

TECHNICAL SPECIFICATIONS

**Land Between the Tracks
Commerce Center
Vail School District
13105 Colossal Cave Rd.
Vail, Arizona 85641**



EXPIRES 9-30-2024

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SECTION 32 0180 – OPERATION AND MAINTENANCE OF LANDSCAPE AND IRRIGATION

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

- A. The work shall consist of furnishing all labor, tools, motorized and non-motorized equipment, vehicles, appliances, materials, permits, insurance, and taxes as necessary to execute complete grounds maintenance of the entire park project. The work shall include, but not necessarily be limited to, the following work:
 - 1. Litter Control
 - 2. Weed Control
 - 3. Pest and Disease Control
 - 4. Rodent Control
 - 5. Irrigation System Maintenance
 - 6. Plant Replacement
 - 7. Pruning
 - 8. Sweeping and Washing of Sidewalks, Curbs, Paving, Tables and Benches.
 - 9. Cleaning and Raking of Planting and Field Areas
 - 10. Temporary Protection

1.2 MAINTENANCE PERIOD

- A. Site maintenance begin at contractors' control of site and continues through acceptance of agency and owner approval of substantial completion of all site work including demolition, grading, hardscape, landscape, irrigation, and site finishes.
- B. The maintenance period shall be three hundred sixty-five (365) days from substantial completion acceptance letter for site work. Unless otherwise approved in writing with school district.

- C. Contractor shall remove invasive species weekly until turned over to school district.

1.3 MAINTENANCE ACTIVITY

- A. Maintenance shall be performed a minimum of one time per week. Work which the Contractor fails to do when necessary, during the maintenance period may be performed by others as directed by the Owner's Representative, the cost to be borne by the Contractor.
- B. Weekly Maintenance Report. Contractor/ maintenance foreman shall perform weekly site walks and provide weekly summary reports of maintenance completed. Summary shall include the following information for all reports: Company name and contact information, Maintenance foreman, day work performed, weather conditions, vegetation conditions, site components.

1. Weekly Report:

Identify any site concerns and damage: rodents, insects, plant decline and damage, etc., controller settings, review of each remote-control valve box, emitting devices, rotor and sprinkle heads and potential leaks from observation of site walk.

2. Quarterly Report shall include item 1 above and review of running irrigation system from manual settings from controller (NOT FROM THE VALVE) and identify any leaks. Adjust controller settings for seasonal needs, review of understory vegetation per species and possible concerns, treatment and recommend care and treatment.

3. Annual Report shall include: all items from 1 and 2 and review of tree conditions, proposed trimming per tree, if necessary, securing of soil for soil test and findings for amendments and treatment, hardscape conditions identifying possible issues and site furnishings.

- C. Maintenance Foreman shall have 3-years' experience in general site maintenance with knowledge of all plant species found on site, irrigation controller and programming, and irrigation components. Additional preferences to include arborist certification, master gardener, university flora and fauna certificates, irrigation certifications, and other items identified specific project conditions.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Materials for irrigation and landscaping maintenance shall be as specified in the irrigation and landscaping sections, respectively. Materials shall not be used until they have been approved by the Owner's Representative who shall have the power to condemn any material or defective workmanship.

PART 3 - EXECUTION

3.1 TREE SUPPORTS

- A. Maintain tree support ties, hoses, guy wires, tree stakes and wires which maintain upward and proper support of the trees. Protect the trees from wind and storm damage. Allow for movement of the trunks to encourage strong growth of trunks.
- B. Tree supports and ties should be removed after 2-year period from installation unless otherwise identified as a concern or issue with self-support.

3.2 LITTER REMOVAL AND CLEAN UP

- A. All litter and dead vegetation which is loose shall be removed from the entire project site at intervals not to exceed seven (7) calendar days.
- B. Contractor shall clean concrete curbs, sidewalks, and other paving by sweeping, vacuum, blower, etc.as necessary on a weekly basis.
- C. Contractor shall clean site furnishings by hosing down, manual treatment means or approved equivalent as necessary on a weekly basis.

3.3 WEED CONTROL

- A. Weed control shall be provided over the entire project site through the use of herbicides and manual labor, which method or methods shall be at the discretion of the Contractor. Grass type weeds and other weeds which spread by underground roots shall be permanently eradicated by the use of translocating herbicides.
- B. Herbicides employed during the term of the maintenance period shall not cause the extermination of any landscape plant nor have detrimental side effects.
- C. No chemical shall stain or cause to stain, nor cause damage to any portion of the site or improvements, including landscape plant material. If staining or

damage occurs, requisite repairs or replacements shall be made by the Contractor at his expense.

- D. A record shall be kept of all chemical applications noting the date applied, location of application, rate of application, whether pre-emergent or post-emergent, and method of application. A copy shall be submitted to the Owner's Representative at the end of the maintenance period.
- E. Applications of chemicals shall be in such a manner so as not to cause injury to the personal health of anyone working on the site, observing, or passing by. Care shall be taken such that no puddles or pools of water which contain toxic amounts of chemicals remain after completion of operations. Chemicals shall not be allowed to fall on or translocate to other areas of the site.
- F. Chemicals shall be approved by the EPA for the intended use and applied in strict accordance with EPA guidelines and the manufacturer's instructions. Chemicals shall be applied by an individual with proper training and possessing the required licenses and certifications for applying herbicides and other chemicals in the State of Arizona.

3.4 PEST AND DISEASE CONTROL

- A. All landscape plants and turf grass shall be provided protection which shall include, but not be limited to, eradication or control of insects, mites, fungi, and non-fungus diseases through the application of appropriate insecticides, miticides, and fungicides, which shall in form be sprays or dusts, all necessary to maintain plants in a healthy and vigorous growing condition.
- B. All insecticides, fungicides, and miticides employed during the term of the Contract shall not cause extermination of any landscape plant material, nor cause damage to the growth characteristics such that the plants will not be able to recover in a normal manner.
- C. All precautionary provisions of paragraph "Weed Control" shall apply to the application of pest and disease control chemicals.

3.5 PRUNING, MOWING AND TURF HEDGING

- A. Pruning of plants shall be done in a manner which preserves the plant's natural growth characteristics and appearance. No shearing will be required or allowed. Any plant sheared, hedged or manipulated shall be replaced with like species and size indicated on the approved plans.
- B. Trees shall be evaluated for trimming and noted within the report. Trees identified for trimming or pruning shall be treated in manor to promote plant

overall growth and development. Remove suckers and low branching shall not exceed 1/3 to 2/3 lifting rule to minimize trunk damage. Thin internal canopy and cross branching. Maintain tree branching above 6' in the sight visibility triangles when obstructing view and to promote safety. Trees shall be pruned up to allow clear access for pedestrians on sidewalks approximately 8' or as identified within the approved plans. Dead or diseased branches shall be removed at their point of origin. Remove all mistletoe upon observation.

