the following pipe couplings for nonpressure applications:
 - a. Sleeve type to join piping, of same size, or with small difference in OD.
 - b. Increaser/reducer-pattern, sleeve type to join piping of different sizes.
 - c. Bushing type to join piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.
 - 2. Use pressure-type pipe couplings for force-main joints. Include PE film, pipe encasement.
- B. Special Pipe Fittings: Use where indicated. Include PE film, pipe encasement.

3.5 INSTALLATION, GENERAL

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line, and pull past each joint as it is completed.
- C. Use manholes for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.
- D. Use proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- E. Install gravity-flow piping and connect to building's storm drains, of sizes and in locations indicated. Terminate piping as indicated.
 - 1. Install piping pitched down in direction of flow, at minimum slope of 1 percent, unless otherwise indicated.
 - 2. Install piping with 12-inch minimum cover.
- F. Extend storm drainage piping and connect to building's storm drains, of sizes and in locations indicated. Terminate piping as indicated.

- K. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed by tunneling, jacking, or a combination of both.

3.6 PIPE JOINT CONSTRUCTION AND INSTALLATION

- A. General: Join and install pipe and fittings according to installations indicated.
- B. Refer to Division 2 Section "Utility Materials" for basic piping joint construction and installation
- C. Concrete Pipe and Fittings: Install according to ACPA's "Concrete Pipe Installation Manual." Use the following seals:
 - 1. Round Pipe and Fittings: ASTM C 443, rubber gaskets.
- D. System Piping Joints: Make joints using system manufacturer's couplings, unless otherwise indicated.
- E. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and that fit both systems' materials and dimensions.

3.7 MANHOLE INSTALLATION

- A. General: Install manholes, complete with appurtenances and accessories indicated.
- B. Form continuous concrete channels and benches between inlets and outlet.
- C. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 24 inches above finished surface elsewhere, unless otherwise indicated.
- D. Install precast concrete manhole sections with gaskets according to ASTM C 891.
- E. Construct cast-in-place manholes as indicated.
- F. Install fiberglass manholes according to manufacturer's written instructions.

3.8 CATCH-BASIN INSTALLATION

- A. Construct catch basins to sizes and shapes indicated.
- B. Set frames and grates to elevations indicated.

3.9 STORM DRAINAGE INLET AND OUTLET INSTALLATION

- A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.
- B. Construct riprap of broken stone, as indicated.
- C. Install outlets that spill onto grade, anchored with concrete, where indicated.
- D. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.
- E. Construct energy dissipators at outlets, as indicated.

3.10 CONCRETE PLACEMENT

- A. Place cast-in-place concrete according to ACI 318 and ACI 350R.

3.11 DRAINAGE SYSTEM INSTALLATION

- A. Assemble and install components according to manufacturer's written instructions.
- B. Assemble and install stainless-steel drainage systems according to ASME A112.3.1 and manufacturer's written instructions.
- C. Install with top surfaces of components, except piping, flush with finished surface.
- D. Assemble channel sections to form slope down toward drain outlets. Use sealants, adhesives, fasteners, and other materials recommended by system manufacturer.
- E. Embed channel sections and drainage specialties in 4-inch (100-mm) minimum concrete around bottom and sides.
- F. Fasten grates to channel sections if indicated.
- G. Assemble trench sections with flanged joints.
- H. Embed trench sections and drainage specialties in 4-inch (100-mm) minimum concrete around bottom and sides.
- I. Make piping connections and install stainless-steel piping with gasketed joints between system components.

3.12 DRAIN INSTALLATION

- A. Install type of drains in locations indicated.
- B. Embed drains in 4-inch minimum depth of concrete around bottom and sides.

- C. Fasten grates to drains if indicated.
- D. Set drain frames and covers with tops flush with pavement surface.

3.14 CLOSING ABANDONED STORM DRAINAGE SYSTEMS

- A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:
 - 1. Close open ends of piping with at least 8-inch-thick, brick masonry bulkheads.
 - 2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.
 - 3. Pump remaining pipe full of grout.
- B. Abandoned Structures: Excavate around structure as required and use one procedure below:
 - 1. Remove structure and close open ends of remaining piping.
 - 2. Remove top of structure down to at least 36 inches (1000 mm) below final grade. Fill to within 12 inches (300 mm) of top with stone, rubble, gravel, or compacted dirt. Fill to top with concrete.
 - 3. Backfill to grade according to Division 2 Section "Earthwork."

3.15 FIELD QUALITY CONTROL

- A. Clear interior of piping and structures of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed.
 - 1. In large, accessible piping, brushes and brooms may be used for cleaning.
 - 2. Place plug in end of incomplete piping at end of day and when work stops.
 - 3. Flush piping between manholes and other structures to remove collected debris, if required by authorities having jurisdiction.
- B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches (600 mm) of backfill is in place, and again at completion of Project.
 - 1. Submit separate reports for each system inspection.
 - 2. Defects requiring correction include the following:
 - a. Alignment: Less than full diameter of inside of pipe is visible between structures.

- b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
 - c. Crushed, broken, cracked, or otherwise damaged piping.
 - d. Infiltration: Water leakage into piping.
 - e. Exfiltration: Water leakage from or around piping.
3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

END OF SECTION 02630

SECTION 02700

GROUTING OF STORM SEWER LINES

PART 1 - GENERAL

1.1 CLEANING

A. The term “cleaned” shall mean the removal of all sand, dirt, roots, grease and all other solids or semi-solid materials from the sewer lines. Grouting repairs shall be conducted immediately following cleaning.

1. Cleaning Equipment

a. The contractor shall provide all equipment necessary for cleaning the sanitary sewers. The equipment used shall be suitable for the sewer conditions and degree of cleaning necessary. The equipment shall meet the following criteria:

1) Mechanically powered equipment:

a) A heavy-duty power rodding machine shall be capable of rodding distances of up to 1,000 feet in one step-up. It shall have the ability to spin the rod either clockwise or counterclockwise, but able to be pushed straight out or pulled back without rotating the machine. It shall also be capable of pulling pipe-size swabs or brushes back through the pipeline for cleaning and flushing purposes. A heavy-duty bucket machine shall be used on dragline work to clean the pipeline with buckets, brushes, scrapers, swabs or other similar devices in order to effectively remove the debris and provide a clean sewer or service lateral.

2) Hydro cleaning Equipment:

a) Hydraulic high-pressure sewer cleaners used for sanitary and storm sewer cleaning shall be specifically designed and constructed for such cleaning. The sewer cleaner shall have a minimum usable water capacity of 600 gallons and pump capable of delivering at least 30 gallons per minute (GPM) at 1,000 psi. Pressure to the nozzle shall be regulated by a relief valve adjustable from 1-1,500 psi minimum.

b) Satisfactory precautions shall be taken to protect the sewer from damage that might be inflicted by the improper use of cleaning equipment. Sewers or service laterals damaged, as a result of the Contractor’s operations shall be promptly repaired by the Contractor at no cost to the City. This includes damage caused by any materials (liquid or solid) that are blown or pushed back in residents’ home through the sewer laterals.

c) All equipment, devices and tools required for this Contract shall be owned (or leased) and operated by the Contractor.

2. Cleaning Sewers
 - a. Selection of sewer cleaning equipment shall be based on the conditions of the sewers at the time the work commences. If cleaning an entire reach of sewer cannot be completed from one manhole, the Contractor shall move to another manhole to complete the work. If the Contractor cannot successfully complete the work after relocating his equipment, the City shall be notified immediately.
 - b. Remove all sludge, dirt, sand, grease, roots, and other materials from the pipe and collect and remove resulting debris from the downstream manhole of the sewer section being cleaned. Passing material from section to section which could be detrimental to pumping equipment or cause accumulations in wet wells will not be permitted. When necessary, an approved dam or weir shall be constructed in the downstream manhole in such a manner that construction debris and solids will be trapped and retained.
 - c. All roots must be removed prior to grouting. If roots are detected during the sealing of joint/defects/service laterals in a reach, the Contractor will be required to remove his grouting equipment from the line, re-clean to effect root removal and reinsert the grouting equipment to the point where the grouting was stopped and continue the operation.
 - d. Existing flows shall not be interrupted for periods longer than one hour without prior written approval from the City. Sewage diverted during cleaning operations shall be returned to the sanitary system and not discharged into the streams or storms drain system. Cleaning of these sewers by means of hydraulic high-pressure jetting will be permitted.
3. Disposal of Debris
 - a. Under no circumstances shall sewage or solids be dumped onto the ground surface, streets or into ditches, catch basins or storm drains.
 - b. All solids or semi-solids resulting from the operations shall be removed from the site by the Contractor. Trucks hauling solids or semi-solids from the site shall be watertight so that no leakage or spillage will occur.
 - c. Disposal shall be at a suitable site selected by the Contractor and approved by the appropriate jurisdictional personnel.
4. Re-Cleaning
 - a. If pipeline is found not to be properly cleaned in the opinion of the City, the television and grouting equipment shall be removed, and the sewer re-cleaned at no additional expense to the City.

1.2 GROUTING

- A. Prior to commencement of joint air testing, the test equipment shall be positioned on a section of sound sewer pipe between pipe joints, and a demonstration performed as described herein. The procedure will demonstrate the authenticity of the air test equipment, as no joint will test in excess of the pipe capability. Should it be found that the barrel of the sewer pipe will not meet the joint test requirements, then the

requirements will be modified to within the pipe integrity limits. If this test cannot be performed successfully, the Contractor shall be instructed to repair or otherwise modify his equipment and re-perform the test until the results are satisfactory to the City. This test may be required at any other time during the joint testing program if the City suspects the testing equipment is not functioning properly.

1. Pipe grouting equipment – general requirements
 - a. The Contractor shall submit his equipment list to the City.
 - b. The Contractor shall allow the City to inspect his equipment. It shall be approved prior to use in the field.
 - c. The Contractor shall also demonstrate to the City the operation of and information provided by any gauges, motors or other readouts relating to the pipe and grouting work. This shall include the air test pressure gauge, the linear footage counter, volume of sealing material, etc.
 - d. No work shall be considered for payment where measurement equipment and/or measuring techniques are unacceptable to the City at any time during the joint sealing program.

2. Chemical Grout Equipment
 - a. Equipment shall be a remote-controlled grout injection rig type with inflatable diaphragms or packers at each end and other suitable approved devices which can be positioned to completely isolate each joint or break in the pipe and simultaneously permit sewage flow.
 - b. Equipment shall consist of two (2) open chemical tanks as the chemical reservoir, from which two (2) positive displacement electric pumps are fed for chemical injection with a combined discharge of no less than 5 GPM at pressures ranging from 1 to 800 psi.
 - c. All components in the catalyst system shall be stainless steel, plastics or neoprene. Standard construction materials may be used for the components of the grout and inhibitor system.

3. Grouting materials for pipe
 - a. The sealing materials shall be a chemical grout and catalyst system. The chemical grout used shall have a documented service of satisfactory performance in similar usage. The grout used shall be Avanti AV-100®, AV-118® or approved equal.
 - b. All the materials shall be delivered to the site in undamaged, unopened containers bearing the manufacturer's original labels. Invoices or other means of providing delivery no more than three months prior to use shall be provided to the Engineer.
 - c. Materials shall have the following minimum properties:
 - 1) A controllable reaction of from five (5) seconds to no more than six (6) hours, at a temperature from ambient to freezing.
 - 2) Viscosity of approximately 2.0 centipoise water which can be increased with additives.
 - 3) Viscosity to remain constant throughout the reaction period.

- 4) The ability to tolerate some dilution and react in moving water.
 - 5) The final reaction shall produce a continuous, irreversible, impermeable, nonporous still gel in pure form, or a stabilized soil in the ground that will not become rigid or brittle.
 - 6) Root inhibitors, such as dichlobenil, shall be incorporated in the mix when roots are present in the joints. If a root inhibiting grout is unavailable from the grout manufacturer, the Contractor shall incorporate Casoron W50, dichlobenil or equal, at no cost to the City, into the grout mix in a quantity and manner recommended by the manufacturer. In so doing, the Contractor specifically covenants and agrees with the City that it shall make no claim against the City for any damages that it may incur as a result of any adverse effect the chemical Casoron W50, dichlobenil or equal may have upon the Contractor's equipment.
 - 7) Use of catalyst containing dimethyl propionitrile (DMAPN) is prohibited.
 - 8) Sealing materials, in place, shall contain no less than 10% of the acrylic base material by volume.
- d. The specified materials are considered toxic and irritants to skin and eyes. Therefore, personnel thoroughly familiar with the handling of the chemicals involved shall do the mixing, handling, and pumping of the chemicals. Proper protection outerwear, including eye protection and respirators for dust inhalation protection, shall be used while mixing or when otherwise exposed to by close contact.
- 1) Chemical Grout
 - a) The chemical grout shall consist of an intimate mixture of dry Acrylamide and dry N.N. – Methylene-biscrylamide, in such proportions that dilute aqueous solutions, when properly catalyzed, will form still gels.
 - b) The grout must make a true solution at concentrations as high as the pounds per gallon water.
 - c) The chemical solution shall have the ability to tolerate groundwater dilution, and to react in moving water.
 - d) The solution shall have the ability to tolerate groundwater dilution, and to react in moving water.
 - e) The solution shall have a viscosity of less than 2 cps which remains constant until gelatin occurs.
 - f) The reaction time shall be controllable from 5 seconds to 6 hours, at temperatures from ambient to freezing.
 - 2) Catalyst
 - a) The catalyst for the chemical grout shall be Ammonium Persulfate
 - 3) Activator

- a) The activator shall be Triethanolamine (T). Activators shall be used with catalyst for all applications at ambient temperature or below.
 - 4) Dye Tracers
 - a) Dyes may be added to the chemical grout solution for ease in identification. Fluorescein, at concentrations of less than 20 ppm, may be used for this purpose. All other dyes must be checked for possible undesirable prior to use.
 - 5) Insoluble (particulate) Additives
 - a) Any inactive solid such as clay or diatomaceous earth may be mixed with the grout as a filler, in any amounts compatible with pumpability and does not affect the quality of the grout. Bentonite may be used to increase the viscosity and strengthen the gel.
 - 6) Other Additives
 - a) The effects of additives not specifically mentioned above must be determined by test, prior to approval for field use.
4. Joint Air Tests
- a. The Contractor shall be required to air test all sanitary sewer line joints prior to any grouting to determine if the potential for joint leakage exists. The air testing procedures will be as described herein.
 - b. Joint air testing shall be performed by a void pressure monitoring system. This shall be accomplished by applying a positive air pressure to the joint, allowing time for the system to stabilize and measure the amount of pressure drop over a given length of time.
 - c. Testing shall be accomplished by isolating the area to be tested with the packer of grouting rig and applying a positive pressure into the void area. Continuous monitoring of the void pressures shall be maintained at all times by means of a pressure testing unit. The pressure meter sensing device shall be located within the void area and accurately transmit this pressure to a readout device located at the technician's TV monitor control panel. The system shall display gauge pressure to the nearest tenth (1/10th) psi and shall respond to and record any change on the void pressure instantly. All pressure measurements shall be made at the void area.
 - d. Testing procedures shall generally consist of applying pressure of ½ psi per foot of depth plus one to two psi or a maximum of 10 psi onto each void area created by the testing device. Where sewers are extremely shallow, deep or in poor condition, the City will adjust the required pressure accordingly. Once the specified pressure in the void area has been displayed on the meter above ground, the application of pressure shall be stopped, and a five-second stabilization period shall commence. The meter shall be observed for 20 seconds and should the pressure in the void area drop more than ½ psi, the joint will have failed the test.

- e. Upon completing the air testing of each joint, the packer shall be deflated. Should the void pressure meter fail to drop to zero, the Contractor shall be instructed to clean his equipment, or make the necessary repairs to provide for an accurate Void Pressure reading.
 - f. Any joint failing the air test prior to grouting shall be sealed as specified herein and retested by the same void pressure method and procedures following sealing to verify the effectiveness of the sealing. This procedure will be repeated until the joint passes the test. Additional sealing and retesting after the initial sealing and retesting shall be at no cost to the City.
5. Sealing Joints
- a. The Contractor shall be required to seal any or all pipe joints, leaks, breaks, holes and other sources of possible groundwater infiltration within a sewer line or service lateral as may be observed on recorded television inspection, and as described herein. Any joint that is sealed shall subsequently be tested by air testing procedures described herein. Costs related to the air test following the sealing will not be measured for payment nor constitute additional cost to the Contract Price but will be considered as incidental to the Contract.
 - b. All pipe joints and breaks shall be sealed by an internal, chemical grouting method. The method used shall not damage, break, move or cause settlement of sewer pipe or manhole structures, and shall be such that the original cross-sectional area and shape of the interior of the sewer shall not be permanently reduced or changed. Any sewer that the City may deem damaged as a result of the Contractor's operations shall be promptly repaired to the City's satisfaction at no expense.
 - c. Sealing materials that set to be hard, rigid product capable of intrusion into the sewer line will not be acceptable.
 - d. If roots were detected during the television inspection, these roots shall be removed immediately prior to any grouting operations. Costs related thereto will not be measured for payment nor constitute additional cost to the Contract Price, but will be considered as incidental to the Contract, unless chemical root removal is recommended by the City.
 - e. If, as determined by the City, concrete sewer pipe had become corroded to the degree that a positive air test cannot be achieved, the Contractor shall direct the back-pressure gaging be monitored to determine a proper seal.
6. Application of Chemical Grout
- a. Provide chemical grouting of sewer joints, leaks, and breaks in the pipe by forcing sealing materials into and through any or all pipeline joints, leaks, or breaks, from within the sewer pipe. If grouting operations restrict or prevent simultaneous sewage flow passage, approved plug or by-pass pumping will be required. Maximum interruption of existing flows shall be limited to one hour unless the City gives prior written approval.

