

PART 1 - GENERAL

1.01 SUMMARY OF WORK

A. Work of this Section includes:

1. Establishment of temporary perimeter controls.
2. Protection of existing utilities and existing plant material and improvements to remain.
3. Demolition of Existing Site Improvements and plant material as designated in the Drawings.
4. Disposal of all debris.

1.02 QUALITY ASSURANCE

A. Review with Owner: Prior to start of work, at the Pre-Construction Meeting, review Demolition and Site Preparation work approach with the Owner and Consultant. Determine approved access routes and address potential problems.

B. Provide constant supervision on-site by an experienced person who is thoroughly familiar with the Work and all applicable regulations and standards.

C. This Work is selective demolition, performed in close proximity to vegetation and existing improvements that must be protected from damage and in a residential neighborhood with nearby houses and pedestrian and vehicular traffic nearby. Take precautions as required to protect all vegetation and improvements that are not specified for removal and as required to protect surrounding properties and residents.

D. 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 public, neighbors, and concurrent performance of other work on the site.

E. Street Cleaning: Keep surrounding streets clean of mud, dirt and construction debris at all times.

F. Burning: On-site burning will not be permitted.

G. Explosives: Explosives will not be permitted.

PART 2 - MATERIALS

2.01 TEMPORARY PERIMETER CONTROLS AND TREE PROTECTION FENCING

Refer to Drawings.

2.02 SEDIMENT CONTROL

A. Refer to Drawings

PART 3- EXECUTION

3.01

A. Erect perimeter controls, tree protection fencing and sediment control measures before beginning Demolition Work.

B. Review on-site with Consultant, the entire temporary controls, tree protection fencing and sediment control before beginning Work.

3.02 SITE INSPECTION

A. Prior to all Work of this Section, carefully inspect the entire site and all objects designated to be removed and to be preserved.

B. Locate all existing utility lines and determine all requirements for disconnecting, abandonment and capping.

3.03 CLARIFICATION

A. The drawings do not purport to show all objects existing on the site.

B. Before commencing the Work of this Section, verify with the Owner or Consultant all objects to be removed and all objects to be preserved.

3.04 SCHEDULING

A. Schedule all Work in a careful manner with all necessary consideration for neighbors and the public and to comply with all applicable regulations.

B. Avoid interference with the use of, and passage to and from, adjacent properties.

3.05 EQUIPMENT

A. Provide adequate and appropriate equipment for performance of the Work without damage to surrounding improvements and vegetation.

3.06 PROTECTION OF EXISTING UTILITIES AND SITE STRUCTURES TO REMAIN

A. The existence and location of underground utilities and vaults are not guaranteed and shall be investigated and verified in the field by the Contractor before starting the Work. Excavation in the vicinity of the existing utilities shall be carried on with extreme caution.

B. The Contractor shall protect all existing site structures except as specifically noted on the drawings. Any damage to these items rendering them unfit for acceptance in the opinion of the Owner shall cause the item to be replaced by the Contractor at no additional cost to the Owner.

3.07 REMOVAL OF DEBRIS

A. All debris, the product of demolition, unless otherwise designated, shall be removed from the site and legally disposed of. Such debris will not be allowed to accumulate on site for more than seven (7) days.

3.08 CLEAN UP

A. Remove all debris from the site and leave the site in a neat and orderly condition to the approval of Owner.

END OF SECTION

SECTION 02112

PART 1 - GENERAL

1.01 SUMMARY OF THE WORK

A. Work included:

1. Protecting existing trees and tree root zones.
2. Erecting and maintaining tree protection fencing

B. Definitions

1. 'Construction Activity': any contractor use of the ground surface including people, vehicles, materials or equipment: storage, walking, equipment/vehicle operation, standing or parking.

1.02 REFERENCE STANDARDS:

N.A.A.: "Pruning Standards for Shade Trees", 1979.

1.03 GENERAL PROVISIONS

A. Provision for access to the site for heavy equipment will be as directed by the Drawings and supplemented by Owner. Equipment shall use prescribed temporary access routes and shall not be allowed in areas other than those designated construction areas and designated access routes. Areas which are altered or disturbed by equipment during the Work shall be returned to pre-existing conditions at no additional cost to Owner.

B. Contractor shall conduct operations such that trees are not damaged and the soil surface under tree crowns is not compacted or damaged. Contractor shall protect root areas and crowns of trees not designated for Work under this Contract for damage from operations and equipment. The Contractor shall repair such damage at no cost to Owner. Provide fences or other barricades where necessary.

PART 2 - MATERIALS

2.01 TREE PROTECTION FENCING: Refer to Drawings. Contractor shall provide and maintain tree protection measures as required to comply with City of West University Place requirements.

2.03 WATER: Suitable for irrigation.

PART 3 - EXECUTION

3.01 WORKMANSHIP

- A. Work shall be performed by personnel trained and experienced in this Work.

3.02 TREE PROTECTION

A. All trees on the property shall be protected against damage during construction operations except those trees designated for removal in the Drawings. The minimum fencing allowed will be as indicated on the Drawings. The Contractor is encouraged to use additional fencing as deemed helpful to protect the existing trees. The tree protection fencing shall be placed before any demolition, excavating or grading is begun and maintained erect and in good repair for the duration of the construction work unless otherwise directed. No material shall be stored, or construction operation carried on within the tree protection fencing. Tree protection shall remain until all work is completed.

B. If a tree is damaged, notify the Consultant immediately. Any damage done to existing tree crowns or roots systems shall be repaired immediately by an approved tree surgeon at the Owner's direction. Roots exposed and/or damaged during demolition and/or grading operations shall be cut off cleanly inside the exposed or damaged area, the cut surfaces painted with approved tree paint, and the topsoil and mulch placed over the exposed root area immediately. The Owner shall have its representative present on the site to observe these operations.

3.03 ARMORING: In close quarters, as approved, a single tree shall be protected by strapping (not nailing) a continuous shield of wood 2 x 4 x 5' high around the trunk.

3.04 ADDITIONAL PROVISIONS:

- A. No excessive activity shall occur within the drip line of any tree.
- B. When cutting back trees, make them shapely and typical of their species.
- C. Limbs and debris from the Work shall be transported and not dragged over the site. Wood and debris shall become property of Contractor and shall be removed from site and legally disposed of. Cost of disposal to be paid by Contractor.

3.05 FENCES AND BARRICADES:

- A. Fences and/or barricades shall be placed where shown on the Drawings or as herein described.

- B. In general, fences and barricades are intended to alert those working on the project that equipment and machinery are not to be stored or operated in the feeder root zone.

END OF SECTION

SECTION 02210

PART 1 - GENERAL

1.01 SUMMARY

A. Furnish labor and materials for the following work:

1. Stripping grassy vegetation.
2. Excavation for proposed improvements: walks, planting beds, walls, etc.
3. Performing cut and fill and shaping to achieve rough grade (subgrade).
4. Place and compact Select Fill under walks and hardscape improvements as required to achieve specified grades.

1.02 POST-CONSTRUCTION SURVEY: Contractor is required to provide to the City a post-construction topographic survey, prepared and sealed by a registered professional surveyor, currently licensed in Texas, documenting compliance with the Grading Plan.

1.03 GENERAL REQUIREMENTS

A. Defects: Settlement is considered to be among defects to be corrected.

B. Protection: Ensure at all times during the work that surface drainage is not allowed to flow or back up onto surrounding properties. Provide positive drainage away from property lines, continuously to the street right-of-way or working inlets. Contractor is responsible for any damage related to surface drainage as a result of failure to provide adequately for interim drainage.

C. Relation with other trades:

1. Cooperate with other trades so that work will be properly coordinated without delays or damage to any part of the work.
2. Landscaping: Bring grades of open areas to level and cross section shown with allowance for top soil, sod and beds where required.
3. Pedestrian Hardscape: Bring grades to level and cross section required with allowance for paving base and wearing surface.

D. Inspection of site: Examine the site to determine the extent of work required and the conditions under which it will be done.

- D. Protection: Take precautions to prevent damage to this and surrounding property and improvements. Do not cut or fill grade within drip line of existing trees designated to remain, except where specifically directed in drawings.

PART 2 - MATERIALS

- A. Select Fill at hardscape: For structural fill to be compacted: Approved type of sand, clayey sand, sandy clay, or loam free of foreign substances, obtained from excavation for this construction or an approved source and having a plasticity index between 8 to 20. Maximum liquid limit 35%. Refer to Drawings for requirements for Select Fill.
- B. Landscape Subsoil Fill: For fill required in landscape areas, approved type of sandy clay-loam free of foreign substances, with 1% to 2% organic content. Provide representative sample for Landscape Architect review before bringing onto site. Landscape Architect may require lab analysis.
- C. Topsoil: Refer to Lawns 02930.

PART 3 - EXECUTION

3.01 EXISTING UTILITIES

- A. General: When unexpected underground utility lines are encountered during excavation, submit immediate notification to proper authorities, the Owner and the Consultant. Cooperate with proper authorities and others concerned to facilitate permanent protection, rerouting, or removal of such lines.
- B. Active lines: If an active utility line will be covered by new construction but does not interfere with the construction, is not under pressure, and is not required by local regulations or the Drawings to be removed, it may remain, provided it is in good condition and well protected and provided that all such lines made of concrete pipe are replaced by heavy duty ductile iron pipe for the length covered by new construction, plus an additional 5 feet beyond limits of new construction.
- C. Inactive lines: Remove, plug, or cap such lines as directed. In absence of specific requirements or local regulations, plug, or cap such lines at least 3 feet outside the construction or as required by local regulations.

3.02 STRIPPING AND STAKING

- A. Remove grassy vegetation from all areas. Take care to prevent disturbance to the soil in tree protection areas.

- B. Stake rough grade for review and approval by Consultant. Discuss requirements for cutting within tree protection areas, for direction by Consultant.

3.04 EXCAVATING

- A. Extent: Excavation is unclassified and includes every material encountered such as clay, stone, stumps, brick, concrete, and other similar existing materials.
- B. Lines, levels, and clearances: Excavate to the lines and limits required for the installation of the work. In addition, provide sufficient clearance for proper execution of work such as forming, draining, and removing suitable material.
- C. Excavated material: That which meets the requirements for Fill may be used for filling, backfilling, and grading. Immediately remove from the site and dispose of excess or unsuitable excavated material.
- C. Grading:
 - 1. Rough grade surface to required tolerance.
 - 2. Excavation within tree protection areas shall be performed under the observation of the Consultant. Hand work will be required around roots.
 - 3. Equipment must be situated and operated as required to minimize disturbance to, or compaction of soil in tree protection areas.

3.04 PROOFROLLING

Concrete Walks and pavement sub-slabs Only: After stripping to the desired grades and prior to fill placement, the subgrade in proposed hardscape areas should be proof-rolled. Proof-rolling should consist of making at least three passes over the area with large roller having a static weight of at least 15 tons. Any soft or heaving areas which do not readily compact should be over-excavated and filled with Select Fill, according to the Geotechnical Report.

Landscape Lawn Areas: Lightly proofroll subgrade only as required to remove voids and soft spots.

3.05 FILLING

- A. Preparation: Fill holes and depressions left by removal of trees, shrubs, improvements, etc and compact subgrade as noted above.
- B. Method: Place Fill in even loose lifts of not more than 6 inch thickness.

1. Fill at structures and hardscape: Compact each lift by rolling or tamping with approved mechanical equipment to 95% of maximum dry density at optimum moisture content determined by ASTM D698 at a moisture content within +/- 2% of the optimum moisture content, using the method approved for the material being tested. Rough-grade the surface as required to achieve finished elevations indicated in the Drawings.
2. Landscape Lawn areas – utilize onsite material and proof-roll to 85% of maximum dry density.

3.06 ROUGH GRADING TOLERANCE

Leave areas reasonably smooth, compacted and free of irregular surface changes. Remove from the site material of an unsatisfactory nature that is either in the original ground or in fill material.

- A. Landscape areas: Surface shall not vary more than 0.1 foot above or below the required finish grade or approved cross section with due allowance for top soil and sod and plant bed material.
- B. Hardscape areas: Surface shall not vary in excess of 1/2 inch from the approved cross section nor more than 1/2 inch above or below the required finish grade in a length of 16 feet measured longitudinally, with due allowance for sub-base and surfacing material base and wearing surface.

3.07 TOPSOIL

- A. Refer to the Drawings and to Lawns 02930.

3.10 HARDSCAPE AREAS

- A. General: Excavate or fill (Ref. Section 3.05 above) to provide the required rough grade.
- B. Where excavation or fill is not required: Restore grades damaged as a result of construction operations. Scarify the surface of the area to a depth of 6 inches and compact it to 95% of its maximum dry density at optimum moisture content determined by ASTM D698. Where existing grade meets requirements, scarifying and re-compacting are not required.
- C. Sub-base: Provide sub-base as described in Drawings.

3.11 SPECIAL REQUIREMENTS

- A. Repair existing grades of areas outside proposed grading which are disturbed by construction operations, and restore to original condition including aeration of compacted soil, placement of top soil and grass sod.

- B. Subgrade soils are sensitive to moisture and must be kept relatively dry for proper workability. Excess passes of heavy compaction equipment may cause surface soils to "pump." If "pumping" occurs, cease all heavy equipment operations and notify Consultant immediately. Provide and maintain proper site drainage during earthwork operations to help maintain the integrity of the subgrade soils.

- C. Stabilization of the surface soils could be required to dry the soil to compactable moisture content and strengthen the subgrade if construction commences or is in progress during wet periods of the year. Cooperate with the Consultant in determining appropriate, approved stabilization materials and procedures. **DO NOT USE LIME FOR STABILIZATION OR TO DRY OUT SOILS.**

END OF SECTION

SECTION 02630

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:

1. Landscape drain inlets and pipe
2. All related excavation and backfill
3. All related fittings and connections
4. Dewatering and moisture control as required

1.02 NOT USED

1.03 GENERAL PROVISIONS

- A. Examine the site to determine the extent of work required and the conditions under which it will be done. Do not proceed until unsatisfactory conditions have been corrected.
- B. Submittals: Submit for Consultant approval
 1. Product material for storm drain pipe and inlets

1.04 QUALITY ASSURANCE

A. Contractor Qualifications

1. Landscape Drainage contractor shall have at least 5 years previous experience in successfully implementing an installation of this scope and scale in the region.
2. The Landscape Drainage contractor shall employ only experienced personnel who are familiar with the required work and who are supervised by a qualified foreman with experience in successfully implementing installations of this scope and scale.