- C. Shrubs and accent plants generally will not require any pruning. Pruning shall only be done to remove dead, diseased, or damaged branches and to control branches which are substantially longer than the main portion of the plant or that create a hazard. As identified within the landscape plans, shrubs and accents may require quarterly to yearly treatment as identified by maintenance foreman and approval of the owner's representative.
- D. Cut grass to maintain a uniform depth of 1 inch. Edge along walks, concrete headers to control runners. All grass clipping shall be collected and hauled off site.

3.6 INERTS

- A. Decorative rock areas shall be raked to maintain a finished appearance where disturbed. Replace decorative rock, which is removed, damaged or otherwise no longer suitable for the use in which it was intended.
- B. Raked earth areas shall be raked to maintain a finished appearance where disturbed.
- C. Apply pre-emergent weed deterrent to all rock areas once a year.

3.7 PLANT REPLACEMENT

- D. All landscape plant material determined by the Owner's Representative to possess health or vigor insufficient to develop a normal plant habit shall be replaced by the Contractor within seven (7) calendar days after receipt of notification.
- E. Replacements shall be of the same genus, species, and variety and of the same size as originally provided. Such replacements shall be at the expense of the Contractor and be subject to the approval of the Owner's Representative.
- F. Replacement at the Contractor's expense shall be occasioned due to causes beyond the control of the Contractor such as, but not limited to, vandalism, and unseasonably severe either condition. Contractor shall repair damaged areas due to circumstances beyond the Contractor's control, after submitting request

for change order and obtaining approval for same from the Owner's Representative.

3.9 IRRIGATION

- A. Irrigation shall be operated at programmed intervals as necessary to maintain good color and sturdy growth of all plant material.
- B. Precautions shall be taken to avoid soil erosion by the irrigation system. Soil eroded by the irrigation system shall be replaced with topsoil conforming to the landscape specifications.
- C. The entire irrigation system shall be maintained by the Contractor to insure balanced and necessary watering. This maintenance shall include, but not be limited to:
 - 1. Removal of sand and debris causing restriction within the emitter orifices.
 - 2. Flushing of drip system filters and the reclaimed water filter at the irrigation point-of-connection as required to remove debris.
 - 3. Necessary timing adjustments to the automatic controller(s), as provided within the mechanism of the equipment.
 - 4. Adjustment of turf sprayheads to maintain efficient, uniform application of water to turf areas.
 - 5. Adjusting sprayheads to minimize overspray onto adjacent paved surfaces and other non-turf areas.
 - 6. Repair or replacement of damage caused by the Contractor. All such repairs or replacements shall be subject to the approval of the Owner's Representative.

3.10 RODENT CONTROL

- A. Rodents, especially burrowing rodents, shall be controlled on the entire project site by the Contractor, using methods approved by the Owner's Representative. Control methods shall safeguard the public from tripping and falling hazards from rodent burrows, rodent spread diseases, etc.

3.11 CONTRACTOR'S RESPONSIBILITY

- A. This Contractor shall be bound by all requirements of the General Conditions and Specifications which in any way apply to his work.

- B. The Contractor shall not be held responsible for any damages effected on or within the project site due to accidental or malicious causes by the public, or an "Act of God". It shall be the responsibility of the Contractor to inform the Owner's Representative of any damage due to the aforementioned causes as soon as detected.

3.12 INSPECTIONS

- A. The Owner's Representative, accompanied by the Contractor, may inspect the site up to twelve (12) times during maintenance period and at its expiration; and at other times when deemed necessary by the Owner's Representative or Contractor. When, in the opinion of the Owner's Representative, the methods being used to control or eradicate pests and weeds or perform other maintenance functions are unsatisfactory, Contractor shall immediately modify his methods, as directed by the Owner's Representative. Final acceptance of the project shall be granted after satisfactory completion of the Maintenance period, replacement of all plant material lost, turnover of controller programming, certificates of applied weed treatment, rodent treatment, weekly, quarterly, annual report and as-built documentation.

END OF SECTION

SECTION 32 1540 – CRUSHED STONE SURFACING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Treat areas designated to receive decorative rock, size rock, and decomposed granite, extra, with pre-emergent herbicide.
- B. Furnish and Place Decorative Rock, Sized Rock, Decomposed Granite Riprap, extra in areas designated to receive inert materials.

1.3 CONDITIONS

- A. Examine related work and surfaces before starting work on this Section. Report to the Owner's Representative, in writing, conditions which will prevent proper provision of this work. Beginning work of this Section without reporting unsuitable conditions to the Architect constitutes acceptance of conditions by Contractor. Any required removal, repair, or replacement shall be done at no additional cost to the Owner.

1.4 SUBMITTALS

- A. Submit samples of the inert materials for each type of inert material proposed along with copies of labels of any pre-emergent herbicides to the Architect for approval prior to beginning work under this section.
- B. Submit quantity invoices or bills of lading for verification of volumes and quantities of material prior to construction for approval by the Architect. Omission of verification will constitute grounds for non-acceptance of any material or procedure.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Place Decorative Rock, Sized Rock, Decomposed Granite Riprap extra for landscape areas shall be size indicated on plans; color to be submitted to the Owner's Representative for review and approval.

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- B. Pre-Emergent Herbicide shall meet all applicable local, State and Federal environmental and labeling laws. Under no conditions shall a soil sterilant be used on the site. Product shall be Surflan.

PART 3 – EXECUTION

3.1 PREPARATION

- A. Remove all weeds and debris from the areas designated for place decorative rock, sized rock, decomposed granite riprap.
- B. Verify subgrade elevations are accurate to allow the addition of 2" of material in landscape areas. If grade is too high, excavate and remove material.
- C. Verify subgrade elevations are accurate to allow the addition of "x" depth of material in riprap and other areas. If grade is too high, excavate and remove material. Grades shall be concaved to collect drainage toward center of swales and water collection areas.
- D. Smooth subgrade and remove all rocks, clods, roots or other debris larger than 1/2" in diameter.
- E. Apply pre-emergent herbicide in conformance with the manufacturer's instructions.

3.2 INSTALLATION IN LANDSCAPE AREAS

- A. Install decorative rock, sized rock, and decomposed granite, rip-rap extra to a depth of X" minimum or as specified on the plans.
- B. Finish grade of material shall be 1" below adjacent hardscape surface.
- C. Swales and water collection areas shall be concaved to collect water within central flow.
- D. Re-apply pre-emergent herbicide in accordance with the manufacturer's instructions.

3.4 CLEAN UP

- A. Upon completion of the work, remove all excess material, equipment and waste to the satisfaction of the Architect.

END OF SECTION

SECTION 32 15 45 - STABILIZED AGGREGATE SURFACING

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes material and labor requirements for construction with Decomposed granite or crushed 3/8-inch or 1/4-inch minus aggregate paving with Stabilizer binder additive for the following items:
1. Stabilized aggregate pathway and patios.