- b. The grouting injection rig shall be positioned over the sewer joint, leak, or break in the pipe by means of a closed-circuit television camera in the line. Accurate measurement of the location of the joint to be sealed shall be made, using a portion of the grouting rig as “Datum” or measurement point shall also be measurement point. Such measurement or point shall also be used to record measurement of the repaired joint. The grouting device shall be an open-ended cylindrical casing type of a size less than the pipe diameter with two cables connected to both ends to pull it back and forth or positioning it in the line. Any inflatable sleeves that require extreme pressure to “seat” against the periphery of the pipe causing pipe fracture will not be allowed. The sleeves shall be pneumatically expanded from the center to both ends. When in an inflated state, two widely spaced annular bladders shall have been formed, each of elongated shape and producing an annular void around the center portion of the casing. Expansion shall be regulated by precise pressure gages and control. No device which is expanded mechanically will be allowed. The pneumatically expanded sleeves shall seat against the inside periphery of the pipe in such a way as to form a voided area completely isolated from the remainder of the line. Two conduits shall pass through one end of the casing and shall be adapted to supply the sealing material, under pressure, to the space at the center of the casing. Into the isolated area, through hose lines leading from above ground, the chemical sealant shall be pumped with instant reading, metered flow controlled, proportioning pumps with pressure in excess of groundwater pressures.
- c. The television, pumping, grouting and air pressure monitoring equipment shall be integrated so that proportions, quantities, and void pressure for materials and sealing can be instantly monitored and regulated in accordance with the type and size of the joint, break in the pipe or leak, void pressure changes and the rate of flow of the sealing solution in relation to the back pressures in order to effect a seal with a minimum amount of material.
- d. In the event that large voids are encountered on the outside of the sewer, including the possibility of “piping” holes to the ground surface which could cause excessive use of grout, a change in operating pressures and pumping rates shall be made so as to avoid excessive use of grout. In such instances, changes in operating procedure shall be accomplished by reducing pressures and pumping rates followed by a termination of pumping until a temporary “set” of the gel is obtained on the outside of the pipe, and then, after sufficient lapse of time, followed by an increase in pressure and resumption of pumping until a proper seal of joint or break in the pipe is obtained.
- e. Upon completion if the injection, the grouting rig shall be moved forward, wiping away the excess grout and allowing the television camera to move

to a suitable position for inspection and/or air test. Each joint, cracks or holes shall then be again air tested as specified hereinbefore. Should any joint fail to pass the air test, it shall be released and retested until the test requirements can be met. If the repair or the other break in the pipe or groundwater leak is deemed to defective by the Owner, the rig shall be moved back into position and the grouting process repeated, with possible modification of the grout composition, until proper sealing of the joint or break in the pipe has been obtained.

- f. The excess grouting material removed from the joint or break by the grouting equipment shall be flushed or pushed forward to the next downstream manhole, removed from the sewer system and disposed of by the Contractor, as specified for disposal of debris resulting from cleaning operations. In no case shall excess grout material from succeeding sections be allowed to accumulate and be flushed down the sewer. The Contractor shall make a tight seal with his equipment at each joint or break to be grouted. If a tight seal is not secured, the Contractor shall remove the equipment and make such adjustments as are necessary to make a tight seal.

7. Monitoring Operations

- a. The Contractor shall provide for monitoring by closed circuit television in a manner which shall provide clear and visible pictures of the positioning of group equipment as well as the finished joint.
- b. Suitable metering devices shall be attached to the internal inspection equipment so that the exact location of the equipment within the pipeline can be noted at all times.

8. Records

- a. For each section of sewer grouted, complete, accurate videotape and typed records shall be kept of joint sealing performed in each manhole section. The records shall include:
 - 1) Identification of the manhole section sealed.
 - 2) The location of each joint sealed.
 - 3) Sealing pressure used.
 - 4) Number of gallons of sealant used.
 - 5) A statement indicated the sealing results (passed or failed) for each joint sealed.
- b. A copy of the typewritten records shall be given to the Owner upon completion of the project.
- c. Title of the video tape records shall be given to the Owner upon completion of the project.
- d. These records shall show the location of each operation or point on information relative to the centerline distance from adjacent manholes clearly defined. Measurement of location shall be readable at ground level by means of a measuring device. Marking on cable or the like will not be allowed. As each repair is accomplished, notations shall be made on a

pertinent location record showing amount to the repair or directed by the Client.

9. Obstructions

- a. Obstructions may be encountered during the course of the sealing operations that prevent the travel of the packer and camera. Should an obstruction not be passable, the Contractor shall withdraw the equipment and begin sealing operations from the opposite end. Of the sewer each. Should additional obstructions be encountered after the reemployment and no means are available for passing the obstructions without damage to the equipment, then the remaining sections of the sewer not sealed shall be excluded from the work requirements of the Contract. Costs related to difficulties encountered during sealing operations will not be measured for payment nor constitute any additional costs to the Contract Price but will be considered as incidental to the Contract.

10. Supervision

- a. Supervision of grouting shall be under the responsibility of a person with a minimum of five (5) years of experience in the application of chemical grout for infiltration control. This person shall be present at all times chemicals are mixed and applied, have overall responsibility for record keeping, and responsibility for safety procedures for protecting all personnel involved with the grouting operation. The name of this person shall be given to the City prior to beginning the grouting work.

11. Guarantee

- a. All work performed by the Contractor shall be guaranteed for a period of one year after the completion and acceptance of the Contract. After a section between manholes has been leak-sealed and accepted by the Engineer, any and all sewer lines joints which develop renewed leakage during the guarantee period shall be resealed by the Contractor at no cost to the Owner. However, the Contractor will not be held responsible for leaks which develop in sewer line joints and are due to structural failure of pipeline or settlement not attributable to his operations.
- b. Prior to expiration of the one-year guarantee period, the Owner may select several sewer sections for an initial retest. The manhole sections selected shall be representative of the majority of the grouting work originally performed. The initial re-test area shall consist of no more than 15% of the lineal feet contained in the original report.
- c. Within the initial re-test area, the Contractor shall re-test all previously grouted joints. Any joint failing the re-test shall be re-grouted. If the failure rate of the re-tested joints is 5% or less of the total joints re-tested, the work shall be considered satisfactory and no further re-testing will be necessary. However, if in the initial re-test area, the number of joints to fail exceeds 5% of the total joints re-tested, then all previously grouted joints shall be re-tested. All joints which fail shall be re-grouted.

- d. In order to ensure that re-testing and any necessary re-grouting will be performed, 2% of the total Contract in cost will be retained in escrow until the re-testing has been satisfactorily completed.
- e.

END OF SECTION 02700

SECTION 02723

INLETS

PART 1 - GENERAL

1.1 SCOPE:

- A. The work covered by this Section shall consist of furnishing all materials for and constructing complete, all curb type inlets at the locations shown on the Drawings or designated by the Engineer.
- B. Curb type inlets shall be constructed to the size, shape and dimensions and at the locations shown on the Drawings or as directed by the Engineer. Inlets may be constructed either of brick or concrete masonry at the option of the Contractor. They shall be provided with cast iron frames and gratings as specified herein and shown on the Drawings.
- C. Each inlet shall be connected to a nearby storm sewer as indicated on the Drawings by means of appropriate storm sewer and suitable fittings.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Concrete shall be 4,000 psi concrete conforming to the applicable requirements of Section 03300 of these Specifications.
- B. Steel reinforcement shall conform to the requirements of Section 03300 of these Specifications.
- C. Brick shall conform to ASTM C 32, Grade SM. Sand for mortar shall conform to ASTM C 144. Hydrated lime shall conform to ASTM C 206.
- D. Frames and gratings shall be of the type shown on the Drawings. Iron castings shall conform to ASTM A 48, Class 30. All castings shall be true to pattern in form and dimensions, free from faults, sponginess, cracks, blowholes and other defects affecting their strength. Bearing surfaces between cast frames and gratings shall be machined, fitted together and match marked to prevent rocking. All castings shall be thoroughly cleaned and painted or coated with a coal tar pitch varnish.
- E. All reinforced concrete pipe and special fittings shall be reinforced concrete culvert, storm drain, and sewer pipe conforming to the latest requirements of ASTM C 76. Pipe shall be of the Class III and shall have circular reinforcement for circular pipe. All applicable subsections of Section 02720 of these Specifications shall apply to the work of connecting the inlet to the sewer.
- F. Precast Concrete Sections:
 - 1. Precast concrete sections shall consist of a flat slab top section, and a base section conforming with the typical details as shown on the Drawings.

2. Precast concrete sections shall be manufactured, tested and marked in accordance with the latest provisions of ASTM C 478.
 3. Minimum compressive strength of the concrete for all sections shall be 4,000 psi.
 4. Maximum allowable absorption of the concrete shall not exceed eight percent of the dry weight.
 5. Circumferential reinforcement in the riser sections and base wall sections shall consists of one line of steel and shall be not less than 0.17 square inch per lineal foot.
 6. The ends of each reinforced concrete riser section and the bottom end of the top section shall be so formed that when the risers and the top are assembled, they will make a continuous and uniform structure.
 7. Joints of the sections shall be of the tongue and groove type. Sections shall be joined using O-ring rubber gaskets conforming to the applicable provisions of ASTM C 443, latest revision, or filled with an approved preformed plastic gasket meeting the requirements of Federal Specifications SS-S-00210, "Sealing Compound, Preformed Plastic for Pipe Joints", Type 1, Rope Form.
 8. Each section shall have not more than two holes for the purpose of handling and laying. These holes shall be tapered and shall be plugged with rubber stoppers or mortar after installation.
 9. Cast iron manhole steps shall be installed in each section in accordance with the details on the Drawings.
- G. Joint materials for concrete pipe shall be in accordance with the requirements of Section 02720 of these Specifications.

PART 3 - EXECUTION

3.01 EXCAVATION:

- A. Excavation shall be in accordance with the requirements of Section 02200 of these Specifications.

3.02 CAST-IN-PLACE CONCRETE CONSTRUCTION:

- A. Forms for concrete shall be constructed of such materials and in a manner meeting the requirements of Section 03300 of these Specifications.
- B. Cast-in-place inlets shall be constructed in place with the base, walls and top all monolithically cast using removable forms of a material and design approved by the Engineer.
- C. The vertical forms, vertical and horizontal wall spacers, steps and placing cone must be carefully positioned and firmly clamped in place before any placement is made. The wall spacers must be located 90 degrees from each other. The forms shall be firmly supported with bottom of forms at the proper elevation to permit the base to be deposited through the vertical forms.
- D. The base shall be deposited down through the wall forms onto undisturbed earth or rock bearing. It shall be evenly distributed around the walls and vibrated both inside and

outside the forms until there is a minimum slope of 60 degrees from the bottom of the forms to the bearing surface both inside and outside of the inlet. When this is complete and before additional concrete is added, the concrete must be carefully vibrated on each side of each pipe.

- E. The base shall be concentric with the inlet and have a minimum diameter of 16-inches greater than the outside diameter of the inlet, and 10-inch minimum thickness under the lowest pipe. Minimum wall thickness shall be 6-inches.
- F. Additional concrete must be deposited in evenly distributed layers of approximately 18-inches with each layer vibrated to bond it to the preceding layer. The wall spacers must be raised as the placements are made. The concrete in the area from which the spacer is withdrawn shall be carefully vibrated. Excessive vibration shall be avoided.
- G. If adjustment of the frame elevation is called for, concrete "do-nut" sections or brick shall be used.
- H. Form marks and offsets shall not exceed 1-inch on the outside surface of the inlet. Form marks and offsets shall not exceed 1/2-inch inside of the inlet. All offsets on the inside surface shall be smoothed and rubbed so there is no projection or irregularity capable of scratching a worker or catching and holding water or solid materials. Honeycombed areas shall be completely removed immediately upon removal of the forms and replaced with a Class "A" concrete as directed by the Engineer.
- I. Should circumstances make a joint necessary, a formed groove or reinforcing dowels shall be required in the top of the first placement for shear protection. Immediately before the second placement is made, the surface of the cold joint shall be thoroughly cleaned and wetted with a layer of mortar being deposited on the surface.

3.03 BRICK CONSTRUCTION:

- A. Brickwork shall be constructed using one-part Portland cement to two parts clean sand, thoroughly mixed to workable plastic mixture. Not over 20 pounds of hydrated lime per sack of cement may be added. No re-tempered mortar shall be used. Brick shall be laid with mortar joints 3/8-inch thick. The inside of the inlet shall be neatly finished with cement mortar 1/2-inch thick.
- B. Each sixth brick course shall be a "Stretcher" course. Inside joints shall be trowel struck flush joints to provide smooth, clean surfaces. Joints shall be broken in successive layers. Wall thickness for inlets 12 feet and less deep shall be 8-inches. Wall thickness for the portion of inlets over 12 feet deep shall be 12-inches.
- C. After the foundation has been prepared and has been approved by the Engineer, the bottom shall be constructed to the required line and grade. After the bottom has been allowed to set for a period of not less than 24 hours, the inlet shall be constructed thereon, care being exercised to form the incoming and outgoing sewer pipe into the wall of the inlet at the required elevation.

- D. Manhole steps shall be inserted into the wall of the manhole at the proper locations and elevations as the work progresses and shall be securely embedded in the masonry.

3.04 PRECAST CONCRETE CONSTRUCTION:

- A. After the base section has been set, and inverts formed, the precast sections shall be placed thereon, care being exercised to form the incoming and outgoing pipes into the wall of the inlet at the required elevations.
- B. Masonry work shall be allowed to set for a period of not less than 24 hours. Outside forms, if any, then shall be removed and the inlet backfilled and compacted. All loose or waste material shall be removed from the interior of the inlet. The inlet grate then shall be placed and the surface in the vicinity of the work cleaned off and left in a neat and orderly condition.

3.05 INVERTS:

- A. All inverts shall be of 3,000 psi concrete meeting the requirements of Section 03300 of these Specifications and shall conform to the shape indicated on the Drawings or as directed by the Engineer. The invert shall be carefully formed to the required size and grade by gradual and even changes in sections. Changes in directions of flow through the inlet shall be made to a true curve with as large a radius as the size of the inlet will permit.

3.06 INLET AND OUTLET PIPE:

- A. Each piece of pipe and special fitting shall be carefully inspected before it is placed, and no defective pipe shall be placed in an inlet. Pipe laying shall proceed upgrade, starting at the lower end of the grade and with the groove uphill. Trench bottoms found to be unsuitable for foundations shall be corrected in accordance with Section 02200 of these Specifications prior to installation of pipe in inlets.
- B. Pipe placed in the walls for outlet connections shall extend through the wall and beyond the outside surface of the walls to allow for connections, the end of the pipe being placed flush with the inside face of the wall. Masonry shall be carefully constructed around the pipe for the full wall thickness so there will be no leakage around the outer surface.

3.07 CASTINGS:

- A. Cast iron frames shall be set accurately to line and finished elevation so that subsequent adjustments will not be necessary.
- B. Where inlets are constructed in paved areas or integral with curb and gutter, the top surface of the frame and grate shall be tilted to conform to the exact slope, crown and grade of the existing adjacent pavement or curb and gutter.
- C. Frames shall be set in full cement mortar beds as shown on the Drawings set in place to match the finished concrete surface.

3.08 CLEANING:

- A. After completion of the inlet, the interior shall be thoroughly cleaned of all excess materials, the grating placed and all unused materials, tools, equipment and debris removed from the area.
- B. After the masonry and frames have had sufficient time to set, but in no case less than 24 hours after placement, the space around the inlet shall be backfilled and tamped to the required grade.
- C. Final cleaning shall be performed in accordance with the requirements of the General Conditions of these Specifications.

END OF SECTION 02723

SECTION 02900

LANDSCAPE MATERIALS

PART 1 GENERAL

1.01 SCOPE

1.02 QUALITY OF WORK AND MATERIALS

The Contractor shall have minimum five years successful experience in the field and shall furnish all materials and perform all work in accordance with these specifications, drawings, and instructions provided by the Landscape Architect or Owner's representative hereafter also referred to as Landscape Architect. The work shall include everything shown on the drawings and required by the specifications and everything to which in the judgment of the Landscape Architect is incidental to what is shown on the drawings or required by the specifications. Workmanship and materials shall be of the best quality and shall be in strict accordance with the intention of the drawings, specifications and samples. The Contractor shall cooperate with the Landscape Architect so that no error or discrepancy in the drawings or specifications shall cause defective or inappropriate materials to be used or poor workmanship to be allowed and so that the work may proceed in the most efficient and effective manner.

1.03 WEATHER

Plant only during weather conditions favorable to landscape construction and to the health and welfare of plants. Contractor to notify Landscape Architect immediately if directed to commence planting operations in conditions detrimental to plant health.

1.04 PROTECTION

- A. Before commencing work, all trees and shrubs which are to be saved must be protected from damage by the placement of fencing flagged for visibility or some other suitable protective procedure approved by the Owner. No work may begin until this requirement is fulfilled.
- B. In order to avoid damage to roots, bark or lower branches, no truck or other equipment shall be driven or parked within the drip line of any tree, unless the tree overspreads a paved way.
- C. The contractor shall use any and all precautionary measures when performing work around trees, walks, pavements, utilities, and any other features either existing or previously installed under this Contract.
- D. The Contractor shall adjust depth of earthwork and loaming when working immediately adjacent to any of the aforementioned features in order to prevent disturbing tree roots, undermining walks and pavements, and damage in general to any existing or newly incorporated item.
- E. Plants transported to the project in open vehicles shall be covered with tarpaulins or other suitable covers securely fastened to the body of the vehicle to prevent injury to the plants. Closed vehicles shall be adequately ventilated to prevent overheating of the plants. Evidence of inadequate protection following digging, carelessness while in transit, or improper handling or storage shall be cause for rejection. All plants shall be kept moist, fresh, and

protected. Such protection shall encompass the entire period during which the plants are in transit, being handled, or are in temporary storage.