1.05 SUBMITTALS

A. Product Data: submit manufacturer's specifications and product data for:

1. Inlets and drains
2. Grates
3. Drain Pipe

B. Samples: NA

C. Schedules: NA

- D. As-Built Drawings: During the course of installation, carefully note changes made to the drainage system during installation. Upon completion of the installation, carefully transfer the as-built data in red ink on clean paper copies, and deliver to the Landscape

Architect for review. After review and comment by the Landscape Architect, make any alterations recommended and provide final As-Built Drawing to the Landscape Architect.

PART 2 - MATERIALS

- 2.01 Landscape inlets and grates: polyethelene atrium grates, by inlet manufacturer, according to Drawings. Black color.
- 2.02 Drain pipe: ADS N-12 HDPE pipe, size according to drawings.
- 2.03 Subdrain Pipe: ADS N-12 HDPE perforated pipe, size according to the drawings
- 2.04 Fittings: as recommended by manufacturer of each drainage product
- 2.05 Inlet and pipe bedding:
 - 1. Bedding for pipe shall be clean sharp sand.

PART 3 - EXECUTION

- 3.01 Contractor shall review the drawings and the anticipated installation site(s) within the project work area. The Contractor shall provide for adequate trench safety systems that comply with, as a minimum, Part 1926, Subpart P, Excavations, Trenchings and Shoring of the Occupational Safety and Health Administration Standards and Interpretations. Specifically, Contractor shall develop and implement a trench safety program in accordance with OSHA standards governing the presence and activities of individuals working in and around trench excavation.
- 3.02 EXCAVATION & TRENCHING
 - A. General: Excavation of every description and of whatever substances encountered, without limit, shall be carried to the required depths. Pile excavated material suitable for backfilling in an orderly manner sufficiently away from the banks to avoid overloading and prevent slides or cave-ins. Remove and dispose of excess excavated material. Grade banks as necessary to prevent surface water from flowing into the excavation and pump out water that accumulates in it. Provide sheeting and shoring as necessary to protect the work and for the safety of personnel. Unless otherwise shown, excavation shall be done by open cut. When existing utilities to be removed are in the area of these operations, provide notice in sufficient time so as to prevent interruption of service.
 - B. Trenches: Dig trench to proper width for laying pipe. Banks shall be as nearly vertical as possible. Accurately grade the bottom to provide uniform bearing and support for each section of the pipe on undisturbed soil at every point along it entire length except at excavation for bell holes and at depression for proper sealing of joints. Dig bell

holes and depressions after the trench bottom has been graded and keep them to minimum dimensions. Remove stones so as to prevent point bearing. Excavate rock to a minimum of 6 inches below required trench depth. Remove wet or other unstable material, incapable of properly supporting the pipe, to the depth required. Backfill to the proper trench depth with coarse sand, fine gravel or other approved material. Conform to the following requirements for specific systems:

1. Structures: Excavate subsurface so as to leave at least 12 inches clear between outer surfaces and the embankment or material supporting the bank. Step or serrate slopes bounding the excavation so as to prevent any wedging action of backfill against the structure.

3.03 BACKFILLING

- A. General: Use suitable materials from excavations. Fill to finish grade elevations of adjacent surface.
- B. Material:
 1. For general use: Suitable backfill material shall be earth, loam, sandy clay, sand and gravel, soft shale or other approved material.
- C. Placing: Deposit fill in 6 inch layers at proper moisture content to facilitate compaction. Thoroughly and carefully ram or tamp each layer until pipe has a cover of one foot. Deposit the remainder of the fill in 8 inch layers and properly tamp, water tamp or consolidate it by other approved means. Where possible, compact materials by settling them with water.
- D. Trenches: Do not backfill until pipe joints have been approved. Remove shoring, sheeting and bracing before backfilling the trench. Backfill placed around the pipe shall be free of large lumps, clods or debris which might result in improper bedding of the pipe. Place backfill equally on both sides of the pipe and maintain approximately the same level as filling progresses.
- E. Structures: Place backfill evenly on all sides of the structure. Remove forms, shoring, sheeting, bracing, etc., before starting to backfill and do not backfill against concrete until directed, which in general shall be at least 7 days after placement. Take care to prevent any wedging action of backfill against structure.
- F. Alignment tolerance: Before placement of pipe, check the line and grade by use of a string line, laser beam, or other means so that when in final position the pipe will be true to line and grade within the following tolerances:
 1. For pipe sizes up to 12 inches diameter: ½”.

3.04 LANDSCAPE DRAINAGE SYSTEM

- A. General: Provide complete system consisting of connecting lines and structures such as inlets, junction boxes, subsurface drainage, etc., for collection and disposal of water from landscape areas.
- B. Construction sequence: Pipe shall be laid starting at the lowest point and proceeding to the highest point in the system. Connections to outfall structures shall be made prior to any other storm drainage construction. Underground drainage structures, located under or adjacent to pavements, earthwork and backfilling incident thereto, shall be completed before the pavement surfacing is placed. Manholes, catch basins, and inlets shall not be completed to final grade until after the grading has been finished and all necessary arrangements have been made to insure suitable connections and tie-ins at grade and alignment with pavements, gutters, curbs, etc.
- C. Installation of pipe: Do not install pipe in trench until the excavation has been completed, the bottom of the trench shaped and the trench has been approved. Furnish and place in position the stakes, grade and batter boards necessary for locating the work. Cut grade and batter boards of such size timber as necessary for their function and substantially support them. Protect the boards and location stakes from damage or change of location. In lieu of batter boards, the Contractor may use approved laser instruments to maintain alignment and grade. Laser instrument shall be set to provide laser beam through the pipe. Above pipe, lasers are not allowed. At least one elevation shot must be taken on each joint of pipe. The pipe shall be maintained to a true alignment both vertically and horizontally. Pipe and specials shall be inspected by the Contractor after they have been installed along the trench and those pieces that fail to meet requirements shall be replaced. Lay out the approved pipe and specials in the trench so that, after the sewer is completed, their interior surface shall conform accurately to the required grades and alignments. Lay the pipe accurately to line and grade with the spigot or tongue downstream entering the bell or groove to full depth and in such manner as not to drag earth into the space for the joints. Fit pipes together and match them so that when laid in the work they will form a sewer having a smooth and uniform invert. As the work progresses, clear the interior of the pipe of dirt and all superfluous materials.
- D. Joints: Use Joint Gaskets or Joint Compound in conformance with joint material manufacturer's instructions.
- E. Clean System: water jet or otherwise clean inlets and pipes to ensure entire system is free of sediment and debris at time of Substantial Completion.

3.05 PROTECTION

- A. Properly protect existing utility lines shown on the Drawings from damage due to these operations. If damage occurs, satisfactorily repair it at no additional expense to

the Owner. If damage occurs to an unknown line, give immediate notification, and if repairs are authorized they shall constitute an additional Change Order.

END OF SECTION

SECTION 02775

PART 1 - GENERAL

1.01 SUMMARY

- A. This Work of this Section shall include:
1. Concrete sidewalks
 2. Concrete curb ramps

1.02 QUALITY ASSURANCE

A. Standards: Except where modified or exceeded by this Specification, conform to Texas Department of Transportation (TxDOT) 1982 Standard Specifications for Construction of Highways, Street and Bridges. The abbreviation TxDOT as used in this Section refers to that document.

B. Defects: Contractor will be required to replace concrete that has defects. Extent of replacement will be determined by Consultant, based on visibility, type and finish of paving and location of nearby concrete joints.

- C. Submittals:
1. Manufacturer's information and color charts for joint sealant and curing compound.
 2. Mix design for each type of concrete mix.

E. Contractor Qualifications:

1. Contractor performing this portion of the Work must have at least 5 years' experience of successful completion of comparable concrete work, including all specified finishes. Provide representative photos of similar work.

F. Consultant Review before Concrete Pour: Consultant or Owner's Inspector shall review all reinforcing and forms of each concrete pour. Forms may be adjusted based on review – contractor shall allow adequate time for adjustment before pour when scheduling reviews. Provide at least 48 hours notification before review is desired.

G. Uniformity: Care is to be taken to ensure uniformity of color and finishes.

H. Weather: Do not place concrete when hot weather conditions would seriously impair the quality and strength of the concrete. Temperature of the concrete at placement may not exceed 90 degrees F. During high winds or

excessively low humidity conditions, at the option of the Consultant, the concrete temperature may be required not to exceed 85 degrees F.

I. Relations with other Trades: Inserts, anchors, sleeves, bolts, plates, and similar items required by other trades to be cast in concrete work shall be furnished and located by each such trade. Build such items into forms in a manner that will prevent displacement or damage to them during placing of concrete.

J. Testing: Contractor shall coordinate all concrete testing as required.

PART 2 - MATERIALS

2.01 REINFORCING FOR CONCRETE

Reinforcing bars shall be ASTM A615 grade 40.

2.02 CONCRETE

Formulate with 3,000 psi grey Portland cement. Conform to requirements for mixing and placing in Concrete. Unless otherwise required, use 4000 psi test Stone Aggregate Working Stress Typ for paving and 3000 psi test Stone Aggregate Working Stress Type for walks, aprons, steps, etc. Concrete shall also have flexural strength at 28 days of 650 psi, at 7 days, 550 psi. Use standard third point loading to test.

2.03 AGGREGATE

A. Aggregate for sidewalk paving shall be limestone or approved equal.

2.04 NOT USED

2.05 POROUS FILL

Bank sand or bank run gravel, 1/2 inch maximum size.

2.06 CURING COMPOUND

ASTM C-309 Type 2, Class B white pigmented and guaranteed not to yellow the concrete surface. Compound shall be W.R. Meadows 1200-White or approved equal.

2.07 PLASTIC CAP

High density polyethylene tubes in 1/2 and 3/4 inch diameter. WMC Products Inc.
- Series F Plastic Dowel Tubes or approved equal.

2.08 EXPANSION BOARD

- A. Timber Boards shall meet the specifications of TxDOT Item 433.2(5)(a).
- B. Impregnated asphalt board shall conform to TxDOT Item 433.2(5)(b).
- C. Board filler shall be free of defects which will impair their usefulness as expansion joint fillers.

2.09 JOINT SEALANT

Cold compound - A one-component, self-leveling, elastomeric polyurethane type cold applied compound with primer recommended by manufacturer for surfaces involved.

BASF Sonneborn Sonolastic SL1
Or approved equal

PART 3 - EXECUTION

3.01 SUB-BASE

Inspect sub-base for proper compaction, cross-section and grade. Submit prompt notice of unsatisfactory conditions. Start of work implies acceptance of the sub-base as satisfactory and later claims to the contrary shall not relieve the Contractor from full responsibility for repair or replacement of paving that is defective.

3.02 PREPARATION FOR CURB RAMP CURBS AND SUBSLAB

- A. Ensure proper location of curb ramps, relative to proposed crosswalks and curb ramp on opposite side of the street. If ramp is not located according to the Drawings, notify Consultant before proceeding.
- B. If roadway curbs have been poured continuously across curb ramp locations, sawcut and remove roadway curbs and portion of roadway paving to accommodate curb ramp as indicated in the Drawings.

3.03 FORMS AND JOINTS

A. Standards: Unless modified or exceeded by this specification, conform to ACI 316 Chapters 1, 2, 4, 5, 6, 10, 11, 12, 13 and 14.

B. Forms:

1. Wood side forms composed of clean S4S lumber; depth of form shall equal thickness of the concrete. Provide two side stakes at joints and intermediate side stakes as required to prevent deflection of the forms.
2. Erect forms on compacted subgrade that has been cut to grade so that the forms are supported by it for their entire length at the required elevation. Form joints so as to prevent deflection.

C. Joints:

1. Control Joint: tooled as indicated in the Drawings.
2. Expansion Joint: Locate according to Drawings. Form paving against the following Filler:
 - a. Preformed bituminous expansion boards. 1/2" wide by full depth of the concrete. Recess filler so as to permit installation of Sealant to proper depth. Form such recesses with removable temporary strips
 - b. treated wood joint - Wood filler of .40 treated Southern yellow pine or heart redwood boards. If surfacing is 25 feet or less in width, filler shall be composed of 2 board lengths maximum but with no board shorter than 6 feet. Recess top of board so as to permit installation of Sealant to proper depth. Form such recesses with removable temporary strips.
 - c. cold joints - Locate only as shown on drawings. Hand tool edges similar to Control Joint. Remove forms.
3. Load transfer accessories – Provide 1/2 inch diameter smooth steel dowels 18 inches long (or special length as indicated in Drawings) having a Plastic Cap at one end. Space 12 inches o.c. along the full length of the joint except where indicated otherwise in the Drawings. Located expansion joints as indicated in the Drawings.

3.03 CONCRETE PLACEMENT

- A. Deposit concrete rapidly in continuous operation and distribute it to required depth for entire width by machine or by hand using shovels or concrete against forms and at joints to prevent honeycombing. Ensure that each section begun can be completed with available concrete. Do not place cold joints except at noted locations. Consolidate concrete by an approved vibratory unit designed to vibrate the concrete internally. Vibrator shall not

come in contact with side forms. Compacted concrete shall be not less than the required thickness.

- B. Strike off concrete to required elevation with sufficient excess concrete to allow for tamping. Tamp surface with an approved template to compact it thoroughly and eliminate surface voids. Take special care to avoid pockets in the surface. Screed surface to required section. With a longitudinal float not less than 10 feet long, level the surface to the required grade.
- C. 6" Curbs at Curb Ramps: Form curbs as indicated in the Drawings to allow specified clear width and alignment of the Curb Ramp. Place and hand-form concrete to specified cross-section shape.

3.04 TOLERANCE FOR PAVING

- A. Use a 10 foot straightedge parallel to the centerline of the area. Move the straightedge sideways across the slab and advance it in stages of not more than 1/2 its length. The surface shall not vary from the straightedge by more than 1/16 inch from its nearest point of contact nor by more than 1/8 inch in any 10 foot length of pavement. Correct any excess variation and refinish the area.
- B. Bird baths of standing water larger than 12" diameter are considered a defect and will require removal of concrete paving. Refer to Quality Assurance, this Section.