1.02 PERFORMANCE REQUIREMENTS

- A. Perform gradation of decomposed granite material or 3/8-inch or 1/4-inch minus crushed aggregate in accordance with ASTM C 136 – Method for Sieve Analysis for Fine and Course.

1.03 SUBMITTALS

- A. Products Data: For each product specified. Submit a 5 lb. sample and sieve analysis for grading of decomposed granite or crushed 3/8-inch or 1/4-inch minus aggregate to be sent to Stabilizer Solutions, Inc. prior to any construction – allow 2-week turn around. Must be approved by Architect.
- B. Shop Drawings: Show details of installation, including plans and sections.

1.04 PROJECT/SITE CONDITIONS

- A. Field Measurements: Each bidder is required to visit the site of the Work to verify the existing conditions. No adjustments will be made to the Contract Sum for variations in the existing conditions.
1. Where surfacing is indicated to fit with other construction, verify dimensions of other construction by field measurements before proceeding with the work.
- B. Environmental Limitations: Do not install decomposed granite or crushed 3/8-inch or 1/4-inch minus aggregate paving during rainy conditions or below 40 degrees Fahrenheit and falling.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: All work under this section shall be done by a licensed landscape contractor with a minimum of 5-years experience in Arizona. Installer to provide evidence to indicate successful experience in providing decomposed granite paving containing stabilizer binder additive. Sub-contractor shall submit documentation showing completion of similar projects indicating successful experience in providing decomposed granite or crushed 3/8-inch or 1/4-inch minus

aggregate paving containing Stabilizer binder additive with references for review by material supplier and Architect.

- B. Mock-ups: Install 4 ft. wide x 10 ft. long mock-up of decomposed granite or 3/8-inch or 1/4-inch minus crushed aggregate paving with Stabilizer additive at location as directed by architect.

1.06 WARRANTY

- A. General Warranty: The special warranty specified in this Article shall not deprive the Government of other rights the Government may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Warranty: Submit a written warranty executed by the installer agreeing to repair or replace components of stabilized surfacing that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, the following:
 - 1. Premature wear and tear provide the material is maintained in accordance with manufacturer's written maintenance instructions.
 - 2. Failure of system to meet performance requirements.
- C. Warranty Period: Contractor shall provide warranty for performance of product. Contractor shall warranty installation of product for the time of one year from completion.
- D. Contractor shall provide, for a period of 60-days, unconditional maintenance and repairs as required.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Stabilizer for crushed stone surfaces provided by the following manufacturer or approved equal:
 - 1. Stabilizer Solutions, Inc. 205 South 28th St., Phoenix, AZ 85034; phone (602) 225-5900, (800) 336-2468; fax (602) 225-5902; website stabilizersolutions.com;

2.02 MATERIALS

- A. Decomposed Granite or 3/8-inch or 1/4-inch crushed aggregate screenings
 - 1. Crushed Stone Sieve Analysis Percentage of Weight Passing a Square Mesh Sieve AASHTO T11-82 and T27-82

1/4" MINUS AGGREGATE GRADATION

U.S. Sieve No.	Percent Passing by Weight
# 3/8"	100
# 4	90 – 100
# 8	75 – 80
# 16	55 – 65
# 30	40 – 50
# 50	25 – 35
# 100	15 – 20
# 200 to	10 – 15

2. Acceptable local supplier list to be provided by Architect.

B. Stabilized Binder

1. Patented, non-toxic, organic binder that is a colorless and odorless concentrated powder that binds decomposed granite or crushed 3/8-inch or 1/4-inch minus aggregate.

2.03 EXCESS MATERIALS

A. Provide architect with the following excess materials for use in future decomposed granite or 3/8-inch or 1/4-inch minus crushed aggregate paving repair: 40 to 50 lb. Bags of the aggregate paving blended with proper amount of Stabilizer.

PART 3 - EXECUTION

3.01 BLENDING STABILIZER

A. Blend 20 lbs. of Stabilizer per 1-ton of decomposed granite or crushed 3/8-inch or 1/4-inch minus aggregate screenings. It is critical that Stabilizer be thoroughly and uniformly mixed throughout decomposed granite or crushed 3/8-inch or 1/4-inch minus aggregate screenings.

3.02 PLACEMENT

A. After pre-blending, place the Stabilized decomposed aggregate or 3/8-inch or 1/4-inch crushed aggregate screenings on prepared sub-grade. Level to desired grade and cross section.

B. Depth of pathways – 3" for heavy foot traffic and light vehicles.

3.03 WATERING

A. Water heavily to achieve full depth moisture penetration of the Stabilized surface and pathway Profile. Water activates Stabilizer. To achieve saturation of Stabilized

surface and pathway Profile, 25 to 45 gallons of water per 1-ton must be applied. During water application randomly test for depth using a probing device to the final depth.

3.04 COMPACTION

- A. Upon thorough moisture penetration, compact aggregate screenings to 85% relative compaction by compaction equipment such as a 2 to 4-ton double drum roller or a 1,000 lb. Single drum roller with vibratory plate tamp. Do not begin compaction for 6 hours after placement and up to 48 hours.
- B. Take care in compacting decomposed granite or crushed 3/8-inch or 1/4-inch minus aggregate screenings when adjacent to planting and irrigation systems. Hand tamping with 8" or 10" hand tamp recommended.

3.05 INSPECTION

- A. Finished surface of pathway shall be smooth, uniform and solid. There shall be no evidence of chipping or cracking. Cured and compacted pathway shall be firm throughout profile with no spongy areas. Loose material shall not be present on the surface. Any significant irregularities in path surface shall be repaired to the uniformity of entire installation.

3.06 MAINTENANCE

- A. Remove debris, such as paper, grass clippings, leaves or other organic material by mechanically blowing or hand raking the surface as needed. Any plowing program required during winter months shall involve the use of a rubber baffle on the plow blade or wheels on the plow that lifts the blade 1/4-inch off the paving surface.
- B. During the first year, a minor amount of loose aggregate will appear on the paving surface 1/16-inch to 1/4-inch. If this material exceeds a 1/4-inch, redistribute the material over the entire surface. Water thoroughly to the depth of 1-inch. Compact with power roller of no less than 1000 lbs. This process should be repeated as needed.
- C. If cracking occurs, sweep fines into the cracks, water thoroughly and hand tamp with an 8" – 10" hand tamp plate.

3.07 REPAIRS

- A. Excavate damaged area to the depth of the Stabilized aggregate and square off sidewalls.
- B. If area is dry, moisten damaged portion lightly.
- C. Pre-bend the dry required amount of Stabilizer powder with the proper amount of aggregate in a concrete mixer.
- D. Add water to the pre-blended aggregate and Stabilizer. Thoroughly moisten mix with 25 to 45 gallons per 1-ton of pre-blended material or to approximately 10% moisture content.