1.05 PERCOLATION TEST

- A. The Contractor shall be responsible for determining existing sub-surface drainage conditions for areas to be planted or sodded. The Contractor shall include as a part of his proposal the cost for making the following percolation tests in any area where he is uncertain about adequate sub-surface drainage. Report unacceptable areas to Landscape Architect/Owner's Representative for instructions.
- B. Percolation tests shall be made as follows:
1. Wait at least 24 hours after rain and dig test pit 12 inches square or 13 1/2 inches in diameter to depth of bottom of plant bed and remove all loose soil. (If standing water is visible, notify Landscape Architect).
 2. Quickly fill pit bottom with 6 inches (approximately 3 1/4 gallons) of water.
 3. Record length of time from filling until disappearance of water and divide number of minutes by 6 to give average time of 1 inch fall.
 4. Compare 1-inch time with following table:

1 inch in 0 - 3 minutes indicates rapid absorption
1 inch in 3 - 5 minutes indicates medium absorption
1 inch in 5 - 30 minutes indicates slow absorption
1 inch in over 60 minutes indicates impervious soil
 5. In plant bed areas where sub-soil conditions do not percolate or the bed is enclosed by pavement, curbs, walks or other hard construction, the contractor shall install a 4" drain line that allows the sub-surface of the bed to drain to the storm system or out to day light on the nearest slope.
- C. Planting shall not begin until planting area drainage has been approved by owner's representative.

1.06 SUBMITTALS

- A. It is the responsibility of the Contractor, before ordering or purchasing materials, to provide (1) photographs of each tree type with description to the Landscape Architect for review and approval. Contractor shall tag and deliver palms and trees that match approved sample photographs. Landscape Architect will decide final approval of all plant material on site.
- B. The Contractor is to submit certification tags from trees, shrubs, seed, and sod verifying type and purity.
- C. Materials: Samples of materials as listed below shall be submitted for inspection on the job site, or as otherwise determined by the Landscape Architect.

<u>Material</u>	<u>Sample</u>
Mulch	1 Bag
Peat Moss	1 Bale
Pine Straw	1 Bale
Top Dressing Sand	1 Cup

- D. Plants shall be subject to inspection and approval at the place of growth, or upon delivery to the site, as determined by the Landscape Architect, for quality, size and variety. Such prior approval will not impair the right of inspection and rejection at the site during progress of the work or after completion, for size and conditions of balls or roots, latent defects or injuries. Rejected plants shall be removed immediately from the site. Notice requesting inspection should be submitted by the Contractor at least one week prior to anticipated date.
- E. Typical samples shall be furnished from each separate source of supply. Approved samples shall be stored on the site and protected until furnishing of material is completed. Plant samples may be planted in permanent positions but labeled as samples.
- F. Upon approval of samples by the Landscape Architect, delivery of materials may begin.

1.07 QUALITY OF PLANTS

- A. Plants shall in all cases conform with requirements of the following:
 - 1. Georgia State Plant Board Codes and Standards.
 - 2. Georgia Nurseryman and Grower's Association Approved Planting Practices.
 - 3. Bailey, Hortus III
 - 4. American Standard for Nursery Stock with the latest versions of rules and grading adopted by the American Association of Nurserymen, Inc.
- B. Unless specifically noted otherwise, all plants shall be of selected specimen quality, exceptionally heavy, symmetrical, tightly knit, so trained or favored in their development and appearance as to be superior in form, number of branches, compactness and symmetry. All plants shall have a normal growth habit, be free of disease, show vigorous health and have a well-developed root system.
- C. Plants shall be free of disease, insect pests, eggs or larvae.
- D. Plants shall not be pruned before delivery.
- E. Trees with abrasion of the bark, sunscalds, disfiguring knots or fresh cuts of limbs over one and one-fourth inches (1-1/4") which have not completely callused shall be rejected.
- F. All plants shall be typical of their species or variety and shall have a normal habit of growth and be legibly tagged with the proper name. All plants shall have been grown under climatic conditions similar to those in the locality of the site of the project under construction or have been acclimated to such condition for at least two (2) years.
- G. The root system of each shall be well provided with fibrous roots. All parts shall be sound, healthy, vigorous, well branched and densely foliated when in leaf.
- H. Container stock shall be delivered to the site in first class condition. Plants shall have stakes in containers where required to support the plants. Plants furnished in containers shall not be

handled by the stem, but only by the containers. Plants that are root bound by their containers shall not be accepted.

- I. Balled and burlapped plants (BB) shall be dug with firm, natural balls of soil and of sufficient size to encompass the fibrous and feeding roots of the plants. No plants moved with a ball shall be planted if the ball is cracked or broken, except upon special approval. Plants balled and burlapped shall be handled by the stems.
- J. Plants marked "BR" in the Plant List shall be dug with bare roots. The roots shall not be cut within the minimum spread specified in the Plant List. Care shall be exercised that the roots do not dry out in moving.

1.08 PLANT MATERIAL SIZE AND MEASUREMENT

- A. Plants shall be measured when branches are in their normal position.
- B. Shrubs shall meet the size requirements stated in the Plant List. The measurements are to be taken from the ground level to the average height of the shrub and not to the longest branch. Height and spread dimensions specified refer to the main body of the trees (measured from the crown of the roots to the tip of the top branch) and shall be not less than the minimum size designated.
- C. Caliper measurements shall be taken at a point on the trunk six inches (6") above natural ground line for trees up to four inches (4") in caliper, and at a point 12 inches (12") above the natural ground line for trees exceeding four inches (4") in caliper.
- D. If a range of size is given, no plant shall be less than the minimum size, and not less than 50% of the plants shall be as large as the upper half of the range specified.
- E. The measurements specified are the minimum size acceptable and, where pruning is required, are the measurements after pruning.
- F. All dimensions on Schedule shall be the minimum acceptable size. Plants larger in size than specified in the Plant List may be used if approved by the Landscape Architect. If the use of larger plants is approved, the ball of earth or spread of roots shall be increased in proportion to the size of the plant.
- G. The minimum acceptable ball size for trees shall be 11" diameter per 1" caliper taken 6" above the ground for trees up to and including 4" caliper. Caliper shall be measured 12" above the ground for trees larger than 4" caliper. In special cases the ball size may be reduced as directed or approved by the Landscape Architect.

1.09 NOTIFICATION OF DELIVERY

Unless otherwise authorized by the Landscape Architect, the Contractor shall notify the Landscape Architect at least 48 hours in advance of the anticipated delivery date of any plant materials.

1.10 RIGHT OF REJECTION

The Landscape Architect reserves the right to inspect and reject plants at any time and at any place. Plants held on site for longer than 2 months must be approved by Landscape Architect before installation

1.11 MAINTENANCE

All planting shall be protected and maintained by the Contractor until time of final acceptance as defined in the guarantee. Maintenance shall include but is not limited to watering, weeding, cultivating, removal of dead material, resetting plants to proper grades or upright position, lawn mowing, fertilizing, and other necessary operations. The Contractor will be responsible for maintenance until 90 days after the time of acceptance. The Contractor shall submit, in writing, maintenance instructions for use by the Owner in caring for the plants.

1.12 PLANT GUARANTEE

- A. All plants, grass and trees shall be guaranteed to be alive and healthy one year after the date of final acceptance. Contractor shall be responsible for maintaining the plant installations for 30 days after final acceptance. The Contractor is responsible for providing adequate maintenance for one year to any plant, including grass, or tree that is dead or not showing satisfactory growth. After a 90-day period, it shall be replaced, or conditions contributing to unsatisfactory growth corrected. All replacements shall be of the original quality and shall be of a size equal to that attained by adjacent plants or trees of the same species. Replacement plant material shall be guaranteed to be alive at the beginning of the following growing season. Only one replacement will be required for each dead grass area. The number of replacements for other plant materials is not limited.
- B. The guarantee may become void if it is determined that plant material kill or unsatisfactory growth results from Owner negligence. The decision for determination of responsibility for damage shall rest solely with the owner's representative.

1.13 FINAL GRADING AND CLEAN UP

After all work has been completed and all soil settled and final finished grading completed, clean-up and adjustments shall be made to insure proper depth of topsoil, proper drainage, proper grades adjacent to walks and curbs, proper slope of plant beds, etc. Remove any soil, peat moss, mulch or plant materials from walks and paving, leaving the areas broom clean.

1.14 DAMAGED/DISTURBED AREAS

- A. Plant or grassed areas damaged during the process of work by other contractors shall be called to the attention of the General Contractor and Landscape Architect in writing within one week of the occurrence, to settle disputes over party responsible for damages.
- B. Damaged areas will be repaired within a timely period to Landscape Architect's satisfaction.

1.15 FINAL APPROVAL

The Landscape Architect shall have the final approval for acceptance of the landscaping.

PART 2 - PRODUCTS:

2.01 GENERAL:

- A. Water: All water necessary for planting and maintenance shall be of satisfactory quality to sustain the growth of plants and shall not contain harmful, natural or man-made elements detrimental to plants. Water meeting the above standard shall be furnished by the Contractor

and all arrangements for securing water and any expenses of transporting to the site and dispersal on the site shall be the responsibility of the Contractor.

- B. Commercial Fertilizer: Provide a complete fertilizer, uniform in composition, dry and free flowing, delivered to the site in the original unopened containers, each bearing the manufacturer's statement of analysis, meeting the following requirements:
- 12% nitrogen, 5% phosphoric acid, 8% potash; with nitrogen derived from 6.6% uramite, 3% sewage sludge and 2.4% ammonium nitrate or approximate equal.
- C. Lime: Shall be agricultural grade high calcium ground limestone and shall be of such fineness that 90% will pass through a No. 10 sieve and not less than 50% through a No. 50 sieve.
- D. Soil Test: Revise fertilizer analysis, quantities of fertilizer and lime as dictated by soil tests made prior to planting.
- E. Hardwood Mulch: Shall be aged for a minimum of three years and ground to a fine texture. Mulch shall be fresh, clean, free from sticks, cones, leaves and other debris.
- F. Pine Straw Mulch: Shall be fresh, clean, free from sticks, cones, leaves and other debris. Pine straw mulch shall be used and maintained as a two inch (2") top dressing in all plant beds and around all trees planted by the Landscape Contractor. Single trees or shrubs shall be mulched to the outside edge of the saucer. Depth to be minimum three inches (3") at final acceptance.
- G. Topsoil: Where required shall be a natural, fertile, friable soil, possessing characteristics of representative productive soils in the vicinity. It shall be obtained from naturally well-drained areas, free from substances harmful to plant growth, and free from clay lumps, stones, stumps, roots, or similar substances two inches or more in diameter. The source and material shall be approved by the Landscape Architect before placing on site. Topsoil shall be free from noxious grass and weeds.
- H. Fertilizer: For grass areas: See planting details for specific requirements.
- I. Pre and Post emergent Herbicide: Contractor to have a licensed herbicide applicator with a minimum three years experience performing all herbicide applications to lawns, trees and shrubs. Herbicides shall be utilized as necessary to control weeds in bed, tree plantings and turf areas unless applicable codes or ordinances stipulate otherwise. Contractor is responsible to be familiar with all applicable local, state and federal codes, ordinances and regulations.
- J. Staking Material:
1. Trees: Stakes for guying trees under shall be No. 2 Southern Pine, 2 x 2, 36", pressure treated with waterborne preservatives complying with AWPB LP-22.
- L. Guying: Galvanized Steel Turnbuckles with #12 gauge, multi-strand galvanized steel wire.

2.02 GENERAL:

- A. See Planting Plan and schedule for plants required. Quantities necessary to complete the work shown on the drawings shall be furnished. Although quantity estimates have been carefully made, the Landscape Architect assumes no liability for omissions or errors.
- B. All plants shall conform to the measurements specified on the Plant List. Such measurements shall be made in accordance with methods stated in section 02900, #1.08. Plants that meet the requirements specified on the Plant List, but which do not possess a normal balance between height and spread will not be accepted. All plants shall be fresh dug, sound, healthy, vigorous, well branched and free of disease and insect egg and larvae and shall have adequate root systems. Trees for planting in rows shall be uniform in size and shape. All materials shall be subject to approval by the Landscape Architect. Where any requirements are omitted from the Plant List, the plants furnished shall be normal for the variety. Plants shall be pruned prior to delivery only upon the approval of the Landscape Architect.
- C. Container Grown Material: All container grown materials shall be healthy, vigorous, well-rooted and established in the containers in which they are sold. They shall have tops which are of good quality and are in a healthy growing condition.
- D. An established container grown plant shall be transplanted into a container and grown in that container sufficiently long for the new fibrous roots to have developed so that the root mass will retain its shape and hold together when removed from the container.
- E. The container shall be sufficiently rigid to hold the ball shape protecting the root mass during shipping.
- F. Container stock shall be delivered to the site in first class condition. Plants shall have stakes in containers where required to support the plants. Plants furnished in containers shall not be handled by the stems, but only by the containers. Plants root bound in containers shall not be accepted.
- F. Sod: Sod shall be a species recommended by an experienced local A.N.A.-certified nursery, grown in a nursery equipped for the production of such sod and capable of meeting the published State Standards for Certification. It shall have been mowed regularly, fertilized and fumigated and shall be free of diseases and harmful insects at the time of delivery. Sod shall be delivered in strips one foot wide and two feet or longer as soil and species permit or in rolls not over six feet long. Sod shall have a minimum of one-inch thickness including roots and soil. Sod bearing holes or thinned root pad, i.e. less than ½” shall be rejected. Sod shall be free of weeds, nut grass, crab grass and other invasive plants.
 - 1. Sprigs: It shall be alive and viable at time of planting.
 - 2. Seeds: All seed shall be certified stock and appropriately labeled. Contractor shall deliver empty seed bags to Landscape Architect on site.

PART 3 - EXECUTION

3.01 GENERAL

- A. Planting operations shall be conducted under favorable weather conditions preferably during the period from October 1 to April 1. The Contractor has the option and assumes full responsibility for planting in unseasonable conditions.
- B. Planting of grass shall be accomplished during recommended season dependent on specified grass and planting method.
- C. Protect roots or balls of plants at all times from sun and drying winds, water and freezing, as necessary until planting.

3.02 PLANTING PROCEDURE:

- A. Cleaning up before commencing work: The Contractor shall clean up work and surrounding areas of all rubbish or objectionable matter. All mortar, cement and toxic material shall be removed from the surface of all plant beds. They must not be stirred with the soil. Extensive clean up work will not be required under this contract. Should the Contractor find such conditions beneath the soil which shall in any way adversely affect the plant growth, he shall immediately call it to the attention of the Landscape Architect. Failure to do so before planting shall render the Landscape Contractor liable for subsequent problems arising from unacceptable subsoil conditions. Use approved herbicide to eliminate temporary plant material as directed.
- B. Stake Out: Stake tree or plant locations and secure approval of them from the Landscape Architect before digging pits, and make adjustments as directed. Locate no tree closer than two feet from pavement or structures.
- C. Planting soil mixture: for trees shall consist of 1/3 topsoil, 2/3 thoroughly pulverized existing soil mixed with 1 1/2 pounds of fertilizer per inch of tree caliper or 10 pounds per cubic yard or 7 1/2 oz. per bushel; and five pounds lime per cubic yard.
- D. Planting Hole: for ball up to two feet in diameter shall be twice the diameter of the ball. Diameter of hole for ball two feet and greater shall be two feet larger in diameter than diameter of ball. Excavate pits with vertical sides.
- E. Large Plastic Containers: Cut off bottom of containers over 5 gallons, place plant and containers in planting hole, cut the container on two sides, removing the remaining part of the container. Examine roots to insure that roots have not begun to circle the container. If roots have begun to circle the plant, Contractor may realign the roots in the hole. If root circling is too severe, plant must be rejected and returned to supplier.
- F. Baskets: Remove rim and handles after placing in the hole. Break or slit sides in several places.
- G. Wire Baskets: After placing in planting hole, remove all twine and rope used to secure wire basket and burlap. Bend or cut the wire and pull away from the root ball. Slit and remove all burlap from the top of the ball at least 1/3 of the way down sides or further as possible. Backfill and cover top of ball with mulch.
- H. Trees and Shrubs: Trees shall be set straight and at such level that after settlement the plant crown shall be 8" above grade; shrubs shall stand 1" - 2" above grade mounded. Each plant shall be set in the center of the pit. Backfill mixture shall be thoroughly tamped around the ball and shall be settled by water after tamping. A water holding saucer shall be formed with

extra soil. Do not handle the tree by the trunk or use the trunk to straighten or adjust the location. (See Details)

- I. Fill: Fill hole with soil mixture and fertilizer as required. Pack lightly with feet. Add more wet soil. Do not cover top of ball with soil, only with mulch. Make sure no burlap is exposed since exposed burlap acts as a wick causing excessive loss of water.
- J. Water Basin: Build basin around all plants or trees which stand alone and are not in larger mulched beds. A water holding earth dam shall be built on the outside of the hole to form a basin to hold water, it shall be 4 - 6" high of soil firm enough to remain in place. If necessary, bring in soil. See Detail.
- K. Pruning: Each tree shall be pruned to preserve the natural character of the plant as directed by the Landscape Architect. All soft wood or sucker growth and all broken or badly damaged branches shall be removed with a clean cut. All pruning cuts over 1/2" in diameter shall be painted over with an approved tree paint.
- L. Guying or Staking: Shall be done immediately after planting. Trees shall stand plumb after staking or guying in accordance with the drawings.

