

## **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 of designated elements indicated on the Drawings.

Due to close proximity of utilities in the park and the desire to save existing trees, some of the demolition should be performed with small lightweight equipment.

Contractor shall secure permission of City of Brookhaven before staging in the parking spaces along Candler Lake East NE or on the paved areas within the horseshoe park.

Demolition items shall consist of the removal of stumps, small trees, underbrush, and other minor items within the limits of construction. Relocation items shall consist of signs and any other element within the limits of construction.

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

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

Demolition process and construction procedures shall not interfere with traffic on Candler Lake East NE or endanger vehicles or drivers on the street or within the park.

Contractor will have to coordinate with other contractors who are in the Horseshoe Rd area.

##### **1.02 SUBMITTALS**

Traffic Control Plan: 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.

##### **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 East NE

#### **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 utility companies of the excavation schedule prior to 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 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. Staging along Candler Lake East 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 site by 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. 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 access along Candler Lake East NE. 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:

Related Section 02060 Demolition, 02540 Erosion and Sediment Control,  
Section 02112 Tree Protection and Tree Penalty Clause shall apply.

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. Contractor may have use on one of the adjacent pavilions as a made shift field office during construction but will be responsible for repairing any damage that occurs to the pavilion.
- 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 maintain reasonable access to the park for use by the citizens.
- F. Contractor shall coordinate with the Owner's Representative to be aware of special events taking place in the park and to take reasonable measures to accommodate the events.
- G. The site has gates on each end of the horseshoe. Contractor will be given keys to these gates for his use in access and control of the site.

1.3 CLEARNG AND GRUBBING:

- A. Within the limits schematically identified on the Drawings, the site will be cleared and grubbed to prepare for construction.

- B. 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 and Engineer 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 limits of construction site 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 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 or turf.

Grubbing shall not occur in the root zones of surviving trees designated to remain.

- 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.

Other contractors within the Horseshoe Loop Road may be using some of the designated staging sites. Contractor shall coordinate with other contractors on the site and arrange for mutual agreement of staging and storage areas.

**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 plans 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.

##### 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.
- J. 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:

<b>TREE PENALTY TABLE</b>					
<b>Large Trees</b>			<b>Small Flowering Evergreen Trees &amp; Shrubs</b>		
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.

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. Contractor may use ‘Orange Shellac’ if pruning paint is unavailable.

### **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 layout of work.**

- 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.
- C. All vegetation removed may be shredded and scattered in the natural areas of the park as mulch. Include mixing granulated nitrogen with the shredded material for faster breakdown.

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.
- D. 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 within 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.
  2. Cover the area with #57 stone to within 3” of finish grade.
  3. Lay filter fabric over top of the #57 Stone
  4. Lay 3” of Topsoil over the filter cloth.
  5. Cover the topsoil with 3” 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 paved areas, creeks and adjacent lots.

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.

**END OF SECTION 02112**

## **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.
- 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 silt fence shall meet the requirements of Section 171 of the Georgia Department of Transportation Standard Specifications, latest edition.
  - 2. Type C 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. Erosion Control socks to be used where tree roots should not be cut by silt fence trencher.
- 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 Type 1.
  - 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. APS 600 Series Silt Stop, as manufactured by Applied Polymer Systems, Woodstock, Georgia, Contact Steve Iwinski (678) 494-5998.
  2. GeoPolymer as manufactured by GeoStop.
  3. Soil Mulch Polymer as manufactured by Soil Mulch.
- 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 Binder: Mulch on slopes exceeding 3 (horizontal) to 1 (vertical) 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. 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.

- C. Sediment Boxes: All inlet grates 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 for delivery of correct pond volume for a period of thirty (30) calendar days.

### 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. Issuance of the Notice of Intent (N.O.I.) and other related requirements is the responsibility of the Owner.

### **2.02 EROSION, SEDIMENTATION, AND POLLUTION CONTROL PLAN UPDATES**

- A. Project Civil Engineer has prepared the ES&PC Plan for the Discovery Boulevard Property Improvements in accordance with Georgia's new 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. GAR100001, 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 Cobb County PARKS 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.
- B Section 02950 Reinforced Lawn for specific grading requirements

**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 seat walls, pavers and pavement.
  - 2. Preparation of granular base for pavement.
  - 3. Excavation and backfilling for utility systems and drainage.
  - 4. Excavation and backfilling for, foundations, and seat retaining walls.
  - 5. Site grading and filling to indicated elevations.
  - 6. Site grading for gravel-based reinforced lawn grass.

**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".

### **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.

### 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 moistened 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.

- E. Gravel Grass: See specific section for grading instructions on gravel grass.

### **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 02523

### CONCRETE TRAILS & RAMP STEPS

#### PART 1 - GENERAL

##### 1.01 SCOPE

- A. Concrete trail shall be staked and constructed so as to be woven through the site and tree canopy. The staking and construction of the trail shall be adjusted to accommodate existing site features including, but not limited to, trees, vegetation, and their root systems. Adjustments to staking and construction is an interactive process between the Project Landscape Architect, Contractor and Surveyor.
- B. Concrete trail shall be hand graded and constructed in a manner that does not disrupt the tree root systems or require unnecessary removal of trees or cutting roots.
- C. Concrete trail shall be built in conjunction with the Ramp Steps.
- D. Concrete trail shall be constructed at the locations and to the dimensions, lines, grades and cross section indicated on the Construction Drawings and in conformity with the provisions and requirements set out in these Specifications.
- E. Concrete trail construction shall include all the necessary excavation, filling, subgrade and subbase preparation, backfilling, final clearing up and testing, as indicated on the Construction Drawings or as directed in writing by the Project Landscape Architect.
- F. Site adjustments shall be made to adapt the alignment and elevations to the existing conditions of the site. Contractor to stake the location and grades of the proposed trail and hold a site meeting with the Owner and Landscape Architect prior to construction.

##### 1.02 QUALITY ASSURANCE

- A. Comply with applicable requirements of Georgia Department of Transportation, Standard Specifications for Construction of Roads and Bridges, current edition.

##### 1.03 PROTECTION

- A. Contractor shall not encroach upon any areas outside the proposed concrete trail surface and shoulder. Equipment shall not twist, turn or backup into adjacent spaces outside the area of the graded trail unless approved in writing by the Project Landscape Architect.
- B. Contractor shall not park vehicles, store or stage any materials or equipment under the overhanging branches or within the drip line of trees to be saved. Drip

line is defined as the area of ground perpendicularly below the outer reaches of the tree's branches.

- C. Contractor shall submit all construction adjustment considerations to the Project Landscape Architect for approval prior to implementation.
- D. Contractor shall keep detailed field notes of all adjustments and changes.
- E. Contractor shall utilize gravel fill base material when paved surfaces or trails are placed over any tree root systems or under any tree canopies. Refer to Section 02112.
- G. The Contractor shall be responsible for protecting all trees, vegetation and root systems. If trees, vegetation and root systems are damaged, the Contractor will be held liable and shall replace materials in accordance with Section 02112.
- H. The Contractor shall be responsible for protecting all project site elements including but not limited to utilities, structures, and streams. The Contractor will be held liable for any damage incurred at no additional cost to the Owner.
- I. The contractor shall use rubber tire small equipment and hand labor to build the trails under the tree canopy.

#### **1.04 SUBMITTALS**

- A. Provide testing reports stating that the materials supplied comply with Specifications. Certificates shall be signed by the concrete producer, Contractor and Geotechnical Engineer.
- B. Data relative to the Contractor's equipment and methods shall be submitted to the Project Landscape Architect for approval prior to installation.

#### **1.05 CONDITIONS**

- A. Weather Limitations:
  - 1. Do not conduct concrete paving operations when surface is saturated or contains excess of moisture that would prevent uniform distribution and required penetration.
  - 2. Construct concrete trail sections only when atmospheric temperature in the shade is above 40 degrees F.
  - 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.
  - 4. Refer to Section 02523 / 3.09 and 3.12 for base course requirements.
  - 5. Placement of concrete shall be in accordance with weather conditions as required by G.D.O.T. specifications.

- B. Grade Control: Establish and maintain the required lines and grades for each course during construction operations as per the Construction Drawings, Specifications and under written direction of the Project Landscape Architect.

#### 1.06 INSPECTION AND TESTING

- A. Project Geotechnical Engineer shall hand probe, hand auger and/or engage the services of a boring rig to determine structural conditions along the route of the trail prior to grading.
- B. Geotechnical Engineer shall conduct a review of all subsurface conditions following preliminary grading. Based on the observations and recommendations of the Geotechnical Engineer, Contractors shall adjust subsurface conditions in order to proceed with placement of gravel fill base.
- C. Geotechnical Engineer shall conduct a review of the sub-base conditions. Based on the observations of the Geotechnical Engineer, Contractor shall adjust the sub-base conditions in order to proceed with placement of pavement.
- D. Pavement and base testing will be performed by an independent testing laboratory as approved by the Project Landscape Architect and the Owner.
- E. The testing agency shall test in-place courses for compliance with specified density, thickness and surface finish requirements.
- F. Earthwork and compaction operations shall conform to the requirements of Section 02200 of these specifications.
- G. 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 2 and 4 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.
- H. Allowable Variation in Thickness:
1. Aggregate Base Course:  $\pm 1/2$ -inch.
  2. Surface Course:  $\pm 1/4$ -inch.
- I. Surface Smoothness: Test finished surface of each course for smoothness using a 16-foot straightedge. Intervals of tests shall be as approved by the Project 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.
- J. 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 that does not comply with the specified testing limits.

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS**

- A. Materials used in the construction of concrete trails, in addition to Section 03300 and other general requirements of these Specifications, shall conform, unless otherwise stipulated by the Geotechnical Engineer and approved by the Project Landscape Architect, 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 builder's sand shall be used.
  4. Fiber Reinforcement: Engineered polypropylene fibers designed for secondary reinforcement of concrete slabs.
  5. Pre-molded 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.

- 6. Concrete Color: Concrete shall be grey concrete mix and shall be from same supplier and same batch mixture. Finished concrete shall have a **medium broom finish** perpendicular to traffic flow on all trail 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"	2"-4"
Walls	3000 psi	3/4"	2"-4"
Pavement, Trails	4000 psi	1-1/2"	2"-4"

- B. Staking Materials shall be placed in field according to the plans and shall consist of the following:
  - 1. 1" x 2" x 3' tall stakes for center line stakeout
  - 2. 1" x 2" x 18" short stakes for corners
  - 3. Plastic flagging tape-
    - Red- Indicates trees to remove
    - Yellow - Indicates trees to save
    - Blue - Indicates centerline
    - Orange - control points
  - 4. Wire Flags (Pink)
  - 5. 2" x 2" x 12" Hub stakes
  - 6. Mallet - Short handle for driving stakes
- C. Plastic Pipe: 4" perforated Schedule 40 ultraviolet light resistant PVC.
- D. Lumber: All lumber shall comply with Section 06100 Rough Carpentry and shall be below ground contact.
- E. Hardware: All hardware, fasteners, nails etc. shall conform to Section 06100
- E. Step Tread materials: Shall be granulated crusher run compacted between steps and frame members.
- D. Geosynthetic Materials:
  - 1. Filter Fabric: Filter Fabric utilized for separation of controlled fill materials from existing subgrades or sediment deposition shall conform to the requirements of the Georgia Department of Transportation Standard Specifications, Section 881.06 for non-woven, needle punched filter fabrics. The requirements outlined under Item 2.02 of this Specification Section will typically be sufficient for most applications. Filter fabric samples, as well as specific manufacturer's property characteristics and

installations guidelines, shall be submitted to the Project Landscape Architect for review and written approval with specific identification of each proposed application.

## 2.02 FORM MATERIALS

- 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, and shall be sound and free from loose knots. 1-inch thick boards may be used to form curves. Stakes shall be not less than 2" x 4" lumber of sufficient length that, when driven, will hold the forms rigidly in place.
- C. Metal forms shall be of approved sections and shall have a flat surface on top. Metal forms 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 EQUIPMENT

- A. No track type equipment shall be used in the construction of this work. Rubber tire vehicles shall be used exclusively and shall be limited to small back hoes, bobcats, pickup trucks, dump trucks and small concrete mixers.
- B. Equipment used to install concrete shall have a total width not to exceed the width of the trail section plus 2'-0"; ~~The use of large heavy-duty track vehicles is prohibited.~~
- C. All equipment necessary and required for the construction of concrete trails shall be in working condition and approved by the Project Landscape Architect, before construction will be permitted to begin.
- D. A one bag mixer will be permitted when the total output of concrete, per 10-hour day, does not exceed 25 cubic yards.
- E. 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. Contractor shall furnish a ten foot (10') longitudinal float of

**Commented [RMM1]:** Most spreaders have to have two feet on either side of the opening for the spreader for gears, wheels and other machinery. Therefore the machine can be no smaller than width of concrete plus 4'.



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 trail.

### **3.02 LAYOUT**

- A. Contractor shall stake trail coordinate control points as per Construction Drawings. Each 3'-0" tall wooden stake shall be flagged with orange tape and shall be identified with coordinate data provided on the Construction Drawings.
- B. Contractor shall stake centerline of the trail as per Construction Drawings. Centerline shall be staked in 50' increments. All stakes shall be 3'-0" tall and be flagged with blue tape.
- C. Contractor shall stake the beginning and end point of each trail curve as per the Construction Drawings. All stakes shall be 3'-0" tall and flagged with blue tape.
- D. Upon completion of the initial staking, the Contractor, surveyor and Project Landscape Architect shall walk the staking alignment for the purpose of making adjustments to the layout.
- E. The Contractor and Surveyor shall make field notes and transfer field adjustments to the project record drawings.
- F. Based on the initial field adjustments and information recorded on the record drawings, the Contractor shall revise the field staking.
- G. Upon completion of the revised field staking, the Contractor, Surveyor and Project Landscape Architect shall walk the staking alignment for the purpose of making minor modifications as deemed necessary by the Project Landscape Architect.
- H. All revised data shall be transferred to the record drawings by the Contractor prior to commencing grading activities.
- I. Contractor must receive written approval of all field staking, including revisions, prior to commencing grading activities.

### **3.03 CLEARING AND GRUBBING**

- A. Clearing and grubbing shall be performed in accordance with the requirements of Section 02110 – Clearing and Grubbing.
- B. Tree protection and selective trimming shall be performed in accordance with Section 02112 – Tree Protection and Selective Clearing.

### **3.04 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 – Demolition of Existing Facilities and Section 02100 – Site Preparation.

### **3.05 TRAIL AND DRAINAGE EXCAVATION**

- A. Trail and drainage excavation shall be performed in accordance with the requirements of Section 02200 – Earthwork.

### **3.06 EMBANKMENT CONSTRUCTION**

- A. Embankment construction shall be performed in accordance with the requirements of Section 02200 - Earthwork.