- E. Apply moistened pre-blended aggregate to excavated area to finish grade.
- F. Compact with an 8" to 10" hand tamp or 250 to 300-pound roller. Keep traffic off areas for 12 to 48 hours after repair has been completed.

END OF SECTION

SECTION 32 33 13 CONCRETE UNIT PAVING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes

1. Interlocking concrete pavers.
2. Crushed stone bedding material.
3. Open-graded subbase aggregate.
4. Open-graded base aggregate.
5. Bedding and joint/opening filler materials.
6. Edge restraints.
7. Geotextile.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. C 67, Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
2. C 131, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
3. C 136, Method for Sieve Analysis for Fine and Coarse Aggregate.
4. C 140, Test Methods for Sampling and Testing Brick and Structural Clay Tile, Section 8 – Freezing and Thawing.
5. D 448, Standard Classification for Sizes of Aggregate for Road and Bridge Construction.
6. C 936, Standard Specification for Solid Interlocking Concrete Pavers.
7. C 979, Specification for Pigments for Integrally Colored Concrete.
8. D 698, Test Methods for Moisture Density Relations of Soil and Soil Aggregate Mixtures Using a 5.5-lb (2.49 kg) Rammer and 12 in. (305 mm) drop.
9. D 1557, Test Methods for Moisture Density Relations of Soil and Soil Aggregate Mixtures Using a 10-lb (4.54 kg) Rammer and 18 in. (457 mm) drop.
10. D 1883, Test Method for California Bearing Ratio of Laboratory-Compacted Soils.
11. D 4254, Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.

B. Interlocking Concrete Pavement Institute (ICPI)

1. Permeable Interlocking Concrete Pavement manual.

1.03 SUBMITTALS

- A. In accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.
- B. Manufacturer's drawing and details: Indicate perimeter conditions, junction with other materials, expansion and control joints, paver layout, patterns, color arrangement, installation and setting details. Indicate layout, pattern, and relationship of paving joints to fixtures and project formed details.
- C. Minimum 3 lb (2 kg) samples of subbase, base and bedding aggregate materials.
- D. Sieve analysis of aggregates for subbase, base and bedding materials per ASTM C 136.
- E. Soils report indicating density test reports, classification, and infiltration rate measured on-site under compacted conditions, and suitability for the intended project.
- F. Erosion and sediment control plan.
- H. Concrete pavers:
 - 1. Manufacturer's product catalog sheets with specifications.
 - 2. Four representative full-size samples of each paver type, thickness, color, and finish. Submit samples indicating the range of color expected in the finished installation.
 - 3. Accepted samples become the standard of acceptance for the work of this Section.
 - 4. Laboratory test reports certifying compliance of the concrete pavers with ASTM C 936.
 - 5. Manufacturer's material safety data sheets for the safe handling of the specified materials and products.
 - 6. Manufacturer's written quality control procedures including representative samples of production record keeping that ensure conformance of paving products to the project specifications.
- H. Paver Installation Subcontractor:
 - 1. A copy of Subcontractor's current certificate from the Interlocking Concrete Pavement Institute Concrete Paver Installer Certification program.
 - 2. Job references from projects of a similar size and complexity. Provide Owner/Client/General Contractor names, postal address, phone, fax, and email address.
 - 3. Written Method Statement and Quality Control Plan that describes material staging and flow, paving direction and installation procedures, including representative reporting forms that ensure conformance to the project specifications.

1.04 QUALITY ASSURANCE

- A. Paver Installation Subcontractor Qualifications:
 - 1. Utilize an installer having successfully completed concrete paver installation similar in design, material and extent indicated on this project.

2. Utilize an installer holding a current certificate from the Interlocking Concrete Pavement Institute Concrete Paver Installer Certification program.
- B. Regulatory Requirements and Approvals: Per VA requirements for licensing, bonding or other requirements of regulatory agencies.
- C. Review the manufacturers' quality control plan, paver installation subcontractor's Method Statement and Quality Control Plan with pre-construction meeting of representatives from the manufacturer, paver installation subcontractor, general contractor, engineer and/or owner's representative.
- C. Mock-Ups:
 1. Install a 10 ft x 10 ft paver area.
 2. Use this area to determine surcharge of the bedding layer, joint sizes, lines, laying pattern(s), color(s) and texture of the job.
 3. This area will be used as the standard by which the work will be judged.
 4. Subject to acceptance by owner, mock-up may be retained as part of finished work.
 5. If mock-up is not retained, remove and properly dispose of mock-up.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. General: Comply with Division 1 Product Requirement Section.
- B. Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.
- C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged container packaging with identification tags intact on each paver bundle.
 1. Coordinate delivery and paving schedule to minimize interference with normal use of buildings adjacent to paving.
 2. Deliver concrete pavers to the site in steel banded, plastic banded, or plastic wrapped cubes capable of transfer by forklift or clamp lift.
 3. Unload pavers at job site in such a manner that no damage occurs to the product or existing construction
- D Storage and Protection: Store materials in protected area such that they are kept free from mud, dirt, and other foreign materials.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Do not install in rain or snow.
- B. Do not install frozen bedding materials.

1.07 MAINTENANCE

- A. Extra materials: Provide 10% additional material for use by owner for maintenance and repair.
- B. Pavers shall be from the same production run as installed materials.

PART 2 PRODUCTS

- A. Manufacturer: Pavestone or approved equivalent
 - 1. Contact: Border products or approved equivalent
- B. Interlocking Concrete Paver Units:
 - 1. Paver Type: Ackerstone Hollard Stone 160mm
 - a. Material Standard: Comply with ASTM C 936.
 - b. Color: Per Hardscape Legend, Submit samples for approval.
 - c. Color Pigment Material Standard: Comply with ASTM C 979.
 - d. Size: 7-13/16 inches [198mm]] x 3-7/8 inches [98mm] x 2-3/8 inches [60mm] thick.

2.02 PRODUCT SUBSTITUTIONS

- A. Substitutions: No substitutions permitted.