3.03 FINISH GRADING

Prior to applying mulch, plant beds and pine straw covered areas shall be stirred 4" deep to loosen soil mixture. Fine grade areas until all bumps and depressions are removed and until the grade conforms to requirements of the grading plan. Eliminate any water pockets and verify surfaces drain away from all buildings. The minimum surface slope of plant beds shall be four percent. Minimum surface slope in lawn areas shall be two percent.

3.04 MULCHING

On completion of planting, all ground cover areas shall be covered with 3" layer of pine straw. All annual bed areas shall be covered with 2" depth of mini-nuggets manufactured by Joe K. Smith or approved equal (phone 524-4286).

3.05 WEED CONTROL (HERBICIDE)

Immediately after planting and applying the mulch, apply 2% granular "Chipco" Ronstar at the rate of 3 pounds per 1,000 square feet. This is slightly more than 2 1/2 pounds of active ingredient per acre. Apply to all plant beds, ground cover and pine straw ground cover. Protect lawns and any susceptible plants.

3.06 GRASSING

- A. General: Includes soil preparation, applying fertilizer, planting and maintenance as required to produce an acceptable stand of grass on areas shown on planting plan.
 - 1. Any damage to planting soil by erosion, construction equipment, construction operations, or other damage shall be repaired prior to application of fertilizer. Finished surface shall be smooth and even.
- B. Soil Preparation: After the area to be grassed has been brought to finished grade, prepare the soil by thoroughly loosening the area by plowing, discing, harrowing, or scarifying until these

areas are friable, well pulverized and acceptable to the Landscape Architect. Any irregularities in the surface resulting from the above operation or from other operations by the contractor, shall be smoothed out before any subsequent operations are begun. All roots and stones larger than 1 1/2" in any dimension, stumps and other foreign material detrimental to final grading, proper bonding, the rise of capillary moisture, or the proper growth of the desired plantings shall be removed.

1. The completed surface shall conform to the finished grades or subgrades shown and shall have a smooth pulverized surface at the time of planting. Any irregularities shall be corrected before the lime and fertilizer are placed.
2. Spread lime and fertilizer over the prepared surface before turning. Fertilizer and lime shall be sufficient to correct irregularities in the soil based on soil tests for the specified turf. Turn the soil one last time the day before planting or placing sod.

C. Sodding: (When required by the Construction Schedule)

1. Prepare planting bed as described for seeded areas except that fine graded soil shall be 1 inch below finished grade established by the grading plan.
2. Stored sod of the species required in the schedule shall be kept moist prior to laying. Wet all areas prior to sodding.
3. Wet all areas immediately prior to sodding.
4. Unroll the sod on the prepared soil. Lay the strips parallel with the strip ends staggered as in bricklayers' running bond pattern. Press each successively laid strip snugly up against the one next to it. Fill cracks, holes, joints with clean, loose sand, free of all grass and plant seeds.
5. Watering, fertilizing and rolling shall be done by the Contractor as described under "Maintenance of Sodded Areas" below.

D. Maintenance of Sodded Areas: The Contractor shall be responsible for maintaining sodded areas by properly watering, weeding and mowing the grass until an acceptable stand has been produced, and been accepted by the Owner and a minimum of 30 days thereafter.

1. A stand shall be considered acceptable when 95% of the total sodded area has been covered with grass and no bare areas greater than one square foot exist. All cracks, joints, dips, pits and other irregularities in the surface must have been corrected by top dressing with sand.
2. The Contractor shall be responsible for re-sodding all bare areas greater than one square foot with the specified mixture and for repairing and re-sodding wash-outs and eroded areas to the original finished grade.
3. Sodded areas shall be mowed when the grass attains a height of 2 inches and as required thereafter until the acceptance of the stand. Reel type mowers, kept well sharpened, shall be used. Turf shall not be accepted until all sod has knitted together and tacked to the soil.
4. All lawn areas shall be given a top dressing of fertilizer to provide 100 pounds available nitrogen per acre when the grass has attained a satisfactory growth and the

first mowing has been performed. Nitrogen shall be derived from Ammonium Nitrate or Nitrate of Soda.

5. Contractor shall be responsible to administer a final top dressing of sand to the turf to fix all dips, pits, cracks, etc., for up to 6 months after final acceptance of a lawn field of play.

3.07 SEEDING

- A. Area: All exterior ground within the limit of contract, except surfaces occupied by buildings, structures, paving, and except areas indicated to be undisturbed or mulched, shall be seeded or planted as shown on drawings.
 1. Furnish topsoil
 2. Finish grading
 3. Prepare seedbed
 4. Seed and maintain areas as indicated on the drawings.
- B. Seed Bed Preparation: Grade areas to finish grades, filling as needed or removing surplus dirt and floating areas to a smooth, uniform grade as indicated on grading plans. All lawn areas shall slope to drain. Where no grades are shown, areas shall have a smooth and continual grade between existing or fixed controls (such as walks, curbs, catch basin, elevational steps or building) and elevations shown on plans. Roll, scarify, rake and level as necessary to obtain true, even lawn surfaces. All finish grades shall meet approval of the Landscape Architect, before grass seed is sown. Loosen soil to a depth of six inches (6") in lawn areas by approved method in the specifications and grade to remove ridges and depressions. Remove stones or foreign matter over two inches (2") in diameter from the top two inches (2") of soil. Float lawn areas to approximately finish grades.
- C. Seed beds should be permitted to settle or should be firmed by rolling before seeds are broadcast.
- D. Seeding should not be performed in windy weather.
- E. Seeding shall be done in two (2) directions at right angles to each other.
- F. Lawn areas shall be seeded by sowing evenly with an approved mechanical seeder at the rate of a minimum of three (3) pounds per 1,000 square feet. Culti-packer or approved similar equipment may be used to cover the seed and to form the seedbed in one operation. In areas inaccessible to culti-packer, the seeded ground shall be lightly raked with flexible rakes and rolled with a water ballast roller. After rolling, seeded areas are to be lightly mulched with wheat straw.
- G. If the project completion date prohibits in-season planting, the Contractor shall prepare for out-of-season seeding or sodding so that all lawns shall be completed and ready for acceptance at time of project completion, without additional cost to the Owner. Lawn maintenance shall be the same as for other planting.
- H. Lawns shall be maintained by the Contractor for at least 30 days after sodding and 60 days after seeding, or as long as is necessary to establish a uniform stand of the specified grasses, or until substantial completion of the project or until acceptance of lawns, whichever is later.

- I. In the event that lawn operations are completed too late in the Fall for adequate germination and/or growth, maintenance shall continue into the following growing season or until a uniform stand of the specified grasses has been established.
- J. Water seeded areas twice the first week to a minimum depth of six inches (6") with a fine spray and once per week thereafter as necessary to supplement natural rain to the equivalent of one-inch (1") or to a six inch (6") depth.
- K. The surface layer of soil for seeded areas must be kept moist during the germination period. After first cutting, water as specified above.
- L. Make weekly inspections to determine the moisture content of the soil and adjust the watering schedule established by the irrigation system installer to fit conditions.
- M. After grass growth has started, all areas or parts of areas which fail to show a uniform stand of grass for any reason whatsoever shall be reseeded in accordance with the plans and as specified herein. Such areas and parts of areas shall be reseeded repeatedly until all areas are covered with a satisfactory growth of grass at no additional cost to the Owner.
- N. Watering shall be done in such a manner and as frequently as is deemed necessary by the Landscape Architect to assure continued growth of healthy grass. All areas of the site shall be watered in such a way as to prevent erosion due to excessive quantities applied over small areas and to avoid damage to the finished surface due to the watering equipment.
- O. Water for the execution and maintenance of this work shall be provided by the Owner at no expense to the Contractor. The Contractor shall, however, furnish his own portable tanks, pumps, hose, pipe, connections, nozzles, and any other equipment required to transport the water from the available outlets and apply it to the seeded areas in an approved manner.
- P. Mowing of the seeded areas shall be initiated when the grass has attained a height of one and one-half to two inches (1-1/2" to 2"). Grass height shall be maintained between one and one-half inches (1" to 1-1/2") at subsequent cuttings depending on the time of year. Not more than one third (1/3) of the grass leaf shall be removed at any cutting and cutting shall not occur more often than ten (10) days apart.
- Q. When the amount of invading grass is heavy, it shall be removed to prevent destruction of the underlying turf. If weeds or other undesirable vegetation threaten to smother the planted species, such vegetation shall be mowed or, in the case of rank growths, shall be uprooted, raked and removed from the area by methods approved by the Landscape Architect.
- R. Protect seeded areas against trespassing while the grass is germinating. Furnish and install fences, signs, barriers or any other necessary temporary protective devices. Damage resulting from trespass, erosion, washout, settlement or other causes shall be repaired by the Contractor at his expense.
- S. Remove all fences, signs, barriers or other temporary protective devices after final acceptance.

END OF SECTION 02900

SECTION 02921

TOPSOIL

PART 1 - GENERAL

1.01 SCOPE

- A. Topsoil for planting shall consist of a rich, friable soil conforming to the requirements and provisions set out in these Specifications, or as approved by the Project Landscape Architect and obtained from locations indicated on the Construction Drawings. Topsoil shall be placed at the locations indicated on the Construction Drawings, set out in the Specifications or as directed by the Project Landscape Architect and in conformity with the provisions and requirements set out in the Specifications.
- B. Suitable topsoil which has been stripped from the project site shall be stockpiled as directed by the Project Landscape Architect. Stockpiled topsoil shall be redistributed in areas indicated on the Construction Drawings and later used before additional topsoil is hauled to the site. Unsuitable material shall not be included in these stockpiles and shall be removed from the project site. The amount of stockpiled topsoil obtained from the site shall be measured by the Project Landscape Architect using the cross-section method and this material shall be excluded from that quantity of material paid for under the of Section 02200 of these Specifications.

PART 2 - MATERIAL

2.01 MATERIAL

- A. Topsoil for planting shall be a rich, friable loam containing a large amount of humus obtained from natural north Georgia woodlands, (the purpose of this is to assure a natural “A” soil horizon with adequate microrhizal content). Topsoil shall be original surface sandy loam, topsoil of good, rich, uniform quality, free from any material such as hard clods, stiff clay, hardpan, partially disintegrated stone, pebbles larger than 1/2-inch in diameter, lime, cement, bricks, ashes, cinders, slag, concrete, bitumen or its residue, boards, sticks, chips or other undesirable or harmful material to plant growth. Topsoil shall be reasonably free from perennial weeds and shall not contain objectionable plant material, toxic amounts of either acid or alkaline elements or vegetable debris undesirable or harmful to plant life.
- B. Topsoil shall be natural topsoil without admixture of subsoil material, and shall be classified as a loam, silt loam, clay loam or a combination thereof. The pH shall range from 5.5 to 6.0. Topsoil shall contain not less than two percent by weight, of organic matter as determined by the Wakley-Black Method as described in Soil Chemical Analysis, 1958, Prentice-Hall, Inc.
- C. The area or areas from which topsoil is secured shall possess such uniformity of soil depth, color, texture, drainage and other characteristics as to offer assurance that, when removed in commercial quantities, the product will be homogeneous in nature

and will conform to the requirements of these Specifications, and as required by the Project Landscape Architect.

- D. Topsoil may not be secured from areas which are, or have been, in cultivation within the past five years.

PART 3 - EXECUTION

3.01 EQUIPMENT

- A. All equipment necessary for the proper removal, transportation, protection and maintenance of topsoil must be available, when required, in first class working condition and shall have been approved by the Project Landscape Architect before construction will be permitted to begin.

3.02 MAINTENANCE

- A. The Contractor shall maintain all topsoil areas, at Contractor's own expense, in connection with any seeding or planting, or otherwise, until Final Acceptance of the Project. Maintenance shall consist of preserving, protecting, replacing and such other work as may be necessary to keep the Project in a satisfactory condition.

3.03 CLEANING

- A. Final cleaning shall consist of completely removing all equipment, rubbish, excess material and unused materials from the project site.
- B. All pavements and structures shall be swept clean of all dirt or rubbish which may have become deposited upon them during construction.
- C. All pavements and structures shall be cleared of any stains that may have become deposited upon them during construction.
- D. Final Cleaning shall be performed in accordance with the requirements of Section 01710 of these Specifications.

END OF SECTION 02921

SECTION 02933

TEMPORARY SEEDING

PART 1 – GENERAL

1.1 SCOPE

- A. The work covered by this section consists of the establishment of a temporary vegetative cover on disturbed areas by seeding with appropriate rapidly growing grass seed. Temporary seeding shall be provided for all exposed soil surfaces that are not to be fine graded or landscaped within 30 days after fine grading.

1.2 PROJECT CONDITIONS

- A. Protect all adjacent public and private property from siltation and other damage due to construction activities with silt dams or fences as indicated on the Drawings.
- B. Temporary seeding shall be applied to any and all disturbed areas left idle for two weeks and shall be applied no later than the 15th calendar day from last land disturbance activity (i.e. clearing, grubbing, or grading).

1.3 QUALITY CRITERIA

- A. Installation shall be in strict compliance with the rules and regulations of the local seed laws.
- B. Installation shall comply with all applicable codes, rules, regulations and ordinances related to erosion control and temporary seeding.

PART 2 – PRODUCTS

2.1 TEMPORARY SEED

- A. Select temporary grass seed appropriate to the season and site conditions. Temporary grass shall be a quick growing species such as millet, rye grass, Italian rye grass or cereal grasses suitable to the area providing a temporary cover which will not later compete with grasses sown for permanent cover. Seed shall meet the requirements of the rules and regulations of the Georgia Seed Law.

2.2 LIME

- A. Provide agricultural grade ground or pulverized limestone. Lime shall contain not less than 85% carbonates with 50% passing a 100-mesh sieve. Lime shall have tested values of 90% minimum germination and 1% maximum weed content.

2.3 FERTILIZER

- A. Provide standard commercial grade fertilizer, either 4-12-12, 6-12-12 or 5-10-15 as required for conditions.

PART 3 – EXECUTION

3.1 SEED-BED PREPARATION

- A. Where soils are known to be highly acid (pH 5.5 and lower), apply lime at the rate of two tons per acre (1 #/10 s.f.).
- B. Apply fertilizer at a rate of 450 lbs./acre (10 #/1,000 s.f.). Lime and fertilizer shall be incorporated into the top 2 to 4 inches of the soil by tilling.
- C. Loosen ground surface by discing, raking or harrowing. If the area has been recently loosened or disturbed, no further roughening shall be required. Remove all large clods, boulders and debris which will interfere with the work. Remove all stones 2" and larger in any given dimension.

3.2 SEEDING

- A. Apply seed evenly with a cyclone seeder, drill, culti-packer seeder or hydro-seeder. Small grains shall be planted no more than one inch deep. Grasses and legumes shall be planted no more than ¼ inch deep. Distribution by hand shall not be permitted.

3.3 ROLLING

- A. Roll all seeded areas before applying mulch. On steep slopes cover seeds by dragging spiked chains or similar methods.

3.4 MULCHING

- A. All seeding in fall for winter cover shall be mulched. Seedings on slopes 4:1 or greater, on adverse soil conditions and in excessively hot or dry weather shall also be mulched.
- B. Mulch shall be straw, or hay spread at the rate of approximately two tons/acre, wood cellulose fiber applied at the rate of approximately 1500 lbs./acre. Bituminous treated mulch shall be used on all slopes steeper than 2:1.
- C. Seedings made during optimum spring and summer seeding dates, with favorable soil and site conditions shall not require mulch if written permission is received by the Engineer.

3.5 WATERING

- A. Provide watering as required to establish and maintain healthy vegetative cover.

3.6 RESEEDING

- A. Reseed and provide straw cover for bare areas 1 s.f. and larger to establish and maintain vegetative cover and to prevent sheet and rill erosion. Repair erosion damage as required and reseed.

END OF SECTION 02933

SECTION 02975

CLEANUP AND FINISH

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Furnish labor, materials, and equipment required to complete cleanup of all paving, building, grounds, and all other areas outlined on the drawing.
- B. Chemicals, paints, cleaning products, concrete or other waste materials shall not be discarded in the planting beds. If such materials are discharged in the plant beds, the contractor shall remove the contaminated soils and replace with viable topsoil.
- C. Debris shall not be dumped on any part of the property or any unauthorized place. All debris, construction material, Contractor's buildings or equipment, stumps, roots, boulders or any other extraneous material deposited during construction shall be removed from the site.
- D. Contractor shall remove all tree protection fencing and erosion control measures in accordance with the requirements of the plans and specifications of this project.

END OF SECTION 02975

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. Formwork for cast-in-place concrete.
- B. Cast-in-place concrete, including concrete for the following, and other items as indicated on the Drawings.
 - 1. Foundation walls, footings, sidewalks.
 - 2. Concrete curbs
 - 2. Grout for reinforced masonry.
- C. Concrete curing and finishing.
- D. Control joints, expansion, and contraction joints.

1.2 NOT USED

1.3 RELATED WORK SPECIFIED ELSEWHERE

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to Work of this Section.
- B. Concrete Reinforcement 03200.

1.4 SUBMITTALS

- A. Submit under provisions of Division One.
- B. Submit manufacturer's catalog cuts, technical data, and recommendations on quantities, installation, and application for the following:
 - 1. Formwork accessories.
 - 2. Concrete admixtures.
 - 3. Waterstops.
 - 4. Grout and patching materials.
 - 5. Bonding agents.
 - 6. Anchor bolts and inserts.
 - 7. Joint fillers.
 - 8. Vapor barrier.
 - 9. Curing and sealing compounds
- C. Submit proposed mix designs and test data. Identify for each mix submitted the method by which proportions have been selected.
 - 1. For mix designs based on field experience, include individual strength test results, standard deviation, and required average compressive strength $f'(cr)$ calculations.