### **3.07 EARTHWORK AND COMPACTION**

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

### **3.08 SUBGRADE PREPARATION**

- A. Fine grading shall proceed to remove bumps, dips and holes from the trail bed. Stump holes must be filled and compacted per the direction of the Geotechnical Engineer.
- B. Contractor shall limit construction activities and access to the area defined on the Construction Drawings as the limit of work. Contractor shall stage construction in a manner that will limit the use of construction equipment to the area defined as the trail corridor. Contractor shall be limited to use of the trail route as the construction access route for the placement of all trail components including, but not limited to sub-base, drainage pipes, foundations, abutments, pedestrian bridges and pavement surfaces.
- C. Subgrade shall be graded and compacted so that the finished concrete trail surface will slope to direct water into the natural drainage swales and conform to natural drainage patterns to the extent possible within the construction limits defined by the Construction Drawings and Specifications.
- D. The subgrade for the trails shall be to a depth equal to the thickness of the concrete plus the base course. Excavation shall allow for compaction of the subgrade as per the direction of the Geotechnical Engineer and written approval of the Project Landscape Architect.
- E. In areas where the trail is located within the dripline of existing trees and vegetation, the Contractor shall review the site conditions with the Geotechnical Engineer and Project Landscape Architect and receive written direction, prior to commencing subgrade excavation. Refer to Section 02112.

- F. Yielding or unsuitable material shall be removed and back filled with satisfactory material per the direction of the Geotechnical Engineer and written approval of the Project Landscape Architect.

### **3.09 BASE COURSE**

- A. Contractor shall limit work to within the proposed edges of subbase.
- B. Contractor shall place graded aggregate base under trails, as directed by the Geotechnical Engineer. Graded aggregate base shall be compacted thoroughly and finished to a smooth, unyielding surface. Finish elevations of graded aggregate base shall accommodate placement of finished concrete trail surface such that existing drainage patterns are preserved.
- C. All subgrade preparation shall be of such width as to permit the proper installation and bracing of the forms.
- D. 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 Geotechnical Engineer and approved in writing by the Project Landscape Architect. 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.
- E. Where the trail passes under or through the drip line of a tree or trees, the Contractor shall place a special fill material system consisting of varying depths of graded aggregate fill placed over geotextile fabrics or geogrid subgrade reinforcements. The Geotechnical Engineer shall be utilized to take soil borings as necessary to determine the subsurface conditions, and determine the profile of base material to be used. The Geotechnical Engineer's recommendations shall be submitted to Project Landscape Architect for written approval.

### **3.10 FORMS**

- A. All forms shall be set upon the prepared subgrade and held rigidly in place so as not to be disturbed or displaced during the placing of the concrete. The placement of the forms shall adhere to the trail staking alignment and finish elevations established during the layout process. Refer to Section 02523 / 3.02. The top of the form shall be set to finish grade elevations and the depth of the forms shall be equal to the thickness of the proposed concrete.
- B. Design formwork 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 and achieve level and plumb work of all finished structures. Provide for opening, offsets, sinkages,

keyways, recesses, moldings, rustifications, reglets, chamfers, blocking, screeds, bulkheads, anchorages, inserts, and other features required in work. Use selected materials to obtain specified finishes. Solidly butt joints and provide back-up at joints to prevent leakage of concrete material.

- D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast-in-place concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Use 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 prior to each use.
- F. Forms shall be removed within 24 hours after placing concrete, and no pressure shall be exerted upon the cast-in-place concrete during the removal of the forms.
- G. Where the concrete trail is to adjoin an existing trail or sidewalk, the existing structure, if not in proper condition for the junction, shall be cut to a neat line perpendicular to both the centerline and the surface of the new trail, or as directed by the Project Landscape Architect.

### 3.11 EXPANSION JOINTS

- A. The trail is designed to accommodate bike, skateboards, wheelchairs and strollers. The use of trowel joints is prohibited. Only saw joints are permitted.
- B. Unless otherwise indicated on the Construction Drawings or as directed by the Project Landscape Architect, pre-moulded expansion joints, 1/2-inch in thickness, shall be placed in locations where the trail abuts non-flexible pavement and / or structures. Transverse expansion joints for concrete trails shall be 1/2-inch thick. All pre-moulded expansion joints must be cut to full width or length of the proposed construction and shall be recessed 1/8" from the top of the finished surface. All longitudinal expansion joints shall be placed as indicated on the Construction Drawings or as directed by the Project Landscape Architect.
- C. All expansion joints shall be caulked flush to trail surface. Caulk shall be Silaflex brand or equal. Color of caulk shall match color of pavement surface.
- D. All protruding expansion joint material shall be trimmed as directed by the Project Landscape Architect.
- E. Locate and install control joints as shown on the construction drawings. (Contractor shall mark the locations of all control joints with a non-permanent

chalk. Project Landscape Architect shall approve all locations of control joints prior to installation.)

- F. Slab-on-grade: Locate and install control joints as shown on drawings. (Contractor shall mark the locations of all control joints with a non-permanent chalk. Project Landscape Architect shall approve all locations of control joints prior to installation.)
- G. Contractor shall review the need for additional joints with the Project Landscape Architect prior to installation. Location of joints shall not impact the strength and / or appearance of the trail.

### 3.12 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. Any irregularities shall be corrected prior to placing concrete.
- 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. The concrete shall be manufactured and placed in accordance with the requirements of Section 03300 of these Specifications.
- E. 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.
- F. During the placement of concrete, contractor shall spade and tamp as necessary to achieve specified compaction.
- G. Each vertical section of concrete that is placed shall be done as a single integral pour that is placed to the full depth of the slab specified. The pouring of multiple layers of concrete to achieve specified finished elevations is prohibited.
- H. Each horizontal section of concrete that is placed shall be coordinated such that the pour begins and ends in pre-determined locations that correspond to the placement of expansion joints.

### 3.13 FINISHING

- A. The concrete shall be stuck-off with a transverse template resting upon the side forms and shall be floated with a 10-foot longitudinal float. The float shall be worked transversely across the concrete in a sawing motion parallel to the edges of the trail in a manner that facilitates the removal of all surplus water, laitance and inert material from the surface. This operation shall be continued until the surface of the concrete shows no variation when checked with a 10-foot straightedge. If necessary, additional concrete shall be added to fill depressions, and the longitudinal float process shall be repeated.
- B. When the surface of the concrete is free from water and just before the concrete obtains its initial set, it shall be finished with a float. The longitudinal surface variations shall be not more than 1/8-inch over a five-foot transverse section. The surface of the concrete must be finished to facilitate positive drainage.
- C. The edges of the trail shall be carefully finished and rounded with an edging tool having a radius of 1/2-inch. Internal control and expansion joints shall not be tooled.
- D. Control joints shall be saw cut. All marks caused by edging shall be removed with a wetted brush or wooden float.
- E. Trails shall have a Medium Broom Finish perpendicular to traffic flow. (Broom finish to be performed after float finish is completed)
- F. Contractor shall be responsible for installing a 10'x10' concrete trail slab that fulfills the requirements specified. The Project Landscape Architect must approve the site sample prior to the installation of concrete along the project trail.

### 3.14 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 below freezing, satisfactory heating devices shall be placed under suitable covers to keep the temperature around the concrete above 45 degrees F.
- B. Pedestrians will not be allowed on the concrete trail until 24 hours after finishing concrete. No vehicles shall be permitted upon on the concrete trail, until the concrete has sufficient strength to support traffic loads.
- C. The Contractor shall construct barricades and protection devices to keep pedestrians and traffic off the trail surface.
- D. If any portion of the trail is damaged prior to Final Acceptance, the contractor shall be responsible for repairing damaged sections of the trail. Repair by

patching is prohibited. The Project Landscape Architect will review the damaged area with the Contractor and determine the limits of the required repair work.

- E. Repair work of damaged trail will include but not be limited to, removal of 10' wide x 10'-0" lengths of concrete slab that correspond to the existing placement of expansion and control joints. The length of material to be removed and replaced must be determined and approved by the Project Landscape Architect. Replacement material must be of type, kind and finish used in the original construction of the trail. The contractor is responsible for all costs associated with required and acceptable repair work.

### **3.15 BACKFILLING**

- A. Contractor shall compact, fine grade and landscape the shoulders of the trail as shown on the Construction Drawings.
- B. Contractor shall fine grade and landscape all areas located between the limits of trail shoulders and limits of construction as shown on the Construction Drawings.

### **3.16 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 Section 01700 of these Specifications.

**END OF SECTION 02523**

## **SECTION 02810**

### **UNDERGROUND IRRIGATION SYSTEM**

#### **PART 1 -GENERAL**

##### **1.1 SYSTEM DESCRIPTION**

- A. In the event no temporary irrigation system is provided, the contractor shall develop an irrigation system in accordance with these specifications.
- B. Shop Drawings: Contactor shall prepare Shop Drawings for the system to conform to these specifications.
- C. The sprinkler system shall include sprinklers, valves, piping fittings, controller, wiring, all of sizes and types as shown on the drawings and specified. The system shall be constructed to grades and conform to areas and locations as shown on the drawings.
- B. Sprinkler lines shown on the shop drawings can be diagrammatic. Spacing of the sprinkler heads or quick coupling valves are shown on the drawings and shall be exceeded only with written permission of the Irrigation Designer.
- C. Unless otherwise specified or indicated on the drawings, the construction of the sprinkler system shall include the furnishing, installing, and testing of all mains, laterals, risers and fittings, sprinkler heads, gate valves, control valves, controllers, electric wire, controls, backflow preventers, enclosures, and other necessary specialties and the removal and/or restoration of existing improvements, excavating and backfill, and all other work in accordance with the plans and specifications a required for a complete system
- D. Reinforced Turf; See Section 02950 for special instructions on how to install irrigation for this system of turf installation.
- E. Contractor shall field stake the location of the water service lines from the meter box to the Green and have it reviewed by the Owner's Representative prior to trenching or digging.

##### **1.2 TEMPORARY IRRIGATION:**

See Section 02808 Watering and Irrigation for instructions on how to proceed on a Temporary Irrigation System in whole or part on the site.

##### **1.3 QUALITY ASSURANCE**



- A. Installer Qualifications: Irrigation Contractor shall have successfully completed five (5) projects similar in material, size, scope and complexity to that indicated for this Project that have resulted in construction with a record of successful in- service performance. This requirement includes Pump Installation Contractor.
  - 1. Firm Experience Period: Five (5) years of firm experience
  - 2. Field Foreman: Five (5) years of experience with installing firm.
- B. Conference: Before any work is started, a conference shall be held between the Contractor and the Owner concerning the work under this Section.
- C. The Contractor shall maintain continuously a competent superintendent, satisfactory to the Owner, on the work during progress with authority to act or him in all matter pertaining to the work.
- D. It is the Irrigation Contractor’s responsibility to coordinate and cooperate with the other Contractors to enable work to proceed rapidly and efficiently.
- E. The Contractor shall confine his operations to the area to be improved and to the areas allotted him by the Designer and General Contractor for material and equipment.
- F. Contractor shall take all necessary precautions to protect the existing site conditions and vegetation.

#### 1.4 SUBMITTALS

- A. General: Submit in accordance with Shop Drawings, Product Data, and Samples.
- B. Shop Drawings and Equipment Product Information:
  - 1. Prior to purchasing materials, submit product information on all sprinkler heads, automatic valves, quick coupling valves, controller, and pipe to be used on the project.
  - 2. Contractor shall review drawings and data to supply actual precipitation rates and times for each zone in maintenance package.
  - 3. Prior to trenching, Contractor shall submit proposed trenching equipment to Designer for approval.
- C. Record Drawings and Instructions
  - 1. Upon completion of installation, Contractor shall produce as-built drawings in AutoCAD 2010 format and furnish one set of reproducible and one set of printed record drawings showing all sprinkler heads, valves, drains, and pipelines to scale with dimensions. These drawings shall have dimensions from easily located stationary points (cross measured) as they relate to all valves, mainlines, and wire. Clearly note all approved

substitutions of size, material, etc. Complete, concise instruction sheets and parts lists covering all operating equipment and weathering techniques shall be bound into folders and furnished to the Owner in three (3) copies. Submission of this information is a requirement for final acceptance.

## 1.5 SITE CONDITIONS

- A. The Contractor shall examine the site, plans and specifications (i.e. system requirements).
- B. It shall be the Contractor's responsibility to report in writing to the Designer any deviations between drawings, specification, and actual site conditions. Failure to do so prior to the installing of equipment shall be done at the Contractor's expense.
- C. Final adjustment of the sprinkler heads and automatic equipment will be done by the Contractor, upon completion of installation, to provide optimum performance.
- D. After completion, testing, and acceptance of the system, the Contractor shall verbally instruct the Owner's personnel in the operation and maintenance of the system. All written instruction shall be included in the bound maintenance package as stated in Paragraph 1.3 - Submittals.

## PART 2 - PRODUCTS

### 2.1 PIPE AND FITTINGS

- A. Pipe sizes shall conform to those shown on the drawings. No substitutions of smaller pipe sizes will be permitted, but substitutions of larger size may be approved. All pipe damaged or rejected because of defects shall be removed from the site at the time of said rejection.
- B. All piping downstream of electric valves, sizes (3) inches and smaller, shall be rigid un-plasticized PVC 200 PSI working pressure extruded from virgin parent material of the type specified on the drawings. The pipe shall be homogeneous throughout and free from visible cracks, holes, foreign materials, blisters, wrinkles and permanently marked with the manufacture's name, material, size, and schedule type. Pipe must bear the NFS seal.
- C. All mainline piping and underground piping under continuous pressure shall be rigid un-plasticized PVC-Class 200 PSI working pressure extruded from virgin parent material of the type specified on the drawings. The pipe shall be homogeneous throughout and free from visible cracks, holes, and foreign materials, blisters, wrinkles and dents.

- D. All plastic fittings to be installed shall be molded fittings manufactured of the same material as the pipe and shall be suitable for solvent weld, slip joint ringtight seal, or screwed connections NO fitting made of other material shall be used except as hereinafter specified.
- E. Slip fitting socket tapers shall be so sized that a dry unsoftened pipe end conforming to these special provisions can be inserted no more than halfway into the socket. Plastic saddle and flange fittings will not be permitted. Only Schedule 80 pipe may be threaded.

## 2.2 SLEEVES

- A. All sleeves shall be Class 200 PVC or stronger. All sleeves are required at every crossing indicated on drawings. (Size Noted)
- B. All sleeves shall be installed under proposed pavement areas prior to subgrade and base construction.
- C. Sleeves shall have a minimum horizontal separation of 18” and a maximum of twenty-four (24) inch clearance below bottom of curb.
- D. All sleeves shall have a minimum horizontal separation of twenty-four (24) and maximum of thirty-six inches from center to center.
- E. Stub up sleeve pipe twelve (12) inches above ground surface and cap. Paint cap with fluorescent orange paint for easy identification.
- F. The location of all sleeves shown on the plans is schematic. The contractor shall make any adjustments necessary to accommodate existing vegetation, utilities, or other existing conditions.
- G. If the road crossings are designated as being bore locations the bore must be ample size to accommodate the size sleeve specified.
- H. Contractor to place all conduit prior to installing any hard surface paving.