2.03 CRUSHED STONE FILLER, BEDDING, BASE AND SUBBASE

- A. Crushed stone with 90% fractured faces, LA Abrasion < 40 per ASTM C 131, minimum CBR of 80% per ASTM D 1883.
- B. Do not use rounded river gravel.
- C. All stone materials shall be washed with less than 1% passing the No. 200 sieve.
- D. Joint/opening filler, bedding, base and subbase: conforming to ASTM D 448 gradation as shown in Tables 1, 2 and 3 below:

Table 1

ASTM No. 8 Grading Requirements
Bedding and Joint/Opening Filler

Sieve Size	Percent Passing
12.5 mm (1/2 in.)	100
9.5 mm (3/8 in.)	85 to 100
4.75 mm (No. 4)	10 to 30
2.36 mm (No. 8)	0 to 10
1.16 mm (No. 16)	0 to 5

Table 2

ASTM No. 57 Base

Grading Requirements

Sieve Size	Percent Passing
37.5 mm (1 1/2 in.)	100
25 mm (1 in.)	95 to 100
12.5 mm (1/2 in.)	25 to 60
4.75 mm (No. 4)	0 to 10
2.36 mm (No. 8)	0 to 5

E. Gradation criteria for the bedding and base:

1. D_{15} base stone / D_{50} bedding stone < 5 .
2. D_{50} base stone / D_{50} bedding stone > 2 .

2.04 ACCESSORIES

A. Provide accessory materials as follows:

1. Edge Restraints
 - a. Manufacturer: Contractor header/ curb.
 - b. Material: Concrete.
 - c. Material Standard.
2. Geotextile Fabric:
 - a. Material Type and Description: woven polypropylene or equivalent.
 - b. material Standard: .
 - c. Manufacturer: Submit samples acceptable to paver manufacture.

PART 3 EXECUTION

3.01 EXAMINATION

A. Acceptance of Site Verification of Conditions:

1. General Contractor shall inspect, accept and certify in writing to the paver installation subcontractor that site conditions meet specifications for the following items prior to installation of interlocking concrete pavers.
 - a. Verify that subgrade preparation, compacted density and elevations conform to specified requirements.
 - b. provide written density test results for soil subgrade to the Owner, General Contractor and paver installation subcontractor.
 - c. Verify location, type, and elevations of edge restraints, utility structures, and drainage pipes and inlets.

2. Do not proceed with installation of bedding and interlocking concrete pavers until subgrade soil conditions are corrected by the General Contractor or designated subcontractor.

3.02 PREPARATION

- A. Verify that the soil subgrade is free from standing water.
- B. Stockpile joint/opening filler, base and subbase materials such that they are free from standing water, uniformly graded, free of any organic material or sediment, debris, and ready for placement.
- C. Edge Restraint Preparation:
 1. Install edge restraints per the drawings at the indicated elevations.

3.04 INSTALLATION

- A. General
 1. Any excess thickness of soil applied over the excavated soil subgrade to trap sediment from adjacent construction activities shall be removed before application of the geotextile and subbase materials.
 2. Keep area where pavement is to be constructed free from sediment during entire job. Geotextiles Base and bedding materials contaminated with sediment shall be removed and replaced with clean materials.
 3. Do not damage drainpipes, overflow pipes, observation wells, or any inlets and other drainage appurtenances during installation. Report any damage immediately to the project engineer.
- B. Geotextiles
 1. Place on [bottom and] sides of soil subgrade. Secure in place to prevent wrinkling from vehicle tires and tracks.
 2. Overlap a minimum of 0.3 in (12 in.) (24 in.) in the direction of drainage.
- C. Open-graded and base
 1. Moisten, spread and compact No. 57 base in 4 in. lift over the compacted No. 2 subbase with a minimum 10 t (10 T) vibratory roller until there is no visible movement of the No. 57 stone. Do not crush aggregate with the roller.
 2. The surface tolerance the compacted No. 57 base should not deviate more than. ± 1 in. over a 10 ft straightedge.
- D. Bedding layer
 1. Moisten, spread and screed the No. 8 stone bedding material.
 2. Fill voids left by removed screed rails with No. 8 stone.
 3. The surface tolerance of the screeded No. 8 bedding layer shall be $\pm 3/8$ in over a 10

ft straightedge.

4. Do not subject screeded bedding material to any pedestrian or vehicular traffic before paving unit installation begins.
- E. Interlocking concrete pavers and joint/opening fill material
1. Lay the pavers [paving slabs] in the pattern(s) and joint widths shown on the drawings. Maintain straight pattern lines.
 2. Fill gaps at the edges of the paved area with cut units. Cut pavers subject to tire traffic shall be no smaller than 1/3 of a whole unit.
 3. Cut pavers and place along the edges with a double-bladed splitter or masonry saw.
 4. Fill the openings and joints with No. 8 stone.
 5. Remove excess aggregate on the surface by sweeping pavers clean.
 6. Compact and seat the pavers into the bedding material using a low-amplitude, 75-90 Hz plate compactor capable of at least 4,000 lbs (18 kN) centrifugal compaction force. This will require at least two passes with the plate compactor.
 7. Do not compact within 6 ft. of the unrestrained edges of the paving units.
 8. Apply additional aggregate to the openings and joints, filling them completely. Remove excess aggregate by sweeping then compact the pavers. This will require at least two passes with the plate compactor.
 9. All pavers within 6 ft. of the laying face must be left fully compacted at the completion of each day.
 10. The final surface tolerance of compacted pavers shall not deviate more than $\pm 3/8$ under a 10 ft long straightedge.
 11. The surface elevation of pavers shall be 1/8 to 1/4 in. above adjacent drainage inlets, concrete collars or channels.

3.05 FIELD QUALITY CONTROL

- A. After sweeping the surface clean, check final elevations for conformance to the drawings.
- B. Lippage: No greater than 1/8 in. difference in height between adjacent pavers.
- C. The surface elevation of pavers shall be 1/8 to 1/4 in. above adjacent drainage inlets, concrete collars or channels.

3.06 PROTECTION

- A. After work in this section is complete, the General Contractor shall be responsible for protecting work from sediment deposition and damage due to subsequent construction activity on the site.

END OF SECTION

SECTION 32 8423 – PLANTING IRRIGATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Furnish all work and material, appliances, tools, equipment, facilities, transportation, and services necessary for and incidental to performing all operations in connection with the installation of underground sprinkler system complete, as shown on drawings and/or specified herein. When the term "Contractor" is used in this section, it shall refer to the irrigation contractor.

1.2 RELATED DOCUMENTS

- A. Conditions of the contract and Division 1 General Conditions are hereby made a part of this section.

1.3 APPLICABLE STANDARDS

- A. ASTM D2241 - Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR)
- B. D2464 - Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Threaded, Schedule 40
- C. D2564 - Solvent cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings
- D. D2855 - Making Solvent - Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings
- E. F-477 - Gasket Pocket Pipe

1.4 WARRANTY AND MAINTENANCE

- A. Warranty:
 - 1. The Contractor is required to guarantee the sprinkler irrigation system in accordance with the requirements below. A copy of the guarantee form shall be included in the Operations and Maintenance Manual. The guarantee form shall be on the Contractor's letterhead and contain the following information:

GUARANTEE FOR SPRINKLER IRRIGATION SYSTEM

We hereby guarantee that the sprinkler irrigation system we provided to be free from defects in materials and workmanship, and the work has been completed in accordance with the drawings and specifications, ordinary wear and tear, and unusual abuse or neglect expected. We agree to repair or replace any defects in material or workmanship including repair of backfill settlement which may develop during the period of two years from the date of Substantial Completion and to repair or replace any damage related to such defects at no additional cost to the Owner. We shall make such repairs or replacements within a reasonable time, as determined by the Owner, after receipt of written notice from the Owner, we authorize the Owner to proceed to have said repairs or replacements made at our expense and we will pay the costs and charges therefore upon demand.