2. For mix designs based on trial mixtures, include trial mix proportions, test results, and graphical analysis and show required average compressive strength $f'(cr)$.
 3. Indicate quantity of each ingredient per cubic yard of concrete.
 4. Indicate type and quantity of admixtures proposed or required.
 5. Submit current test reports for aggregates showing compliance with specified quality and gradation.
- D. Submit affidavits from an independent testing agency certifying that materials furnished under this section conform to Specifications.
- E. Provide documentation from manufacturers assuring compatibility of admixtures with other ingredients. Provide documentation from manufacturers assuring compatibility of all surface applied products.
- F. Submit concrete placement schedule prior to start of any concrete placement operations. Include location of all joints indicated on drawings, plus anticipated construction joints.
- G. Submit copies of delivery tickets complying with ASTM C 94 for each load of concrete delivered to site. Include on the tickets the additional information specified in the ASTM document.
- H. Submit description of planned protective measures for cold weather or hot weather concreting.

1.5 QUALITY ASSURANCE

- A. The American Concrete Institute (ACI), ACI 318 "Building Code Requirements for Reinforced Concrete" and ACI 301 "Specifications for Structural Concrete for Buildings" shall be part of these Specifications as though written and attached hereto.
- B. Work shall comply with recommendations and requirements of the following, except as specifically superseded by these Specifications:
1. ACI 211 "Selecting Proportions for Concrete";
 2. ACI 226 "Silica Fume in Concrete";
 3. ACI 308 "Curing Concrete";
 4. ACI 304 "Measuring, Mixing, Transporting and Placing Concrete";
 5. ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures";
 6. ACI 302 "Floor and Slab Construction";
 7. ACI 305 "Hot Weather Concreting";
 8. ACI 306 "Cold Weather Concreting";
 9. ACI 347 "Formwork for Concrete"; and
 10. ACI 330
- C. Provide at least one person who shall be present during the execution of this portion of the Work and who shall be thoroughly trained and experienced in placing the types of concrete specified and who shall direct work performed under this Section.
- D. Concrete Quality Control
1. Procure concrete from a single Architect/Engineer-approved source. Source shall be a central commercial batching plant conforming to "Concrete Plant Standards" of the Concrete Manufacturer's Association automatic proportioning type.
 2. Conform to ASTM C94, paragraphs 1 through 15 and paragraph 18.
 3. Obtain materials of each type from same source for the entire project.

4. The Contractor shall engage testing agency to conduct tests and perform other services specified for quality control during construction.
- E. Project Conditions
1. Notify Architect/Engineer at least 48 hours in advance of intent to place concrete.
 2. Do not place concrete when the ambient temperature is below 40°F nor when the concrete temperature or ambient temperature exceeds 85°F. The Architect/Engineer may approve the placement of concrete under the above conditions, provided the recommendations of ACI 305 or ACI 306 are strictly adhered to.
 3. Do not place concrete when environmental conditions may adversely affect the placing, finishing, or curing of concrete, or its strength.
- F. The Contractor is responsible for correction of concrete work which does not conform to the specified requirements, including strength, tolerances, and finishes. The Contractor shall correct deficient concrete as directed by the Architect/Engineer.

PART 2 - PRODUCTS AND MATERIALS

2.1 FORMWORK

- A. Form Materials:
1. Concrete not exposed to view: Any standard form materials that shall produce structurally sound concrete.
 2. Exposed finish concrete: Materials selected to offer optimum smooth, stain-free final appearance and minimum number of joints. Material shall resist hydrostatic head without bowing or deflection.
 3. Plywood: PS-1, B-B high density concrete form overlay, Class I.
- B. Formwork Accessories:
1. Form coating: Form release agent that will not adversely affect concrete surfaces or prevent subsequent application of concrete coatings.
 2. Form ties: Commercially manufactured types; cone snap-ties, taper removable bolt, or other type which will leave no metal closer than 1-1/2 inches from surface of concrete when forms are removed, leaving not more than a one-inch diameter hole in concrete surface.

2.2 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type I or Type II for normal weight concrete; Type II for lightweight concrete. Use only one brand of cement for each structure.
- B. Fly Ash: ASTM C618, Type F, Tables 1, 2, 3, and 4.
- C. Microsilica (silica fume): "Force 10,000" as manufactured by W.R. Grace & Company.
- D. Water: Fresh, clean, and potable.
- E. Aggregates:
1. Normal weight concrete: ASTM C 33.
 2. Light weight concrete: ASTM C330, expanded shale.

3. Aggregate for normal weight concrete for interior slabs on grade shall conform to Georgia State DOT specification 603-0202 for Crushed Gravel.
 4. Fine aggregate: percentage passing No. 200 sieve shall be less than 2%.
 5. Coarse aggregate: Percentage passing No. 200 sieve shall be less than 0.7%.
 - a. Nominal size 1": ASTM Size No. 57
 - b. Nominal size 3/4": ASTM Size No. 67
 - c. Nominal size 1/2": ASTM Size No. 7
 6. Aggregates shall have been tested within the past six months from the date of the contract for the following:
 - a. Gradation: ASTM C136
 - b. Material finer than 200 sieves: ASTM C117
 - c. Organic impurities: ASTM C40
 - d. Soundness: ASTM C88
 - e. Clay lumps: ASTM C142
 - f. Light weight constituents: ASTM C123
 - g. Abrasive of coarse materials: ASTM C131
 - h. Soft particles: ASTM C235
 - i. Resistance to freeze-thaw: ASTM C66, ASTM C682.
- F. Admixtures
1. Admixtures that produce more than 0.1 percent of soluble chloride ions by weight of cement are prohibited.
 2. Admixtures shall be certified by their manufacturer for compatibility with other mix components.
- G. Air-Entraining Admixture: ASTM C 260. The following products or approved equivalents will be among those considered acceptable:
1. "Air Mix"; The Euclid Chemical Company.
 2. "Micro-Air"; Master Builders, Inc.
 3. "Daravair"; W. R. Grace & Co.
- H. Water-Reducing Admixture: ASTM C 494, Type A. The following products or approved equivalents will be among those considered acceptable:
1. WRDA with HYCOL; W.R. Grace & Co.
- I. High-Range Water-Reducing Admixture (Superplasticizer): ASTM C 494, Type F or G. The following products or approved equivalents will be among those considered acceptable:
1. "WRDA 19"; W.R. Grace & Co.
 2. "Daracem-100"; W. R. Grace & Co.

2.3 MISCELLANEOUS MATERIALS AND ACCESSORIES

- A. Nonshrink Grout: CRD-C 621, Grade B.
1. Provide nonmetallic type only.
 2. The following products or approved equivalents will be among those considered acceptable:
 - a. "Masterflow 713 or 928"; Master Builders, Inc.
 - b. "Euco N-S Grout"; The Euclid Chemical Company.
 - c. "Xpandcrete"; Anti-Hydro Waterproofing Co.
 - d. "Embeco 636"; Master Builders for equipment bases.

- B. Burlap: AASHTO M 182, Class 2 jute or kenaf cloth.
- C. Moisture-Retaining Cover: ASTM C 171, and as follows:
1. Fiber-reinforced waterproof paper.
 2. Polyethylene film.
 3. White burlap-polyethylene sheeting.
- D. Bonding Systems: ASTM C881; Type, grade, and class as required for project conditions. The following products or approved equivalents will be among those considered acceptable:
1. "Concresive LPL", Master Builders, Inc.
 2. "Sikadur 32 Hi-Mod", Sika Corporation.
 3. "Euco #452 Epoxy System"; Euclid Chemical Company.
- E. Adhesive anchor system:
1. Reinforcing bars:
 - a. "HIT C-100 System", HILTI.
 - b. "Keligrout"; KELKEN GOLD, INC., Princeton, NJ (phone 800-342-5154)
 2. Anchor bolts:
 - a. "HVA System", HILTI.
 - b. "Kelibond Anchors", KELKEN GOLD, INC., Princeton, NY (phone 800-342-5154)
- F. Expansion Joint Filler for pavements and sidewalks: Nonextruding bituminous type conforming to ASTM D1751.
- G. Isolation joint filler for slabs on grade: Preformed cork, 1/2" thick, conforming to ASTM D1752, Type II.
- H. Preformed Control Joint: "Screed Cap" for joints to receive sealant; "Zip Cap-Control Joint" for sawcut type joints; as manufactured by Greenstreak, Inc.
- I. Waterstop: Polyvinyl chloride (PVC), ribbed type with center bulb. Size appropriate to application. Supply prefabricated corner shapes.
- J. Waterstop: Bentonite type, "Volclay Waterstop-Rx", as manufactured by American Colloid Company.
- K. Vapor Barrier: Polyethylene sheets 10 mils thick. Top with 2-inch clean sand fill.
- L. Vapor Barrier: Moistop as manufactured by Fortifiber Corporation.
- M. Dovetail Anchor Slot: Galvanized steel, 22 gauge, felt filled.
- N. Wedge anchors: Hohman & Barnard, size as noted on Drawings.

2.4 SURFACE APPLIED CURING AND SEALING COMPOUNDS

- A. Products of the following manufacturers, provided they comply with requirements of the contract documents, will be among those considered acceptable:
1. Master Builders, Inc.
 2. Anti-Hydro Company, Inc.

3. The Euclid Chemical Company.
 4. W. R. Meadows, Inc.
 5. Sonneborn Building Products Division/ChemRex, Inc.
 6. L & M Construction Chemicals, Inc.
- B. Curing and Sealing Compounds: For interior or exterior applications.
1. Products shall comply with ASTM C 309, Type 1, clear styrene acrylate type, 30% minimum solids content.
 2. Maximum allowable moisture loss of 0.3 grams per square centimeter.
 3. Do not apply to surfaces scheduled to receive other finishes, coatings or coverings unless specifically approved by the Architect/Engineer.
 4. "SuperRez-Seal"; The Euclid Chemical Company or approved equivalent.
- C. Sealing and Hardening Compounds: Generally, for use at exterior slabs and walks subject to deicing products.
1. Concrete shall receive initial water cure as described elsewhere in this section.
 2. Product shall be siloxane based, 20% minimum solids content.
 3. "Euco-Guard 200"; The Euclid Chemical Company or approved equivalent.
- D. Chemical Hardening Compounds: For interior applications where a denser and more durable surface is required.
1. Concrete shall receive initial water cure as described elsewhere in this section.
 2. Product shall be magnesium silioco fluoride that reacts chemically with the free lime and calcium salts in the hardened concrete.
- E. Concrete Curing Compounds: Generally, for interior curing applications.
1. Product shall comply with ASTM C309, Type 1, Class B, wax free, resin based.
 2. Maximum allowable moisture loss of 0.3 grams per square centimeter.
 3. "KUREZ", The Euclid Chemical Company or approved equivalent. Do not apply to surfaces scheduled to receive other finishes, coatings, or coverings unless specifically approved by the Architect/Engineer.
 4. For surfaces that are scheduled to receive other finishes, coatings, or coverings, use dissipating resin-type compound, "KUREZ-DR", The Euclid Chemical Company or approved equivalent.
- F. Evaporation retarder: "Confilm"; Master Builders Company.

2.5 CONCRETE MIX DESIGN

- A. Do not begin concrete operations until proposed mixes have been reviewed and approved by the Architect/Engineer.
- B. Comply with recommendations of ACI 211.1 for normal weight concrete.
- C. For each type and strength of concrete, establish the required average strength $f'(cr)$ of the design mix on the basis of either field experience or trial mixtures as specified in ACI 301, and proportion mixes accordingly. If trial mixtures method is used, employ an independent testing agency acceptable to the Architect/Engineer for preparing and reporting proposed mix designs.
- D. Admixtures:
1. Air-entraining admixture: Add at rate to achieve specified air content.

2. High-range water-reducing admixture (superplasticizer): Add as required for placement and workability.
 3. Do not use admixtures not specified or approved.
- E. Design mixes to meet or exceed each requirement specified. Where more than one criterion is specified, the most stringent shall apply. For example, a minimum cement content or maximum water-cement ratio might result in strengths greater than the minimum specified; likewise, a greater cement content or lower water-cement ratio may be required in order to achieve the required strength.
- F. Normal Weight Concrete - Type A
1. Minimum compressive strength f'_c : 3,000 psi @ 28 days.
 2. Maximum water-cement ratio by weight: 0.50.
 3. Minimum cement content: 475 lbs. per cubic yard.
 4. Coarse aggregate size: 1".
 5. Maximum slump: 3-1/2 inches \pm 1 inch.
 6. Air Content: 4-6%.
 7. Schedule: Foundation work.
- G. Normal Weight Concrete - Type B
1. Minimum compressive strength f'_c : 4,000 psi @ 28 days.
 2. Maximum water-cements ratio by weight: 0.45.
 3. Minimum cement content: 540 lbs. per cubic yard.
 4. Coarse aggregate size: 3/4"-1".
 5. Maximum slump: 3-1/2 inches \pm 1 inch.
 6. Schedule: interior slabs on grade.
- H. Normal Weight Concrete - Type C
1. Minimum compressive strength f'_c : 4,000 psi @ 28 days.
 2. Maximum water-cement ratio by weight: 0.45.
 3. Minimum cement content: 590 lbs. per cubic yard.
 4. Coarse aggregate size: 1/2".
 5. Maximum slump: 3-1/2 inches \pm 1 inch.
 6. Air Content: 4-6%.
 7. Schedule: exterior sidewalk or paving, structural piers & walls
- I. Light Weight Concrete - Type D
1. Minimum compressive strength f'_c : 4,000 psi @ 28 days.
 2. Minimum cement content: 660 lbs. per cubic yard.
 3. Coarse aggregate size: 3/4".
 4. Maximum slump: 2-1/2 inches \pm 1 inch.
 5. Air Content: 4-8%.
 6. Schedule: Supported floors on composite steel deck.
- J. Light Weight Insulating Concrete - Type-E
1. Comply with requirements for U.L. Design number P907.
 2. Six c.f. Perlite aggregate per bag of Portland cement.
 3. One- and one-half pint 12.5 % solution neutralized vinsol resin, air-entrainment agent.
 4. Average dry density: 27 pcf.
 5. Minimum compressive strength: 150 psi.
 6. Schedule: Fire rated roof assembly.

- K. Provided that no additional expense to owner is involved, contractor may submit for Architect's/Engineer's approval requests for adjustment to approved concrete mixes when circumstances such as changed project conditions, weather, or unfavorable test results occur. Include laboratory test data substantiating specified properties with mix adjustment requests.

2.6 CONTROL OF MIX IN THE FIELD

- A. A tolerance of up to 1 inch above specified slump will be permitted for 1 batch in 5 consecutive batches tested. Concrete of lower slump than that specified may be used, provided proper placing and consolidation is obtained.
- B. If slump upon arrival at the site is lower than 1 inch below the value specified, one addition of water in accordance with ASTM C 94 will be permitted to bring slump within tolerance, provided that:
1. A positive means is available to measure the amount of water added at the site.
 2. The specified (or approved) maximum water-cementitious ratio is not exceeded.
 3. Not more than 45 minutes have elapsed since batching.
- C. Total Air Content: A tolerance of plus or minus 1-1/2 percent of that specified will be allowed for field measurements.
- D. Do not use batches that exceed tolerances.

2.7 CONCRETE MIXING

- A. Mix concrete materials in transit mixers, complying with requirements of ASTM C94, paragraphs 1 to 15 and 18 only.
- B. Elapsed time between initial contact of the cement with water and the completed discharge of the batch at the project site shall not exceed 90 minutes or 300 revolutions of the drum, whichever comes first. These limits shall be reduced at the direction of the Architect/Engineer.
- C. Concrete batch plant shall conform to requirements of the "Concrete Plant Standards" of the "Concrete Manufacturer's Association".

PART 3 – EXECUTION

3.1 HOT AND COLD WEATHER CONCRETING

- A. Do not proceed with work of this section for hot or cold weather placement without approval of the Architect/Engineer.
- B. Comply with recommendations of ACI 306 when air temperatures are expected to drop below 40 degrees F either during concrete placement operations or before concrete has cured.
1. Do not use frozen or ice-laden materials.
 2. Do not place concrete on frozen substrates.
 3. Do not add salt, calcium chloride, anti-freeze compounds.
- C. Comply with recommendations of ACI 305 when ambient temperature before, during, or after concrete placement is expected to exceed 85 degrees F.
1. Do not use retarding admixtures.

2. Make special provisions for curing and finishing.

3.2 CONCRETE FORM PREPARATION

- A. Comply with requirements of ACI 301 and ACI 347 for formwork, and as herein specified. The contractor is responsible for design, engineering, and construction of formwork, and for its timely removal.
- B. Earth forms are not permitted.
- C. Design and fabricate forms for easy removal, without impact, shock, or damage to concrete surfaces or other portions of the work.
- D. Design to support all applied loads until concrete is adequately cured, within allowable tolerances and deflection limits.
- E. Construct and brace formwork to accurately achieve end results required by contract documents, with all elements properly located and free of distortion. Provide for necessary openings, inserts, anchorages, and other features shown or otherwise required.
 1. Minimize form joints and make watertight to prevent leakage of concrete.
 2. Provide chamfered edges and corners at exposed locations, unless specifically indicated otherwise on the drawings.
 3. Provide openings to accommodate work of other trades, sized and located accurately. Securely support items built into forms; provide additional bracing at openings and discontinuities in formwork.
 4. Provide temporary openings for cleaning and inspection in most inconspicuous locations at base of forms, closed with tight-fitting panels designed to minimize appearance of joints in finished concrete work.
 5. Build into concrete work all required ties, anchors, anchor bolts, sleeves, and other inserts. Accurately set items, by using templates, in their final position at the time concrete is placed.
- F. Comply with minimum tolerances established in ACI 117, unless more stringent requirements are indicated on the drawings.
- G. Provide either form materials with factory applied non-absorptive liner or field applied form coating. If field applied coating is employed, thoroughly clean and recondition formwork and reapply coating before each use. Rust on form surfaces is unacceptable.