## 2.3 CONTROL SYSTEM

- A. The automatic controllers shall be as shown on the plans and shall be made by the same manufacturer as valves.
- B. Install Rain Check or Mini-Click type shut off device to override the control timer in the event of rain.

## 2.4 CONTROL WIRE

- A. Control wire shall be type UF, UL approved, for direct burial and shall be gauge 14 or larger for the control wire and gauge 12 or larger for common wire.
- B. Joining of underground wires shall be made with watertight connectors in valve boxes. No splicing between boxes is acceptable. Utilize 3M DBR/Y-6 Connections unless directed otherwise.
- C. All wire connections in valve boxes; first example shall stay open until the Designer approves.

## 2.5 IRRIGATION VALVES

- A. Zone Control Valves
  - 1. Globe-type diaphragm valves of normally closed design, with bronze bodies or heavy-duty plastic and covers (type noted on drawings). Operation accomplished by means of an integrally mounted heavy-duty 24-volt AC solenoid complying with National Electrical Code, Class II Circuit, solenoid coil potted in epoxy resin within a plastic-coated stainless-steel housing. Solenoids shall be completely waterproof, suitable for direct underground burial. Provide a flow stem adjustment in each valve.
  - 2. To be installed with Single Station Decoder (as specified on plans).

## 2.6 VALVE BOXES

- A. All valves shall be installed in thermoplastic valve access boxes of the size required to permit access to the valve. Valve boxes shall include black thermoplastic locking covers. Manufacturer - Carson or approved equal.
- B. All valve boxes shall be installed on at least a two (2) cubic foot gravel base to provide foundation and drainage.
- C. All valve box elevations shall be ½" below finished grade.

## 2.7 THRUST BLOCKS

- A. Place one cubic ft. of concrete for each inch of pipe diameter for thrust block. Thrust shall not allow vertical or horizontal movement of pipe in any direction unless otherwise noted on design. Thrust blocking shall be provided on all piping three (3) inch diameter and larger.

## 2.8 DRIP IRRIGATION

- A. Drip irrigation equipment shall be as specified on plans (emitter types, emitter flow rates, etc). Also reference the Temporary Irrigation Section 02808.

### **PART 3 - EXECUTION**

#### **3.1 EXCAVATION AND BACKFILL**

- A. Trenches for pipe sprinkler lines shall be excavated of sufficient depth and width to permit proper handling and installation by any other method the Contractor may desire if approved by the Owner, pipe manufacturer, and Designer. The backfill shall be thoroughly compacted and evened off with the adjacent soil level. Selected fill dirt or sand shall be used if soil conditions are rocky. In rocky areas the trenching depth shall be two (2) inches below normal trenching depth to allow for this bedding. The fill dirt or sand shall be used in filling (4) inches above the pipe. The remainder of the backfill shall contain no lumps or rocks larger than three (3) inches. The top twelve (12) inches of backfill shall be topsoil, free of rocks, subsoil, or trash. Any open trenches or partially backfilled trenches left overnight or left unsupervised shall be barricaded to prevent undue hazard to the public.
- B. The Contractor shall backfill in six (6) inch compacted lifts as needed to bring the soil to its original density.
- C. In the spring following the year of installation, the Contractor shall repair any settlement of the trenches by bringing them to grade with topsoil and seeding with the existing lawn type(s). Watering and maintenance of the repaired areas shall be the Owner's responsibility.

#### **3.2 INSTALLATION OF PLASTIC PIPE**

- A. Plastic pipe shall be installed in a manner that permits expansion and contraction as recommended by the manufacturer.
- B. Plastic pipe shall be cut with a handsaw or hacksaw with the assistance of a square in sawing vice or in a manner so as to ensure a square cut. Burrs at cut ends shall be removed prior to installation so that a smooth unobstructed flow will be obtained.
- C. All plastic-to-plastic joints shall be solvent weld joints or slip seal joints. Only the solvent recommended for the pipe and fittings shall be installed as outlined and instructed by the pipe manufacturer. The Contractor shall assume full responsibility for the correct installation.
- D. The joints shall be allowed to set at least twenty-four (24) hours before pressure is applied to the system on PVC pipe.

### **3.3 CONTROLLER AND ELECTRICAL CONNECTIONS**

- A. All electrical connections shall conform to the National Electrical Code, latest edition.
- B. Control wires installed beneath walks, drives, or other permanent surfaces shall be placed in sleeves.
- C. Wires shall be spliced only at valve boxes.
- D. Leave twenty-four (24) inch loop of wire at each valve for expansion/contraction and servicing.
- E. Controllers and valves shall be from the same company e.g. (Rain Bird, Toro or approved equal).
- F. 120 VAC electrical power supply to the controller location shall be supplied by others.

### **3.4 FLUSHING AND TESTING**

- A. After all new sprinkler piping and risers are in place and connected for a given section and all necessary division work has been completed and prior to the installation of sprinkler heads all control valves shall be opened and a full head of water used to flush out the system.
- B. Sprinkler main shall be pressure tested as follows:
  - 1. Two (2) hour pressure test at 1.5 times the system operating pressure
  - 2. Twenty-four (24) hour pressure test at the system operating pressureIf leaks occur, repair and repeat the test until no leaks occur (pressure does not drop). Give Designer twenty-four (24) hours notice prior to testing.
- C. Testing of the system shall be performed after completion of the entire installation and any necessary repairs shall be made at the Contractor's expense to put the system in good working order before final payment by the Owner.
- D. Adjustment of the sprinkler heads, and automatic equipment, will be done by the Contractor upon completion of installation to provide optimum performance. Minor adjustments during the guarantee period will be made by the Owner.
- E. After completion, testing, and acceptance of the system, the Contractor will instruct the Owner's personnel in the operation and maintenance of the system.

### **3.5 CLEAN UP AND PROTECTION**

- A. During irrigation work, Contractor shall keep project site clean and orderly

- B. Upon Completion of Work, clear grounds of debris, superfluous materials and all equipment. Remove from site to satisfaction of the Owner's Representative.

### **3.6 WINTERIZING THE SYSTEM**

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

### **3.7 INSPECTION**

- A. Periodic Inspections will be made by the Landscape Architect/Owner's Representative to review the quality and progress of the work. Work found to be unacceptable must be corrected within a timely mater (to be determined by Owner's Representative). Remove rejected materials promptly from the project site.
- B. It will be the responsibility of the Irrigation Contractor to provide a reliable communication system (i.e. Two-way radios or remote radio control activation system) for Substantial Completion and all periodic inspections.

## **PART 4 – CODES, PERMITS, WARRANTY, AND GUARANTEE**

### **4.1 CODES AND ORDINANCES**

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

### **4.2 PERMITS AND FEES**

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

### **4.3 WARRANTY AND GUARANTEE**

- A. The Contractor shall furnish a certificate of warranty registration and a written guarantee of work and materials for a one-year period from the date of final acceptance of the Irrigation System by the Owner and the Designer.

**END OF SECTION 02810**



## SECTION 02870

### SITE FURNISHINGS & FENCE

#### PART I GENERAL

##### 1.1 SECTION INCLUDES

- A. Benches as shown on drawings and as specified herein.
- B. Picnic Tables as shown on the drawing and details.
- C. Trash Receptacles as shown on the drawings and details.
- D. 5' Metal Security Fence around the splash pad with gate.

##### 1.2 SUBMITTALS

- A. Contractor shall submit minimum of two (2) sets of color options for Owner.
- B. Contractor shall consult the project Site Detail sheet for more information.

- 1.3 Manufactures: All products and installation shall conform to the requirements of the manufactures' specifications.

#### PART 2 PRODUCTS

##### 2.1 BENCHES:

- A. Manufacturer: Victor Stanley, PO Drawer 330, Dunkirk, MD 20754  
Toll Free: 1 800-368-2573: Tel (301) 855- 880: Website: Victorstanley.com
- B. Benches shall be RBF-28 Steelsites RB Series.
- C. Local Sales Representative: Hasley Recreation, Inc. Flowery Branch, Ga.  
[Sales@hasley-recreation.com](mailto:Sales@hasley-recreation.com) 770 965- 4042
- D. Anchor bolts are not provided by manufacturer.
- E. Finish: Coated with zinc rich epoxy then finished with polyester powder coating
- F. Metal components are steel shotblasted, etched, phosphatized, preheated and electrostatically power-coated with T.G.I.C. polyester power coating.
- G. Color; Black Powder coated.
- H. Assembly: This product is shipped fully assembled

##### 2.2 PICNIC TABLE

- I. Manufacturer: Victor Stanley, PO Drawer 330, Dunkirk, MD 20754  
Toll Free: 1 800-368-2573: Tel (301) 855- 880: Website: Victorstanley.com
- J. Picnic Tables shall be all steel, ST-5 Homestead Series
- K. Local Sales Representative: Hasley Recreation, Inc. Flowery Branch, Ga.  
[Sales@hasley-recreation.com](mailto:Sales@hasley-recreation.com) 770 965- 4042
- L. Metal components are steel shotblasted, etched, phosphatized, preheated and electrostatically power-coated with T.G.I.C. polyester power coating.
- M. Finish: Grey IPE Slats

- N. Color; Black Powder coated.
- O. Assembly: This product is shipped partially assembled

### 2.3 TRASH RECEPTACLES:

- P. Manufacturer: Victor Stanley, PO Drawer 330, Dunkirk, MD 20754  
Toll Free: 1 800-368-2573; Tel (301) 855- 880: Website: Victorstanley.com
- Q. Trash Receptacles shall be SD-242 Ironsites Series.
- R. Local Sales Representative: Hasley Recreation, Inc. Flowery Branch, Ga.  
[Sales@hasley-recreation.com](mailto:Sales@hasley-recreation.com) 770 965- 4042
- S. Anchor bolts are not provided by manufacturer.
- T. Finish: Coated with zinc rich epoxy then finished with polyester powder coating
- U. Metal components are steel shotblasted, etched, phosphatized, preheated and electrostatically power-coated with T.G.I.C. polyester power coating.
- V. Color; Black Powder coated.
- W. Assembly: This product is shipped fully assembled

### 2.4 FENCES:

- X. Manufacturer: Ameristar 1555 N. Mngo Tulsa, OK 74166  
Toll Free: 1 888-333-3422: Website: Ameristarfence.com
- Y. Fences shall be 5' Montage Majestic Steel Fence and gate.
- Z. Local Sales Representative: Hasley Recreation, Inc. Flowery Branch, Ga.  
[Sales@hasley-recreation.com](mailto:Sales@hasley-recreation.com) 770 965- 4042
- AA. Latch shall be Vertical Pull Model MLVPS2BGA, DD technologies.
- BB. Finish: Coated with zinc rich epoxy then finished with polyester powder coating
- CC. Metal components are steel shotblasted, etched, phosphatized, preheated and electrostatically power-coated with T.G.I.C. polyester power coating.
- DD. Color; Black Powder coated.
- EE. Assembly: This product is shipped partially assembled

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.
- B. Restore damaged finishes and test for proper function. Clean and protect work from damage.
- C. Contractor has to provide the anchor bolts to attach the bench and trash receptacle to the surface.
- D. Install site elements in accordance with the manufacturer's recommendations.

### 3.2 BENCHES

- A. Install benches where indicated on plans flush and level with surrounding pavement surfaces.

- B. Install anchor bolts not provided by manufacturer to attach to the surface. Benches must be set flush and leveled at all times.

### **3.3 PICNIC TABLE**

- A. Table does not come with an attachment option but sits on the surface.
- B. Contractor and Client can devise an attachment if that becomes an issue.

### **3.4 TRASH RECEPTACLE**

- A. Installation: Install per manufacture's specifications. See detail on Construction Documents.
- B. Concrete: See Section 03310 for Concrete Base Specifications.

### **3.5 SECURITY FENCE**

- C. Installation: Install fence per manufacture's specifications. See site detail on Construction Documents.
- D. Concrete: See Section 03310 for Concrete Base Specifications around the posts.
- E. Install 5' gate in accordance with manufacturers specification.

**END OF SECTION 02870**

**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 (2) 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 ensure 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 1/2" 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 root balls 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 ensure 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 washouts 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 AmmoniumNitrate 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.
- C. See Section 02950 Reinforced Lawn Gravel Grass for reference to specific topsoil preparation.

#### 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 15<sup>th</sup> 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 02934**

**SODDING**

**PART 1 GENERAL**

**1.01 SCOPE**

Sodding shall consist of establishing certain critical areas with sod as designated on the Drawings.

**PART 2 PRODUCTS**

**2.01 SOD**

- A. Sod shall consist of a live, dense, well-rooted growth of turf grass species as noted on the Drawings. The sod shall be free from Johnson grass, nut grass and other obnoxious grasses and shall be of suitable character for the purpose intended and for the soil in which it is to be planted. It shall be un-injured at the time of planting.
- B. Sod shall be uniform in thickness, having not over 2-inches or less than 1-inch of soil.
- C. Sod strips shall have a consistent width of 12 or 18-inches.
- D. Reference Section 02950 Reinforced Lawn Gravel Grass for specifics on how to lay sod on the gravel surface.

**2.02 FERTILIZER**

- A. Fertilizer (10-10-10) used in connection with sodding, shall contain 10 percent nitrogen, 10 percent phosphoric acid and 10 percent potash. The fertilizer shall be furnished in standard containers with the name, weight and guaranteed analysis of the contents clearly marked. The containers shall ensure proper protection in handling and transporting the fertilizer. All commercial fertilizer shall comply with local, state and federal fertilizer laws.
- B. Ammonium nitrate shall be a standard commercial product, shall conform to the requirements for other commercial fertilizers as specified above, and shall have a minimum of 32-1/2 percent nitrogen.

**2.03 LIME**

Agricultural limestone shall be dolomitic and contain not less than 85 percent of calcium carbonate and magnesium carbonate combined and shall be crushed so that at least 85 percent will pass the No. 10 mesh sieve and 50 percent will pass a No. 40 mesh screen.

**2.04 WEATHER LIMITATIONS**

Sod shall be planted only when the soil is moist and favorable to growth. No planting shall be done between October 1 and April 1 unless weather and soil conditions are considered favorable and permission is granted by the Engineer.

**PART 3 EXECUTION**

**3.01 SODDING**

- A. The area to be sodded shall be constructed to the lines and grades indicated on the Drawings or as directed by the Engineer, and the surface loosened to a depth of not less than 3-inches with a rake or other device. If necessary, it shall be sprinkled until saturated at least 1-inch in depth and kept moist until the sod is place thereon. Immediately before placing the sod, the fertilizer shall be uniformly applied at the rate of 12 pounds of Grade 10-10-10, or equivalent, per 1,000 square feet. Agricultural limestone shall be applied at the rate of 50 pounds per 1,000 square feet.
- B. The entire area shall be thoroughly covered with sod. The sod shall be placed on the prepared surface with the edges in close contact and, as far as possible, with staggered joints.
- C. The sod shall be maintained moist from time of removal until reset but shall be placed as soon as practicable after removal from place where growing. Immediately after placing it shall be rolled with a light- weight roller or hand tamped to the satisfaction of the Engineer.
- D. Sod on slopes steeper than 3 to 1 shall be held in place by wooden pins about 1-inch square and 6-inches long, driven through the sod into the soil until they are flush with the top of the sod.