Project: _____
Location: _____
Signed: _____
Address: _____
Phone: _____
Date of Acceptance: _____
(Contractor to fill out upon project acceptance)

B. Maintenance

1. Work shall include but not be limited to:
 - a. Adjustment of sprinkler height and plumb to compensate for settlement and/or plant growth.
 - b. Backfilling of all trenches.
 - c. Adjustment of head coverage (arc of spray) as necessary.
 - d. Unstopping heads plugged by foreign material.
 - e. Adjustment of controller as necessary to insure proper sequence and watering time.
 - f. All maintenance necessary to keep the system in good operating condition.
2. Exclusions
 - a. Guarantee and maintenance after final acceptance does not include alterations as necessitated by re-landscaping, regrading, addition of trees or the addition and/or changes in sidewalks, walls, driveways, etc., except to the extent that such work is caused or necessitated by the irrigation Contractor or his general Contractor.

1.5 SUBMITTALS

- A. The Contractor shall submit to the Owner's Representative two (2) copies of shop drawings or manufacturer's "cut sheet" for each type of sprinkler head, pipe, controller, valves, check valve assemblies, valve boxes, wire, conduit, fittings and all other types of fixtures and equipment which he proposes to install on the job. The submittal shall include the manufacturer's name, model number, equipment capacity and manufacturer's installation recommendation, if applicable, for each proposed item.
- B. A contract will not be issued to the Contractor until he has submitted the required information. No partial submittal will be accepted, and submittals shall be neatly bound into a brochure and logically organized. After the submittal has been approved, substitutions will not be allowed except by written consent of the Owner's Representative.
- C. Shop drawings
 - 1. Include dimensions, elevations, construction details, arrangements and capacity of equipment, as well as manufacturer's installation recommendations.
- D. Record Drawings
 - 1. Record dimensioned locations and depths for each of the following:
 - a. Sprinkler pressure line routing (Provide dimensions for each 100 lineal feet (maximum) along each routing, and for each change in directions).
 - b. Gate Valves, Irrigation control valves, Control wire routing, Sleeves under paving and other related items as may be directed by the Owner's Representative.
- E. Dimensioning
 - 1. Locate all dimensions from two permanent points (buildings, monuments, sidewalks, curbs or pavements).
- F. Changes
 - 1. Record all changes which are made from the Contract Drawings, including changes in the pressure and non-pressure lines.
 - 2. Record all required information on a set of blackline prints of the drawings. Do not use these prints for any other purpose.
 - 3. Maintain information daily. Always keep drawings at the site and available for review by the Owner's Representative.

G. Record Drawing Submittal

1. When record drawings have been approved by the Owner's Representative, transfer all information to a set of bond prints using permanent blue ink.
2. Changes using ball point pen are acceptable, Highlighter felt are not acceptable.
3. Make dimensions accurately at the same scale used on the original drawings, or larger.
4. If photo reduction is required to facilitate controller chart housing, notes or dimensions shall be a minimum 1/4" in size.

1.6 CONTROLLER CHARTS

- A. Do not prepare charts until record drawings have been approved by the Owner's Representative.
- B. Provide one controller chart for each automatic controller installed. Chart may be a reproduction of the Record Drawing if the scale permits the chart to fit into the controller door. If photo reduction prints are required, keep reduction to maximum size possible to retain full legibility.
- C. Chart shall be blackline print of the actual system showing the area covered by that controller. Identify the area of coverage of each remote-control valve, using a distinct different pastel color drawn over the entire area of coverage.
- D. Following approval of charts by the Owner's Representative, they shall be sealed between two layers of 20 mil plastic sheets.
- E. Charts must be completed and approved prior to final acceptance of the irrigation system.

1.7 OPERATING AND MAINTENANCE MANUAL

- A. Provide two individually bound manuals detailing operating and maintenance requirements for the irrigation system.
- B. Manuals shall be delivered to the Owner's Representative no later than 10 days prior to completion of work.
- C. Provide descriptions of all installed materials and systems in sufficient detail to permit maintenance personnel to understand, operate and maintain the equipment.

D. Information Required

1. Index sheet, stating the Irrigation Contractor's name, address, telephone number and name of person to contact, Duration of guarantee period, Equipment list providing the following for each item:
 - a. Manufacturer's name
 - b. Make and model number
 - c. Name and address of local manufacturer's representative
 - d. Spare parts list in detail
 - e. Detailed operating and maintenance instructions for major equipment.

1.8 SUBSTITUTION OF MATERIALS

- A. This irrigation system has been designed around the irrigation components herein stated and as shown on the plans. Any changes of brand name, trade name, trademarked, patented articles, or any other substitutions will be allowed only by written order signed by the Owner's Representative. The Owner is under no obligation to accept materials other than as specified. If a bidder wishes for a substitute item to receive consideration as an approved equal, the bidder and each item must meet all the following requirements without exceptions.

1. Criteria

- a. An item, to be considered a substitute, must meet the same specifications of materials, fabrication or construction, dimension or size, shape, finish, performance standards, warranty or guarantee, and any other pertinent and salient features of quality, as indicated in manufacturer's specifications for the original specified item.

2. Submittal for Consideration

- a. A sample of the item, along with a written request for consideration, shop drawings, and written specifications, must have been received by the Owner's Representative a minimum of ten (10) calendar days after bid opening date. The item shall then be examined, and the bidder shall be notified, in writing, seven (7) days later, whether the item is an approved equal. The Owner's Representative shall be the final judge of whether an item submitted for consideration qualifies as being an acceptable substitute.
- b. Under no circumstances shall an item be given consideration as an "approved equal" substitute later than ten (10) days after the bid opening. After that date, all items shall be furnished per the original specifications. Likewise, unless certified as "approved equal" per the time frame and the requirements above, the successful bidder (known as

Contractor after signing the contract) shall install all items per the original plans and specifications. Equipment or material installed or furnished without prior approval of the Owner's Representative as herein specified, may be rejected and the Contractor required to remove such materials at his own expense.

- c. The Contractor alone shall bear complete responsibility for the installation and operation of any material or equipment installed on the job (as a substitute for specified equipment or material) should such substituted material prove to be defective, inoperable, or inapplicable.