3.05 FINISHING CONCRETE

- A. Sidewalk Broom Finish: At proper time in concrete curing, pull a new, stiff-bristle broom across the concrete surface, in direction noted on drawings, to create a lightly textured surface with neat, even, parallel broom marks.
- ~~B. Sidewalk Etched Finish: All areas indicated on the Drawings to receive etched finish shall be hand troweled to achieve a smooth surface. Do not broom areas to be etched. Apply the etched finish at the proper time after the pour (as required to match approved sample finish), not less than 21 days or more than 60 days after placing the concrete. Contractor is responsible for achieving a uniform finish as noted in the drawings, including light etch (a light 'sandpaper' finish that removes the top 'cream' but does not expose large aggregate) and heavy etch (exposes the top surface of large aggregate) Use either sandblasting or acid-etch methods, complying with all applicable safety and environmental guidelines.~~

~~Contractor is responsible for preventing sand or acid from affecting or reaching surrounding surfaces.~~

- ~~C. Curb Ramp Curbs: Trowel and finish curb to match finish of roadway curbs.~~

3.06 JOINTS

- A. Refer to the Drawings for type of joint required.
- B. Tooled joints shall be struck at the appropriate time during finishing. Joints shall be neat, straight, even and consistent width, with consistent tooled radius on each side.
- C. Sawcut joints shall be cut within 12 hours of finishing the concrete. 'Early Entry' saw equipment shall be used to facilitate early sawing, to minimize shrinkage cracks. Joints shall be width and depth specified in the Drawings. Joints shall be even and straight, without excessive chipping. Errant sawcuts may be grounds for rejection of the concrete.

3.07 CURING

All sidewalk concrete shall have Curing Compound applied at the appropriate time after the concrete pour, according to the manufacturer's recommendations. Cover the surface with Curing Compound in two applications, each at the manufacturer's recommended rates, but not less than one gallon per 180 square feet each application. The second application shall be applied at a 90 degree direction to the first application. Material shall be applied using airless sprayer or roller as required to achieve light, continuous coverage.

3.08 JOINT SEALANT

Where Sealant is required in Expansion Joints, clean the joint with a mechanical wire brush or other equipment as necessary to provide a satisfactory clean joint. When joint is clean and dry, and the temperature is above 50 degrees F and it is not foggy or raining, mix and apply Joint Sealant as directed by the manufacturer so as to fill the joint to within 1/16 inch of the adjacent finished surface. Color to match color of adjacent concrete.

3.11 PROTECTION

Protect other adjacent materials and particularly curbs and gutters from becoming soiled by paving materials, curing compound and joint sealant. If necessary, cover work to be protected during operations.

3.12 TESTS

- A. Client reserves the right to require testing, at their discretion and payment. Contractor shall cooperate and arrange requested testing desired by the Client. Contractor is responsible for paying for re-testing required due to failure of the tested material to meet requirements, or failure of the Contractor to be ready for scheduled test collection.
- B. If quality of materials or workmanship appears questionable, cores of the finished paving may be required to be taken and tested for density and thickness. Contractor shall properly patch any such cored areas. If the cores prove to meet specified requirements, the cost of the tests and patching the cored areas will be borne by the Owner. If any sample is deficient in quality or quantity or compaction of material, the tests and patching of the cored areas shall be paid for by the Contractor. Further, any deficiency shall be remedied as directed by the Owner to whatever extent deemed advisable. Retesting of corrected work shall be paid for by the Contractor.

END OF SECTION

SECTION 02776

PART 1 – GENERAL

1.1 SUMMARY

- A. Section includes requirements for aggregate surfacing including:
 - 1. Decomposed Granite Paving

1.2 RELATED WORK OF OTHER SECTIONS

- A. Coordinate work of this Section with work of other Sections as required to properly execute the work and as necessary to maintain satisfactory progress of the work of other Sections.

1.3 QUALITY ASSURANCE

- A. Correct work which does not conform to the specified requirements, including strength, tolerances and colors. Correct deficient materials as directed by the Consultant.

1.4 SUBMITTALS

- A. Samples: At least 30 days before beginning construction of aggregate surfacing submit to Consultant one 5 lb sample of each aggregate representative of size and color specified.

1.5 PRODUCT HANDLING

- A. Material shall be delivered and stockpiled at job site at a location agreed upon by the Consultant.

PART 2 - PRODUCTS

2.1 MATERIALS / PRODUCTS

- A. Decomposed Granite: ¼” Minus Decomposed Granite, as provided by Collier Materials, Marble Falls, TX (877/603-3030), or approved equal.
- B. Geotextile: Mirafi 140 or approved equal.

PART 3 - EXECUTION

3.2 DELIVERY AND STORAGE

- A. Schedule delivery of the material to minimize on-site storage.
- B. Store material in area(s) determined by the Owner.
- C. Protect material during storage as required to prevent excessive separation of fines from aggregate.

3.3 PREPARATION

- A. Review related drawings and stake out on the ground areas to receive aggregates and obtain approval of the Consultant before excavation work is begun.
- B. In order to minimize conflict, locate all existing utilities prior to beginning work.

3.4 INSTALLATION

- A. Environmental limitations: do not install aggregates during wet or rainy conditions (prior to, during or immediately following rainfall).
- B. Install drainage structures and swales at specified locations and in accordance with Drawings.
- C. Prepare subgrade according to the Drawings, including excavation and fill as required.
- D. Top Course Aggregate:
 - 1. Aggregates shall be clean and free of foreign materials before installation.
 - 2. Compact with plate compactor.
 - 3. Finished surface shall be smooth, uniform and solid. Paving material shall be firm all the way through with no spongy areas.
 - 4. Any significant irregularities in paving surface (variations more than ½” from required grade) shall be smoothed out prior to acceptance of work. Smooth by re-wetting the area thoroughly, then plate compacted again.
 - 5. Installation should start at the farthest point from the construction access and proceed out, in order to minimize disturbance to the completed trail surface.
 - 6. Work shall be level and true to line and grade; shall be installed properly to coincide and align with adjacent work and elevations.
 - 7. Schedule aggregate surfacing to ensure the work is in good condition at completion of the project and is not disturbed by other work. Re-dress and compact any areas that are disturbed, so that they blend in with surrounding aggregate surfacing and meet specified line and grade. Aggregate surfaces shall have like-new appearance at the time of the Substantial Completion review.

END OF SECTION

SECTION 02780

PART 1 GENERAL

1.01 SUMMARY

- A. This section specifies the requirements for providing and installing:
1. Mortar-set brick pavers in sidewalks
 2. Sand-set pavers in sidewalks
 3. Related bedding and joint sands and mortar

1.02 REFERENCES

A. American Society for Testing and Materials

1. ASTM C 33, Standard Specification for Concrete Aggregates
2. ASTM C 136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
3. ASTM C 144, Standard Specification for Aggregate for Masonry Mortar.
4. ASTM C 902, Standard Specification for Pedestrian and Light Traffic Paving Brick.
6. ASTM D 698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
7. ASTM D 1557, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
8. ASTM D 2940, Standard Specification for Graded Aggregate Material For Bases or Subbases for Highways or Airports

1.03 NOT USED

1.04 SUBMITTALS

- A. Manufacturer's product information:
1. Unit pavers
 2. Polymeric joint additive
- B. Samples:
1. Unit pavers: representative color and size of each paver type

1.05 QUALITY ASSURANCE

A. Installer Qualifications: at least 5 years' experience in successfully implementing installations of this scope and complexity. Consultant may require evidence of comparable experience.

B. Mock-Ups:

1. Do not start Work until Landscape Architect has approved mock-up(s).
2. Approved mock-up is the standard by which appearance, workmanship, substrate preparation and material application will be judged.
3. Refer to Drawings for Mock-ups required.

1.06 DELIVERY, STORAGE AND HANDLING

A. General:

1. Deliver, store and handle in accordance with manufacturer's recommendations.
 - a. Delivery: Deliver materials in manufacturer's original, unopened, undamaged packaging with identification labels intact.
 - b. Unload pavers with proper equipment, so no damage occurs to pavers.
 - c. Storage: Store materials so they are protected from contamination by foreign substances and excessive moisture.
 1. Store pavers to prevent damage and staining.
 2. Do not store bedding sand and jointing sand on compacted aggregate base course or in areas that channel water into the sand.
 3. Cover bedding sand and jointing sand with waterproof covering. Secure the covering in place.

PART 2 PRODUCTS

2.01 UNIT PAVERS – Refer to Drawings

2.02 JOINTING AND BEDDING MATERIALS

A. Sand-Set Unit Pavers: Provide jointing sand and bedding sand as follows:

1. Clean, well graded, sand free from soluble salts and other deleterious or foreign matter. Sand shall be natural silica sand or sand manufactured from crushed rock.
2. Do not use screenings or stone dust for jointing sand or bedding sand.
3. Comply with ASTM C 144.
4. Joint Sand: Polysweep by SEK Surebond, or approved equal. 'Tan' color.

5. Bedding Sand Material Requirements:

Sieve size	Percent Passing
No. 4 (4.75 mm)	100
No. 8 (2.36 mm)	95 to 100
No. 16 (1.18 mm)	70 to 100
No. 30 (0.600 mm)	40 to 75
No. 50 (0.300 mm)	10 to 35
No. 100 (0.150 mm)	2 to 15
No. 200 (0.075 mm)	0

B. Mortar-Set Unit Pavers: Mortar setting bed and joint material shall be 2,500 p.s.i. Type S mason mortar mix.

~~2.04 — METAL EDGING: refer to Drawings~~

PART 3 EXECUTION

3.01 INSTALLATION – UNIT PAVERS

- A. Concrete Sub-Slab: refer to Drawings and Concrete Sidewalk specification
- B. Lay out paver pattern on sub-slab for review and approval by Consultant.
- C. Prepare bedding sand or mortar bed according to Drawings.
- D. Lay pavers in pattern(s) shown on Drawings.
 1. Lay full pavers first.
 2. Mix pavers from at least two pallets to produce uniform color blends. Follow manufacturer's recommendations for color blending.
 3. Place units by hand without using hammers.

E. Set consistent joint width according to the Drawings. For sand-set pavers use lugs to determine joint width – lugs should be placed in contact with adjacent paver. Provide 1/16 inch to 3/16 inch (2 to 5 mm) wide joints between pavers. 1/8 inch width is optimal. No more than 5% of joints may exceed ¼ inch wide.

F. Adjust pavers to form straight bond lines and appropriate joint widths. Maximum bond line variation shall be $\pm \frac{1}{2}$ inch (13 mm) over a 50 foot (15 m) string line.

G. Fill gaps at paved area edges with cut pavers.

1. Cut pavers at edges as indicated on Drawings with a wet cut masonry saw. Pavers are not to be chopped.
2. Cut pavers shall be no smaller than one-third of a whole paver (except where pattern is to be maintained and smaller pieces are surrounded by a full paver and field paver border course).

H. Do not permit traffic, including construction equipment, on sand-set pavers before initial compaction and joint filling. Disturbed areas of pavers should be taken up, the sand re-screeded and pavers relaid.

I. Vibrate sand-set pavers into sand using a high frequency/low-amplitude plate compactor capable of 3,000 lbf to 5,000 lbf (13 to 22 kN) at a 75 to 100 Hz frequency. Protect pavers from chipping during compaction by using a plate compactor with a rubber matt, rubber rollers or other approved materials placed over pavers. Do not compact within 6 feet of unrestrained edges. Remove cracked or damaged pavers and replace with new units.

J. After sand-set pavers are fully settled and free from movement simultaneously spread, sweep and compact dry jointing sand (with joint sand polymer incorporated per polymer manufacturer's recommendations) into joints until they are completely filled and sand no longer falls into joints.

K. Protect sand setting bed areas not covered with compacted pavers with waterproof covering overnight.

L. When weather conditions are such that pavement performance may be compromised, discontinue laying operations, align and compact pavers prior to work suspension.

M. On laying operations recommencement, verify acceptable setting bed condition before further pavers are laid. If water has entered bedding sand, remove pavers and saturated bedding sand; install unsaturated sand replace and compact pavers.

N. Sweep and remove excess sand from pavement when installation is complete, unless excess sand is to be used to help protect pavers from damage.

O. Return to site over a period of up to one year to add sand to fill joints as needed.

3.03 FIELD QUALITY CONTROL – UNIT PAVERS

A. Finished pavement surface shall not deviate more than $\pm 3/8$ inch (10 mm) from specified elevations.

B. Check final surface profile for conformance to Drawings.

D. Maximum variation from a specified surface profile shall be $\pm 3/16$ inch (5 mm) in 10 feet.

E. Height difference between adjacent pavers shall not exceed $1/8$ inch (3 mm).

3.04 PROTECTION – UNIT PAVERS

A. After work in this Section is complete, General Contractor shall protect work from damage due to subsequent construction activity on site.

END OF SECTION

SECTION 02810

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF THE WORK OF THIS SECTION

- A. Work for this Section shall include, but not limited to providing and installing an automatic landscape irrigation system, including piping, valves, risers, heads, connection to water supply, backflow preventer and controller, in accordance with local codes and regulations, as required to properly water all landscape areas, and in accordance with the Drawings.

1.02 RELATED WORK OF OTHER SECTIONS

- A. Coordinate with work of other Sections as required to properly execute the Work and as necessary to maintain satisfactory progress of the work of other Sections.