**3.02 WATERING AND MAINTENANCE**

- A. The sod shall be watered as directed by the Engineer for a period of two weeks after which ammonium nitrate shall be applied at the rate of three pounds per 1,000 square feet and the sod given a final watering.
- B. The Contractor shall not allow any equipment or material to be placed on any planted area and shall erect suitable barricades and guards to prevent Contractor's equipment, labor or the public from traveling on or over any area planted with sod.
- C. It shall be the obligation of the Contractor to secure a satisfactory growth of grass before final acceptance of the Project.

**END OF SECTION 02934**

**SECTION 02950**

**REINFORCED TURF**

**PART 1 – GENERAL**

**RELATED DOCUMENTS**

The Drawings and general provisions of the Contract, including General and Special Conditions, apply to work of this section. Contractor shall refer to the following sections:

Section 02200 Earthwork  
Section 02810 Irrigation System  
Section 02900 Landscape Work

**DESCRIPTION OF WORK**

Furnish all materials, equipment and labor as necessary for preparation of graded areas, soil preparation, fertilizer, gravel fill, turf grass, maintenance, guarantee, and related items as required to complete the work as indicated on the drawings and specified herein.

**JOB CONDITIONS:**

All existing buildings, walks, walls, paving, piping and other items of construction and planting already completed or established shall be protected from damage by the contractor. Any damage resulting from negligence shall be repaired or replaced to the satisfaction of the owner.

Coordination: Construction shall not begin until all exterior building construction within the contract limit boundary has been completed, except as directed otherwise by the Landscape Architect.

Percolation Test: Contractor shall insure that subsurface soils under the proposed gravel fill area will percolate as defined in Section 02900.

**QUALITY ASSURANCE:**

General: The contractor shall have a minimum of five years successful experience in this field of grading and turf installation. A resume shall be furnished to the Landscape Architect upon request. The selection of the contractor shall be approved by the Landscape Architect.

Work under Section 02200 shall be performed in co-ordination with this section by a contractor meeting the quality assurance requirements of both Sections.

Materials: The Contractor shall retain at the time of delivery and furnish to the Landscape Architect delivery tickets for all materials received.

Samples: Samples of materials as listed below shall be submitted for inspection on the job site, or as otherwise determined by the Landscape Architect.



<u>Materials</u>	<u>Sample</u>
57 Stone - <b>washed</b>	1 Pint
89 Stone - <b>washed</b>	1 Pint
Turf Grass	1 8” Square
Fertilizer	1 bag

Typical samples shall be furnished from each separate source of supply. Approved samples shall be retained on site until furnishing of construction is completed.

## **PART 2 – PRODUCTS:**

### **GENERAL:**

Water: All water necessary for sodding and maintenance shall be of satisfactory quality to sustain the growth of grass and shall not contain harmful, natural or man-made elements detrimental to the turf. Water meeting the above standards 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.

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: Type of fertilizer may need to be modified based on the turf grass type selected for the project. See the plant schedule to determine variety of grass specified.

Soil Test: The contractor shall make soil tests to determine the current conditions of the sub-base soils and revise fertilizer and quantities of lime as dictated by the soil tests.

Topsoil: Where required, topsoil 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.

Lime shall be applied at the rate necessary to obtain 6.0 PH soil measurement.

Fertilizer shall be 50% nitrogen, slow release, 16-8-8 or 16-16-16 applied at rate of 400 pounds/acre on the sub-base soil before placing the gravel fill.

### **PLANT MATERIALS:**

#### **GENERAL:**

See Planting Plan and Construction (BID) Schedule, Sodding Work for area 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. Contractor shall verify necessary quantities to finish the work.

Sod shall be Certified Sod of the species or mixture called for on the plans, 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.

Note: Only sod that has a proven track record are varieties of Bermuda.

### **PART 3 – EXECUTION**

#### **GENERAL:**

Sodding operations shall be conducted under favorable weather conditions preferable for the type turf specified. The Contractor has the option and assumes full responsibility for sodding in unseasonable conditions.

Protect roots of turf at all times from sun and drying winds, water and freezing, as necessary until placing.

Stored sod must be kept damp and protected.

Reference the sod profile detail in the drawings to understand the layers of installation.

#### **SOIL PREPARATION AND PLANTING EXECUTION PROCEDURE:**

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 sub-base surface of all sod areas. They must not be stirred with the soil. Should the Contractor find such conditions beneath the soil which shall in any way adversely affect the turf growth, he shall immediately call it to the attention of the Landscape Architect. Failure to do so before beginning shall make the responsibility of corrective measures the responsibility of the Contractor. Use approved herbicide to eliminate temporary plant material as directed.

Rough Grading: Contractor shall proceed to bring the subsoil-base level to within 8"-10" of the proposed finished turf grade for the proposed turf area. If existing soil is too low, contractor shall bring in adequate fill soil to meet the subsurface grade.

Subsoil Base level shall be scarified a minimum of 4"- 6" deep and hand raked smooth to grade before placing the topsoil layer.

Topsoil Layer: Lay 2 – 3” of friable topsoil over the subsoil surface as needed to reach the sub-base grade below the gravel layer. Topsoil fill shall be a sandy clay loam at proper Ph for selected turf variety.

Lime and Fertilizer Application: Spread lime and fertilizer uniformly over the topsoil areas to be mix thoroughly into the topsoil to depth of four inches during the tilling operation. Spreading shall be done with approved mechanical spreaders or seed drills, and blended into the soil. Contractor shall retain and count empty bags for verification of fertilizer rate.

Topsoil Preparation: After the topsoil placement over subsoil level in area to be graveled has been brought to finished sub-base grade, prepare the soil by tilling the topsoil until the topsoil and sub base levels have interfaced and are friable, well pulverized and acceptable to the Landscape Architect. Soil layer shall be scarified a minimum of 6” deep and tilled a minimum of 4” deep. This is considered the sub-grade level under the gravel layer; therefore, it does not have to be completely smoothed out, only rough raked and moderately compacted to the prescribed grade. All foreign material detrimental to grading shall be removed.

Irrigation Lines: Irrigation lines shall be installed after topsoil preparation with the stubs for irrigation heads extended up above the proposed gravel layer to the sod surface level.

Drainage: In low areas or along the edges of pavement on the down slope side where water may get trapped, install 4” perforated drainpipes and connect to closest storm inlet or daylight out to low grades. See the site grading plans for proper locations.

Gravel Base Course: Place a 3”-4” layer of washed #57 stone over the prepared sub-grade, irrigation lines, and drainpipe installations. Gravel shall be washed free of fines and other small particles before spreading. Spread the gravel to a uniform depth to within ¾ to 1/2:” of the bottom of the turf level. Gravel shall be spread with small rubber tire tractor with a box blade, roll compacted, and hand raked to a relatively smooth finish. **Do not** use heavy track equipment or bobcats.

Gravel Leveling Course: Spread a ½ to ¾” layer of washed #89 stone over the surface of the base #57 stone as a leveling course. The #89 stone shall be washed free of all fines and small particles before installation. Hand rake the gravel to a uniform smooth surface suitable for laying the sod. Finish grade level shall be within a 1” to 1.5” tolerance of the top of the finished turf grade. Take care to be sure there are not dips, sinks, holes, or high spots that will be reflected on the surface of the finish lawn. Fill spots with #89 stone.

Watering: Spray the surface of the stone until thoroughly wet before placing the sod.

Sodding: Finished surface of the gravel bed as described for turf areas shall be no greater the 1 ½ inches below proposed finished turf grade as established by the grading plan. Low areas to be filled with #89 stone to meet grade.

Stored sod of the species required in the schedule shall be kept moist prior to laying. Dampen all gravel areas immediately prior to placing the sod. Cover sod to prevent drying by the sun.

Unroll the sod on top of the prepared gravel beds. Lay the strips parallel with the strip ends staggered in a brick layers' running bond pattern. Select the running direction to be perpendicular to the most significant downhill direction of flow for runoff of the lawn. Press each successively laid strip of sod snugly up against the adjacent one. Reject all sod that does not have a root layer profile on the bottom. If sod has been scalped of the root layer, it will not survive and shall not be installed. Ensure that strips of sod are snugly butted up to each other.

Roll the installed sod with a 100 lb. hand roller to gently press in place. Lightly fertilize immediately after installation. Spread at a rate of 3 pounds per 1,000 S.F. Determine if the sod has been fertilized by the supplier immediately before delivery and adjust application accordingly.

Sand Fill: Do **not** fill cracks with top dressing sand, at time of installation. Sand fill may occur three (3) months after turf has taken root in the gravel. It is important that the voids in the gravel not be filled with fine sand particles until the roots have had adequate opportunity to penetrate down through the voids in the gravel and attach to the sub-base topsoil.

Complete Irrigation: Extend irrigation stubs and install heads as indicated to finish the system.

Turf must be kept heavily watered for the first 6 weeks, and lightly watered for the next 6 weeks. Contractor shall check the progress of the roots by pulling up a test plot of the turf to determine the root penetration through the gravel to tack down to the gravel. Turf and rock must not be allowed to dry during the first 12 weeks.

Foot traffic must be restricted the first two weeks, with no mowing. After two weeks, or until tack down, the turf shall be kept mowed at a 2" height until the roots have thoroughly penetrated down to the topsoil base. Use a mower with sharp blades and thatch catcher.

When turf has thoroughly tacked down to the gravel, maintenance may begin to mow the turf at the prescribed height suitable for the species of grass installed.

Heavy foot traffic may begin at 12 weeks or when the turf has sufficiently attached its roots into the gravel so as not to move, sink or pull free. This can be monitored by pulling at plots of turf to determine how well it is attached.

Lawn area 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.

Do not allow any vehicular traffic other than small push mowers on the turf for 6 months. Once the grass has firmly established itself into the sub-base soil, the lawn can absorb significant foot and vehicular use without damaging the grass. Riding mowers can be used at this time. However, the turf will need continuous maintenance care to maintain its health.

During serious droughts the gravel tends to dry out so extra water will be needed.

**MAINTENANCE:**

Surface Repair: Any areas that settle or show dips, sinks, or other uneven levels of surface must be repaired in the first two weeks. This is accomplished by lifting the sod and adding #89 stone to the low spot to reach grade and replace the sod. High spots can be corrected by lifting the sod and removing gravel.

All sodding shall be protected and maintained by the Contractor until time of final acceptance. Maintenance shall include but is not limited to watering, weeding, top dressing, replacement of dead material, mowing, fertilizing, and other necessary operations.

The Owner will be responsible for maintenance after final acceptance. The Contractor shall submit, in writing, maintenance instructions for use by the Owner in caring for the turf during warranty period.

Sand fill: When the sod has tacked down into the gravel to the point where it can not be pulled free by hand, contractor may top dress the turf to fill cracks, voids, and minor dips in the surface of the lawn. This should not occur before three (3) months.

General Maintenance: When the lawn is turned over to the Owner for regular maintenance, it is important that the turf be monitored to maintain good health. Because the turf is designed for heavy use, it must have the following routine attention.

- A. Do not allow grass clippings to settle into the turf. Always use a thatch catcher
- B. Fertilize on a regular schedule
- C. Mow slightly higher than normal for the species selected
- D. Do not allow sod to dry out during periods of extreme heat or drought
- E. Replace dead spots by removing sod and enough gravel to re-level the surface

### **WARRENTY:**

All grass shall be guaranteed to be alive and health 90 days after the date of final acceptance, or to remain alive and healthy through one full growing season following planting, which ever occurs first. Contractor shall be responsible for maintaining the plant installations for 90-days after final acceptance. Any grass that is dead or not showing satisfactory growth after 90-day period shall be replaced, or conditions contributing to unsatisfactory growth corrected. All replacements shall be of the original quality and shall be of equal quality to that installed. Replacement turf shall be guaranteed to be alive at the beginning of the following growing season. Only one replacement will be required for each plot of dead grass.

The guarantee may become void if it is determined that turf kill or unsatisfactory growth results from Owner negligence or abuse. The decision for determination of responsibility for damage shall rest solely with the Landscape Architect.

### **FINAL CLEAN UP:**

After all work has been completed and all surfaces settled, clean-up and adjustments must be made to ensure proper depth of base gravel, proper drainage, proper grades adjacent to walks and curbs, proper slope of plant beds, etc. Remove all soil, gravel, or grass from walks and paving, leaving the areas broom clean.

## **REINFORCED TURF**

### **ABREVIATED INSTALLATION PROCESS**

1. Bring the rough sub-grade to within  $\pm 8''$ - $10''$  of the finished turf grade
2. Be sure the surface of the final sub-grade, fill or cut, is scarified to break hard pan or compacted subsoils.
3. Add 2-3'' of sandy clay loam topsoil.
4. Lightly spread slow release 16-16-16 fertilizer over the topsoil surface at  $\pm 400$  lbs./acre. and rototill 4'' deep. Hand rake smooth the surface and lightly compact.
5. Spread washed #57 Stone 3 -4'' deep to within 2'' of the proposed finished grade. It is critical that the fines be washed out of the #57 stone to avoid filling the air voids in the gravel layer. Choke the top the #57 stone with  $\frac{1}{2}''$  layer of #89 Stone carefully spread to within 1'' of finished grade. Be sure the finished surface is relatively smooth and even.
6. Spray the gravel to dampen the surface of the gravel immediately before laying the sod.
7. Lay 1'' thick layer of sod directly on top of the top gravel bed. Butt fit the strips tightly together to prevent open voids or gaps. Do not top dress or fill voids with sand.
8. Irrigate heavily so that the gravel does not dry out or draw moisture out of the sod. Irrigation is required daily until the white root hairs tack down into the gravel so that you cannot lift the sod layer.
9. Keep all traffic off the grass for a minimum of 6 weeks until it completely tacks down. No vehicles or riding mowers on the grass for 8-10 weeks.
10. Check regularly for root penetration by lifting the corner of a sod palette to observe the root hairs as they penetrate the gravel down to the soil layer and tack down too tight to lift up.
11. After the sod tacks down and has had several months to grow in, top dress with sand to fill any joints. Go lightly with sand so that it does not infiltrate the gravel and fill the voids.
12. Do not mow the lawn until the sod is tacked down too tight to shift or move.
13. Use a thatch catcher on the mowers used to cut the turf. Spray wash any mower to be used on the turf before mowing to remove invasive turf or weed seeds from the mower.

The roots will eventually penetrate through the gravel layers until they reach the topsoil and spread through the soil layer. The roots in the gravel will gradually expand to become woody stems connecting the leaf structure to the root mass in the topsoil.

This profile prevents the roots from being crushed under compaction and provides greater air access to the root system. It can also serve as a storm water storage layer under the lawn to reduce runoff. In some cases, the subgrade can be graded so as to become a subsurface drainage system.

The grass will not need as much irrigation once it is established, it will dry quickly during periods of draught. The profile allows the grass to stay healthy even under heavy foot traffic use. This application is especially good for a heavy use lawn or amphitheater setting.