3. Codes and Permits

- a. All work under this contract shall comply with the provisions of these specifications, as illustrated on the accompanying drawings, or as directed by the Owner's Representative and shall satisfy all applicable local codes, ordinances, or regulations of the governing bodies and all authorities having jurisdiction over this project.
- b. Installation of equipment and material shall be done in accordance with the requirements of the National Electric Code, local and national Plumbing Codes and standard plumbing procedures. The drawings and these specifications are intended to comply with the necessary rules and regulations; however, some discrepancies may occur. Where such discrepancies occur, the contractor shall immediately notify the Owners Representative in writing of the discrepancies and apply for an interpretation. Should the discovery and notification occur after the execution of a contract, any additional work required for compliance with the regulations shall be paid for as covered by these contract documents.
- c. The Contractor shall give all necessary notices, obtain all permits and pay all costs in connection with his work; file with all governmental departments having jurisdiction; obtain all required certificates of inspection for his work and deliver to the Owner's Representative before request for acceptance and final payment for his work.
- d. The Contractor shall include in the work any labor, materials, services, apparatus or drawings in order to comply with all applicable laws, ordinances, rules and regulations whether shown on the drawings and/or specified.

1.9 QUALITY ASSURANCE

- A. The installation of the irrigation system shall be made by an individual or firm duly licensed under the State of Arizona Registrar of Contractors.
 1. Superintendent: A superintendent satisfactory to the Owner's Representative shall be on in the employ of the Contractor and shall be always on the site while the specified herein is being performed.

2. The superintendent shall not be changed, except with the consent of the Owner's Representative
3. The superintendent shall be authorized to represent the Contractor.
4. The superintendent shall have a minimum of 7 years' irrigation installation experience and a minimum of 2 years supervisory experience.

1.10 NOTIFICATION OF OWNER'S REPRESENTATIVE

- A. The Owner's Representative shall have free access to the work whenever it is in preparation or progress and proper facilities for such access and inspection. The Contractor shall notify the Owner's Representative when he will and will not be on the job. Should the Contractor work periodically on the job, the Owner's Representative shall have the right to require the Contractor to give a 24-hour notice of each day or partial day that he intends to work on the project. The Contractor shall perform no work unless the Owner's Representative has been properly notified. Failure to notify the Owner's Representative may require the Contractor to redo, uncover pipe, expose for inspection, etc., all that the Owner's Representative was unable to inspect.

1.11 EXISTING UTILITIES

- A. Location and Elevations: The Contractor shall examine the site and verify to his own satisfaction the locations and elevations of all utilities both public and private and availability of utilities and services required. The Contractor shall inform himself as to their relation to the work and the submission of bids shall be deemed as evidence thereof. The Contractor shall repair at his own expense, and to the satisfaction of the Owner's Representative, for damage to any utility shown or not shown on the plans.
- B. Should utilities not shown on the plans be found during excavations Contractor shall promptly notify Owner's Representative for instructions as to further action.
- C. Contractor shall make necessary adjustments in the layout as may be required to connect too existing stub outs, should any such stub outs not be located exactly as shown and as may be required to work around existing work, at no increase in cost to the Owner. All such work will be recorded on record drawings and turned over to the Owner's Representative prior to final acceptance.

1.12 COOPERATION

- A. Work under this contract may be accomplished with other Contractors and trades on the project site at the same time. The Contractor shall allow each

Contractor and trade adequate time at the proper stage of construction to fulfill his contract.

1.13 ELECTRIC POWER

- A. Electric power to operate the controller is provided to controller location with final location field verified. General contractor shall coordinate electrical and landscape sub-contractors to ensure sleeving, conduit and electrical outlets are installed and approved by architect or owner representative. Service wiring to the controller cabinet shall be furnished by the irrigation contractor.

1.14 EARTH GROUNDING

- A. Use grounding electrodes that are UL listed or manufactured to meet the minimum requirements of Article 250-52 of the 2002 edition of the NEC.
- B. Minimum grounding requirements for grounding circuit shall include copper clad steel ground rod, a solid copper ground plate and 100 lbs of PowerSet earth contact material.
- C. Contractor shall install grounding elements as required by controller manufacture's specifications on 2-wire system.

1.15 WATER FOR TESTING

- A. The Owner shall furnish all water necessary for testing, flushing and jetting.

1.16 EXTRA EQUIPMENT

- A. Supply as part of this contract the following tools:
 - 1. Two keys for the automatic controller
 - 2. The above-mentioned equipment shall be turned over to the Owners Representative at the conclusion of the project. Before final inspection can occur, evidence that the Owner has received this material must be shown to the Owner's Representative.

1.17 SLEEVES AND ELECTRICAL CONDUITS

- A. Sleeves and electrical conduits will need to be installed as noted on the Construction Drawings. Contractor shall be responsible for timely placement of all sleeves and conduits at no additional cost to the Owner.

1.18 PROGRESS MEETINGS

- A. Contractor shall attend all progress meetings as requested by the Owner's Representative during installation and as needed to keep work progressing.

1.19 LOCATING UNDERGROUND FACILITIES

- A. All mainlines and irrigation lines greater than 2" in diameter shall have a purple #18 insulated tracer wire securely attached to it at 8' oc and shall have 12" of tracer wire accessible above grade at the termination and be securely attached at that point.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Unless otherwise noted on the plans, all materials shall be new and unused. This irrigation system has been designed around the irrigation components herein stated and as shown on the plan. Any changes of brand name, trade name, trademarked, patented articles, or any other substitutions will be allowed only by written order as outlined in Section 1.06.

2.2 EQUIPMENT

- A. PVC Pressure Mainline Pipe Fittings
 - 1. Pressure mainline piping shall be Schedule 40 PVC 1" – 3" and Class 200 for 4" and larger. Class 315 SDR 21 as specified on plans. Refer to Irrigation Legend.
 - 2. Pipe shall be made from NSF approved type I, grade I PVC compound conforming to ASTM specification D - 2241. Piping up to and including 4" size shall be SDR solvent weld. Pressure mainline piping 6" size and larger to be gasket pocket type as manufactured by the Swanson Company or equal and shall conform to ASTM F-477.
 - 3. PVC solvent weld fittings shall be Schedule 80k, Type I NSF approved conforming to ASTM test procedure D2466 (for sizes up to and including 3") and shall be as manufactured by Spears, Lasco or Dura.
 - 4. Solvent cement and primer for PVC solvent-weld pipe and fittings shall be Red Hot Blue Glue and Christy's Purple Primer. Manufacturer's installation requirements shall be strictly adhered to.

5. All PVC pipe shall bear the markings showing the Manufacturer's name, Nominal pipe size, Schedule or class, Pressure rating in psi, National Sanitation Foundation (NSF) approval and Date of extrusion.
6. All fittings shall bear the manufacturer's name or trademark, material designation, size, applicable IPS schedule and NSF seal of approval.

B. PVC Non-Pressure Lateral Piping

1. Non-pressure buried lateral line piping shall be PVC Schedule 40 with solvent weld joints for sizes 1/2" to 8".
2. Pipe shall be made from NSF approved, Type I, Grade II PVC compound conforming to ASTM resin specifications D1784. All pipe shall meet requirements set forth in Federal Specification PS-22-70, for the appropriate standard dimension ratio (SDR).
3. PVC Solvent weld fittings shall be Schedule 40, Type I NSF approved conforming to ASTM test procedure D2466 as manufactured by Spears, Lasco or Dura.