1.03 QUALITY ASSURANCE

- A. Qualifications of installers: As required to comply with current federal, state and local regulations.
- B. Irrigation Contractor shall have at least 5 years experience in successfully implementing installations of this scope and scale in the region. The Consultant may require evidence of comparable experience.
- C. Irrigation Contractor shall employ only experienced personnel familiar with the required work and who are directly supervised by a qualified foreman with experience in successfully implementing installations of this scope and scale, who is onsite during all work operations.
- D. Review: At all times permit the Landscape Architect to visit and observe the work or any part thereof. Maintain property facilities and provide safe access for such observations of the work. Where the specifications require work to be tested, it shall not be covered up until tested or approved by the Landscape Architect. The Contractor shall be solely responsible for notifying the Landscape Architect (48 hours notice minimum required), where and when such work is in readiness for testing. Should any such work be covered without such test or approval, it shall, if so ordered be uncovered at the Contractor's expense. Observations will be required as follows:

- 1. Pre-start meeting
- 2. Mainline pressure test
- 3. Coverage test and pre-final observation
- 4. Final Observation

1.04 SUBMITTALS

- A. Materials List: At least twenty-one (21) calendar days before any irrigation system materials are delivered to the job site, submit to the Landscape Architect a complete list of irrigation system materials proposed to be furnished and installed.
 - 1. Show manufacturer's name and catalog number for each item. Furnish complete catalog cuts and technical data; and furnish the manufacturer's recommendations as to method of installation.
 - 2. Upon approval by the Landscape Architect, the manufacturer's recommendation of actual methods of installation used in the work.
 - 3. Do not permit any irrigation system component to be brought onto the job site until it has been approved by the Landscape Architect or his representative.
 - 4. Approval of any item or alternate item indicates only that it apparently meets the requirements of the drawings on the basis of the information submitted, and does not relieve Contractor of any responsibility.
- B. As-Built Drawings: During the course of installation, carefully note changes made to the irrigation system during installation. Upon completion of the irrigation system installation, carefully and legibly transfer the as-built data to new copies of the irrigation plan, and deliver to the Landscape Architect.

1.05 PRODUCT AND HANDLING

- A. Protections: Use means necessary to protect irrigation system materials before, during, and after installation and to protect the installed work and materials of other trades and vandalism.
- B. Replacement: In the event of damage, immediately make repairs and replacements necessary, to the approval of the Landscape Architect and at no additional cost to the Owner.
 - 1. Exercise care in handling, loading, unloading, and storing plastic pipe and fittings until ready to install; transport plastic pipe only on a vehicle with a bed long enough to allow the pipe to lay flat to avoid undue bending and concentrated external load.
 - 2. Repair dented or damaged pipe by cutting out the dented or damaged section and rejoining with a coupling or slip fix.

1.06 JOB CONDITIONS

- A. General: The Contractor shall not willfully install the sprinkler system as on the drawings when it is obvious in the field that obstructions, grade differences, or

- differences in the dimensions exist that might not have been considered in the design. Such obstructions or differences shall be brought to the attention of the Landscape Architect. In the event this notification is not performed, the Contractor shall assume full responsibility for any revisions necessary.
- B. Connections to Utilities: Verify and be familiar with the location, size and detail of water mains provided as the source of water and electrical supply to the sprinkler system, as shown on the plans. Source of supply and point of connection shall be existing water mains at approximate locations as shown on plans. The Contractor shall provide water meter as sized on plans.
1. Prior to cutting into the soil, locate cables, conduits, sewer septic tanks, and other utilities, as are commonly encountered underground: If necessary, contact the appropriate utility coordinator. Take proper precautions not to damage or disturb such improvements, if a conflict exists between such obstacles and the proposed work, promptly notify the Landscape Architect. Proceed in the same manner if rock layer or any other conditions encountered underground make changes advisable.
 2. Where investigation of subsurface conditions has been made by a qualified professional in areas in which local materials may be obtained, the Contractor may request the use of such information but will be directly responsible for its verification and accuracy.
- C. Permits and Fees: The Contractor shall apply and pay for all necessary permits and fees required in the pursuit of his work as required by the governing codes.
- D. Coverage: This design is diagrammatic. It is the Contractor's responsibility to provide complete coverage of the areas to be irrigated. Should deficiencies be noted, the Contractor shall immediately notify the Landscape Architect for approval of changes or additions. Should the Contractor install additional equipment without the Landscape Architect's and Owner's written authorization, compensation for additions may be waived by the Owner.
- E. Power: Another trade shall provide 115 volt power to controller location. The Contractor shall provide connection to power source.

1.07 PROJECT GUARANTEE

- A. The entire sprinkler system shall be unconditionally guaranteed by the Contractor as to material and workmanship, including settling of backfilled areas below grade for period of one year following the date of Substantial Completion of the work.
1. If, within one year from the date of completion, settlement occurs and adjustments in pipes, valves, and sprinkler heads is necessary to bring the

system to the proper level of the permanent grades, the Contractor, as part of the work under this Contract, shall make adjustments without extra cost to the Owner.

2. Should any operational difficulties in connection with the sprinkler system develop within the specified guarantee period, which in the opinion of the Landscape Architect may be due to inferior material or workmanship, said difficulties shall be immediately repaired at no additional cost to the Owner, including any other damage caused by such defect.
3. Guarantee excludes replacement, after acceptance, due to vandalism.

1.08 SCHEDULES

- A. The Contractor shall begin the installation of the Landscape Irrigation System immediately as the site becomes available.

1.09 PROTECTION

- A. All items required to complete this contract remain the property and responsibility of the Contractor until final acceptance. Take adequate precautions to protect all work and materials against damage. Cooperate fully with other trades to insure a satisfactory completion.

1.10 FINAL ACCEPTANCE

- A. Upon the Contractor's notification that the installation is complete, the Landscape Architect will review the installation and, if final acceptance is not given, will prepare a "punch list" which, upon completion by the Contractor, will signify final acceptance by the Owner. An As-Built Drawing must be submitted to the Landscape Architect before final acceptance will be made.
- B. The work shall be accepted in writing when the entire scope of work is in a completed and undamaged condition, and satisfactory to the Landscape Architect and Owner. In judging the work, no allowance for deviation from the original plans and specifications will be made unless previously approved by the Landscape Architect.

PART 2 - PRODUCTS

2.01 PIPES AND FITTING

- A. PVC Pressure Rated Pipe - Type 1220 (PVC Class 200)
 1. Type I Grade II pressure rated pipe.

2. Materials shall meet requirements set forth in the ASTM current standards.
 3. Outside diameter of pipe shall be the same size as iron pipe.
 4. Pipe shall be marked at intervals not to exceed 5 feet with the following information: Manufacturer's name, nominal pipe size, PVC type and grade (i.e. PVC 1220), S.D.R. rating class, NSF approval and commercial standard designation CS 256-63.
 5. PVC pipe shall comply with standards set forth in CS 256-63.
 6. PVC Type I shall be threaded.
 7. PVC fittings shall be Schedule 40 or 80, PVC Type II.
 8. Solvent shall be Christie's #715 or Blue NSF approved as manufactured by Industrial Polychemical Service, Gardena, California, or approved equal.
 9. Caution shall be utilized in handling Type I pipe due to the possibility of cracking or splitting when dropped or handled carelessly.
- B. When connection is plastic to metal, male adapters shall be used. Joint compound shall be no-lead base (teflon paste, tape or equal) (male end being PVC and female end metal).
- C. Pipe fittings for copper tubing shall be ANSI B16.22 wrought copper or cast brass recessed solder joint type fittings.

2.02 RISERS

- A. Pop-up spray heads shall have triple swing joints or flex tubing with male "x barb" adapters as shown in the detail drawings.
- B. Rotary Heads: Shall have triple swing joints as shown in drawings or flex tubing with male "x barb" adapters.

2.03 VALVES

- A. Gate valves 2 1/2" and smaller shall be 125 lb. SWP bronze gate valve with screw-in bonnets, nonrising stem and solid wedge disc.
 1. Gate valves 2 1/2" and smaller shall have threaded ends and shall be equipped with a bronze hand-wheel or operating nuts.

2. Gate valves 2 1/2" and smaller shall be similar to those manufactured by Nibco or approved equal.
- B. Quick coupling valves shall be of manufacturer shown on the drawings or approved equal. Upon completion of the contract and prior to final acceptance, supply the Owner with two (2) quick coupler keys and hose ells. The quick coupler keys and hose ells shall be of the same manufacturer as the coupling valve. Quick couplers shall be secured by a 3.5' rebar sunk in ground and attached to quick coupler.
- C. The electric remote control valves shall be of the type and manufacturer shown on the drawings, or approved equal, and installed per detailed drawings and manufacturer's recommendations. Valves shall be installed minimum 6" from fixed objects and 12" apart.

2.04 VALVE BOXES

- A. Refer to Drawings for Valve Box requirements. ~~Valves, including pressure regulating valves, filters, and remote control valves shall be installed in black valve boxes, Model #1419-12B as manufactured by Carson Industries, or approved equal.~~

2.05 CONTROLS AND WIRING

- A. Automatic controllers, where required, shall be of the type and manufacturer shown on the Drawings and installed per manufacturer's recommendations and the Drawings.
- B. Controllers shall not be programmed to operate at the same time.
- C. Wiring to be used for connecting the automatic controller to the electric solenoid actuated remote control valve shall be type UF 600 V, 7-strand or solid copper, PVC insulation, single conductor, UL approved underground feeder cable. Each pilot or "hot" wire shall be red with the common wire being white. Field splices between the controller and electric valves are not permitted. Control wire shall be #14 gauge. Splices at remote control valves shall be with Pen-Tite, Skotch-Lot, or DS 400 Connectors. Two extra wires shall be installed from the controller to farthest valve in each direction, yellow in color.
- D. 115 volt wire shall be per local code as to type and quality.

2.06 BACKFLOW PREVENTION UNITS

- A. Backflow prevention, where required, for the potable water system shall be of size and type as indicated on the drawings. Backflow prevention units shall be installed in accordance with detailed Drawings and the requirements set forth by

local codes and/or the City Health Department. Backflow units must be tested upon completion of project by certified tester.

2.07 SPRINKLER HEADS

- A. Sprinkler heads shall be of the types and sizes with the diameter (or radius) of throw, pressure, discharge and other designation necessary to determine the types and sizes as indicated on the Drawings. They shall be constructed of high-impact plastic.
- B. Heads of a particular type of function in the system shall be of the same manufacturer and shall be marked with the manufacturer's name and identification in such a position that they can be identified without being removed from the system.

PART 3 - EXECUTION

3.01 TRENCHING AND BACKFILLING

- A. Excavation shall be open vertical construction sufficiently wide to provide free working space around the work installed and to provide ample space for backfilling and compacting.
 - 1. Trenches for pipe shall be cut to required grade lines, and trench bottom shall be compacted to provide an accurate grade and uniform bearing for the full length of the time.
- B. Backfill with excavated soil. Unsuitable material, including clods and rocks over 2-1/2 inches in size, shall be removed from the premises and disposed of legally at no cost to the Owner. Backfilling shall be done carefully and shall be properly compacted by hand tamping and/or flooding to avoid after-settling. Hand rake trenches to leave grade in as good as or better condition than before installation and flush with surrounding grade.
- C. Depth of trenches shall be sufficient to provide a minimum cover above the top of the pipe as follows:
 - 1. 12 inches over non-pressure lateral lines.
 - 2. 18 inches over non-potable sprinkler mainline 3" and smaller.
 - 3. 24 inches cover over pipe serving potable water prior to a backflow preventer, or pressure sprinkler mainline 4" and larger.
 - 4. 30 inches cover over pipe crossing under paving.

- D. Surplus earth remaining after backfilling shall be removed from the premises and disposed of legally at no cost to the owner.

3.02 INSTALLATION OF PIPING

- A. Irrigation piping layout is diagrammatic. Contractor can make minor adjustments to the system as required to avoid physical elements or conform to other site conditions. There shall be no conflicts between irrigation system, planting, and structural elements. The Contractor is responsible for maintaining coverage as indicated.
 - 1. Verify the static pressure, size of service to meter, at each point of connection and to make final connections allowing for possible minor deviations from location shown on plans due to site conditions. Any deviation from design criteria shall be brought to the attention of the Landscape Architect. Continuation of work shall be at Contractor's risk and expense.
- B. Carefully inspect pipe and fittings before installation, removing dirt, scale, and burrs and reaming as required; install pipe with markings up for visual inspection and verification.
- C. PVC pipe shall be installed in a manner which will provide for expansion and contraction as recommend by the pipe manufacturer.
 - 1. Class 200 PVC shall be used for main lines and lateral piping.
 - 2. In joining, use only the specified solvent and make joints in strict accordance with the manufacturer's recommended methods; give solvent welds at least 15 minutes set-up time before moving or handling and 24 hours curing time before filling with water.
 - 3. For plastic-to-steel connections, work the steel connections first; use a nonhardening, non-lead base pipe dope on threaded plastic-to-steel connections and use only light wrench pressure.

3.03 INSTALLATION OF EQUIPMENT AND WIRING

- A. Automatic controller(s) shall be installed at the location(s) shown on the drawings.
 - 1. Adequate coverage (18" min.) of the 24 volt service wire leading from the controller shall be installed from the bottom of the controller to trenches.
- B. Install control wires with irrigation mains and laterals in common trench where possible. Lay control wire to side of pipe. Provide 12" long looped slack of both

- wires at valves and changes of direction. If wire is in trench with no irrigation pipe, the wire must be contained in PVC conduit.
- C. Electric work shall be installed per code requirements.
 - D. Quick coupling valves shall be set approximately 12 inches from walks, curbs, or paved areas where applicable. Excavate soil below quick coupler to 6 inches minimum. Backfill with washed gravel, set box even with adjacent finish grade, backfill, compact and finish grade.
 - E. Valves and valve boxes shall be installed as shown in the details and in accordance with the manufacturer's recommendations.
 - 1. Automatic valves shall be size shown on plans.
 - 2. Install each control valve in a separate valve box with a minimum of 12 inches between valves and 6 inches from any walk or structure.
 - 3. Excavate soil below valve to 6 inches minimum. Backfill with washed gravel, set box even with adjacent finish grade, backfill, compact to finish grade.

3.04 TESTING

- A. Sprinkler Mains: Test sprinkler mains for a period of 12 to 14 hours under normal pressure. If leaks occur, replace joint or joints and repeat test.
- B. Lateral Piping: Test laterals located under streets and other paved areas where couplings are installed for a period of one hour. If leaks (or pressure drips) occur, replace couplings and repeat test.
- C. Complete tests prior to backfilling. Sufficient backfill material may be placed in trenches between fittings to insure stability of line under pressure. In each case, leave connections at valves and backflow device open to visual inspection until testing is completed.