Do not recommend this profile for an athletic field in that certain areas on fields get intense use that will wear through the turf layer into the gravel and expose the base to the surface. The gravel will then give way to traffic and begin to spread on the surface.

This profile is best used for periodic parking areas, event lawns or festival areas that get periodic heavy use. Daily use by cars will eventually kill the turf.

Care for the lawn includes appropriate watering and fertilizer. Turf does not need aeration. The gravel will damage the aeration machine spikes. Grass must be mowed with a thatch catcher otherwise the fines will work their way down into the gravel and begin to fill the voids. Turf should not be mowed less than 1” height.

During heavy use, the leaf layer will be crushed or damaged, but the root zone will stay safe. Within a few days the grass will recover and sprout out new leaves. .

**END OF SECTION 02950**

**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.

**END OF SECTION 02975**



**SECTION 03200**

**CONCRETE REINFORCEMENT**

**PART 1 – GENERAL**

**1.1 WORK OF THIS SECTION**

- A. Work covered by this Section includes the furnishing and installation of concrete and masonry reinforcement as specified in the Contract Documents.

**1.2 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. Cast-in-Place Concrete 03300

**1.3 SUBMITTALS**

- A. Submit under provisions of Division One.
- B. Manufacturer's certification that reinforcement meets Specification requirements, and/or certified mill test reports
- C. Shop Drawings shall show dimensions, spacing, bar and mesh schedule, bending details, stirrup and support details, and other pertinent data and in accordance with ACI 315.
- D. Submit manufacturer's printed product data, clearly marked, indicating proposed fibrous concrete reinforcement materials. Submit manufacturer's printed batching and mixing instructions.

**1.4 QUALITY ASSURANCE**

- A. Provide at least one person who will be present during execution of this portion of the work and who shall be thoroughly familiar with the type of materials being installed, the referenced standards and the requirements of this work, and who shall direct all work performed under this section.
- B. Work shall comply with requirements and recommendations of the following:
  - 1. American Concrete Institute, ACI 315, "Manual of Standard Practice for Detailing Reinforced Concrete Structures."
  - 2. American Concrete Institute, ACI 318, "Building Code Requirements for Reinforced Concrete Structures."
  - 3. American Concrete Institute, ACI-ASCE 530 and 530.1, "Building Code Requirements for Masonry Structures."

4. American Welding Society, AWS D1.4, "Structural Welding Code for Reinforcing Steel".
5. American Welding Society AWS D12.1. "Recommended Practices for Welding Reinforcing Steel, Metal Inserts, and Connection in Reinforced Concrete Construction."
6. Concrete Reinforcing Steel Institute (CRSI), "Manual of Standard Practice."
7. American Concrete Institute, ACI SP-66 "Detailing Manual."
8. American Concrete Institute, ACI 544, "Report on Fiber Reinforced Concrete."

## **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. All deliveries shall be accompanied by detailed bills of material which shall include information pertaining to bar size, bar mark, length of bends, total length of bar, weight of individual sets of bars and total weight delivered for each structure. Bundles shall be color coded.
- B. Store reinforcement off the ground, under suitable cover or in a suitable enclosure. Maintain easy access for inspection and identification of materials.
- C. Maintain reinforcement free from dirt, grease, scale, loose rust, oil, paint, other foreign matter, and all deleterious materials. Clean all reinforcement as required to meet these conditions and maintain such clean condition until such time as concrete is placed.

## **1.6 JOB CONDITIONS**

- A. All reinforcing steel within the limits of a day's pour shall be in place and firmly wired prior to commencement of concrete placing operations.
- B. Installation or wiring of steel less than six hours before commencing placement of concrete shall not be permitted, except by special written authorization of the Architect/Engineer. At least six hours of review time for each pour location shall be provided to the Architect/Engineer by the Contractor after the last reinforcement is placed and prior to placement of concrete.
- C. The reinforcing steel, in place, shall be subject to review and approval by the Architect/Engineer prior to placing of any concrete.
- D. The Contractor shall notify the Architect/Engineer a minimum of at least 24 hours prior to readiness for each reinforcing review.

## **PART 2 - PRODUCTS AND MATERIALS**

### **2.1 MATERIALS**

- A. Reinforcing Bars: Deformed bars conforming to ASTM A615, Grade 60, including Supplementary Requirement S1.
- B. Wire Fabric Plain Type: ASTM A185. Flat sheets only.
- C. Wire Fabric Deformed Type: ASTM A497.
- D. Tie Wire: 16-gauge annealed type.
- E. Supporting Devices: Size and shape appropriate to conditions. Where concrete is exposed to view, chairs shall have plastic coated feet.
- F. Supporting devices for slabs on grade shall have sand plates.
- G. Dowels: plain round bars conforming to ASTM A675 Grade 80.
- H. Fiber Reinforcing (Alternate temperature reinforcing for slabs on grade)
  - 1. Fibermesh 300 (or engineer approved equal) 100 percent virgin polypropylene, fibrillated fibers containing no reprocessed olefin materials and specifically manufactured to an optimum gradation for use as concrete secondary reinforcement. Volume per cubic yard shall equal a minimum of 0.1% (1.5 pounds).
  - 2. Fibrous concrete reinforcement shall be as manufactured by Fibermesh Company, 4019 Industry Drive, Chattanooga, TN 37416, or an engineer approved equal.
  - 3. Physical Characteristics:
    - a. Specific gravity: 0.91.
    - b. Tensile strength: 50 to 110 ksi.
    - c. Fiber length: graded per manufacturer.
- I. Adhesive and grouted anchors shall be KELIBOND and KELIGROUT as manufactured by KELKEN GOLD of South Plainfield, New Jersey (201-753-0088), or an approved equal.
- J. Mechanical Rebar Splices: CADWELD T Series and B Series as manufactured by Erico Products, Inc., or an approved equal.
- K. Pipe Sleeves: Standard weight pipe conforming to ASTM A120.

## 2.2 FABRICATION

- A. Fabricate reinforcement in accordance with CRSI Manual of Standard Practice, ACI SP-66 and ACI 318.
- B. Accurately fabricate to the details and dimensions shown on the Drawings.
- C. All bars shall be bent cold and shall not be bent or straightened in a manner that

will injure the material (i.e. torched).

- D. Bend all reinforcement in accordance with ACI 318.
- E. No bars that are partially embedded in concrete shall be field bent except as shown on the Drawings or as permitted by Architect/Engineer.

## **1BPART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Accurately position reinforcement and firmly support in place. The system of holding reinforcement in place shall insure that steel will not be able to move during concrete placement. If necessary, top reinforcing shall be adequately held in position to support the weight of the workmen without displacement. All reinforcement shall be rigidly wired in place with adequate spacers and tie chairs. Bar supports shall be 3'-0" on center maximum, and in accordance with ACI 315.
- B. For concrete slabs on ground or fill, support reinforcement on approved chairs. "Hooking-up" or "Walking-in" of any reinforcement including mesh, will not be permitted.
- C. Protective concrete cover shown on the Contract Documents, or required by ACI Code, shall be rigidly adhered to. Coordinate conduit and insert placement so as to avoid decreasing or increasing protective cover on reinforcement.
- D. In the event conduits, piping, inserts, sleeves, or any other items interfere with the placing of reinforcement, as indicated on the Contract Documents, consult Architect/Engineer for required changes.
- E. Protect installed reinforcing from damage and displacement before, during, and after placement of concrete. Exposed reinforcing intended for bonding with future extensions shall be protected from corrosion.
- F. At the time concrete is placed, all reinforcement shall be free from dirt, mud, ice, rust, scale, loose mill scale, oil, paint, and other coatings which may destroy or reduce bond between steel and concrete.
- G. The Contractor shall repair or replace damaged, distorted or displaced reinforcement.
- H. Fiber Reinforcing
  - 1. Add fibrous concrete reinforcement to concrete materials at the time concrete is batched in amounts in accordance with approved submittals for each type of concrete required.
  - 2. Mix concrete in strict accordance with fiber reinforcement manufacturer's

- instructions and recommendations for uniform and complete distribution.
3. Manufacturer shall provide a qualified technical representative to instruct the concrete supplier in proper batching and mixing of materials to be provided.

### **3.2 SPLICES IN REINFORCEMENT**

- A. Lap splices (wired together) and embedment lengths shall conform to:  
Concrete - ACI 318 - Chapter 12  
Masonry - ACI 530 - Chapter 8
- B. No splices of reinforcement shall be made except as shown on the plans or as specified/authorized by the Architect/Engineer.
- C. Mechanical splices shall be installed in strict accordance with manufacturer's instructions.
- D. Welding of reinforcing is not permitted unless specified or authorized by the Architect/Engineer.

**END OF SECTION 03200**

**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. Slab on grade.
  - 3. 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<sup>0</sup>F nor when the concrete temperature or ambient temperature exceeds 85<sup>0</sup>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 sieve: 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. "Axpandcrete"; 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 silicofluoride 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 walkways 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 water tight 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: Strikeoff 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. 1 set per 100 cubic yards or fraction 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 1 specimen per set at 7 days for information unless an earlier age is required.
  - b. Test 2 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 by more 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 03310 CONCRETE WORK

### PART 1 – GENERAL

#### 1.1 RELATED DOCUMENTS:

The provisions of Division 1 shall govern this section

#### 1.2 DESCRIPTION OF WORK:

Extent of concrete work is shown on the drawings, and includes, but is not necessarily limited to the following:

Wall footings, sidewalks, crosswalks, and pavement slabs

#### 1.3 RELATED WORK SPECIFIED ELSEWHERE:

Section 02200:	Earthwork
Section 03200:	Concrete Reinforcement
Section 03300	Cast in place Concrete
Section 03310:	Concrete Work
Section 3523:	Concrete Sidewalks

#### 1.4 QUALITY ASSURANCE:

Sample Pours: Prior to commencing overall construction of concrete surfaces, Contractor shall coordinate with Owner/Landscape Architect to construct a minimum of three sample pours of the finished concrete product. Sample shall include color additives, finish and adjacent brick border. Concrete paving may not begin until a sample pond is approved.

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.

Codes and Standards: Comply with the provisions of the following codes, specifications and standards, except where more stringent requirements are shown or specified:

ASTM C 33	Concrete Aggregates
ACI 301	"Specifications for Structural Concrete for Buildings"
ASTM C 150	Portland Cement
ACI 311	"Recommended Practice for Concrete Inspection"
ASTM C 94	Ready-Mixed Concrete
ACI 318	"Building Code Requirements for Reinforced Concrete"
ACI 347	"Recommended Practice for Concrete Form Work"
ACI 304	"Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete"

Concrete Testing Service: Employ at Contractor's expense a testing laboratory acceptable to the Owner to perform material evaluation tests and to design concrete mixes.

Materials and Installed Work may require testing and re-testing, as directed by the Landscape Architect, at any time during the progress of the work. Always allow free access to material stockpiles and facilities. Tests, not specifically indicated to be done at the Owner's expense, including the re-testing of rejected materials and installed work, shall be done at the Contractor's expense.

Tests for Concrete Materials: Test aggregates by method of sampling and testing of ASTM C 33. For Portland Cement, sample the cement and determine the properties by the methods of test of ASTM C 150.

Submit written reports to the Landscape Architect for each material sampled and tested, prior to the start of the work. Provide the project identification name and number, date of report, name of contractor, name of concrete testing service, source of concrete aggregates, material manufacturer and brand name for manufactured materials, and values specified in the referenced specification for each material as acceptable for intended use.

Certificates of material properties and compliance with specified requirements may be submitted in lieu of testing. Certificates of compliance must be signed by the materials producer and the Contractor.

#### 1.5 SUBMITTALS:

Product Data: Submit manufacturer's product data with application and installation instructions for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, joint systems, curing compounds, and others as requested by the Landscape Architect.

Laboratory Test Reports: Submit laboratory test reports for concrete materials and mix design test as specified.

Material Certificates provide materials certificates in lieu of materials laboratory test reports when permitted by Landscape Architect. Material certificates shall be signed by manufacturer and Contractor, certifying that each material item complies with, or exceeds, specified requirements.

Color: Submit product data and sample to Landscape Architect for approval.

## **PART 2 - PRODUCTS**

### 2.1 CONCRETE MATERIALS:

Portland Cement: ASTM C 150, Type I, unless otherwise acceptable to Landscape Architect.

Use one brand of cement throughout project, unless otherwise acceptable to Landscape Architect.

Normal Weight Aggregates: ASTM C 33 and as herein specified. Provide aggregates from a single source for exposed concrete. Local aggregates not complying with ASTM C 33 but which have shown by special test or actual service to produce concrete of adequate strength and durability may be used when acceptable to the Landscape Architect.

Fine Aggregate: Clean, sharp, natural sand free from loam, clay, lumps or other deleterious substances. Dune sand, bank-run sand and manufactured sand are not acceptable.

Coarse Aggregate: Clean, uncoated, processed aggregate containing no clay, mud, loam or foreign matter, as follows:

Crushed stone processed from natural rock or stone.

Washed gravel, either natural or crushed. Use of pit or bankrun gravel is not permitted.

Maximum Aggregate Size: Not larger than one-fifth of the narrowest dimension between sides of forms, one-third of the depth of slabs, nor three-fourths of the minimum clear spacing between individual reinforcing bars.

Water: Potable

Air Entraining Admixture: ASTM C 260.

Water-Reducing Admixture: ASTM C 494, Type A.

Calcium Chloride: will not be permitted in concrete.

Color: Schofield (Submit samples for selection) Price Sombrero Buff.

## 2.2 PROPORTIONING AND DESIGN OF MIXES:

Prepare design mixes for each type and strength of concrete in accordance with applicable provisions of ASTM C 94. Use an independent testing facility acceptable to Landscape Architect for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing unless otherwise acceptable to Landscape Architect.

Submit written reports to Landscape Architect for each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed by Landscape Architect.

Adjustment to Concrete Mixes: Mix Design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant; at no additional cost to Owner and as accepted by Landscape Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Landscape Architect before using in work.

## 2.3 ADMIXTURES:

Use air-entraining admixture in exterior exposed concrete, unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having air content within following limits.

Pressure:



4% for maximum 2" aggregate  
6% for maximum 3/4" aggregate, 7% for maximum 1/2" aggregate  
Other concrete: 2% to 4% air

Use admixtures in strict compliance with manufacturer's directions.

#### 2.4 CONCRETE STRENGTHS AND SLUMPS:

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	MAX. AGG. SIZE	SLUMP
Footings, Bases	3000 psi	1 1/2"	1 - 3"
Sidewalks & Paving	3000 psi	3/4"	1 - 4"

#### 2.5 CONCRETE MIXING:

Ready-Mix Concrete: Comply with requirements of ASTM C 94, and as herein specified. Delete references for allowing additional water to be added to batch for material with insufficient slump. Addition of water to the batch will not be permitted. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C 94 may be required. When air temperature is between 85 F (30 C) and 90 F (32 C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90F (32 C), reduce mixing and delivery time to 60 minutes.

Color: Follow manufacturer instructions.