3.3 JOINT CONSTRUCTION

- A. Construction Joints: Locate and install construction joints as indicated on Drawings. If construction joints are not indicated, or if contractor opts to add additional joints, locate in manner which will least impair strength and stability of the structure.
 1. Contractor shall submit location diagrams to Architect/Engineer for approval if locations are not shown on the Contract Documents.
 2. Provide keyways not less than 1-1/2 inches deep.
 3. Continue reinforcement across and perpendicular to construction joints, unless details specifically indicate otherwise.
 4. Provide adequate shear reinforcement as shown on the Drawings or as directed by the Architect/Engineer.

5. Where a joint is to be made, the surface of the concrete shall be thoroughly cleaned. Joints shall be wetted and slushed with a coat of neat cement grout immediately before placement of new concrete. The grout shall be a neat cement and sand grout (1:3 mix) placed to a 1/2" minimum thickness. An approved bonding compound may be used in lieu of the cement grout with approval of the Architect/Engineer.
 6. Provide waterstops as indicated, and on all construction joints below grade adjacent to usable spaces. Install to form continuous, water-tight dam, with field joints fabricated in strict accordance with manufacturer's instructions.
- B. Movement Joints: Construct isolation joints in slabs poured on grade at points of contact with vertical components, such as foundation walls and column pedestals.
1. Install joint filler to full concrete depth. Recess top edge of filler 1/8 inch where joints are unsealed.
 2. Slabs on grade shall be tied to foundation walls with #3 reinforcing bars at 4'-0" unless specifically shown otherwise on the drawings.
 3. Smooth dowels greased or treated one end to prevent bond shall be installed at columns and as shown on the Drawings. Refer to "Installing Dowels", this section.
- C. Expansion Joints: Construct expansion joints where indicated. Install expansion joint filler to full depth of concrete. Recess edge of filler to depth indicated to receive joint sealant (and backer rod where necessary) specified in Division 7.
- D. Control Joints - Slabs on grade: Spacing of joints in slabs shall not exceed three times the thickness of the slab on center in feet nor 15 feet. Joints shall typically isolate columns and shall run between columns.
1. If locations of joints are not specifically shown on the Drawings, the Contractor shall submit location diagram to the Architect/Engineer for approval.
 2. Form control joints by means of saw cuts one-fourth the depth of the slab (1-1/4" minimum), performed as soon as possible after slab finishing without possibility of dislodging aggregate.
 3. Form control joints with preformed plastic accessories as directed by manufacturers.
- E. Control Joints - Walls: Construct control joints in walls within 5'-0" of corners/intersections and then at 25'-0" on center.
1. Contractor shall submit location diagram to Architect/Engineer for approval if locations are not shown on the Drawings.
 2. Construct weakened plane vertical control joints as shown on the drawings. Provide adequate shear reinforcement as directed by the Architect/Engineer.
 3. Joints above grade shall be constructed to provide for the installation of watertight joint and sealant. Joints shall be filled with appropriate backer rod and sealant.
 4. Provide waterstops where indicated on the Drawings and on all joints below grade adjacent to usable spaces. Install to form continuous watertight dam, with field joints fabricated in strict accordance with manufacturer's instructions.

3.4 INSTALLATION OF SMOOTH DOWELS

- A. Install dowels as noted on the Drawings.
- B. One end of dowel on one side of joint shall be non-bonded, allowed to slip.
- C. Methods:

1. Coat the non-bonded end with grease and wrap snugly with polyethylene tape. Work shall be neat and snug without excess material.
2. Use pre-molded dowel caps over non-bonded end.

3.5 INSTALLATION OF BUILT-IN ITEMS

- A. Set anchorage devices and other items required for other work connected to or supported by cast-in-place concrete, using templates, setting drawings, and instructions from suppliers of items to be embedded.
- B. Set edge forms and intermediate screeds as necessary to achieve final elevations indicated for finished slab surfaces.
- C. Set anchor bolts furnished under Division 5, using templates and in coordination with steel shop drawings.
- D. Comply with requirements of Paragraph 6.3 of ACI 318.

3.6 CONCRETE PLACEMENT

- A. Provide materials necessary to ensure adequate protection of concrete during inclement weather before beginning installation of concrete.
- B. Before beginning concrete placement, inspect formwork, reinforcing steel, and items to be embedded, verifying that all such work has been completed.
- C. Moisten wood forms immediately before placing concrete in locations where form coatings are not used.
- D. Provide runways for wheeled equipment to convey concrete. Do not support runways on reinforcing or wheel equipment directly over reinforcing.
- E. Schedule continuous placement of concrete to prevent the formation of cold joints.
- F. Provide construction joints if concrete for a particular element or component cannot be placed in a continuous operation.
- G. Deposit concrete as close as possible to its final location, to avoid segregation.
- H. Limit horizontal layers to depths which can be properly consolidated, but in no event greater than 24 inches.
- I. Consolidate concrete by means of mechanical vibrators, inserted vertically in freshly placed concrete in a systematic pattern at close intervals. Penetrate previously placed concrete to ensure that separate concrete layers are knitted together.
- J. Vibrate concrete sufficiently to achieve consistent consolidation without segregation of coarse aggregates.
- K. Do not use vibrators to move concrete laterally.

- L. Strike off and level concrete slab surfaces, using highway straight edges, darbies, or bull floats before bleed water can collect on surface. Do not work concrete further until finishing operations are commenced.

3.7 FINISHING FORMED SURFACES

- A. Repair surface defects, including tie holes, immediately after removing formwork.
- B. Remove honeycombed areas and other defective concrete down to sound concrete, cutting perpendicular to surface or slightly undercutting. Dampen patch location and area immediately surrounding it prior to applying bonding compound or patching mortar.
- C. Before bonding compound has dried, apply patching mixture matching original concrete in materials and mix except for omission of coarse aggregate, and using a blend of white and normal Portland cement as necessary to achieve color match. Consolidate thoroughly and strike off slightly higher than surrounding surface.
- D. Unexposed Form Finish: Repair tie holes and patch defective areas. Rub down or chip off fins or other raised areas exceeding 1/4-inch height.
- E. Exposed Form Finish:
1. Repair and patch defective areas with fins or other projection completely removed and smoothed.
 2. Smooth Rubbed Finish: Apply to surfaces indicated no later than 24 hours after form removal. Wet concrete surfaces to be finished and rubbed with Carborundum brick or other abrasive until uniform color and texture are achieved. Do not apply separate grout mixture.

3.8 FINISHING SLABS

- A. Finishing Operations
1. Do not directly apply water to slab surface or dust with cement.
 2. Screeding: Strike-off to required grade and within surface tolerances indicated. Verify conformance to surface tolerances. Correct deficiencies while concrete is still plastic.
 3. Bull Floating: Immediately following screeding, bull float or darby before bleed water appears to eliminate ridges, fill in voids, and embed coarse aggregate. Recheck and correct surface tolerances.
 4. Do not perform subsequent finishing until excess moisture or bleed water has disappeared and concrete will support either foot pressure with less than 1/4 inch indentation or weight of power floats without damaging flatness.
 5. Final floating: Float to embed coarse aggregate, to eliminate ridges, to compact concrete, to consolidate mortar at surface, and to achieve uniform, sandy texture. Recheck and correct surface tolerances.
 6. Troweling: Trowel immediately following final floating. Apply first troweling with power trowel except in confined areas, and apply subsequent trowelings with hand trowels. Wait between trowelings to allow concrete to harden. Do not overtrowel. Begin final troweling when surface produces a ringing sound as trowel is moved over it. Consolidate concrete surface by final troweling operation. Completed surface shall be free of trowel marks, uniform in texture and appearance, and within surface tolerance specified.
 7. Grind smooth surface defects which would telegraph through final floor covering system.
- B. Finishes: Coordinate appearance and texture of required final finishes with the Architect/Engineer

before application.

1. Broomed Float Finish: After floating and when water sheen has practically disappeared, apply uniform transverse corrugations approximately 1/16-inch-deep, without tearing surface.
 2. Trowel Finish: As specified above.
- C. Slab Surface Tolerances:
1. Achieve flat, level planes except where grades are indicated. Slope uniformly to drains.
 2. Floated finishes: Depressions between high spots shall not exceed 5/16 inch under a 10-foot straight edge.
 3. Troweled finishes: Achieve level surface plane so that depressions between high spots shall not exceed 1/8 inch under a 10-foot straight edge.
- D. Slab Finish Schedule: Apply finishes in the following typical locations and as otherwise shown on the drawings:
1. Broomed float finish:
 - a. Sidewalks, exterior ramps and slabs.
 2. Trowel finish:
 - a. Exposed interior floors.

3.9 CONCRETE CURING AND PROTECTION

- A. Prevent premature drying of freshly placed concrete and protect from excessively cold or hot temperatures until concrete has cured.
- B. Provide curing of concrete by one of the methods listed and as appropriate to service conditions and type of applied finish in each case. Curing period shall be not less than 7 days for standard cements and mixes.
- C. Cure formed concrete surfaces by moist curing with forms in place for full curing period or until forms are removed.
1. Keep wet wooden or metal forms exposed to heat of the sun.
 2. If forms are removed prior to completion of curing process, continue curing by one of the applicable methods specified.
- D. Water Cure: The surface of finished concrete shall be kept continuously wet for a minimum of seven days.
1. Concrete surfaces shall be kept continuously wet by sprinkling or fogging with water and by a covering material thoroughly saturated with water and kept wet by intermittent hosing. Concrete shall be protected against freezing during the curing.
 2. Covering material shall be kept continuously moist so that a film of water remains on the concrete surface throughout the curing period. Alternate cycles of wetting and drying shall not be permitted during the curing period.
 3. The use of a moisture retaining cover over burlap or a manufactured type of moisture retaining cover shall be permitted. Lap not less than 3 inches at edges and ends, and seal with waterproof tape or adhesive. Repair holes or tears during curing period with same tape or adhesive. Maintain covering in intimate contact with concrete surface. Secure to avoid displacement.
 4. Do not use plastic sheeting directly on surfaces that will be exposed to view when in service.

- C. Compound Cure: Curing compounds shall be applied immediately following last finishing operations.
1. Apply curing compound at rate stated by manufacturer to conform with moisture-retention requirements specified, using second, immediate application at right angles to first. Reapply if damaged by rain.
 2. Apply additional coat near substantial completion to act as sealer.
 3. Use curing compounds only in locations permitted or required. Do not apply to surfaces to receive other finishes, coatings, or coverings.
- D. Hardening Compound: Apply to concrete after initial water cure and seasoning of the concrete as recommended by manufacturer. Apply two or more applications as recommended by manufacturer to achieve maximum hardness.
- E. Avoid rapid drying at end of curing period.
- F. During and following curing period, protect concrete from temperature changes of adjacent air in excess of 5 degrees F per hour and 50 degrees F per 24 hours. Progressively adjust protective measures to provide uniform temperature changes over entire concrete surface.

3.11 JOINT FILLER

- A. Concrete surfaces shall be fully cured (minimum 120 days).
- B. Fill full depth of crack for proper load transfer.
- C. Install in strict accordance with manufacturer's instructions.

3.12 REMOVAL OF FORMS AND SUPPORTS

- A. Non-Load-Bearing Formwork: Provided that concrete has hardened sufficiently that it will not be damaged, forms not actually supporting weight of concrete or weight of soffit may be removed after concrete has cured at not less than 50 degrees F for 24 hours. Maintain curing and protection operations after form removal.

3.13 MISCELLANEOUS CONCRETE ITEMS

- A. Fill in holes and openings left in concrete structures for passage of work by other trades after such work is in place. Place such fill-in concrete to blend with existing construction, using same mix and curing methods.
- B. Provide machine and equipment bases and foundations, as indicated on drawings. Set anchor bolts at correct elevations, complying with diagrams or templates of equipment manufacturer.
- C. Provide concrete grout for reinforced masonry where indicated on drawings and as scheduled.

3.14 CONCRETE REPAIRS

- A. Patch tie holes, honeycomb, and other surface imperfections in accordance with ACI 301 and as directed by the Architect/Engineer.
- B. Defective concrete is defined as concrete not conforming to required lines, details, dimensions,

tolerances or specified requirements.

- C. Repair or replacement of defective concrete or surface imperfections shall be as determined by the Architect/Engineer.
- D. Do not patch, fill, touch-up, repair, or replace any concrete except upon specific approval of methods and materials by the Architect/Engineer for each individual area.

3.15 REMOVAL OF EXISTING CONCRETE

- A. Saw cut surfaces or drill holes at regular intervals sufficient to establish a fracture plane for removal by power tools.
- B. Salvage all existing reinforcing; do not cut away until specifically directed by the Architect/Engineer, or as shown on the Drawings.
- C. New work bonded to existing work:
 - 1. Clean and roughen existing surface by sandblasting, water-blasting, scabber, or other approved method.
 - 2. Embed dowels and reinforcing as detailed on the Drawings.
 - 3. Coat surface with bonding agent applied in strict accordance with manufacturer's instructions.
- D. Existing work cut away for new work.
 - 1. Saw cutting and removal shall continue to within 1/4" of the finished surface. The final 1/4" removal shall be completed by grinding to the final surface.
 - 2. Cut existing reinforcing bars 1/2" below the surface. Coat with anti-corrosion protective coating. Grout holes.
 - 3. Provide bond breaker where new concrete work is adjacent to existing work but structurally separate.

3.16 QUALITY CONTROL TESTING DURING CONSTRUCTION

- A. Composite Sampling and Making and Curing of Specimens: ASTM C 172 and ASTM C 31.
 - 1. Take samples at point of discharge.
 - 2. For pumped concrete, perform sampling and testing at the frequencies specified herein at point of delivery to pump, and perform additional sampling and testing at the same frequency at discharge from line. Results obtained at discharge from line shall be used for acceptance of concrete.
- B. Slump: ASTM C 143. One test per batch. Modify sampling to comply with ASTM C 94.
- C. Air Content of Normal Weight Concrete: ASTM C 173 or ASTM C 231. One test per strength test performed on air-entrained concrete.
- D. Concrete Temperature: One test per strength test.
- E. Compressive Strength Tests: ASTM C 39.
 - 1. Mold and cure one set of 4 standard cylinders for each compressive strength test required.
 - 2. Obtain samples on a statistically sound, random basis, minimum frequency as follows:
 - a. One set per 100 cubic yards or fraction thereof for each day's pour of each concrete

- class.
 - b. One set per 3500 square feet of slab or wall area or fraction thereof for each day's pour of each concrete class.
 - c. When the above testing frequency would provide fewer than 5 strength tests for a given class of concrete during the project, conduct testing from not less than 5 randomly selected batches, or from each batch if fewer than 5.
3. Test Schedule:
- a. Test one specimen per set at 7 days for information unless earlier age is required.
 - b. Test two specimens per set for acceptance of strength potential; test at 28 days unless other age is specified. The test result shall be the average of the two specimens. If one specimen shows evidence of improper sampling, molding, or testing, the test result shall be the result of the remaining specimen.
 - c. Retain one specimen from each set for later testing, if required.
4. Strength potential of as-delivered concrete will be considered acceptable if all of the following criteria are met:
- a. No individual test result falls below specified compressive strength $>$ than 500 psi.
 - b. Not more than 10 percent of individual test results fall below specified compressive strength $f'(c)$.
 - c. Average of any 3 consecutive strength test results equals or exceeds specified compressive strength $f'(c)$.
5. Testing for evaluation of field curing:
- a. Frequency: One field set of specimens per strength acceptance test.
 - b. Mold specimens from same sample used for strength acceptance tests. Field-cure, and test at same age as for strength acceptance tests.
 - c. Evaluate construction and curing procedures and implement corrective action when strength results for field-cured specimens are less than 85 percent of test values for companion laboratory-cured specimens.
- F. Test Results: Testing agency shall report test results in writing to Architect/Engineer and contractor within 24 hours of test.
- 1. Test reports shall contain the following data:
 - a. Project name, number, and other identification.
 - b. Name of concrete testing agency.
 - c. Date and time of sampling.
 - d. Concrete type and class.
 - e. Location of concrete batch in the completed work.
 - f. All information required by respective ASTM test methods.
 - 2. Nondestructive testing devices such as impact hammer or sonoscope may be used at Architect's/Engineer's option for assistance in determining probable concrete strength at various locations or for selecting areas to be cored, but such tests shall not be the sole basis for acceptance or rejection.
 - 3. The testing agency shall make additional tests of in-place concrete as directed by the Architect/Engineer when test results indicate that specified strength and other concrete characteristics have not been attained.
 - a. Testing agency may conduct tests of cored cylinders complying with ASTM C 42, or tests as directed.
 - b. Cost of additional testing shall be borne by the Contractor when unacceptable concrete has been verified.

END OF SECTION 03300

SECTION 03523

CONCRETE SIDEWALKS

PART 1 - GENERAL

1.01 SCOPE:

- A. Concrete sidewalks shall be constructed of Portland cement concrete, at the locations and to the dimensions, lines, grades and cross section indicated on the Drawings or as directed by the Owner and in conformity with the provisions and requirements set out in these Specifications.
- B. Concrete sidewalks shall include all the necessary excavation, unless otherwise indicated, subgrade and subbase preparation, backfilling, final clearing up and completing all incidentals thereto, as indicated on the Drawings or as directed by the Project Landscape Architect.
- C. All materials and methods of construction for concrete sidewalks and pavement shall conform to the requirements of the Georgia Department of Transportation Standard Specifications and ASTM C 94 "Standard Specification for Ready Mixed Concrete".
- D. Gravel parking areas and driveways shall conform to aggregate base requirements outlined in this Section of the specifications.