3.05 FINAL ADJUSTMENT

- A. After installation has been completed, make final adjustment of sprinkler system preparatory to Landscape Architect's final review.
- B. Completely flush system to remove debris from lines by removing nozzles from heads on ends of lines and turning on system.
- C. Check sprinklers for proper operation and proper alignment for direction of throw.

- D. Check each section of spray heads for operating pressure and balance to other sections by use of flow adjustment on top of each valve.
- E. Check nozzles for proper coverage. Prevailing wind conditions or slopes may indicate that arc of angle or trajectory of spray should be other than as shown on drawings. In this case, change nozzles to provide correct coverage as part of this contract without additional cost to the Owner.

3.06 CLEAN UP

Clean up all debris caused by work of this section, keeping the premises clean and neat at all times.

3.07 FINAL ACCEPTANCE

Upon meeting above requirements, a final review shall be conducted by the Landscape Architect in conjunction with other landscape work. Should any deficiencies be encountered, Contractor shall correct immediately prior to final acceptance. Until final acceptance, the Contractor shall be responsible for maintenance of systems and equipment on the site.

END OF SECTION

SECTION 02872

PART 1 – GENERAL

1.1 SUMMARY

- A. Section includes furnishing and installing:
 - 1. site furnitureInstall in the quantities, locations and arrangements indicated in the plans.
Install at locations indicated in the Drawings or as directed by Consultant.

1.2 REFERENCES

- A. ASTM F 1487-93 Standard Consumer Safety Performance Specification for Playground Equipment for Public Use.
- B. Americans with Disabilities Act of 1990 (ADA), with amendments.
- C. US Consumer Product Safety Commission (CPSC) "Handbook for Public Playground Safety", 1998 edition.
- D. IPEMA Certification: International Play Equipment Manufacturers Association (www.ipema.org)
- E. ASTM F 1292-95 Specification for Measurement of Impact Attenuation of Surface Systems Under and Around Playground Equipment.
- F. ASTM F 355-86 Test Method for Shock Absorbing Properties of Playing Surface Systems and Materials.
- G. ASTM F1487, Standard Consumer Safety Performance Specification for Playground Equipment for Public Use

1.3 SUBMITTALS

- A. Submit manufacturer's data, specifications, and installation instructions for each site furnishing item. Indicate by transmittal that a copy of each instruction has been forwarded to the installer.
- B. Submit shop drawings for each item required, including location plan layout and details illustrating location and sizes of units, CPSC required fall zone clearances, anchoring details, hardware list, and erection procedures.
- C. Submit color chip of each item for approval by the Consultant.
- D. Qualification data: for installer of each type of item

1.4 QUALITY ASSURANCE

- A. Play Equipment Installer Qualifications: Arrange for installation of play equipment only by a firm that meets all of the following requirements:
 - 1. Certified by the play equipment manufacturer(s) to have successfully passed the play manufacturer(s) installation training program for installation of play equipment types approved for installation;
 - 2. A local supplier of the play equipment furnished, or, maintains an affiliation with a local supplier of the play equipment furnished. Local supplier shall maintain an adequate stock of spare parts for

- play equipment components normally requiring periodic maintenance and replacement;
3. Maintains a Comprehensive General Liability policy with minimum limits of \$2,000,000 for bodily injury.
- B. Regulatory Requirements: Comply with the Americans with Disabilities Act (ADA) and with code provisions as adopted by authorities having jurisdiction.

1.5. DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original packages and containers bearing brand name and identification of manufacturer or supplier. Store materials under cover and in a manner to keep them dry, protected from weather, direct sunlight, contamination and damage from other causes.

1.6. SEQUENCING AND SCHEDULING

- A. Sequence and schedule installation of each site furnishings unit so that work begun one day is completed the same day or provide complete security of installation site and materials not yet installed to prevent unauthorized entry into installation site and loss of products and other materials and potential injury to the public. Prevent entry into play equipment areas until all units are in place, including all safety and access surfacing, and units are accepted.

PART 2 - PRODUCTS

2.1 SCHEDULE

Refer to Drawings

2.2 MATERIALS

- A. ~~Modular Play Structures: Provide modular play structures produced by a single manufacturer for undivided responsibility for design and construction complying with CPSC "Public Playground Handbook for Safety". Refer to Drawings for type and manufacturer of the equipment design, arrangement, features and quality required for this Project. Submit proposed substitutions in accordance with specified requirements documenting compliance with requirements, including equivalent design, features, performance and quality, arranged to fit available space, provide fall zones complying with requirements, and permit installation of adjacent equipment.~~
- B. ~~Modular Play Structure Design, Construction and Performance Requirements: Provide the following or equivalent as approved by Engineer.~~
1. ~~Use materials that are structurally sound and suitable for safe play; grind to remove weld splatter.~~
 2. ~~Hardware and Fasteners: Provide Grade 5 button head socketed and pinned cap screws for primary structural fasteners with a locking patch type material. Provide fasteners fabricated from carbon~~

- ~~steel and finished with durable zinc nickel plating. Provide all zinc nickel plated fasteners with a locking patch material that will provide a minimum of four times the installation torque to remove the fastener. Provide special tools for pinned hex fasteners.~~
- ~~3. Locking Collars: Fabricate from 6061-T6 aluminum alloy cut to 1/2" lengths, with a 2 1/4" O.D. and a 1 3/16" I.D. Drill and tap collars for 3/8" x 1/2" zinc nickel plated set screw with locking patch to secure the rail.~~
 - ~~4. Bolt Links/Double Clevis: Provide steel forgings with a zinc nickel finish and equipped with a 3/8" x 1 1/4" pinned hex shoulder bolt. Fabricate double clevis from cast steel with a zinc nickel finish. Provide 7/16" x 2 7/16" hex head shoulder bolts and 3/8" x 1 1/4" hex pin shoulder bolt fasteners.~~
 - ~~5. Slip and Mold Resistant PVC Coating: Thoroughly clean metal components in a hot pressure washer and prime all exposed surfaces with a clear thermosetting acrylic solution. Dip preheated components in a UV stabilized, mold resistant, slip resistant polyvinyl chloride and oven cure at approximately 400°F for 15 minutes to achieve a 0.080" thick (± 0.020") PVC coating system with an 85 durometer hardness in a matte finish brown color.~~
 - ~~6. Polyester Powder Coating: Clean parts in a phosphatizing bath, seal with a non-chromium based corrosion inhibitor, and dry. Provide all metal components in all blue color. Electrostatically apply and bake on polyester powder coating meeting or exceeding the following:
 - ~~a. ASTM D 3359B for adhesion~~
 - ~~b. ASTM D 3363 for hardness~~
 - ~~c. ASTM D 1735 for flexibility~~
 - ~~d. ASTM D 2794 for impact resistance~~
 - ~~e. ASTM D 2424 for oven bake resistance~~
 - ~~f. ASTM D 17 for salt spray resistance employing a "checkered" adhesion test and a 500 to 700 hour salt spray test monthly.~~~~
- ~~C. Modular Play Structure Components shall be as shown on Drawings~~
- ~~D. Swing Structures: As indicated on the Drawings.~~
- ~~F. Spring Riders: As indicated on the Drawings.~~
- ~~G. Wood Chip Safety Surfacing: Provide hardwood chip safety surfacing system (depth after compaction) that meets ADA accessibility criteria and provides a minimum critical height of 78" with a maximum deceleration rate of 200g and a Head Injury Criteria index not exceeding 1,000 (CPSC "Public Playground Handbook for Safety" critical height guidelines, ASTM F 1292-95 and ASTM F 355-86). System shall consist of a 12" deep minimum bed of specified wood chips, with drainage system and ground surface preparation. Subject to compliance with requirements, provide "Kiddie Cushion" complete with required system components provided by Living Earth or equivalent system approved by Consultant.~~

- H. Furniture: As indicated on the Drawings, or approved equal.
- I. Where indicated for bolt anchorage to paving, provide Hilti 316 Stainless Steel 3/8" x 4" expansion anchors with Hilti Tamper Proof Nuts (HTN).

PART 3 - EXECUTION

3.1. PREPARATION

- A. Accurately stake out the locations of all site furnishings work and obtain acceptance of location by Consultant prior to proceeding. Staking shall clearly indicate location and alignment of all surrounding pavement and edges, and all play equipment. No payment will be made for installations not made in approved locations or for cost of removals and relocations to approved locations. Work includes re-staking as directed to provide suitable clearances from existing above and below grade improvements and obstructions.

3.2. INSTALLATION - GENERAL

- A. Examine substrates, areas and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Verify that items provided under other sections of Work are sized and located as required to accommodate Amenities according to drawings and specifications.
- C. Examine supporting members to ensure that surfaces are at elevations indicated or required to comply with regulations.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.
- E. Drilled-in anchors: Accurately layout location of drilled-in adhesive anchors. Drill holes of proper diameter perpendicular to pavement surface. Allow adhesive anchors to cure in accordance with manufacturers printed instruction prior to tightening nuts.
- F. Provide temporary forms and supports for items indicated to be cast into concrete.
- G. Install items plumb, level, true to line and at height as indicated.
- H. After installation, clean soiled surfaces according to manufacturers written instructions. Protect amenities from damage or further soiling until acceptance by Engineer.

~~3.3. PLAYGROUND EQUIPMENT INSTALLATION~~

- ~~A. Installation of playground equipment must be performed by a firm trained and approved by the respective equipment manufacturer(s); refer to the Quality Assurance Article for additional requirements. Install all playground equipment including swings, slides, spring riders, and modular play structures (including permanent concrete post footings) in strict accordance with the respective equipment manufacturer's printed instruc-~~

~~tions for equipment provided, CPSC referenced guidelines, and ASTM F 1487 standard for playground equipment safety.~~

~~B. Installation of fiberglass Climbing Boulders shall be in strict accordance to the manufacturer's instructions, including concrete footings and anchors.~~

~~C. For all play equipment verify that:~~

~~1. layout of each piece of equipment will accommodate required Fall Zones.~~

~~2. that Fall Zones do not intersect Fall Zones of other pieces of playground equipment (except as indicated on the drawings for spring riders and for Climbing Boulders).~~

~~3. **at least six inches of additional clearance is provided** between the edge of required Fall Zones and borders over and above that required by CPSC guidelines for playground safety.~~

3.4. SECURITY

A. Schedule installation of each site furnishing unit so that work begun one day is completed the same day or provide complete security of installation site and materials not yet installed to prevent unauthorized entry into installation site and loss of products and other materials.

3.5. CHECK AND ADJUST

A. Check each item of site furnishing to confirm that all components are in place and are in proper operation. Adjust, lubricate and replace components as required for proper operation.

3.6. INSTALLATION MANUALS

A. Provide complete printed installation instructions for layout and installation of each site furnishing unit required. Provide a parts inventory checklist accompanying each site furnishing unit together with a source listing to obtain replacements for damaged or missing components. Parts list component names and part numbers shall match label description on packaging and packing slip delivered with each unit. Provide telephone numbers for manufacturer's representatives to expedite replacement components and resolve installation problems.

3.7. WARRANTY

A. Provide one-year special project-warranty for the site furnishings work, agreeing to repair or replace site furnishings which become unserviceable or objectionable in appearance due to defects in materials and workmanship, including removal and replacement of superimposed work which must be removed to repair or replace site furnishings.

END OF SECTION

SECTION 02930

PART 1 - GENERAL

1.01 SUMMARY

A. Furnish labor and materials for the following work:

1. Preparation of subgrade in lawn areas.
2. Placement and shaping of topsoil in lawn areas.
3. Installation of sod in lawn areas.

1.02 SUBMITTALS

A. Quality Control Submittals

1. Submit certificate of sod type and growing conditions.
2. Submit 1 gallon sample of topsoil for Consultant approval.

1.03 NOT USED

1.04 QUALITY ASSURANCE

A. Lawn materials shall comply with all government regulations prevailing at the supply source and the job site.

B. Review: The Landscape Architect must approve fine grading before application of lawns.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver seed and fertilizer materials in original unopened containers, showing weight, analysis, and name of manufacturer. Store in a manner to prevent wetting and deterioration.

B. Cut and deliver sod within 24-hours.

1. Do not harvest or transport sod when moisture content may adversely affect sod survival.
2. Protect sod from sun, wind, and dehydration prior to installation.

1.06 SITE CONDITIONS

A. Work by other contractors will be ongoing during this work.

B. Protect existing utilities and site improvements. Have underground utilities located by servicing agency and/or the General Contractor.

- C. The General Contractor is responsible for all grades being established, topsoil being placed, and finish graded to proposed elevations.
- D. Examine the job site and notify the Landscape Architect of any deficiencies of work in place by others. Do not proceed until unsatisfactory conditions have been corrected.
- E. Water will be available on site. An automatic irrigation system will be installed as part of the Work. Refer to irrigation drawings for the extent of the system. Landscape Contractor shall provide temporary irrigation equipment, labor, etc. if required to establish lawns in areas not covered by an automatic irrigation system.

1.07 WARRANTY

- A. Warrant all lawns for a period of one year from date of Final Acceptance. Promptly re-sod unacceptable areas during the warranty period as directed by the Owner or Landscape Architect.
- ~~B. If work for a phase is accepted by the Owner, the one year Warranty will begin at the date of Final Acceptance of that phase. Warranty periods for different phases may have different expiration dates.~~

1.07 SCHEDULES

- A. Contractor is responsible to coordinate with General Contractor regarding mobilization and completion schedule.

1.08 INSTALLATION MAINTENANCE PERIOD

- A. Installation Maintenance shall begin immediately upon starting any portion of the Lawns and continue until Final Acceptance. Maintenance shall be performed in accordance to 02935 – Exterior Landscape Maintenance.

1.09 REVIEW AND ACCEPTANCE

- A. Where reviewed lawn work does not comply with the requirements, replace rejected work and continue specified maintenance until re-reviewed by the Landscape Architect and found to be acceptable.
- B. Acceptance of sodded lawns will depend upon establishment of lawn grass over 100% of the lawn area with no bare or dead areas.

1.10 PROTECTION

- A. All items required to complete this Contract remain the property and responsibility of the Contractor until Substantial Completion. Adequate precautions to protect all work and materials against damage shall be taken. Coordinate with other trades to insure a satisfactory completion. Maintain grade stakes set by others until removal is mutually agreed upon by all parties.