### PART 3 - EXECUTION

#### 3.1 JOINTS:

Construction Joints: All construction joints shall be saw cut. No trowl or tooled joints are acceptable. Locate and install construction joints not shown on drawings, so as not to impair strength and appearance of the structure, as acceptable to Landscape Architect.

Provide keyways at least 1-1/2" deep in construction joints in walls, slabs and between walls and footings; accepted bulkheads designed for this purpose may be used for slabs.

Place construction joints perpendicular to the main reinforcement. Continue reinforcement across construction joints.

Isolation Joints in Slabs-on-Ground: Construct isolation joints in slabs on ground at points of contact between slabs and vertical surfaces, such as pedestals, walls, steps, and elsewhere as indicated.

#### 3.2 INSTALLATION OF EMBEDDED ITEMS:

General: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of items to be attached thereto.

Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface. Provide and secure units sufficiently strong to support types of screed strips by use of strike-off templates or accepted compacting type screeds. Coordinate location of pipe conduits and other required penetrations of the surface.

### 3.3 CONCRETE PLACEMENT:

Pre-placement Inspection: Before placing concrete, inspect and complete form work installation, reinforcing steel, and items to be embedded or cast-in. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work. Moisten wood forms immediately before placing concrete where coatings are not used.

Coordinate the installation of joint materials and moisture barriers with placement of forms and reinforcing steel.

General: Comply with ACI 304, and as herein specified.

Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of

weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable in its final location to avoid segregation.

Placing Concrete Slabs, Beams, Columns: Deposit and consolidate concrete slabs, beams and columns in a continuous operation within limits of construction joints, until the placing of a panel or section is completed.

Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.

Bring slab surfaces to correct level with straightedge and strike off. Use bull floats or darbies to smooth surface, free of humps and hollows. Do not disturb slab surfaces prior to beginning finishing operations. Do not sprinkle water on the plastic surface.

Maintain reinforcing in proper position during concrete placement operations.

Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified.

When air temperature has fallen to or is expected to fall below 40 F, uniformly heat water and aggregate before mixing to obtain a concrete mixture temperature of not less than 50 F, and not more than 80 F at point of placement.

Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

Do not use calcium chloride, salt and other materials containing antifreeze agents or chemical accelerators, unless otherwise accepted in mix designs.

**Hot Weather Placing:**

When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.

Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 F (32 C). Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing.

Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.

Do not use retarding admixtures unless otherwise accepted in mix designs.

**3.4 FINISH OF FORMED SURFACES:**

**Smooth Rubbed Finish:** Provide smooth rubbed finish to scheduled concrete surfaces, which have received smooth form finish treatment, not later than one day after form removal.

Moisten concrete surfaces and rub with carborundum brick or other abrasive until a uniform color and texture is produced. Do not apply cement grout other than that created by the rubbing process.

**Trowel Finish:** Apply trowel finish to monolithic slab surfaces to be exposed-to view.

After floating begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and with a surface plane tolerance not exceeding 1/8" in 10' when tested with a 10' straightedge.

**3.5 CONCRETE CURING AND PROTECTION**

**General:** Protect freshly placed concrete from premature drying and excessive hot or cold temperatures.

**Method:** Apply approved liquid type curing material to exposed concrete slabs.

**3.6 CONCRETE SURFACE REPAIR**

**Patching Defective Formed Areas:** Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to Landscape Architect.

Cut out honeycomb, rock pockets, voids over 1/4" in any dimension, and holes left by tie rods and bolts, down to solid concrete but in no case to a depth of less than 1". Make edges of cuts perpendicular to the concrete surface. Before placing cement mortar or proprietary patching compound, thoroughly clean, dampen with water and brush-coat the area to be patched with neat cement grout, or proprietary bonding agent.

For exposed-to-view surfaces, blend white portland cement and standard portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surfaces.

Repair defective slab surfaces by removing and replacing entire slab with fresh concrete.

### 3.7 QUALITY CONTROL TESTING DURING CONSTRUCTION:

The Owner shall employ a testing laboratory to perform tests and to submit test report.

Sampling and testing for quality control during placement of concrete shall include the following, as directed by Landscape Architect.

Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.

Slump: ASTM C 143; one test for each concrete load at point of discharge; and one test for each set of compressive strength test specimens.

Compression Test Specimen: ASTM C 31: One set of 6 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.

Compressive Strength Tests: ASTM C 39: One set for each 100 cy. yds. or fraction thereof of each concrete class placed in any one day or for each 5,000 sq. foot of surface area placed. 2 specimens tested at 7 days, 3 specimens tested at 28 days, and one specimen retained in reserve for later testing if required.

When frequency of testing will provide less than 3 strength tests for a given class of concrete, conduct testing from at least 3 randomly selected batches or from each batch if fewer than 3 are used.

When total quantity of a given class of concrete is less than 50 cy. yards strength test may be waived by Landscape Architect if, in his judgement, adequate evidence of satisfactory strength is provided.

When strength of field-cured cylinders is less than 85% of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.

Test results will be reported in writing to Landscape Architect, Owner and Contractor on same day that tests are made. Reports of compressive strength tests shall contain the project

identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete placement, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of break for both 7-day tests and 28-day tests.

Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained as directed by Landscape Architect. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed. Contractor shall pay for such tests conducted, and any other additional testing as may be required, when unacceptable concrete is verified.

Final Clean Up: Finished surface shall be left free and clean of tire marks, construction stains, residue, slug, grit, dirt, paint and other elements that mar the final appearance.

All excess concrete and debris shall be removed from the site. Plant beds shall be left clear of construction debris

**END OF SECTION 03310**

## 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.

### 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 an 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 04100

### MASONRY MORTAR

#### Part 1 GENERAL

##### 1.01 Scope

The work covered by this Section consists of furnishing all labor, equipment and material required to ensure the proper proportioning of materials for masonry mortar and related work as described herein and or shown on the Drawings.

##### 1.02 Storage and Protection

- A. Cementitious materials shall be delivered to the site in unbroken bags or other approved containers, plainly marked and labeled with the manufacturer's name and brand.
- B. Cementitious materials shall be handled in a manner which will prevent the inclusion of foreign materials and damage by water or dampness.

##### 1.03 Quality Assurance

- A. Materials shall conform to the current editions of the following standards:
  - 1. Masonry Cement: ASTM C91.
  - 2. Aggregate for Masonry Mortar: ASTM C 144.
  - 3. Portland Cement: ASTM C 150, Type I.
  - 4. Hydrated Lime for Masonry Purposes: ASTM C 207, Type S.
  - 5. Mortar for Unit Masonry: ASTM C 270.
  - 6. Latex Portland Cement Mortar: ANSI A118.4
- B. The Contractor shall submit to the Engineer written evidence that the cement, lime and aggregate is in conformance with the material and mechanical requirements specified herein. Certified copies of independent laboratory test results or mill test results from the cement, lime and/or aggregate supplier may be considered evidence of compliance provided such tests are performed in accordance with the appropriate ASTM testing standards by experienced, competent personnel. In case of doubt as to the accuracy or adequacy of mill tests, the Engineer may require that the Contractor furnish test reports from an independent testing laboratory on samples of cement, lime and/or aggregate.
- C. In addition to these submittals, the Contractor shall submit to the Engineer test results in compliance with ASTM C 270, Section 9 for each type of mortar to be used in the work. The test report shall also include the average compressive strength of three 2-inch cubes of laboratory prepared mortar. Mortar mix ingredients and proportions shall not be changed during the course of the work without the Engineer's approval. Extreme care shall be taken to assure that the same proportion of each ingredient is used in each batch. Mortar color shall be proportioned by weight in individual containers

prior to mixing. Measuring mortar color by volume during mixing shall not be allowed.

## **Part 2 PRODUCTS**

### **2.01 Materials**

#### **A. Masonry Cement**

1. Masonry cement shall be a mixture of Portland cement and Type S hydrated lime. The mix shall not contain inert or noncementitious mineral fillers. If package mix is used, other hydraulic cements may be substituted for a part of the Portland cement. However, the Portland cement shall not be less than 30 percent of the total. Packaged mixes shall conform to the requirements of ASTM C 91.
2. The composition of the masonry cement shall be printed on each bag in terms that show compliance with these requirements.
3. If a packaged mix is not used, the Portland cement shall conform to ASTM C 150, Portland Cement, Type I and hydrated lime shall conform to ASTM C 207, Type S. The hydrated lime may be used in dry or paste form.

B. Sand: Aggregate for use in masonry mortar shall be clean, free from salt or other deleterious materials and conform to ASTM C 144, Aggregate for Masonry Mortar.

C. Water: Water for mixing shall be potable, clean and free from oil, acids, salts and other deleterious matter.

#### **D. Color**

1. Masonry cement used in load bearing and non-load bearing CMU wall construction shall be grey.
2. Masonry cement used in the granite stone shall be colored. Colors shall be approved by the Engineer in conjunction with the selection of the granite stone and CMU veneers.

## **Part 3 EXECUTION**

### **3.01 Installation**

#### **A. Mixing and Placing**

1. All mortar materials shall be accurately measured by volume and thoroughly mixed until they are evenly distributed throughout the batch. Mix mortar as follows: first, add approximately 3/4 of required water, 1/2 the sand and all the cement and lime; mix and add remainder of sand. Mix briefly; then add remainder of water in small quantities until workability of batch is satisfactory to masons. Mortar color when used shall be added to the 3/4 of required water prior to adding sand. After all materials have been added, mix for a minimum of five minutes. Completely empty drum before recharging for next batch.



2. All mortar shall be mixed in a powered, batch-type mechanical mixer. This requirement will not be waived except for minor jobs and only upon the approval of the Engineer.
  3. Mortars mixed for more than one hour shall not be used. A mortar which shows a tendency to become dry before this time shall have water added to it and shall be re-mixed. The use of a continuous mixer or retempered mortar shall not be permitted.
  4. Mortar for pointing shall have integral waterproofing added in accordance with the manufacturer's instructions.
  5. Mortar for exterior brick paving shall have a bond coat between the concrete slab and mortar setting bed. Bond coats consist of Portland cement mixed to a creamy consistency with latex additive. The bond coat is used to create improved bond between the concrete slab and the mortar setting bed. It is installed as the setting bed and pavers are laid and should not exceed 1/16 in. (2mm).
- B. Mix Proportions: All mortar shall conform to the requirements of ASTM C 270. Mix proportions by volume. Allowable error is two percent.

1. Mortar Mixes

Types	Mix by Parts Description	A	B
M	Portland Cement	1	1
M	Masonry Cement	0	1
M	Hydrate Lime	1/4	0
M	Damp Loose Aggregate	3 - 3-1/2	4-1/2 - 6
N	Portland Cement	1	0
N	Masonry Cement	0	1
N	Hydrate Lime	1	0
N	Damp Loose Aggregate	4-1/2 - 6	2-1/4 - 3
S	Portland Cement	1	1/2
S	Masonry Cement	0	1
S	Hydrate Lime	1/2	0
S	Damp Loose Aggregate	4-1/2	4-1/2

2. Mortar Uses

- a. Use Type M for all load bearing masonry and in foundation walls where masonry materials occur.
- b. Use Type N for all interior non-load bearing masonry.
- c. Use Type S for all face stone work, backup and parging.
- d. Type M may be used in lieu of Type N or S.
- e. Type S may be used in lieu of Type N.
- f. Use Type M for exterior mortared masonry unit paving
- g. Use Latex-Portland Cement Mortar in applications such as heavy vehicular traffic pavements or pavements where proper drainage is not possible.

**END OF SECTION 04100**

## SECTION 04200

### UNIT MASONRY WORK

#### PART 1 - GENERAL

##### RELATED DOCUMENTS

Section 04100 - Masonry Mortar  
Section 04400 – Stone Masonry

##### DESCRIPTION OF WORK:

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

##### QUALITY ASSURANCES:

Use an adequate number 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 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. Submit samples of each color and shape for approval prior to purchase. Color range sample for variations of grey granite shall be submitted for approval.

#### SAMPLE PANELS:

No work shall proceed until sample panels are completed and approved by the Landscape Architect.

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's acceptance of visual qualities of the sample before start of masonry work. Protect 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 and brick paving and walk including all borders and edges. Sample may be built in place and become part of finish work upon approval by Landscape Architect. 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. Extend cover a minimum of 12" beyond work completed.

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:**

The Contractor shall be responsible for estimating and furnishing sufficient quantities required to complete the project. The quantities estimated shall be stated in the bid proposal for the purpose of establishing credits for differences in cost of brick selected and allowance stated above.

#### Concrete Masonry Units (Concrete Block):

Size: Manufacturer's standard units with nominal dimensions of 16" long, 8" wide and 8" high (15 5/8" x 7 5/8" x 7 5/8" actual) and other sizes indicated.

Hollow Load-Bearing Concrete Masonry Units: ASTM C 90, Grade N. Normal weight units using concrete aggregates complying with ASTM C 33 producing dry net unit weight of not less than 125 pounds per cubic foot.

Provide manufacturer's standard color and texture, unless otherwise indicated.

#### Mortar Materials:

Masonry Cement for Exposed Work: Brixment-in-color. Color shall be as required to closely match brick.

Portland Cement: ASTM C 150, Type I, except Type III may be used for cold weather construction. Provide natural color.

Masonry Cement: ASTM C 91, non-staining, except with 12% maximum air content by volume.

Hydrated Lime: ASTM C 207, Type S.

Aggregates: ASTM C 144.

#### 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.

Provide units fabricated as follows:

Truss type fabricated with single pair of 9 ga. Side rods and 9 ga. continuous diagonal cross-rods spaced not more than 16" o.c. Hot dip galvanized after fabrication with 1.5 oz. Zinc coating, ASTM A 153, Class B2.

Wall Ties:

Provide Z-Bar type, 3/16" diameter hot dipped galvanized steel wire, 2" legs x 10" length, as Dur-O-Wall D/A 500 for reinforced brick walls.

Provide Z-Type, 3/16" diameter mill galvanized steel wire, as Dur-O-Wal D/A 512, No.7 for brick veneered walls.

Anchors and Ties:

Provide straps, bars, bolts and rods as indicated.

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

Mortar Mix:

Mortar shall consist of (by volume) one-part Portland cement, two parts masonry cement and six parts sand, with sufficient water for workable plastic mix.

Portland Cement Grout:

Grout shall consist of (by volume) one-part Portland cement, two parts sand, and two parts coarse aggregate, maximum size 3/8". Add sufficient water to provide a fluid mix, with 8 1/2" to 10" slump.

Manufacturer:

Obtain masonry units from one manufacturer of uniform texture and color for each kind required, for each continuous area and visually related areas.

**PART 3 - EXECUTION**

Layout work carefully to avoid unnecessary cutting of brick. Contractor is expected to adjust layouts to fit common brickwork dimensions.

**STAKING:**

See paragraph 1.8 of Supplementary 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. Approved sample shall be maintained in finished condition through the construction process.

**INSTALLATION, GENERAL:**

**Thickness:**

Build masonry construction to the full thickness shown, except single-width walls to the actual thickness of the masonry units, using units of nominal thickness shown or specified.