1.02 CONDITIONS

- A. Weather Limitations:
 - 1. Do not conduct concrete paving operations when surface is saturated, or contains excess of moisture, which would prevent uniform distribution and required penetration.
 - 2. Construct concrete sidewalk sections only when atmospheric temperature in the shade is above 40 degrees F, when the underlying base is dry and when weather is not rainy.
 - 3. Place base course when air temperature is above 35 degrees F and rising. No base course shall be placed on a frozen, saturated, or otherwise unsuitable subgrade material.
- B. Grade Control: Establish and maintain the required lines and grades for each course during construction operations.

1.03 INSPECTION AND TESTING:

- A. Pavement and base testing will be performed by an independent testing laboratory paid by the Owner.
- B. The testing agency shall test in-place courses for compliance with specified density, thickness and surface smoothness requirements.

- C. Earthwork and compaction operations shall conform to the requirements of Section 02200 of these specifications.
- D. Concrete Strength: One set of acceptance and field cylinders (a total of four) from the same batch of concrete will be made for each 50 cubic yards or fraction thereof, not less than once for each 5,000 square feet of pavement in each day's placing for each class and mix design.
1. Each batch of concrete shall be tested for slump prior to placement. Slump shall be between 1/2 and 1 1/2 inches as determined by AASHTO Test Method T119.
 2. Acceptance cylinders are compression test cylinders molded in the field, stored and cured in the field for the first 24 hours after molding and thereafter in the laboratory of the testing agency until time of testing. Average breaking strength at 28 days of a set of two acceptance cylinders will comprise test.
 3. Field cylinders are compression test cylinders molded in the field, stored and cured on the work site in the same location and subject to the same exposure as job concrete of which it is a representative. Each set of two acceptance cylinders will have two matching field cylinders.
 4. One field cylinder will be broken at seven days and the remaining will be held in reserve.
- E. Allowable Variation in Thickness:
1. Aggregate Base Course: $\pm 1/2$ -inch.
 2. Surface Course: $\pm 1/4$ -inch.
- F. Surface Smoothness: Test finished surface of each course for smoothness using a 16-foot straightedge. Intervals of tests shall be as directed by the Landscape Architect. Surfaces will not be acceptable if exceeding the following:
1. Base Course: 1/4-inch in 16 feet.
 2. Surface Course: 1/8-inch in 10 feet.
- G. Contractor's Duties Relative to Testing:
1. Notifying laboratory of conditions requiring testing.
 2. Coordinating with laboratory for field-testing.
 3. Paying costs for additional testing performed beyond the scope of that required and for retesting where initial tests reveal non-conformance with specified requirements.
 4. Paying the cost of overlays or pavement removal and replacement which does not comply with the specified testing limits.
- H. Samples:
Contractor shall pour at least 3 samples of colored concrete complete with finish and an adjacent integral curb for approval prior to committing to the entire concrete pour.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Materials used in the construction of sidewalks, in addition to Section 03300 and other general requirements of these Specifications, shall conform, unless otherwise stipulated, to the following:
1. Portland cement shall conform to ASTM C 150, Type 1.
 2. Graded aggregate base shall be uniform throughout and conform to requirements of Section 815.01 of the Georgia Department of Transportation Specifications.
 3. Sand: Dune sand, bank-run sand and manufactured sand are not acceptable. Only builders sand shall be used.
 4. Fiber Reinforcement: Engineered polypropylene fibers designed for secondary reinforcement of concrete slabs.
 5. Color: Schofield (Samples to be selected).
 6. Premolded joint filler for expansion joints shall conform to the requirements of ASTM D 1751 or ASTM D 1752. The joint sealer for the joints in the concrete pavement shall meet the requirements of Federal Specification SS-S-164 and shall be hot poured type.
 7. Concrete Color: Concrete shall include integrated colors in the concrete mix and shall be from same supplier and same batch mixture. Finished concrete shall have a light broom finish parallel to traffic flow on all sidewalk sections.
 8. All concrete, except where shown or specified otherwise, shall have the following minimum compressive strengths at 28 days, and slump at time of placement:

Location	Strength	Maximum Aggregate Size	Slump
Footings, Bases	3000 psi	1-1/2"	1"
Walls	3000 psi	3/4"	1"
Pavement, Sidewalks	4000 psi	1-1/2"	1"

2.02 FORM MATERIAL:

- A. Unless otherwise indicated, construct formwork for exposed concrete surfaces with plywood, metal, natal-farmed plywood faced or other acceptable panel-type materials to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to the joint system specified. Provide form material with sufficient thickness to withstand pressure of newly placed concrete without bow or deflection.
- B. Lumber used in construction of wood forms shall be free of bulge or warp, of uniform width, not less than 2-inches in thickness, except that 1-inch thickness may be used on curves, and shall be sound and free from loose knots. Stakes shall

be not less than 2" x 4" lumber of sufficient length that, when driven, they will hold the forms rigidly in place.

- C. Metal forms shall be of approved sections and shall have a flat surface on top. They shall present a smooth surface of the desired contour, sufficiently thick and braced to withstand the weight of the concrete without bulging or becoming displaced.

PART 3 - EXECUTION

3.01 LABOR:

- A. For finishing, competent and skilled finishers shall be provided.

3.02 EQUIPMENT:

- A. All equipment necessary and required for the construction of concrete sidewalks must be on the Project, proven to be in first class working condition and approved by the Owner, before construction will be permitted to begin.
- B. A one bag mixer will be permitted when the total output of concrete, per 10-hour day, does not exceed 25 cubic yards.
- C. Satisfactory floats, edgers, spades and tamps shall be furnished. Tamps of not over 8-inch diameter and weighing not less than 25 pounds shall be provided for tamping subgrade. A 10-foot longitudinal float of the inverted T-type with plough handles attached for manipulation, and a rigid float not less than 18-inches longer than the width of the walk being constructed, shall be provided.

3.03 REMOVAL OF STRUCTURES AND OBSTRUCTIONS:

- A. Unless otherwise indicated or stipulated, the removal of structures, obstructions, etc., will be performed in accordance with the requirements of Section 02060 of these Specifications.

3.04 EARTHWORK AND COMPACTION

- A. Earthwork and compaction operations shall be performed in accordance with requirements of Section 02200 of these specifications.

3.05 SUBGRADE PREPARATION:

- A. The subgrade for the sidewalk shall be formed by excavation to a depth equal to the thickness of the concrete plus the base course.
- B. All subgrade shall be of such width as to permit the proper installation and bracing of the forms.

- C. Yielding, or unsuitable material shall be removed and backfilled with satisfactory material in accordance with recommendations and approval of geo-technical consultant. Place 6-inches of graded aggregate base, as determined by the geotechnical sub-consultant, under concrete sidewalks as necessary for subgrade stabilization, compacted thoroughly and finished to a smooth, unyielding surface and proper line, grade and cross section of the proposed construction.
- C. Additional stabilization of poor subgrade areas may be necessary to achieve compaction criteria for aggregate base. These additional subgrade stabilization measures shall be performed under the direct supervision of the geo-technical consultant. These measures may include, but are not limited to, placement of

geogrid reinforcement materials, aggregate bridge lifts, undercutting of unsuitable soils and soil cement admixtures.

3.06 FORMS:

- A. All forms shall be set upon the prepared subgrade, true to lines and grade, and held rigidly in place so as not to be disturbed or displaced during the placing of the concrete. The top of the form shall be set to exact grade and the height shall be equal to not less than the thickness of the proposed concrete.
- B. Design form work to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.
- C. Construct forms complying with ACI 347, to sizes, shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades level and plumb work in finished structures. Provide for opening, offsets, sinkages, keyways, recesses, moldings, rustifications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain finishes. Solidly butt joints and provide back-up at joints to prevent leakage of cement paste.
- D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like to prevent swelling and for easy removal.
- E. Immediately before placing the concrete, the forms shall be given a coat of light oil and where being removed and used again, the forms shall be thoroughly cleaned and oiled each time.
- F. Forms shall be removed within 24 hours after placing concrete and no pressure shall be exerted upon the concrete in removing forms.

- G. When the concrete sidewalk is to be joined to an existing sidewalk, the existing sidewalk, if not in proper condition for the junction, shall be cut to a neat line perpendicular to both the centerline and the surface, or as indicated by the Owner.
- H. Curb line form: In locations where sidewalk is poured behind an existing curb, the top of the back of the curb as the finish line. Contractor shall protect the existing curb from damage during the process.

3.07 JOINTS:

- A. Control joints shall be saw scores. No trowel joint shall be permitted or accepted.
- B. Unless otherwise indicated on the Drawings or as directed by the Landscape Architect, premoulded expansion joint filler, 3/4-inch in thickness, shall be placed at the locations and in line with expansion joints in the adjoining pavement, gutter or curb. Transverse expansion joints for concrete sidewalks shall be 3/4-inch thick. When expansion joints are not required in the adjoining pavement or gutter, and not otherwise indicated on the Drawings, a 3/4-inch premoulded expansion joint filler shall be placed at intervals of not over 30 feet apart. All premoulded expansion joint filler must be cut to full width or length of the proposed construction and shall extend to within 1/2-inch of the top or finished surface. All longitudinal expansion joints shall be placed as indicated on the Drawings or as directed by the Project Landscape Architect.
- C. All expansion joints shall be true, even and present a satisfactory appearance.
- D. All expansion joint material protruding after the concrete has been finished shall be trimmed flush as directed by the Landscape Architect.
- E. Construction Joints: Locate and install construction joints not shown on the Drawings, so as not to impair strength and appearance of the structure, as acceptable to the Landscape Architect. Review need for additional joints or scores with the Landscape Architect prior to construction.
- F. Control Joints in Slabs-on-Ground: Construct control joints in slabs-on-ground to form panels of patterns as shown. Locate expansion type joint at spacing recommended by Portland Cement Association.
- G. Control Joints in Sidewalks: Provide joints in pattern as indicated on the Drawings. Locate expansion type joints at spacing as indicated.
- H. Saw joints shall be cut no sooner than 7 hours or less than 24 hours from initial pour.

3.08 MANUFACTURING AND PLACING CONCRETE:

- A. Immediately before placing concrete, the depth of the proposed concrete shall be checked by means of a template cut true to the cross section of the proposed construction and any irregularities shall be corrected.
- B. Immediately before placing concrete, all subgrade shall be thoroughly sprinkled or wetted.
- C. Concrete shall not be placed upon a frozen subgrade or subbase.
- D. Construction joints will be permitted only at grooves or at expansion joints, unless otherwise approved by the Owner.
- E. The concrete shall be manufactured and placed in accordance with the requirements of Section 03300 of these Specifications.
- F. The concrete shall be placed immediately after mixing; the edges, sides, etc. shall be thoroughly spaded and the surfaces tamped sufficiently to thoroughly compact the concrete and bring the mortar to the surface. The concrete shall be deposited and compacted in a single layer.

3.09 FINISHING:

- A. The concrete shall be stuck-off with a transverse template resting upon the side forms and then shall be floated with a 10-foot longitudinal float working the float transversely across the concrete with a sawing motion, always maintaining it parallel to the edges of the sidewalk, or driveway, where practicable, and in such a manner that all surplus water, laitance and inert material shall be removed from the surface. This operation shall be continued until the surface of the concrete shows no variation from a 10-foot straightedge. If necessary, additional concrete shall be added to fill depressions, and the longitudinal float used again. The longitudinal float shall not be moved ahead more than one-half its length at any time.
- B. When the surface of the concrete is free from water and just before the concrete obtains its initial set, it shall be gone over and finished with a wooden float so as to produce a sandy texture. The longitudinal surface variations shall be not more than 1/4-inch under a 12-foot straightedge, nor more than 1/8-inch on a five-foot transverse section. The surface of the concrete must be finished so as to drain completely at all times.
- D. The edges of the sidewalks or driveways shall be carefully finished and rounded with an edging tool having a radius of 1/2-inch.
- E. Finish: The finished surface of the concrete shall be a light broom finish perpendicular to the flow of traffic.

- F. The edges of the concrete at contraction joints shall be rounded with an edging tool having a radius of 1/4-inch. The top and ends, where practicable, of expansion joint material shall be cleaned of all concrete and the expansion joint material shall be trimmed so as to be slightly below the surface of the concrete. All marks caused by edging shall be removed with a wetted brush or wooden float.
- G. The surface of sidewalks shall be divided into blocks by use of a grooving tool. Grooves shall be placed so as to cause contraction joints to be placed at a groove line, where practical. The grooves shall be spaced equal to the sidewalk width, but not to exceed 10' spacing between joints. The grooves shall be cut to a depth of not less than 1-inch. The edges of the grooves shall be edged with an edging tool having a radius of 1/4-inch, and any marks caused by edging or otherwise shall be removed with a wetted brush or wooden float so as to give the surface a uniform texture and finish

3.10 PROTECTION AND CURING:

- A. Immediately after finishing the concrete, it shall be covered and cured in accordance with the requirements of Section 03300 of these Specifications. Curing materials shall conform to the requirements of ASTM C 309 (liquid membrane compound) or ASTM C 171. If the temperature falls to below freezing, satisfactory heating devices shall be placed under suitable covers to keep the temperature around the concrete at above 45 degrees F.
- B. Pedestrians will not be allowed upon concrete sidewalks until 12 hours after finishing concrete, and no vehicles or loads shall be permitted upon any sidewalk or driveway until the concrete has attained sufficient strength for such traffic.
- C. The Contractor shall construct such barricades and protection devices as are necessary to keep pedestrians and traffic off the sidewalks.
- H. If any sidewalk is damaged at any time previous to final acceptance of the project, it shall be repaired by removing all concrete within the limits of the grooves, and be replaced, at the Contractor's expense, with concrete of the type, kind and finish in the original construction.

3.11 BACKFILLING:

- A. Immediately after the concrete has set sufficiently, the spaces along the sides or edges of the sidewalk shall be refilled with suitable material, this material shall be compacted in layers of not over 4-inches each, until firm and solid.

3.12 CLEANING:

- A. All excess or unsuitable material shall be removed and disposed of in accordance with requirements of Section 02200 of these Specifications.
- B. Final clean up shall be performed in accordance with the requirements of these Specifications.
- C. All material becoming the property of the Owner shall be stored in a manner and at locations near or on the Project as directed by the Owner.

END OF SECTION 02523

SECTION 04400

STONE MASONRY

PART 1 - GENERAL

RELATED DOCUMENTS

General and Specials Conditions shall apply to this section.

DESCRIPTION OF WORK:

Extent of each type of masonry work is indicated on drawings. In general, the work includes: Stone masonry, mortar, and accessories needed to complete the work as shown on drawings.

QUALITY ASSURANCES:

Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.

Sub-contractor or mason: Shall have a minimum of three years experience in the installation of flat work paving and stone walls respectively.

Construction Tolerances:

Variation from Plumb: For vertical lines, walls and arises do not exceed 1/8" in 3'.

Variation from Level: For top of walls and masonry courses do not exceed 1/8" in 10'. Tops of all borders, steps and paving shall be flush to adjacent bricks unless specified.

Variation in Cross-Sectional Dimensions: For thickness of walls do not exceed minus 1/4" or plus 1/2".

SUBMITTALS:

Product Data: Submit manufacturer's specifications and other data for each type of masonry unit, accessory, and other manufactured products, including certifications that each type complies with specified requirements. Include instructions for handling, storage, installations and protections.

SAMPLE PANELS:

No work shall proceed until sample panels are completed and approved by the Landscape Architect and or Owner's Representative.

Construct sample flat work panel 4'x4' using specified stone and mortar, bond and joint tooling required for final work, indicating the proposed range of color, texture and workmanship to be expected in the completed work. Obtain Landscape Architect or Owners Representatives acceptance of visual qualities of the sample before start of masonry work. Protect sample panels during construction as a standard for judging completed masonry work. Use sample panels to test proposed cleaning procedures.

Construct sample panels to show finished condition of each pattern of stone paving and wall including all borders and edges. Sample may be built in place and become part of finish

work upon approval by Landscape Architect or Owner's Representative. Use sample panels to test jointing, pointing and cleaning procedures.

Samples shall be maintained throughout the project as a standard. Samples shall be removed as part of final cleanup.

Borders shall be installed with clean joints, even and uniformly spaced. Corners shall be neatly butted or mitered.

JOB CONDITIONS:

Protection of Work: During construction, cover work with heavy waterproof sheeting at end of each day's work. Cover partially completed structures when work is not in progress.

Do not apply uniform loading for a least 12 hours after building masonry walls, columns or paving.

Do not apply concentrated loads for at least 3 days after building masonry walls, columns or paving.

Staining: Prevent grout or mortar from staining the face of masonry to be left exposed. Remove immediately grout or mortar in contact with such masonry.

COLD WEATHER PROTECTION:

Remove any ice or snow formed on masonry bed by carefully applying heat until top surface is dry to the touch.

Remove all masonry determined to be frozen or damaged by freezing conditions.

Perform the following construction procedures while the work is progressing:

When air temperature is from 40 degrees F to 35 degrees F, heat sand

or mixing water to produce mortar temperatures between 40 degrees F and 120 degrees F.

Do not proceed with masonry work until temperatures are 35 degrees F and rising.

Perform the following protections for completed masonry not being worked on:

When the mean daily air temperature is from 40 degrees F and below, protect masonry from rain or snow for at least 24 hours by covering with weather resistive membrane.

PART 2 - PRODUCTS

MASONRY UNITS, GENERAL:

Granite for the seatwalls and the splash pad columns:

Stones: minimum of 4" depth grey Elberton Granite Rubble as Rip Rap.
Supplier: Aztec Stone Empire 5055 Buford Hwy, Atlanta, Ga 30071
Ph. 770 368-9337 website: aztecstoneempire.com.

Colors:

Grey
Dark Grey

Finish: Rubble

Pattern: Solder Course 3" height x 4" depth, length varies.