PART 2 - PRODUCTS

2.01 SOD

- A. Sod shall have been grown in a sod nursery certified by the Department of Agriculture, on topsoil, and shall be two years old with a heavy top and strong well-knit root system. Sod shall be Premium Grade Live, uniform in color, leaf texture, and free of weeds, undesirable grasses, stones, roots, thatch, and extraneous material and with 98% purity.
- B. Sod shall be **'Sand-Based' St. Augustine.**

2.02 FERTILIZER AND SOIL AMENDMENTS

- A. Fertilizer shall be Microlife Ultimate or approved equal organic, biological slow-release fertilizer.
- B. SGTX 'Hi Carbon Mix', as provided by Sustainable Growth Texas (Contact Betsy Ross, 512/636-3711), or approved equal. Dry mix – may be applied by Contractor.
- C. SGTX 'Fungal/Bacterial Extract', as provided by Sustainable Growth Texas (Contact Betsy Ross, 512/636-3711), or approved equal. Wet mix – must be applied by Sustainable Growth Texas or approved equal.

2.03 TOPSOIL

- A. Topsoil shall be 2 inch deep layer of coarse gravelly sand. 'Concrete Sand' may be acceptable.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Immediately before placement of topsoil, scarify subgrade to a depth of 2 inches, place Hi Carbon Mix evenly across specified lawn area at a rate of 5 lbs. per 1,000 s.f. and re-establish specified subgrade and shape.
- B. Place topsoil and hand-rake to specified finished grade and shape.
- C. Request Consultant review of finished lawn soil surface. Do not apply sod before Consultant review and approval of the finished soil surface.

3.02 SOD INSTALLATION

- A. Apply to finished grade after raking, before sod installation:
 - 1. Microlife Ultimate fertilizer, at a rate of 15 lbs per 1,000 s.f. Sweep excess fertilizer pellets off hardscape elements after application to avoid staining.
- B. Moisten the topsoil before placing sod to prevent grass roots from burning or drying out.

- C. All sod shall be laid in place within 12 hours of delivery to the Site.
- D. Plant sod by hand so that all edges of each piece of sod fits securely to the adjacent piece **without gaps or voids**. Roll sod to eliminate undulations and unevenness, and to provide firm contact of roots with topsoil. The finished surface shall be true to grade, smooth, even, and equally firm at all points.
- E. When sodding on slopes of 3:1 or greater, provide staking as approved by Landscape Architect.
- F. Water sod lightly with a fine mist after every 500 sq. ft. has been installed. Keep sod thoroughly watered after installation and until establishment by frequent watering daily as required to keep the upper 6" soil moist for at least 10 days.
- G. Mow lawns as necessary to encourage dense coverage.
- H. Two weeks after planting, drench all lawn areas with Fungal / Bacterial Extract.

3.04 CLEAN UP AND REPAIR

- A. Paved areas over which hauling operations have been conducted shall be cleaned and kept clean. Promptly remove materials spilled on pavements.
- B. Restore/repair all site areas and improvements damaged as a result of lawn installation.

END OF SECTION

SECTION 02935

PART 1 - GENERAL

1.01 SUMMARY

A. This section specifies the requirements for providing and implementing a landscape maintenance program in accordance with the Drawings and Specifications.

1.02 REQUIREMENTS OF REGULATORY AGENCIES

A. Perform Work in accordance with all applicable laws, codes, and regulations required by authorities having jurisdiction over such work and provide for all permits required by local authorities.

B. Hours of Operation: comply with all local restrictions on hours of maintenance activities.

1.03 CONTRACTOR RESPONSIBILITIES

A. The Contractor shall begin maintenance immediately upon starting any portion of the Work of this contract. Contractor is responsible for performing all maintenance activities until Final Acceptance of the entire project.

B. Trees: The Contractor's maintenance of new planting shall consist of watering, cultivating, weeding, mulching, re-staking, tightening and repairing of guys, resetting plants to proper grades or upright position, restoration of the planting saucer, and furnishing and applying such sprays and invigorants as are necessary to keep the plantings free of insects and disease and in thriving condition.

C. Irrigation System: Maintenance of irrigation system shall consist of monitoring and adjustment of the duration and frequency of the watering schedule, adjustment of heads for coverage and elevation, repair of leaks in both mains and lateral lines and all other work required to establish a complete working irrigation system.

D. Lawns: Maintenance of new lawns shall consist of mowing, watering, weeding, repair of all erosion and re-sodding as necessary to maintain a uniform stand of specified grass.

1.04 PROTECTION

A. Protect planting areas and lawns at all times against damage of all kinds for duration of maintenance period. Maintenance includes temporary protection fences, barriers and signs as required for protection. If any plants become damaged or injured, because sufficient protection was not provided, treat or replace as directed by Owner at no additional cost to Owner.

1.05 FINAL ACCEPTANCE

A. Work under this section will be accepted by Landscape Architect upon satisfactory completion of all work, including maintenance, replacement of plant materials and lawns

under the Warranty Period. Upon final Acceptance, the Owner will assume responsibility for maintenance of the Work.

1.06 WARRANTIES AND REPLACEMENTS

A. Refer to other sections.

1.07 MAINTENANCE INSTRUCTIONS

A. At the completion of work, furnish two (2) copies of written maintenance instructions to Owner and one (1) copy to Landscape Architect for maintenance and care of all planting throughout the year.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Materials required for installed items shall match those already in use.

B. Samples of all materials not specified under other sections of these Specifications shall be submitted for review by Landscape Architect prior to use.

C. Top-dress Fertilizer: *Micro Life Ultimate 8-4-6* as provided by San Jacinto Environmental (713/957-0909) or approved equal, applied at rates recommended by supplier.

2.02 REQUIRED EQUIPMENT

A. Contractor shall have available for their use the following maintenance equipment:

1. Lawn Mowers
2. Gasoline Powered Edgers
3. Trash Collection Equipment
4. Line Trimmers
5. Miscellaneous Hand Tools, Rakes, Brooms, Etc.
6. Blowers
7. Other as needed.

PART 3 – EXECUTION

3.01 WATERING

It shall be the responsibility of the Contractor to assure that the correct watering of plant materials is being accomplished through the following irrigation techniques:

A. Regular deep watering to all new trees until there are definite signs that the trees have established themselves, new growth is apparent, and no trees are experiencing stress conditions.

B. Frequent watering to the lawn areas to insure against drying. This may be accomplished as above, by the automatic sprinkler system, hand watering or portable

- sprinklers. Contractor shall monitor settings of automatic sprinkler controls and recommend necessary adjustments according to climatic changes.
- C. Contractor shall be responsible for watering areas within the project limits that do not have irrigation systems.
 - D. Contractor shall be responsible for damages to irrigation system caused by maintenance operations.

3.02 MAINTENANCE OF TURF AREAS

- A. Mowing lawn/grass areas shall be accomplished with sharp, properly adjusted mowers of the correct size for the various areas.
- B. Mowing frequency shall be as per the Landscape Maintenance Program. Blade heights shall be set according to the following schedule.
 - 1. 1 ½ inches Initial Mowing
 - 2. 1 ½ inches April – November
 - 3. 2 inches December – March
- D. In the event of a prolonged rainy period and a surge of leaf growth is anticipated, the mower height may be readjusted to prevent “scalping” or skinning of lawn on preceding cuts.
- E. Lawn shall be edged evenly at all walks, headers and other structures as per the schedule. Use an edger, not a line trimmer.
- F. Until the establishment of the turf, the Contractor will be responsible for replacing soils that have eroded onto the paved areas. Residual soils on paving will be removed and if not mingled with objectionable materials may be re-used in eroded areas.
- G. Immediately upon observing any lawn grass spreading into shrub or groundcover areas, the Contractor shall initiate a program of removal and maintain this program throughout the maintenance period.
- H. Any lawn grass appearing in paved areas shall receive an application of soil sterilant according to manufacturer’s direction. The sterilant shall be approved and will not be detrimental structurally to paved areas.
- I. Special effort shall be given to the control to fire ants infesting the site. After control is accomplished, the ant mounds shall be lowered and tamped to the existing grade.
- J. Apply top dress fertilizer to lawn per schedule below.

3.03 MAINTENANCE OF TREES

A. Contractor shall adjust and tighten as required all tree staking and guying. Removal as directed by Owner's Representative.

B. All weeds within the mulched area around each tree shall be removed at each visit. Under no circumstances shall weeds and grass within planted areas be allowed to attain more than 4 inches growth.

C. Contractor shall be continuously alert for signs of insect presence or damage or the presence or damage from plant fungi. Upon locating such evidence, the Contractor shall report it to the Owner's Representative and take action as directed.

3.04 MAINTENANCE OF IRRIGATION SYSTEM

A. Irrigation System: Maintenance of irrigation system shall consist of monitoring and adjustment of the duration and frequency of the watering schedule, adjustment of heads for coverage and elevation, repair of leaks in both mains and lateral lines and all other work required to establish a complete working irrigation system.

3.05 DE-WATERING

A. Contractor shall de-water by pumping or siphoning as often as necessary to remove excess moisture from soil in planting areas and tree pits. De-watering to occur during scheduled visits as required.

3.06 SCHEDULE

A. THE EXECUTION ITEMS OF PART 3 IN THIS SPECIFICATION SHALL BE PERFORMED AS PER THE FOLLOWING SCHEDULE AS APPLICABLE FOR THE MAINTENANCE PERIOD:

MONTH	# OF VISITS PER MONTH
January	2
February	2
March	4
April	4
May	5
June	4
July	5
August	5
September	5
October	3
November	2
December	2

B. TOPDRESS FERTILIZER: Thirty (30) days after lawn installation.

C. MULCHING, WEEDING, WEED CONTROL, GUYING AND STAKING ADJUSTMENT: As required at each visit.

- D. MEETING: Contractor shall meet once each month and at the end of the maintenance period with the Owner's maintenance personnel. Contractor shall review irrigation system schedule and operation and other pertinent and helpful maintenance information at each meeting.

END OF SECTION

SECTION 02950

PART 1 - GENERAL

1.01 SUMMARY

A. This section specifies the requirements for providing and installing plant material, planting soils, soil amendments and fertilizer.

1.02 REFERENCES

A. Plant material sizes shall comply with *American Standard for Nursery Stock* (ANSI Z60.1), unless indicated otherwise on the drawings.

B. Plant material species shall be as indicated in *Hortus Third, American Joint Committee on Horticultural Nomenclature, Standardized Plant Names*, or be cultivars generally accepted in the trade.

1.03 NOT USED

1.04 DEFINITIONS

A. *Height* is indicated with a tolerance. The smaller dimension is the minimum acceptable. The larger dimension represents the maximum permissible, except with the approval of the Landscape Architect. The average dimension of all plants must roughly equal the average of the tolerance figures shown for each item. Where trimmed plants are indicated, plant dimensions shall conform.

B. *Spread* is the dimension which represents the minimum acceptable horizontal measurement of a plant. Spread is a measurement of the general mass of the plant, not tip to tip of isolated branches. A spread tolerance not to exceed 40 percent upward in diameter is acceptable. Spread shall meet the minimum in all directions and must be considered as pivoting on the center of the plant. Where tolerance is shown between two spread dimensions, the smaller dimension is the minimum acceptable.

C. Tree *Caliper* shall serve as a guide to tree uniformity and degree of maturity. Caliper of the trunk shall be taken 6 inches above ground level for trees up to and including 4 inch caliper size, and taken 12 inches above the ground for larger sizes.

D. *Clear trunk* is the distance above ground where the lowest balanced branching begins.

E. *Ball and burlap (B&B)* shall mean the containment of a tree or plant root system in a soil ball wrapped with burlap and secured in a wire basket. Ball shall be firm, neat, slightly tapered and well-burlapped. Balls shall be 10 inches in diameter for each 1 inch of caliper. Trees with loose or broken balls at time of planting will be rejected.

F. *Box or Container Grown* trees shall mean the containment of a tree or plant root system in soil secured with a box of wood planking or plastic container. Wood boxes shall be secured with metal strapping and nails to prevent breakup during delivery, transfer or placement. Boxed or container grown trees shall be either grown in a container from a seedling or nursery grown trees transplanted to containers no less than six months prior to planting, or such time as required to root substantially throughout the container. Box sizes shall be a minimum of 9 inches square for each 1 inch of caliper, with an equal depth. Boxes shall be square with slightly tapered sides and free of any chemical or deleterious substance that would be harmful to the plant.

1.05 SUBMITTALS

A. Product Data:

1. Submit manufacturers' specifications and/or analysis for fertilizers and amendments.
2. Submit lab analysis for compost: 'Total Package' from Soil Foodweb New York (631/750-1553 soilfoodwebny@aol.com)

B. Samples:

1. Submit a one pound sample of specified soils, soil mix(es), mulch and compost.
2. Submit representative photographs of each type/size of plant and tree.

C. Schedules: Submit the landscape work schedule showing dates for each type of work in each area of the site.

D. Plant Sources and photos: At least 60 days before planting, submit detailed list indicating source name, address and phone number for each plant source, and representative photographs of each plant type. Change of plant source without approval by consultant may be grounds for rejection.

1.06 QUALITY ASSURANCE

A. Contractor Qualifications

1. Contractor performing Landscape Work shall have at least 5 years' experience performing projects of similar scale and complexity.
2. The Landscape Contractor shall employ only experienced personnel who are familiar with the required work and who are supervised by a qualified foreman with experience in successfully implementing installations of this scope and scale.

B. Source Quality Control

1. General: Ship landscape materials with certificates of inspection as required by governmental authorities. Comply with governing regulations applicable to landscape materials.