Cut masonry units with motor-driven saw designed to cut masonry with clean sharp, unchipped edges. Cut units as required to provide pattern shown and to fit adjoining work neatly. Use full units without cutting 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 concealed masonry with all units in a wythe bonded by lapping not less than 2". Bond and interlock each course of each wythe at corners, unless otherwise shown. Do not use units with less than 4" horizontal face dimensions at corners

If drawings do not clearly indicate the pattern or detail of the 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-hour period as required to restore workability.

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

#### Bedding and Jointing:

Lay hollow concrete masonry units with full mortar coverage on horizontal and vertical face shells; also bed webs in mortar in starting course on footings, and where adjacent to cells or cavities to be reinforced or to be filled with concrete or grout.

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.

If not otherwise indicated, lay walls with 3/8" minimum and 1/2" maximum joints. Lay all flat work with 1/2" minimum and 5/8" maximum joints.

#### Joint Treatment:

For concealed work, struck flush.

Wall caps and exposed joints of all stonework shall have joints tooled slightly concave.

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

#### Horizontal Joint Reinforcing

Provide continuous horizontal joint reinforcing as shown and specified. Fully embed longitudinal side rods in mortar for their entire length with a minimum cover of 5/8" on exterior side of walls and 1/2" at other locations. Lap reinforcement a minimum of 6" at ends of units. Provide continuity at corners by using prefabricated "L" sections.

Space continuous horizontal reinforcing as shown on drawings.

#### REINFORCING BARS:

Install reinforcing bars as specified in cells of concrete masonry units where shown on drawing. Fill cells solid with mortar around reinforcing.

#### 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 weepholes, and completely fill with mortar. Point-up all joints at corners, openings and adjacent work to provide a neat, uniform appearance.

Clean exposed stone 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 manufacturer's 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 lawns when using chemical cleaning agents.

Slug, dust and debris left from the operation of mixer and brick 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 04200**

## **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.

##### **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 supplier's specifications and other data for each type of stone masonry units, 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 cap work panel 2' x 2' 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 wall panels to show finished condition of each pattern of stone paving and

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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 seat walls:

Stones: 4” depth grey Elberton Granite Rubble as a 4” veneer.  
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.

Concrete Blocks: Standard 8 x 8 x 16 CMU grey blocks See Section 04200

Cap: Built from 4” thick stone materials that match the wall.

**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 masonry 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.

All flat work shall have concave recessed joints.

#### REINFORCING BARS:

Install reinforcing bars as specified in cells of concrete masonry units where shown on drawing. Fill cells solid with mortar around reinforcing.

#### 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 weepholes, 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 lawns or 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 information 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.

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

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.

1. Ground Contact Lumber: Pressure treat all above and ground contact items with waterborne preservatives to a minimum retention of 0.40 lb./cu. ft. or approved equal. After treatment, kiln-dry lumber and to a maximum moisture content of 19 and 15 percent, respectively.
2. Water Contact: Lumber or posts in constant contact with fresh or salt water shall be Marine Grade treatment.

3. Complete fabrication of treated items before treatment, where possible. If cut after treatment, apply field treatment complying with AWPA M4 to cut surfaces.
  4. Exterior Type: Use for exterior locations and where indicated.
  5. Inspect each piece of treated lumber after delivery and discard damaged, defective or untagged 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. 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. Nails: Grip-Rite 12 in x 3/8 in Spike. 12 Hgspk 125 galvanized Sinker.
  2. Power-Driven Fasteners: CABO NER-272
  3. Bolts: Steel bolts complying with ASTM A 307, Grade A with ASTM A 563 hex nuts and where needed flat washers.
- F . Concrete footer: 'Sakrete' filled in hole with post.

- G. Water Sealant: Finished steps and framing shall be sanded smooth and sealed with Thompsons Water Seal or equal.

### **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.
- C. Construct per details included on the Drawings.

**END OF SECTION 06100**

## SECTION 16010

### ELECTRICAL GENERAL REQUIREMENTS

#### PART 1 - GENERAL

##### 1.1 SCOPE OF WORK:

- A. Contractor shall install all electrical work covered by the below specifications and approved drawings. Provide all material, labor transportation, tools, supervision, etc., necessary to complete the total electrical job. All items not specifically mentioned herein which are obviously necessary to make a complete working installation shall be provided by the contractor, including any necessary field engineering and/or detail drawings required. Drawings shall be submitted for approval as provided for in Paragraph 1.4 Shop Drawings.
- B. The work shall consist of, but shall not be limited to, the installation of the following systems:
  - 1. Interior electrical systems for power, lighting, miscellaneous systems and new electrical power into the space as indicated on the Drawings.
  - 2. Power connections to equipment specified in specifications and on the approved drawings.
  - 3. Temporary Power as required for the project.
- C. Contractor is required to stake out the location of the service line from the power pole to the site and have it reviewed for location adjustments to save trees by the Owners Representative prior to digging any trenches.

##### 1.2 CODES AND FEES:

- A. All work shall be done in accordance with the requirements of the National Electrical Code, NFPA #70, 2020 Edition and all local and state codes.
- B. The contractor shall obtain and pay for all inspections required by the building and safety codes and ordinances and the rules and regulations of any legal body having jurisdiction.
- C. All electrical items covered by this specification shall be U.L. labeled and listed for the purpose.

##### 1.3 DRAWINGS:

- A. The drawings indicate the general arrangement of electrical equipment. The

contractor shall review civil and landscape architectural drawings for built-in equipment; conditions indicated on other plans shall govern for this work. Coordinate installation of electrical equipment with the structural and mechanical equipment and access thereto. Coordinate installation of recessed electrical equipment with concealed ductwork and piping, and wall thickness.

- B. Do not scale drawings. Dimensions for layout of equipment shall be obtained from architectural and/or mechanical unless specifically indicated on electrical drawings.
- C. Discrepancies shown on different drawings, between drawings and specifications or between documents and field conditions shall be promptly brought to the attention of the architect.

#### 1.4 SHOP DRAWINGS:

- A. The contractor shall submit for review by the architect, eight sets of complete schedules and data of materials and equipment to be incorporated in the work. Submittals shall be supported by descriptive materials, such as catalog sheets, product data sheets, diagrams, performance curves, and charts published by the manufacturer, to show conformance to specification and drawing requirements, model numbers alone will not be acceptable. Data submitted for review shall contain all information required to indicate compliance with equipment specified. Complete electrical characteristics shall be provided for all equipment. The architect reserves the right to require sample of any equipment to be submitted for approval.
- B. Each individual submittal item for materials and equipment shall be marked to show specification section and paragraph number which pertains to the item.
- C. Prior to submitting shop drawings, the contractor shall review the submittal for compliance with the contract documents and place a stamp or other confirmation thereon which states that the submittal complies with contract requirements. Submittals without such verification will be returned without review.
- D. Submittals shall be made for each of the following items:
  - Wiring Devices
  - Fire Sealing Materials, Instructions and UL Certifications
  - Panelboard
  - Circuit Breakers

#### 1.5 RECORD DRAWINGS:

- A. At the time of final inspection, provide three (3) sets of complete data on

electrical equipment used in the project and Reproducible As-Built drawings reflecting all field changes. This data shall be in bound form and shall include the following items:

1. Test results required by these specifications.
2. Panelboard shop drawings and copies of the final circuit directories reflecting all field changes.
3. Data sheets indicating electrical characteristics of all devices and equipment.
4. The As-Built Drawings shall have the Contractor's name, address, telephone number, fax number, date and indicate that the drawings are "As-Built".

**1.6 ELECTRICAL SERVICES:**

- A. Electrical power shall be as indicated on the drawings. Existing power pole near the gate of the horseshoe.

**1.7 SITE INVESTIGATION:**

- A. Prior to submitting bids on the project, the contractor shall visit the site of the work to become aware of existing conditions which may affect the cost of the project.

**1.8 EQUIPMENT CONNECTIONS:**

- A. All equipment requiring electrical connections shall be connected under this section of these specifications. Where electrical connections to equipment require specific locations, such location shall be obtained from shop drawings. Do not scale drawings for location of conduit stub-ups or boxes to serve specific equipment, unless dimensioned on the electrical drawings.
- B. Equipment furnished under other divisions of these specifications to be connected under this section of the specifications shall consist of, but not be limited to, the following:
  1. Owner furnished equipment if applicable.
- C. The contractor's attention is directed to other sections of these specifications, where equipment requiring electrical service is specified, to become fully aware of the scope of the work under this section of these specifications requiring electrical service and connections to equipment specified elsewhere.

**1.9 COOPERATION:**

- A. The contractor shall coordinate his electrical activities with other trades so as to avoid delays, interference's, and any unnecessary work.

**1.10 GUARANTEE:**

- A. For guarantee of work under Division 26, refer to the general and special conditions.

**PART 2 - PRODUCTS**

**2.1 MATERIALS:**

- A. Materials or equipment specified by manufacturer's name shall be used, unless approval of other manufacturers is listed in addendum to these specifications. Request for approval of substitute materials shall be submitted in writing to the architect at least ten working days prior to bid openings. Faxed request will not be accepted or reviewed.
- B. Where substitution of materials alters space requirement indicated on the drawings, submit shop drawings indicating proposed layout of space, all equipment to be installed therein, and clearances between equipment.
- C. All material shall be new and shall conform to the applicable standard or standards where such have been established for the particular material in question. Publications and standards of the organization listed below are applicable to materials specified herein.
  - 1. American Society for Testing and Materials (ASTM).
  - 2. Underwriters' Lab (UL).
  - 3. National Electrical Manufacturer Association (NEMA).
  - 4. Insulated Cable Engineers Association (ICEA).
  - 5. Institute of Electrical and Electronic Engineers (IEEE).
  - 6. Edison Electric Institute (EEI).
  - 7. National Fire Protection Association (NFPA).
  - 8. American Wood Preservers Association (AWPA).
  - 9. American National Standards Institute (ANSI).
- D. Material of the same type shall be the product of one manufacturer.

- E. All cost incurred by the acceptance of substitutions shall be borne by the contractor. Proof for all substitution shall be by the contractor.

### **PART 3 - EXECUTION**

#### **3.1 WORKMANSHIP:**

- A. All work shall be neatly, orderly, and securely installed with conduits, panels, boxes, switches, etc., perpendicular and/or parallel with the principle structural members. Exposed raceways shall be offset where they enter surface mounted equipment. Wiring installed in panels and other enclosures shall be looped and laced and not wadded or bundled.

#### **3.2 TESTS:**

- A. At final inspection, a test will be made and the entire system shall be shown to be in proper working order as per these specifications and the approved drawings.
- B. Contractor shall provide all instruments, labor and materials for any essential intermediate and final testing.
- C. Equipment covers (i.e., panelboard trims, device plates, and junction box covers) shall be removed, as directed, for inspection of internal wiring. All circuits throughout project shall be energized and shall be tested for operation and equipment connections in compliance with contract requirements. Accessible ceiling shall be removed, as directed, for inspection of equipment installed above ceilings.
- D. Perform the following test after the installation but prior to energizing equipment:
  - 1. Megger test all feeders and branch circuits 50 Amps or greater and all high voltage circuits. Allowances for leakages shall be within the manufacturers recommend tolerances. Testing methods shall be per the cable manufacturer's recommendations. Certified test results and the manufacturers data/recommendations shall be provided to the Engineer as indicated below.
  - 2. The Contractor shall perform any other test which may be required by any legal authority having jurisdiction to verify this installation meets that requirement or requirements.

#### **3.3 IDENTIFICATION:**

- A. Contractor shall identify each device such as circuit breakers, panelboards, controllers, etc. with Black on White Phenolic Tags using machine cut letters, 1/4" minimum height, unless otherwise noted. Permanently attach to each device as required, do not use screws for any NEMA 3R device. For all



panelboards, switchboards, transformers, fusible disconnecting motor starters and fusible disconnect switches include name, voltage, phase, number of wires, ampacity rating, short circuit rating and name/location of feed to the device.

#### 3.4 CLEANING AND PAINTING:

- A. Oil, dirt, grease, and other foreign materials shall be removed from all raceways, fittings, boxes, panelboard trims, and cabinets to provide a clean surface for painting. Scratched or marred surfaces of lighting fixtures, panelboard and cabinet trims, or other equipment enclosures shall be touched up with paint furnished by the equipment manufacturers specifically for that purpose. Painting in general is specified under other sections of the specifications.
- B. Trim covers for flush-mounted panelboards, pull boxes, junction boxes and control cabinets shall not be painted unless specifically required by the architect. Where such painting is required, trim covers shall be removed for painting. Under no conditions shall locks, latches or exposed trim clamps be painted.
- C. Unless specifically indicated to the contrary, all painting shall be done under Painting of these specifications.

**END OF SECTION**

## SECTION 16100

### BASIC MATERIALS AND METHODS

#### PART 1 - GENERAL

##### 1.1 GENERAL:

- A. Provide complete conduit system including boxes, fittings and supports. All empty conduits shall be left with fiber polyline pull cord. Conduits shall be concealed except in unfinished spaces such as areas without ceilings or on existing precast concrete walls. Refer to the Architectural Drawings for wall designations.

##### 1.2 RACEWAYS:

- A. Contractor shall install all conduits as per the below requirements.
  - 1. Intermediate Metal Conduit (IMC) shall be ferrous galvanized conduit and shall comply with Article 342 of the National Electrical Code.
  - 2. Rigid steel conduit shall be ferrous galvanized conduit and shall comply with Article 344 of the National Electrical Code.
  - 3. Electrical Metallic Tubing (EMT) shall be ferrous galvanized conduit and shall comply with Article 358 of the National Electrical Code. EMT conduit shall be used only in areas with concealed conduits. No exposed EMT will be allowed.
  - 4. Liquid tight flexible metal conduit shall comply with Article 350 of the National Electrical Code.
  - 5. Flexible metal conduit shall comply with Article 348 of the National Electrical Code.
  - 6. Rigid nonmetallic conduit shall be polyvinyl chloride Schedule 40 (PVC) and comply with Article 352 of the National Electrical Code. Schedule 40 (PVC) conduits shall be used only in underground conduit runs, use rigid steel or IMC 90-degree bend below grade to transition to above grade. No exposed Schedule 40 (PVC) conduits will be allowed.
- B. Coordinate all raceways with the mechanical ductwork and plumbing work installed in the job.
- C. See Architectural and Civil Specifications for additional information on materials and methods for the repair of all floors, walls and ceilings that are

disturbed during either the installation of the interior electrical systems. Seal all penetrations through any rated floor, wall or ceiling as per the requirements of the Architectural Specifications and/or as specified herein.