Manufacturer: Obtain masonry products from one supplier, of uniform texture and color for each kind required, for each continuous area and visually related areas.

MORTAR MATERIALS:

Masonry Cement for Exposed Work: ASTM C 270 Type S (1800-PSI) Color to be approved by landscape architect.

MASONRY ACCESSORIES:

Continuous Wire Reinforcing and Ties for Masonry: Provide welded wire units prefabricated in straight lengths of not less than 10' with matching corner units. Fabricate from cold-drawn steel wire complying with ASTM A 82, with deformed continuous side rods and plain cross-rods, and a unit width of 1-1/2" less than thickness of wall.

Anchors and Ties: Provide straps, bars, bolts and rods as indicated.

Reinforcing Bars: Deformed steel ASTM A 615, Grade 60 of the sizes shown.

PART 3 - EXECUTION

LAYOUT:

See Special Conditions for process.

SAMPLE: Contractor shall install and clean to finished condition enough work to include each element pattern, bond and jointing of the masonry to serve as a sample. No work shall commence until the sample is approved by the Landscape Architect or Owner's Representative. Approved sample shall be maintained in finished condition through the construction process.

INSTALLATION, GENERAL:

Thickness: Build masonry construction to the full thickness shown, except build single-width walls (if any) to the actual thickness of the masonry units, using units of nominal thickness shown or specified.

Break units with stone hammer designed to chip and break field stones with controlled similar irregular edges. Stone units as required to provide pattern shown and to fit adjoining work neatly. Use full units without breaking or chipping wherever possible.

Frozen Materials and Work: Do not use frozen materials or materials mixed or coated with ice or frost. For masonry, which is specified to be wetted, comply with the BIA recommendations. Do not build on frozen work. Remove and replace masonry work damaged by frost or freezing.

Pattern Bond: Lay exposed masonry in the pattern shown on the details. Do not use units with less than 4" horizontal face dimensions at corners.

If drawings do not clearly indicate the pattern or bond, the contractor shall immediately contact the Landscape Architect for clarification.

Stopping and Resuming Work:

Rack back 1/2 masonry unit length in each course; do not tooth. Clean exposed surfaces of set masonry, wet units lightly (if specified to be wetted) and remove loose masonry units and mortar prior to laying fresh masonry.

Wherever contractor determines there is not adequate information to construct an element, bond, or pattern of the design, the contractor shall not proceed with the work until the Landscape Architect is notified.

Batch Control Mortar:

Measure and batch materials by volume such that the required proportions for mortar can be accurately controlled and maintained. Measurement of sand exclusively by shovel will not be permitted.

Mix mortar ingredients for a minimum of 5 minutes in a mechanical batch mixer. Use water clean and free of deleterious materials which would impair the work. Do not use mortar which has begun to set, or if more than 2-1/2 hours has elapsed since initial mixing. Re-temper mortar during 2/1/2-hr. period as required to restore workability.

Mixer shall not be located in proximity of plants or plant beds.

Bedding and Jointing:

Lay stone with partially filled bed, head and collar joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not flush head joints. Rake all joints to minimum 1/2" depth on the face of the stone.

All joints butting against concrete or other masonry installations shall be a silicon flexible joint material or expansion material.

Joints: maintain joint widths shown, except for minor variations required to maintain bond alignment.

Joint Treatment: For concealed work, struck flush.

Exposed joints of all work shall have raked joints to a minimum of ½ inch from the face of the stone.

Any joints falling out shall be replaced by contractor for up to one year after final acceptance.

REPAIR, POINTING AND CLEANING:

Remove and replace masonry units which are loose, chipped, broken, stained or otherwise damaged, or if units do not match adjoining units as intended. Provide new units to match adjoining units and install in fresh mortar or grout, pointed to eliminate evidence of replacement.

Pointing: During the tooling of joints, enlarge any voids or holes, except weep-holes, and completely fill with mortar. Point-up all joints at corners, openings and adjacent work to provide a neat, uniform appearance.

Clean exposed masonry surfaces by the bucket and brush hand cleaning method or by high pressure water method.

Use commercial cleaning agents only with approval of owner and landscape architect and in accordance with suppliers' instructions.

Do not allow chemical cleaning agents to damage adjacent plant materials, contaminate soil in plant beds, or damage surface of other materials.

Workmen shall not track across plant beds when using chemical cleaning agents.

Slug, dust and debris left from the operation of mixer and masonry saw shall be removed from the site and cleaned from all finished surfaces.

FINAL CLEAN UP:

All finished masonry shall be left in cleaned condition free of mortar, stains, slug or other debris.

All adjacent plant beds shall be left clear of mortar, refuse, bricks and other contaminates. Any soil contaminated by masonry work shall be removed and replaced with suitable topsoil. Any plant material damaged by masonry or cleanup work shall be replaced by the contractor.

END OF SECTION 04400

SECTION 06100

ROUGH CARPENTRY

1.1 GENERAL

- A. Submittals: Submit the following:
1. Contractor shall remove a treatment tag from each lumber delivery and provide the Landscape Architect and Owner with a copy of the tag, manifest and delivery date. Include in daily reports and provide at regular on-site project meetings.
 2. Contractor shall provide material certificates for dimension lumber specified to comply with minimum allowable unit stresses.
 3. Wood treatment data, including chemical treatment manufacturer's instructions for handling, storing, installing, and finishing treated materials.
 4. Research or evaluation reports of the model code organization acceptable to authorities having jurisdiction that evidence code compliance of engineered wood products, foam-plastic sheathing, air-infiltration barriers, metal framing anchors, power-driven fasteners, and fire-retardant-treated wood.

1.2 PRODUCTS

- A. Lumber, General: Comply with DOC PS 20 and with applicable grading rules of inspection agencies certified by the American Lumber Standards Committee's (ALSC) Board of Review. Provide dressed lumber, S4S, with each piece factory marked with grade stamp of inspection agency.
1. For exposed lumber, furnish pieces with grade stamps or tags applied to ends or back of each piece, or omit grade stamps and provide grade-compliance certificates issued by inspection agency.
 2. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.
 3. Provide lumber with 15 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.
- B. All permeant wood products making contact with the ground or exposed to the natural elements shall be **GROUND CONTACT** treated wood. No exceptions shall be made. Every piece of lumber shall have a treatment tag attached to one end and shall conform to AWWA Category Use Chart for UC4B .60 CCA, .31CA-C or equal.

Wood-Preservative-Treated Materials: Comply with applicable requirements of AWWA C2 (lumber) and AWWA C9 (plywood). Mark each treated item with the Quality Mark Requirements of an inspection agency approved by ALSC's Board of Review.

1. Above Ground Lumber: Pressure treat aboveground items with waterborne preservatives to a minimum retention of 0.40 lb/cu. Ft or equal such as .23 MCA or .31 CA-C. After treatment, kiln-dry lumber and plywood to a maximum

moisture content of 19 and 15 percent, respectively. Treat indicated items and the following:

- a. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - b. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
 - c. Wood framing members less than 18 inches above grade.
 - d. Wood floor plates installed over concrete slabs directly in contact with earth.
2. Ground Contact Lumber: Pressure treat ground contact wood members or freshwater with waterborne preservatives to a minimum retention of 0.60 lb/cu. ft. or approved equal such as .23 MCA or .31 CA-C.
 3. Water Contact: Lumber, posts or piles in constant contact with fresh water shall be Marine Grade treatment or .UC4C - .80 CCA or equal for piles only. Saltwater or brackish contract for posts or piles shall be UC5B - 2.5 CCA
 4. Deck boards shall be .80 CCA for all lumber exposed to surface water or over wetlands, water bodies or ground contact.
 4. Complete fabrication of treated items before treatment, where possible. If cut after treatment, apply field treatment complying with AWPA M4 to cut surfaces. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.
 5. Exterior Type: Use for exterior locations and where indicated.
 6. Inspect each piece of treated lumber or plywood after drying and discard damaged or defective pieces.
- C. Dimension Lumber: Provide dimension lumber of grades indicated according to the ALSC National Grading Rule (NGR) provisions of the inspection agency indicated.
1. Non-Load-Bearing Interior Partitions: Provide Standard, Stud, or No. 3 grade and any of the following species:
 - a. Species: Mixed southern pine; SPIB.
 2. Framing Other than Non-Load-Bearing Partitions: Provide Construction or No. 2 grade and any of the following species:
 - a. Species: Southern pine; SPIB.
 3. Exposed Framing: Provide material hand-selected from lumber of species and grade indicated below for uniformity of appearance and freedom from characteristics and would impair finish appearance.
 - a. Species and Grade: Southern pine, Select Structural; SPIB.
- D. Concealed Boards: Provide lumber with 19 percent maximum moisture content and any of the following species and grades:

1. Species and Grade: Eastern softwoods, No. 3 Common per NELMA rules.
 2. Species and Grade: Northern species, No. 3 Common or Standard per NLGA rules.
 3. Species and Grade: Mixed southern pine, No. 2 per SPIB rules.
 4. Species and Grade: Western woods, Standard per WCLIB rules or No. 3 Common per WWPA rules.
- E. Miscellaneous Lumber: Provide No. 3 or Standard grade lumber of any species for support or attachment of other construction, including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, and similar members.
- F. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that evidence compliance with building code in effect for Project. Provide engineered wood products with allowable design stresses, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
1. Parallel-Strand Lumber: Lumber manufactured by laying up wood strands using an exterior-type adhesive complying with ASTM D 2559, and cured under pressure to produce members with grain of strands parallel to their lengths and complying with the following requirements:
 - a. Extreme Fiber Stress in Bending: 2900 psi for 12-inch nominal-depth members.
 - b. Modulus of Elasticity: 2,000,000 psi.
 2. Prefabricated Wood I-Joists: Units manufactured by bonding stress-graded lumber flanges to wood-based structural-use panel webs with exterior-type adhesives complying with ASTM D 2559, to produce I-shaped joists complying with the following requirements:
 - a. Structural Capacities: Establish and monitor structural capacities according to ASTM D 5055.
- L. Extruded Cellular Polystyrene Sheathing: ASTM C 578, Type IV, in manufacturer's standard lengths and widths with T & G or shiplap long edges as standard with manufacturer.
- M. Polyisocyanurate Foam Sheathing: Rigid, closed-cell foam board; formed by expanding polyisocyanurate resin using hydrochlorofluorocarbons (HCFCs); with aluminum foil facings laminated to both sides; complying with FS HH-I-1972/1, Class 1 or 2; with a thermal resistance (R-value) for 1-inch thickness of 7.2 ° F x h x sq. ft./Btu at 75 ° F; in thicknesses indicated. Foam-plastic core, 4-1/4 inches thick or less, and facings shall have flame spread of 25 or less, when tested individually.

- P. Fasteners: Size and type indicated. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with a hot-dip zinc coating per ASTM A 153 or of Type 304 stainless steel.
1. Power-Driven Fasteners: CABO NER-272.
 2. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

1.3 EXECUTION

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted.
- B. Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.

END OF SECTION 06100

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Salvaging nonhazardous demolition and construction waste.
 - 2. Recycling nonhazardous demolition and construction waste.
 - 3. Disposing of nonhazardous demolition and construction waste.
- B. Related Requirements:
 - 1. Section 02060 "Demolition" for disposition of waste resulting from partial demolition of structures, and site improvements, and for disposition of hazardous waste.
 - 2. Section 02100 "Site Preparation" for disposition of waste resulting from site clearing and removal of above and below grade improvements.

1.2 DEFINITIONS

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Achieve end-of-Project rates for salvage/recycling of 50 percent by weight of total non-hazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials, including but not limited to the following:
 - 1. Demolition Waste:
 - a. Metal roof.
 - b. Concrete paving.
 - c. Concrete reinforcing steel.
 - d. Concrete masonry units.
 - e. Chain link fence.
 - f. Wood joists.

- g. Rough hardware.
- h. Supports and hangers.
- i. Valves.
- j. Sprinklers.
- k. Electrical conduit.
- l. Copper wiring.
- m. Lighting fixtures.
- n. Lamps.
- o. Ballasts.
- p. Electrical devices.
- q. Switchgear and panelboards.
- r. Transformers.

2. Construction Waste:

- a. Masonry and CMU.
- b. Lumber.
- c. Wood sheet materials.
- d. Metals.
- e. Piping.
- f. Electrical conduit.
- g. Packaging: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following uncontaminated packaging materials:

- 1) Paper.
- 2) Cardboard.
- 3) Boxes.
- 4) Plastic sheet and film.
- 5) Polystyrene packaging.
- 6) Wood crates.
- 7) Plastic pails.

1.4 INFORMATIONAL SUBMITTALS

- A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Use Form CWM-7 for construction waste and Form CWM-8 for demolition waste. Include the following information:
 - 1. Material category.
 - 2. Generation point of waste.
 - 3. Total quantity of waste in tons.
 - 4. Quantity of waste salvaged, both estimated and actual in tons.
 - 5. Quantity of waste recycled, both estimated and actual in tons.
 - 6. Total quantity of waste recovered (salvaged plus recycled) in tons.
 - 7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
- B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.

- C. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- E. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- F. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- G. Qualification Data: For waste management coordinator and refrigerant recovery technician.
- H. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.5 QUALITY ASSURANCE

- A. Waste Management Coordinator Qualifications: Experienced firm, with a record of successful waste management coordination of projects with similar requirements, that employs a LEED-Accredited Professional, certified by the USGBC, as waste management coordinator.
- B. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.
- C. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- D. Waste Management Conference: Conduct conference at Project site. Review methods and procedures related to waste management including, but not limited to, the following:
 - 1. Review and discuss waste management plan including responsibilities of waste management coordinator.
 - 2. Review requirements for documenting quantities of each type of waste and its disposition.
 - 3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
 - 4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
 - 5. Review waste management requirements for each trade.

1.6 WASTE MANAGEMENT PLAN

- A. General: Develop a waste management plan according to ASTM E 1609 and requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of demolition, site-clearing and construction waste generated by the Work. Use Form CWM-1 for construction waste and Form CWM-2 for demolition waste. Include estimated quantities and assumptions for estimates.

- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Use Form CWM-3 for construction waste and Form CWM-4 for demolition waste. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
 2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
 3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
 4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
 5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
 6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.
- D. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Use Form CWM-5 for construction waste and Form CWM-6 for demolition waste. Include the following:
1. Total quantity of waste.
 2. Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.
 3. Total cost of disposal (with no waste management).
 4. Revenue from salvaged materials.
 5. Revenue from recycled materials.
 6. Savings in hauling and tipping fees by donating materials.
 7. Savings in hauling and tipping fees that are avoided.
 8. Handling and transportation costs. Include cost of collection containers for each type of waste.
 9. Net additional cost or net savings from waste management plan.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
1. Comply with operation, termination, and removal requirements in Section 015000 "Temporary Facilities and Controls."
- B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.

- C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.
 - 1. Distribute waste management plan to everyone concerned within three days of submittal return.
 - 2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
 - 2. Comply with Section 015000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.
- E. Waste Management in Historic Zones or Areas: Hauling equipment and other materials shall be of sizes that clear surfaces within historic spaces, areas, rooms, and openings, by 12 inches or more.

3.2 SALVAGING DEMOLITION WASTE

- A. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 - 3. Store items in a secure area until installation.
 - 4. Protect items from damage during transport and storage.
 - 5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.
- B. Salvaged Items for Sale and Donation: Not permitted on Project site.
- C. Salvaged Items for Owner's Use: Salvage items for Owner's use and handle as follows:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 - 3. Store items in a secure area until delivery to Owner.
 - 4. Transport items to Owner's storage area designated by Owner.
 - 5. Protect items from damage during transport and storage.
- D. Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.
- E. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.
- F. Plumbing Fixtures: Separate by type and size.
- G. Lighting Fixtures: Separate lamps by type and protect from breakage.
- H. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

3.3 RECYCLING WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
- C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.
 - 1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
 - a. Inspect containers and bins for contamination and remove contaminated materials if found.
 - 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
 - 4. Store components off the ground and protect from the weather.
 - 5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

3.4 RECYCLING DEMOLITION WASTE

- A. Asphalt Paving: Grind asphalt to maximum 1-1/2-inch size.
- B. Asphalt Paving: Break up and transport paving to asphalt-recycling facility.
- C. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
 - 1. Pulverize concrete to maximum 4-inch size.
- D. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
 - 1. Clean and stack undamaged, whole masonry units on wood pallets.
- E. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
- F. Metals: Separate metals by type.
 - 1. Structural Steel: Stack members according to size, type of member, and length.
 - 2. Remove and dispose of bolts, nuts, washers, and other rough hardware.
- G. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.
- H. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.

- I. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.
- J. Metal Suspension System: Separate metal members including trim, and other metals from acoustical panels and tile and sort with other metals.
- K. Carpet: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.
 - 1. Store clean, dry carpet in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.
- L. Carpet Tile: Remove debris, trash, and adhesive.
 - 1. Stack tile on pallet and store clean, dry carpet in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.
- M. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.
- N. Conduit: Reduce conduit to straight lengths and store by type and size.

3.5 RECYCLING CONSTRUCTION WASTE

- A. Packaging:
 - 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
 - 2. Polystyrene Packaging: Separate and bag materials.
 - 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
 - 4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- B. Wood Materials:
 - 1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
 - 2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
 - a. Comply with requirements in Section 329300 "Plants" for use of clean sawdust as organic mulch.
- C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.
 - 1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.
 - a. Comply with requirements in Section 329300 "Plants" for use of clean ground gypsum board as inorganic soil amendment.

3.6 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn waste materials.
- C. Burning: Burning of waste materials is permitted only at designated areas on Owner's property, provided required permits are obtained. Provide full-time monitoring for burning materials until fires are extinguished.
- D. Disposal: Remove waste materials from Owner's property and legally dispose of them.

END OF SECTION 017419