2. Do Not Make Substitutions: If specified landscape material is not obtainable, submit to Landscape Architect proof of non-availability and proposal for use of equivalent material, including verified cost increase or decrease.
 3. Analysis and Standards: Package standard products with manufacturer's certified analysis. For other materials, provide analysis by recognized laboratory made in accordance with methods established by the Association of Official Agriculture Chemists, wherever applicable or as further specified.
 4. Growing Conditions and Sizes: Plant material shall be grown in a recognized nursery in accordance with good horticultural practice. Plant material shall be of size and root condition specified. Plant material of larger size may be used if acceptable to Landscape Architect, and if size of root mass is increased proportionately.
 5. Plant Sourcing: All plants are to be located by the Contractor. Contractor is responsible for reserving plants ahead of time as required to provide specified materials, anticipating market conditions, seasonal factors and other factors that may limit plant availability.
 6. Tagging: The Landscape Architect may individually select and tag some plant materials at the place of growth. The Landscape Architect reserves the right to select some or all plants for use on the project, or select representative samples of each species, for compliance with requirements for name, variety, size, and quality. Representative samples are to be tagged and maintained throughout the period of installation. Plant materials delivered to Site not matching samples will not be used.
- 1.07 DELIVERY, STORAGE, AND HANDLING
- A. Deliver insect controls and fertilizer materials in original unopened containers, showing weight, analysis, and name of manufacturer.
 - B. Transport plant material in closed vehicles or covered to protect from harmful exposure to heat, cold or wind. Protect bark and branches from damage. Do not allow root balls to crack. Do not bend or bind the trees in such manner as to damage bark, break branches, or destroy natural shape. Damaged plant material is subject to rejection.
 - C. Immediately after unloading, water all plant material by hand until the root systems are saturated.
 - D. Store insect controls and fertilizer in a manner to prevent wetting and deterioration.

- E. Schedule plant material shipments to coincide with planting time. If planting is delayed after delivery, keep plants in a shaded, secure location covering the root-balls of B&B material with mulch or topsoil. Do not remove container grown stock from containers. Hand water all stored plant material at least twice a day. *Never allow the root system to dry out.*

1.08 SITE CONDITIONS

- A. Work by other contractors will be ongoing during this work.
- B. Determine location of underground utilities, and perform work in a manner which will avoid possible damage. Do not permit equipment or trucks to damage utilities. Hand excavate, as required, to minimize possibility of damage to underground utilities and existing tree roots.
- C. When conditions detrimental to plant growth are encountered, such as lime-treated soil, rubble fill, adverse drainage conditions, or obstructions, notify Landscape Architect before planting.
- D. Plant trees after final grades are established and prior to planting of lawns, unless otherwise acceptable to the Landscape Architect. If planting of trees occurs after lawn work, protect lawn areas and promptly repair damage resulting from planting operations. Maintain grade stakes set by others until removal is mutually agreed upon by all parties concerned.
- E. Examine the subgrade, verify the elevations, and observe the conditions under which work is to be performed. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Contractor and Landscape Architect.
- F. Protection: Do not move any equipment over existing or newly placed paving without providing necessary protections such as board-roading as required. Coordinate with General Contractor.
- G. Water is not available on site. Contractor is responsible for transporting potable water to the site as required.

1.09 SEQUENCING AND SCHEDULING

- A. The Contractor shall begin landscape work immediately as site becomes available and be completed without delay as directed by the Owner and the Landscape Architect.
- B. Contractor is responsible to coordinate with General Contractor regarding mobilization and completion schedule. No additional payment will be made for additional mobilizations or demobilizations.

1.10 WARRANTY

- A. Guarantee plants and trees for one year (12 months), beginning at the date of Substantial Completion. Replace plants not in vigorous, thriving condition as soon as weather permits and on notification by the Landscape Architect or the Owner's representative. Replace plants, including trees, which have partially died thereby damaging shape, size, or symmetry.
- B. Warranty excludes replacement of plant materials because of injury by storm, drought, hail, freeze, insects, or diseases contracted after Final Acceptance.

1.11 INSTALLATION MAINTENANCE

- A. Installation Maintenance shall begin immediately upon starting any portion of the Landscape Work and continue until Final Acceptance. Maintenance shall be performed in accordance to Landscape Maintenance specification.

1.12 PROTECTION

- A. All items required to complete this Contract remain the property and responsibility of the Contractor until Final Acceptance. Take adequate precautions to protect all work and materials against damage. Cooperate fully with other trades to insure a satisfactory completion.

1.13 REVIEW AND ACCEPTANCE

- A. The Contractor is responsible for the landscape work until Final Acceptance.
- B. Where reviewed landscape work does not comply with the requirements, replace rejected work and continue specified maintenance until reviewed again by the Landscape Architect and found to be acceptable. Remove rejected plants and materials promptly from the Project Site.
- C. Upon request, the Landscape Architect will review the work for Final Acceptance when the punch list of incomplete work items has been addressed. Work will be accepted when the job is in a completed, undamaged condition and approved by the Landscape Architect and Owner.

PART 2 - PRODUCTS

2.01 PLANT MATERIAL

- A. Plant material shall be first-quality, no. 1 grade, sound, healthy, vigorous, well-branched, and densely foliated. All plants shall be free of disease, insects, eggs or larvae, and shall have a healthy, well-established root system.
- B. Single trunk trees shall have straight trunks with the single leader intact, and be of form true to species, meeting height and spread standards after pruning. No flat-sided

- trees or trees with open areas on any side will be acceptable. Trees shall be consistently superior in form and branching.
- C. Tree Root Balls and Planting Depth:
1. Trees shall not be planted too deep in the container. Tree root flare shall be clearly visible above the surface of the root-ball soil in the container. Trees that are placed too deep in the container shall be rejected. The contractor is responsible to ensure proper condition and to plant at the proper depth onsite. Improperly planted trees will be rejected.
 2. Tree root balls shall not have excessive encircling roots. Contractor is responsible to ensure root ball conditions received from the source.
- C. Shrubs shall have generous, well-twigged side branches, and the plant, as a whole, is to be full to the ground.

2.02 SOIL MIXES AND AMENDMENTS

- A. Tree Backfill: Refer to Drawings. Native Topsoil must be tilled or hand-worked to break down clods.
- A. Shrub, Ground Cover, and Perennial Bed Preparation: A well-blended mix of 75% sandy loam topsoil (imported, not on-site topsoil), 25% compost.
- B. Imported topsoil for Planting Beds: Soil shall be fertile, friable natural sandy loam top soil, without admixture or subsoil material. Specified soil is reddish-brown in color and typically mined in the Brazos River valley, near Richmond, Texas. As supplied by Living Earth Richmond or approved equal. The soil shall contain a normal amount of peds and shall not be screened. It shall be free of nut grass, excessive weed seed or other foreign matter.
- C. Fertilizer: Microlife Ultimate, or approved equal organic, biological slow-release fertilizer.
1. Tree Pits: 1 ounce per gallon size of tree (e.g. 15 ounces for a 15 gallon tree), thoroughly mixed into the backfill soil.
 2. Shrub Beds: Apply at 40 pounds per 1,000 square feet of bed surface and mix into soil mix and top 2 inches of subsoil thoroughly before installing plants.
- D. Mulch shall be shredded hardwood hammermilled through a 1-1/2 inch screen producing a shredded, fibrous material. Pine bark or wood chips are not acceptable.
- E. Compost
1. Well-composted humus containing manures, leaves, bark fines, rice hulls, and other organic components. Peat Moss is not acceptable. No manure content is acceptable.
 2. Accepted supplier: Living Earth Technology.

3. Compost shall test within range of Soil Food Web standards using a full bio-assay to include the following:
 - a. 15-25 micrograms of active bacteria,
 - b. 100- 3000 micrograms total bacterial biomass,
 - c. 15-25 micrograms active fungal biomass,
 - d. 100-300 micrograms total fungal biomass,
 - e. 10,000 each of flagellates and amoebae,
 - f. 20-100 ciliates, and
 - g. 2- 20 beneficial nematodes.
4. Compost shall meet the Solvita Compost Maturity test of 6.0 or higher.

F. Planting Amendments:

1. Planting Amendments below shall be as provided by Sustainable Growth Texas (Contact Betsy Ross, 512/636-3711), or approved equal.
2. Shrub Beds:
 - i. SGTX 'Foundational Mineral Mix'. Dry mix - may be applied by Contractor.
 - ii. SGTX 'Hi Carbon Mix'. Dry mix - may be applied by Contractor.
 - iii. Liquid Compost Extract. Wet mix – must be applied by Sustainable Growth Texas or approved equal.
 - iv. SGTX 'Fungal/Bacterial Extract' – Wet mix – must be applied by Sustainable Growth Texas or approved equal.
3. Tree Pits:
 - i. Liquid Tree Injection: SGTX Tree Injection. Wet mix – must be applied by Sustainable Growth Texas or approved equal.
 - ii. SGTX 'Hi Carbon Mix'. Dry mix - may be applied by Contractor.
 - iii. SGTX 'Fungal/Bacterial Extract' – Wet mix – must be applied by Sustainable Growth Texas or approved equal.

2.03 LANDSCAPE ACCESSORIES

- A. Tree staking as indicated in Drawings
- B. Filter Fabric as indicated in Drawings.
- C. Tree pit inspection tube as indicated in Drawings.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine the area this work is to be executed in, and notify the Landscape Architect of deficiencies of work in place by others. Do not proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Obtain review and approval of rough grade by Landscape Architect before beginning planting bed preparation.
- B. Prepare planting beds according to Drawings.
- C. Layout individual tree and shrub locations by either staking or placing plant in the location without planting, and request Landscape Architect review. (Place trees in position for review.) Make minor adjustments as may be requested.

3.03 PLANT MATERIAL INSTALLATION

A. Tree Planting

1. Hand-excavate tree pit according to tree planting details. Use of augers is not acceptable. Shape of tree pit must be shallow bowl with gentle sides as indicated, and bottom surface of the tree pit must be roughened by hand tool.
2. Remove container, or bottom of box, and set tree to proper grade position, faced to give the best appearance or relationship to one another and adjacent structures. Remove the side of the box, cleanly cut off broken or frayed roots and cut the sides of the root ball in several locations. Gently roughen rootball sides by hand tool and direct exposed roots out to encourage root growth into tree pit.
3. Place root ball staking according to the Drawings.
4. Place backfill, including Fertilizer thoroughly blended into backfill soil at 1 oz. per gallon size of tree, around the ball and carefully compact to avoid injury to the roots and to fill any voids. After backfilling pit 2/3 full, thoroughly soak backfill with water and allow settling. After the water has been absorbed, fill the pit with backfill and tamp lightly to grade. Form a watering basin of the size indicated on the drawings.
5. Prune, thin out, and shape trees in accordance with standard horticultural practice. Prune trees to retain required height and spread. Unless otherwise directed by the Landscape Architect, do not cut tree leaders, and remove only injured or dead branches from flowering trees. Remove and replace excessively pruned or malformed stock resulting from improper pruning.
5. Liquid Tree Injection: inject ½ gallon per caliper inch into the root ball.
6. Carbon Mix: Spread 5 lbs. of SGTX Hi-Carbon Mix on the surface of the tree pit soil, under the mulch topdressing.
7. Fungal/Bacterial Extract: 2 weeks after planting, drench foliage and soil surface with extract.

B. Shrub, Ground Cover, and Herbaceous Planting

1. Apply Mineral Mix to rough grade at a rate of 4 lbs. per 1,000 square feet before placing bed soil.
2. Prepare planting beds using specified soil. Fine grade beds, leaving edges 1" below adjacent tops of curbs or walks, and assuring positive drainage away from buildings.
3. Apply Fertilizer at a rate of 40 lbs. per 1,000 s.f. and mix thoroughly into bedding soil and top 2 inches of subgrade.
4. Apply Hi-Carbon Mix to finished bedding soil surface at a rate of 5 lbs. per 1,000 square feet.
5. Apply Liquid Compost Extract to bed soil surface at 5 gallons per 1,000 s.f.
6. Place plants in position within bed areas before containers have been removed. Obtain the approval from the Landscape Architect before planting. The Landscape Architect reserves the right to interchange plants prior to planting.
7. Plant plants in approved positions, setting plants with tops of root balls even with finish grade. Roughen rootball sides by hand tool to cut encircling roots and to direct roots out into the surrounding soil. Compact soil carefully around each root ball and water each plant thoroughly to eliminate air pockets.
8. Two weeks after planting, drench all plants and mulch surface with Fungal / Bacterial Extract.
9. Planting Bed Preparation – Under canopy of existing tree
 - a. Remove temporary mulch for root zone protection
 - b. Hand-Rake soil to loosen surface to about ½" depth
 - c. DO NOT ROT0-TILL THIS AREA
 - d. Place 1" layer of Planting Bed soil and fine grade
 - e. Apply amendments as described above.
 - f. Plant and place mulch topdressing as specified.

3.05 TREE STAKING

- A. Staking shall be completed as shown on the Drawings, immediately after planting.

3.07 MULCHING

- A. Place mulch in bed areas as indicated in the Drawings.

3.08 CLEAN UP AND REPAIR

- A. Paved areas over which hauling operations have been conducted shall be cleaned and kept clean. Promptly remove materials spilled on pavements.
- B. Restore/repair all site areas and improvements damaged as a result of landscape work.
- C. Remove all plant tags, and clean plants from the mulching operation.

END OF SECTION

SECTION 04200

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:

1. Brick unit masonry
2. Masonry waste disposal

1.02 SUBMITTALS & MOCKUPS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each different masonry unit, accessory, and other manufactured products specified.

C. Samples for verification of the following:

1. Full-size units for each different exposed masonry unit required showing the full range of exposed color, texture, and dimensions to be expected in the completed construction.
2. Accessories embedded in the masonry.

D. Material certificates for the following, signed by manufacturer and Contractor, certifying that each material complies with requirements.

1. Each different cement product required for mortar and grout, including name of manufacturer, brand, type, and weight slips at time of delivery.
2. Each type and size of anchors, ties, and metal accessories.

E. Material test reports from a qualified independent testing agency, employed and paid by Contractor or manufacturer, indicating and interpreting test results relative to compliance of the following proposed masonry materials with requirements indicated:

1. Mortar complying with property requirements of ASTM C 270.
2. Grout mixes. Include description of type and proportions of grout ingredients.

F. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

G. Mock-Ups: Refer to Drawings.

1.03 QUALITY ASSURANCE

A. Contractor Qualifications:

1. Vertical (walls) shall be contracted to a single company with comparable experience for at least five (5) years.

B. Single-Source Responsibility for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one source and by a single supplier for each different product required.

C. Single-Source Responsibility for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source or producer for each aggregate.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store stone masonry units on elevated platforms, under cover, and in a dry location to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, and other causes. If units become wet, do not install until they are in an air-dried condition.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.05 PROJECT CONDITIONS

A. Protection of Masonry: During erection, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.

~~2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.~~

B. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and mortar splatter by coverings spread on ground and over wall surface.