## **PART 2 - PRODUCTS**

### **2.1 CONDUCTORS:**

- A. All conductors shall be copper and have 600-volt type THHN/THWN insulation except where noted on drawings. Conductors installed where fixtures are used as raceway shall be 90°C Type THHN or XHHN.
- B. All branch circuits shall be a minimum of #12 AWG solid or stranded copper except for motor leads, which shall be a minimum #12 AWG stranded copper, unless otherwise noted on drawings.
- C. All branch circuit and feeder conductors, No. 6 AWG and smaller shall be color coded as follows: 208Y/120-volt, three phase system, Phase A--Black, Phase B--Red, Phase C--Blue, Neutral--White, Ground--Green. 120/240-volt single phase system, Phase A--Black, Phase B--Red, Neutral--White, Ground--Green. 480Y/277-volt, three phase system, Phase A--Brown, Phase B--Orange, Phase C--Yellow, Neutral--Gray, Ground--Green with stripe.

### **2.2 PULLBOXES:**

- A. All pull boxes shall be constructed of code gauge galvanized sheet steel and comply with Article 314 of the National Electrical Code, for the number, size and position of conduits entering the box, size of box and maximum number of conductors in a box.

### **2.3 OUTLET BOXES:**

- A. Outlet boxes shall be provided for each lighting fixture and for each device. Boxes shall not be smaller than specifically indicated herein and shall be larger if required by Article 314 of the National Electrical Code for the number and size of conductors installed. Where lighting fixtures are installed in continuous rows, only one outlet box shall be required unless otherwise noted on drawings.

### **2.4 RECEPTACLES AND WALL SWITCHES:**

- A. Receptacles and wall switches shall be of the type and size indicated on the drawings. Equal quality devices manufactured by Bryant, Hubbell or P & S may be used.
  - 1. All switches shall be 20-amp 120/277-volt Specification grade with gray handles unless otherwise noted. Switches shall be as indicated on

drawings.

2. Duplex outlets shall be 20-amp 125-volt A.C. 3 wire straight blade with gray face, unless otherwise noted on drawings.
  3. GFCI duplex outlets shall be 20-amp 125 volt A.C. 3 wire with gray face, unless otherwise noted on drawings.
- B. Device plates shall be one piece single or multi-gang type selected to match the specific device or combination of devices. Device plates for flush mounted devices shall be Brushed Stainless Steel 302/304 type, unless specifically indicated otherwise. Devices flush mounted in exposed masonry construction shall be jumbo type. Device plates for surface mounted devices shall be used with the type of outlet of outlet box in which the device is mounted. All devices installed in areas exposed to the weather and where specifically indicated shall be provided with a weatherproof device in-use extra duty metal coverplate.

### **PART 3 - EXECUTION**

#### **3.1 RACEWAYS:**

- A. Exposed conduits shall be installed parallel or at right angles to existing walls, ceilings, and structural members. Support exposed conduits at not more than ten-foot intervals and within three feet of outlets, junction boxes, cabinets and fittings. Individual runs of conduits shall be supported by one hole conduit straps; groups of conduits shall be supported on 1 1/2" X 1 1/2" fourteen gauge channel; Kindorf, Unistrut or Powers, suspended from structure with 3/8" threaded steel rods with spring steel conduit supporters. Attach rods to structure with swivel type clamps. Individual runs of exposed conduits attached to structural steel shall be supported by beam clamps. Where conduits must pass through structural members obtain approval of architect with respect to location and size of hole prior to drilling.
- B. Concealed branch circuit conduits shall be supported at intervals not exceeding ten feet and within three feet of each outlet, junction box, cabinet or fitting. Individual branch circuit conduits shall be attached to structural steel members with spring steel type conduit clips and to non-metallic structural members with one hole conduit straps. Where branch circuit conduits must be suspended below structure, conduits shall be supported by trapeze type support, typical to the type for exposed conduits indicated above. Conduits shall not be attached to channels of ceiling suspension system or suspension wires. Concealed feeder conduits larger than one inch trade diameter, above ceiling, shall be attached to structure on intervals not exceeding twelve feet with conduit beam clamps, one hole conduit straps or trapeze type support in accordance with conditions encountered.
- C. Conduit support device shall be attached to structure with wood screws on

wood, toggle bolts on hollow masonry, lead shield on solid masonry and machine bolts, clamps or spring steel clips on steel. Nails are not acceptable.

- D. Rigid conduit shall be attached to sheet metal enclosures with two bonding type lock nuts and insulated bushing. EMT connectors and couplings shall be watertight compression type and manufactured by Thomas and Betts or Appleton. All connectors shall be of the insulated throat type. Rigid conduit stub ups not attached to enclosure shall be terminated with steel insulated throat, grounding type bushing. All connectors and couplings shall be approved for the purpose.
- E. Expansion fittings shall be provided in all feeder conduits where conduits pass through building expansion joints. All conduits penetrating rated fire walls or rated fire floors shall be installed with devices to maintain the fire rating of the wall or floor penetrated. Use O.Z. Gedney "Fire-Seal" or approved alternate. Contractor shall caulk holes on both sides of smoke walls where conduits penetrate.
- F. Protect conduits against dirt, plaster, and foreign debris with conduit plugs. Plugs shall remain in place until all masonry work is complete.
- G. All conduits entering buildings from below grade shall be sealed with fiber and insulating electrical putty to prevent entrance of moisture.
- H. Conduit seals shall be used where noted on drawings and per Article #300-5 and #300-7 of the National Electrical Code. Seals shall be Crouse-Hinds Type "EYS", Appleton Type "EYF" or O.Z. Gedney Type "EY" or "EYA".
- I. Flexible conduit shall comply with the above and below specifications.
  - 1. Flexible conduit shall be used for connection to vibrating equipment, electric duct heaters, unit heaters and rotating machinery and for connection from junction box to corresponding recessed lighting fixture.
  - 2. Flexible liquidtight conduit connecting motors, duct heaters, unit heaters and other electrical equipment subject to vibration not less than eighteen inches in length or as permitted by the NEC.
  - 3. Flexible metal conduit from outlet box to recessed lighting fixture shall not exceed six feet in length.
  - 4. Flexible conduit used for other than connections to lighting fixtures shall not be less than one-half inch trade size and in no case shall flexible conduit size be less than permitted by the National Electrical Code for the number and size of conductors to be installed therein. three-eighths inch flexible conduit may be used for connection to light fixtures providing conduit fill requirements of National Electrical

Code are not exceeded.

5. Ground continuity through flexible conduit shall be maintained with green equipment grounding conductor, do not use flexible conduit for ground continuity.
6. When exposed to weather, when specifically indicated, or when installed in areas subject to moisture, flexible conduit shall be liquidtight type.
7. All connectors for flexible conduit shall be standard set screw type, cast connectors, bushed as required for flexible conduit. When used with liquid type flexible conduit, connectors shall be standard compression type.

### 3.2 PULL OR JUNCTION BOXES:

- A. Pull boxes shall be provided where specifically indicated and where required to facilitate the installation of conductors. Pull boxes shall be installed exposed only in unfinished spaces, unless otherwise specifically indicated, and shall be installed to be fully accessible.
- B. Where pull boxes are installed in finished spaces, boxes shall be standard screw cover j-boxes and galvanized switch boxes, gangable, where not exposed to the weather. Surface mounted boxes shall be cast metal Type "FD" with blank covers.
- C. Pull boxes required for horizontal feeders containing more than one feeder shall be provided with reinforced flange and removable 12 gauge 1 1/2" X 1 1/2" galvanized channel for support of conductors. Wood supports within pull boxes are not acceptable.
- D. Splices shall not be permitted in pull boxes except when specifically approved in writing by the Architect or where specifically shown on the drawings. Where splices are permitted, splices shall be made with splicing sleeves attached to conductors with hydraulic crimping tool. Split bolt connectors are not acceptable for splices within pull boxes.
- E. Feeders within pull boxes shall be individually laced with nylon tie straps of the type with enlarged tab to permit identification of each feeder within pull box.
- F. Minimum pull or junction box size shall be as per the NEC.

### 3.3 CONDUCTORS:

- A. All feeder and branch circuit conductors No. 4 AWG and larger shall be

phase identified in each accessible enclosure by 1" wide plastic tape attached to conductors in a readily visible location. Tape colors shall match color requirements specified herein.

- B. All branch circuit conductors shall be connected as indicated on the drawings. Common neutrals and ground wires may be pulled in conduits where only opposite phase conductors are run. All conduits shall have a ground wire pulled and shall comply with Article 250 of the National Electrical Code.
- C. Conductors within enclosures, i.e., panels, terminal cabinets, control cabinets shall be grouped and laced with nylon tie straps. Conductors within pull boxes shall be grouped and identified with nylon tie straps with circuit identification tag.
- D. Splices in conductors shall be made only within junction boxes, wiring troughs and other enclosures as permitted by the National Electrical Code, 2020 Edition. Do not splice conductors in panelboards, safety switches, or motor control enclosures. Splices in conductors No. 10 AWG or smaller shall be made with Skotchlok insulated spring connectors, Ideal wing nuts, or Ideal steel crimp connectors with wrap-cap insulating caps. Splices in conductors No. 8 AWG and larger shall be made with split bolt connectors taped with No. 88 plastic electrical tape or Ideal Type GP or GT tap connectors and insulating cover unless splices are specifically indicated to be made with crimping sleeve applied to conductors with hydraulic operated crimping tool.
- E. Conductors used only for 120-volt control wiring systems shall be minimum No. 14 AWG stranded type MTW 600-volt insulation. Control conductors to be J.I.C. color coded. Where control conductors terminate on terminal strip, make termination with lug applied to conductor with crimping tool.
- F. Phase rotation established at service equipment shall be maintained throughout entire project.
- G. Pull wires shall be 500# minimum test continuous fiber polyline.

### 3.4 OUTLET BOXES:

- A. Outlet boxes shall be sized as per the NEC and as required for the installation and installed where required for the installation and as per the NEC.
- B. Review architectural drawings for areas where outlets occur within specific architectural or structural features and install outlets as shown on architectural drawings, or, if not shown, accurately center and align boxes within the architectural feature or detail.

- C. Unless otherwise indicated or specified, all switches and receptacles shall be mounted with top of device, the distances indicated herein, above the finished floor except where finished walls are exposed concrete block, in which case height shall be adjusted to allow outlet box for device to be mounted at block joint. Review architectural drawings for any device requiring specific location. Mounting heights for devices shall be as the requirements of the "ADA" and as follows (unless noted otherwise):
1. Wall receptacles: 18"
- D. All devices shall be mounted within outlet boxes to allow device plates to be in contact with wall on all sides. Devices shall be accurately aligned with major axis of device parallel to adjacent predominate building feature.

**END OF SECTION**



**SECTION 16400**

**ELECTRICAL SERVICE AND DISTRIBUTION EQUIPMENT**

**PART 1 - GENERAL**

1.1 GENERAL:

- A. Provide and install all electrical distribution equipment as specified, scheduled or indicated on the approved drawing and these specifications.
- B. There is an existing power pole with a meter for the existing security cameras. Feed the electrical for the site receptacles from this meter and panel out to the community green site.

**PART 2 - PRODUCTS**

2.1 PANELBOARDS:

- A. Shall be bolt-in circuit breaker type with a rated main breaker or rated main lugs only as noted on drawings. All shall have UL approved interrupting capacity of equal to or greater than the Fault Currents indicated on the Power Riser Diagram. All multiple breakers shall be common trip type only. GFCI (Ground Fault Circuit Interrupter) breakers shall be provided where specifically indicated. All panels shall be fully rated, no series ratings are acceptable. All circuit breakers shall have 75 degree C rated lugs.
- B. End and side gutter shall have minimum clearance as required by the NEC. Depth shall be 5 3/4" minimum.
- C. Circuit breakers shall be numbered and connected to panel bus in the following sequence: Circuit 1, Phase A; Circuit 3, Phase B; Circuit 5, Phase C. Where bus diagrams are indicated on the drawings, breakers shall be positioned in panel to conform to diagrams; otherwise, single pole breakers shall occupy top positions in panel with blank spaces in lower positions and two and three pole breakers in between.
- D. Main lugs of panels or main circuit breaker shall be UL listed for copper or aluminum conductors. Lugs shall be of the proper range for feeder conductors indicated on the drawings. Each circuit protective device shall be identified with numeral designation, cross referenced with typewritten circuit directory on interior of panel door. All panel directories shall include the Room Number served by the individual circuit. A copy of each panel directory, reflecting all field changes shall be included in the bound data to be provided by the contractor at the time of final inspection.

- E. Conductors within panels shall be grouped and laced with nylon tie straps. Splicing of conductors within panels is not acceptable. Only one conductor shall be installed under terminal of individual circuit breaker.
- F. All panels throughout project shall be keyed alike.
- G. Circuit breakers shall be provided with trip rating class and poles as indicated on the drawings. Class indicated is designation according to Federal Specification W-C-375C/GEN 2000 and indicates the frame size and interrupting rating required. Operation of multiple breakers shall be by single handle; tie handles are not acceptable.
- H. All panelboards shall be marked with Arc Flash Warning Labels as required by Article 110.16 of the NEC.

### **PART 3 - EXECUTION**

#### **3.1 MANUFACTURERS' RECOMMENDATIONS:**

- A. The contractor shall install all electrical distribution equipment in accordance with the manufacturer's recommendations and these specifications.

**END OF SECTION**

## SECTION 16450

### GROUNDING

#### PART 1 - GENERAL

##### 1.1 GROUNDING:

- A. Shall comply with Article 250 of the National Electrical Code and all state and local codes and the requirements of the utility company serving the site.
- B. Grounding shall be provided as per these specifications and the approved drawings.
- C. The electrical system shall be a grounded wye supplemented with equipment grounding systems. All non-current carrying parts of the electrical system i.e., raceways, equipment enclosures and frames, junction and outlet boxes, machine frames and other conductive items in close proximity with electrical circuits, shall be grounded to provide a low impedance path for potential ground faults.
- D. The neutral conductor of the 480Y/277 Volt, Three Phase, 4 Wire or 208Y/120 Volt, Three Phase, 4 Wire or 120/240 Volt, Single Phase, 3 Wire systems shall be grounded to the ground system as indicated on the drawings. Grounding conductor shall be copper sized in accordance with Table 250.66 of the National Electrical Code and as indicated on the drawings. Conductor shall be installed in PVC Conduit to the ground point connection.

#### PART 2 - PRODUCTS

##### 2.1 PRODUCTS:

- A. Ground rods shall be 3/4" copperweld sectional rods 10'-0" in length. Top of the ground rod shall be twelve (12) inches below finished grade. Connection to the ground rod shall be made by chemical weld process. Resistance to ground shall not exceed twenty-five (25) ohms.

#### PART 3 - EXECUTION

##### 3.1 GROUNDING:

- A. Each panelboard shall be provided with a copper or aluminum equipment grounding bar brazed or riveted to the associated enclosures or cabinet and an insulated neutral bar. The related feeder and branch circuit grounding conductors shall be brazed to the grounding bar or connected with pressure connector.

- B. A grounding conductor shall be installed in all power and lighting conduit installations. All circuit grounding conductors shall be sized as per Table 250.122 of the National Electrical Code.
  
- C. All motors shall be grounded by drilling and tapping the bottom of the motor junction box and attaching the conductor to the box with a round head bolt used for no other purpose. Conductor attachment shall be through the use of a lug attached to conductor with crimping tool.

**END OF SECTION**

## **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**