2. Protect sills, ledges, and projections from mortar droppings.

C. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg F and above.

PART 2 - PRODUCTS

2.01 MANUFACTURERS/SUPPLIERS

~~A. Concrete masonry unit: CMU shall be provided by manufacturer that provides products that comply with requirements indicated in the Drawings.~~

B. Portland Cement, Mortar Cement, Masonry Cement, and Lime:

1. Essroc Materials, Inc.
2. Glen-Gery Corporation.
3. Lafarge Corporation.
4. Lehigh Portland Cement Co.
5. Riverton Corporation (The)

C. Brick: Refer to Drawings

D. Joint Reinforcement, Ties, and Anchors:

1. Dur-O-Wal, Inc.
2. Heckman Building Products, Inc.
3. Hohmann & Barnard, Inc.
4. Masonry Reinforcing Corp. of America.
5. National Wire Products Industries.
6. Southern Construction Products.

2.02 NOT USED

~~2.03 CONCRETE MASONRY UNITS~~

~~A. ASTM C90, hollow load bearing type, light weight, Type I Moisture Controlled~~

~~B. Size: As indicated in Drawings, plus other sizes as required to achieve indicated shapes and sizes indicated.~~

2.03 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

B. Hydrated Lime: ASTM C 207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207.

1. For pigmented mortars, use colored portland cement-lime mix of formulation required to produce color indicated, or if not indicated, as selected from manufacturer's standard formulations. Pigments shall not exceed 10 percent of portland cement by weight for mineral oxides nor 2 percent for carbon black.

D. Aggregate for Mortar: ASTM C 144; except for joints less than 1/4 inch, use aggregate graded with 100 percent passing the No. 16 sieve.

1. White-Mortar Aggregates: Natural white sand or ground white stone.

E. Ready-Mixed Mortar: Cementitious materials, water, and aggregate complying with requirements specified in this Article; combined with set-controlling admixtures to produce a ready-mixed mortar complying with ASTM C 1142.

F. Water: Potable.

2.04 TIES AND ANCHORS, GENERAL

A. General: Provide ties and anchors specified in subsequent articles that comply with requirements for metal and size of this Article, unless otherwise indicated.

B. Wire: As follows:

1. Galvanized Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 coating.
2. Wire Diameter: 0.25 inch.

C. Steel Sheet: As follows:

1. Galvanized Steel Sheet: ASTM A 526, G 60 (commercial quality), steel sheet zinc coated by hot-dip process on continuous lines prior to fabrication, for sheet-metal ties and anchors in interior walls and in exterior walls when completely embedded in mortar.
2. Galvanized Steel Sheet: ASTM A 366 (commercial quality) cold-rolled, carbon-steel sheet hot-dip galvanized after fabrication to comply with ASTM A 153, Class B-2 or B-3, as applicable, for sheet-metal ties and anchors in exterior walls not completely embedded in mortar and grout.

D. Galvanized Steel Sheet Thickness: For steel sheet hot-dip galvanized by continuous process prior to fabrication:

1. 0.1084 inch.

E. Thickness of Steel Sheet Galvanized After Fabrication: Uncoated thickness of steel sheet for hot-dip galvanizing after fabrication:

1. 0.1046 inch.

F. Reinforcing Bars: ASTM A615/615M, deformed billet steel, Grade 40 or 60

2.05 MASONRY CLEANERS

A. Job-Mixed Detergent Solution: Solution of 1/2-cup dry measure tetrasodium polyphosphate and 1/2-cup dry measure laundry detergent dissolved in 1 gal. of water.

B. Proprietary Acidic Cleaner: Manufacturer's standard-strength, general-purpose cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry surfaces of type indicated below without discoloring or damaging masonry surfaces; expressly approved for intended use by manufacturer of masonry units being cleaned.

2.06 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Add cold-weather admixture (if used) at the same rate for all mortar, regardless of weather conditions, in order to ensure that mortar color is consistent.

B. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification, for job-mixed mortar; and ASTM C 1142 for ready-mixed mortar, of types indicated below:

1. Limit cementitious materials in mortar to portland cement and lime.
2. Use type indicated below:
 - a. Type: S.

2.07 SOURCE QUALITY CONTROL

A. The Owner MAY employ and pay a qualified independent testing agency to perform the following testing for source quality control. Retesting of materials failing to meet specified requirements shall be done at Contractor's expense.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of unit masonry. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

- A. Thickness: Build cavity and composite walls and other masonry construction to the full thickness shown. Build single-wythe walls to the actual thickness of the masonry units, using units of thickness indicated.
- B. Build chases and recesses to accommodate items specified in this and other Sections of the Specifications.
- C. Leave openings for equipment to be installed before completion of masonry. After installing equipment, complete masonry to match construction immediately adjacent to the opening.
- D. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining construction. Use full-size units without cutting, where possible. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- E. Mix units for exposed unit masonry from several pallets or cubes as they are placed to produce uniform blend of colors and textures.
- ~~F. Wetting of Stone Masonry Units: Wet brick prior to laying if the initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb the water so they are damp but not wet at the time of placement.~~
- G. Horizontal Reinforcement:
1. Place reinforcement at maximum 16" o.c. vertically, at topmost course, and at first two courses above and below openings.
 2. Extend minimum 24" each side of openings
 3. Center reinforcing in wall
 4. Lap ends 6" minimum; use fabricated tee and corner fittings at corners and intersections
- H. Control Joints:
1. Refer to Drawings for locations of Joints
 2. Keep joints free from mortar and grout
 3. Install joint backing and joint sealer at control joints
- I. Reinforcing Bars:
1. Position bars accurately and hold securely in place. Maintain 1" minimum clearance from masonry members.
 2. Grout at intervals of not more than 60" in 6 to 8 inch lifts
 3. Vibrate grout during and after placement to ensure complete filling
 4. Stop grout 1-1/2" below top of masonry if grouting is stopped for 1 hour or more, except where completing grouting of finished wall.
- J. Weeps:
1. Locate in head joints in first course above finished grade, except where specifically indicated differently in Drawings.

2. Locate at maximum of 32" on center.
3. Set weeps flush with exterior face of masonry.
4. Maintain weeps free of grout and mortar.

3.03 CONSTRUCTION TOLERANCES

A. Variation from Plumb: For vertical lines and surfaces, do not exceed 1/4 inch in 10 feet, nor 3/8 inch in 20 feet, nor 1/2 inch in 40 feet or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4 inch in 20 feet, nor 1/2 inch in 40 feet or more. For vertical alignment of head joints, do not exceed plus or minus 1/4 inch in 10 feet, nor 1/2 inch maximum.

B. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed 1/4 inch in 20 feet, nor 1/2 inch in 40 feet or more. For top surface of bearing walls, do not exceed 1/8 inch in 10 feet, nor 1/16 inch within width of a single unit.

C. Variation of Linear Building Line: For position shown in plan and related portion of columns, walls, and partitions, do not exceed 1/2 inch in 20 feet, nor 3/4 inch in 40 feet or more.

D. Variation in Cross-Sectional Dimensions: For columns and thickness of walls, from dimensions shown, do not exceed minus 1/4 inch nor plus 1/2 inch.

E. Variation in Mortar-Joint Thickness: Do not vary from bed-joint thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch. Do not vary bed-joint thickness from bed-joint thickness of adjacent course by more than 1/8 inch. Do not vary from head-joint thickness indicated by more than plus or minus 1/8 inch. Do not vary head-joint thickness from adjacent head-joint thickness by more than 1/8 inch. Do not vary from collar-joint thickness indicated by more than minus 1/4 inch or plus 3/8 inch.

3.04 LAYING MASONRY

A. Lay out walls or columns in advance for accurate spacing of surface bond patterns with uniform joint widths and for accurate locating of openings, movement-type joints, returns, and offsets. Avoid the use of less-than-half-size units at corners, jambs, and where possible at other locations.

B. Lay walls or columns to comply with specified construction tolerances, with courses accurately spaced and coordinated with other construction.

C. Bond Pattern for Exposed Masonry: Lay exposed masonry in the following bond pattern; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

1. One-half running bond with vertical joint in each course centered on units in courses above and below.

D. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

E. Stopping and Resuming Work: In each course, rack back 1/2-unit length for one-half running bond or 1/3-unit length for one-third running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly if required, and remove loose masonry units and mortar prior to laying fresh masonry.

F. Built-in Work: As construction progresses, build-in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.

3.05 MORTAR BEDDING AND JOINTING

A. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not furrow bed joints or slush head joints.

B. Tool exposed joints to achieve joint shape indicated in the Drawings.

C. Cut joints flush for masonry walls that are to receive plaster or other direct-applied finishes (other than paint), unless otherwise indicated.

3.06 ANCHORING MASONRY TO STRUCTURAL MEMBERS

A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:

1. Provide an open space not less than 1 inch in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar or other rigid materials.
2. Anchor masonry to structural members with flexible anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.07 NOT USED

3.08 FIELD QUALITY CONTROL

A. The Owner MAY employ and pay a qualified independent testing agency to perform the following testing for field quality control. Retesting of materials failing to meet specified requirements shall be done at Contractor's expense.

B. Testing Frequency: Tests and Evaluations listed in this Article will be performed during construction for each 5000 sq. ft. of wall area or portion thereof.

C. Mortar composition and properties will be evaluated per ASTM C 780.

D. Evaluation of Quality-Control Tests: In the absence of other indications of noncompliance with requirements, masonry will be considered satisfactory if results from construction quality-control tests comply with minimum requirements indicated.

3.09 REPAIRING, POINTING, AND CLEANING

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

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point-up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for application of sealants.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears prior to tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Consultant's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
4. Wet wall surfaces with water prior to application of cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
5. Clean brick by bucket and brush hand-cleaning method described in BIA Technical Note No. 20 Revised, using one of the following masonry cleaners:
 - a. Job-mixed detergent solution.
 - b. Proprietary acidic cleaner, applied in compliance with directions of acidic cleaner manufacturer.

E. Protection: Provide final protection and maintain conditions that ensure unit masonry is without damage and deterioration at time of Substantial Completion.

3.10 MASONRY WASTE DISPOSAL

A. Recycling: Undamaged, excess masonry materials are Contractor's property and shall be removed from the Project site for his use.

B. Excess Masonry Waste: Remove excess, clean masonry waste that cannot be used as fill, as described above and other masonry waste and legally dispose of off Owner's property.

END OF SECTION

SECTION 02500

PART 1 - GENERAL

1.01 SUMMARY

- A. This Work of this Section shall include:
Fabrication and Installation of:
Railings, Fences and Gates

1.02 SUBMITTALS

- A. Shop Drawings: complete, measured shop drawings are required for metal fabrication items.

1.03 QUALITY ASSURANCE

- A. Contractor Qualifications:
 - 1. Fabrication work of this Section shall be contracted to a single company with comparable experience for at least five (5) years.
- C. Standards: Except where modified or exceeded by this Specification, conform to applicable sections of ASTM 123. Refer to Structural Specification for additional standards.
- D. Comply with governing codes and regulations. Provide fabricated products of acceptable manufacturers which have at least 5 years successful experience producing products of a similar nature.
- E. Consultant may review components during fabrication at location of fabrication. Review during fabrication does not relieve Contractor of responsibility to provide metal fabrications that fully meet the requirements of the contract documents.
- F. Uniformity: Care is to be taken to ensure uniformity of color and finishes.
- G. Relations with other Trades: Coordinate schedule requirements related to placement of concrete footings, foundations and beams. Coordinate requirements related to on-site measurement required for proper fabrication of metal components.

PART 2 - MATERIALS

2.01 STEEL

- A. Steel pipe, tubing, plate, mesh, rods, angles and shapes per the Drawings.

- B. All steel is to be black steel, which will be hot-dip galvanized after fabrication, except where otherwise noted in the Drawings.
 - C. Hot-dip galvanizing shall conform with ASTM A123 / A 123M, latest edition.
- 2.02 ALUMINUM: shall be 6061 extruded aluminum components.

2.03 FASTENERS

- A. Furnish all bolts, nuts, screws, clips, washers, and any other fasteners necessary for proper installation of items specified herein and in the Drawings, of a material compatible with the related metal fabrication.
- B. Steel fasteners are to be hot-dip galvanized in conformance with ASTM A153, latest edition. Refer to Drawings for additional information.

PART 3 - EXECUTION

3.01 SURVEY AND FIELD MEASUREMENT

- A. Contractor is responsible to make accurate field measurements required for preparation of accurate Shop Drawings and fabrication of members that fit together accurately in the field.

3.02 FABRICATION

- A. Metal fabrications are to be high quality, finely crafted, with true lines, angles and curves as specified. Joints are to be tight and uniform. All angles are to be true 90 degrees unless designated otherwise. No deformities in shape, line or finish may be visible from 10' away.
- B. All materials are to be new, in good condition.
- C. Welds normally exposed to view in the finished work shall be uniformly mad and shall be ground smooth as much as possible within conformance with structural requirements.
- D. Refer to the Drawings for additional fabrication requirements and paint finish.

3.03 SHIPPING

- A. Coordinate schedule for shipping so that metal fabrications are not stored on-site any longer than necessary.

- B. Metal fabrications shall be shipped in such a manner as to prevent damage to the components. Provide adequate protection and bracing during loading, shipping and unloading.

3.04 INSTALLATION

- A. Metal fabrications are to be transported on-site and handled in a manner that prevents damage to the components. Contractor shall be responsible for providing equipment capable of moving, lifting and placing components without damage to the components, to surrounding improvements or vegetation.
- B. All metal fabrications are to be installed and assembled using connections indicated in the Drawings. Minimize field welding to those connections that are absolutely necessary. Components that do not fit or connect as specified shall be returned to the fabrication shop for modification and hot-dip galvanizing.

3.05 PROTECTION

- A. After installation of metal fabrications, the Contractor shall protect them in-place for the duration of construction, as required to prevent damage by equipment or personnel during other operations. The Contractor shall be responsible for determining best sequencing of operations to prevent damage. Metal components that are damaged prior to Substantial Completion are subject to rejection during construction or at completion of construction; if rejected, they must be removed and replaced.

END OF SECTION