C. Galvanized Pipe & Fittings

1. Where indicated on the drawings and on the details, use galvanized steel pipe ASA Schedule 40 mild steel screwed pipe.
2. Fittings shall be medium galvanized screwed beaded malleable iron. Galvanized couplings may be merchant coupling.
3. All galvanized pipe and fittings installed below grade shall be painted with two coats of Koppers # 50 Bitumastic (except swing joint assembly).

D. Backflow Preventer

1. Backflow Preventer shall be a reduced pressure type of the size shown on the project plans.

E. Isolation Valves

1. Brass lead-free ball valve similar to those manufactured by Nibco for 1" to 2-1/2". Gate valves similar to those manufactured by Matco-Norea 3" and Larger. Valves shall be installed in control valve boxes.
2. Ball valves shall be set on side to all for ease of turning on and off and handle pointing up in "Off" situation.

F. Valve Boxes

1. A box shall be provided for all valves and equipment as detailed on the project plans. Valve boxes shall be made of high-strength, plastic suitable for turf irrigation purposes. Boxes shall be suitable in size and configuration for the operability and adjustment of the valve. Extension sections will be used as appropriate to the depth of piping. All valve box covers shall bolt down and shall be colored green and imprinted "irrigation".
2. Boxes for valves shall have a locking or bolt down cover. Box shall be as manufactured by Ametek. Only one remote control valve/gate valve assembly shall be installed per valve box. Box shall be rectangular and be sufficiently large to allow easy access, maintenance and repair of the equipment contained therein.

G. Quick Coupling Valves and Wire Splices

1. Box shall be a 10" diameter round, plastic valve box.

H. Electric Control Valves

1. Valve shall be of size indicated on Drawings Valves shall be as indicated on the drawings.

I. Control Wire

1. Control wire shall be UF-UL listed, color coded copper conductor direct burial size 14. Tape control wires to side of main line every 10 feet. Where control wire leaves main or lateral line, bury a minimum of 24" deep. Use 3M DBY waterproof wire connectors at splices and locate all splices within valve boxes. Use white color for common wire and red for signal wire. Each common wire may serve only one controller. Do not use black on any 24V circuit. One extra control wire shall be run from panel continuously from valve to valve throughout system controlled by that controller, similar to common wire for use if a wire fails. Wire shall be different color than all other wires, shall not be green, and shall be marked in control box as an extra wire.
2. 2-Wire shall be Rain Master Compatible – TW-CAB-14, 14-gauge (red/black) polycoated (blue) wire cable for 2-wire path.
3. Decoder – TW-D-1, 2, OR 4, size as required per field conditions.

J. Irrigation Controller

1. Electric and Battery Automatic Controllers shall be of the sizes and model shown on the plans. Controller shall provide a minimum of 2 spare stations for future connection.

2. Grounding per Manufactures specifications with TW-LA-1, Lighting arrestor, provided every 250 feet or as identified within manufactures specifications.
3. All Controllers shall be earth ground per American Society of Irrigation Consultants (ASIC) Guild line 100-2002 (www.asic.org, "Design Guides"). Contractor shall submit shop drawing for grounding materials and location review and approval prior to installation.

K. Pressure Regulator

1. Self contained, single seat, direct acting, spring loaded, diaphragm actuated type as manufactured by Senniger or approved equivalent.

L. Filters

1. Filters used downstream of the Remote-Control Valves shall be a Y strainer type with minimum of 200 mesh filtration. The filter shall have a threaded opening to allow attachment of a hose for flushing. The filter shall have features similar to the Rain Bird RBY-100-150MX.

M. Emitter Assembly

1. Emitters shall be of the pressure compensating, self flushing type.
2. The cases of the emitters shall be made of durable black, heat resistant acetal plastic material. It shall be resistant to temperature variation, ultraviolet radiation, smog (ozone), common liquid fertilizer and weed spray.
3. The emitter shall be capable of continuous, clog free operation with 140 mesh (minimum) filtration. The emitter shall be capable of being installed in any position and maintain its given flow characteristics. The emitter shall be non-adjustable.
4. The emitter shall function with a system pressure range of 15 psi minimum to 50 psi maximum. The emitters shall be available in flow ranges from .85 to 2.0 gph.
5. The emitter assemblies as shown on the plans shall consist of the emitter and .22" OD spaghetti distribution tubing which shall not exceed 8" in length.
6. Trees shall be irrigated with multi-port 1 or 2 gph/port, six ports per tree pending of species. Refer to Emitter schedule for required gallons per minute (see plans).

N. Emitter Hose

1. The flexible emitter hose, which shall deliver water to the emitter assembly shall be manufactured from virgin polyethylene material having the following physical characteristics:

O.D.	.704"
I.D.	.600 min.
Wall	.0052"
Carbon Black	1.5 - 3.5
Density	.92 - .93
Melt/Environmental Stress/Crack Resistance	0/100/100

2. Fittings for use with the emitter hose shall be of the compression, internal barb type, constructed of virgin PVC or glass-filled polypropylene materials, and as detailed on the project plans.

O. Sleeves:

1. Provide where shown on the drawings and specified herein.
2. All mainlines, lateral line piping, emitter headers and lateral piping and all control wire shall be installed in a sleeve under all paving, walls and concrete surfaces.
3. All sleeving shall be SCH 40 PVC solvent weld pipe.
4. All joints shall be solvent welded.
5. All sleeves shall be installed as detailed on the project plans.
6. All sleeves shall extend a minimum of 18" beyond the edge of the item being sleeved.
7. Each sleeve shall be taped along its entire length with metallic locator tape manufactured for that purpose.
8. Sleeves shall have a minimum horizontal clearance of 12" from each other and other piping. Sleeves shall not be installed parallel and directly over another line. Sleeves shall have a minimum of 9. inches vertical clearance where they cross other lines.

P. Other equipment:

1. Other Components shall be as recommended by Manufacturer and subject to Architect's review and acceptance and as necessary to complete and make system operational.
2. No Pre-manufactured Swing joints are accepted.

3. No male adapters are accepted; Utilize Sch. 80 Toe Nipples or Nipples sized as required.

PART 3 - EXECUTION

3.1 GENERAL

- A. Contractor Responsibility: The Contractor shall not willfully install the irrigation system as shown on the drawings when it is obvious in the field that obstructions, grade differences or discrepancies in equipment usage, area dimensions or static water pressure exist that might not have been considered in the engineering. Such obstructions or differences shall be brought to the attention of the Owner's Representative. In the event this notification is not performed, the Contractor shall assume full responsibility for any revision necessary.
- B. All material and equipment shall be delivered to the job site in unbroken reels, cartons or other packaging to demonstrate that such material is new and of a quality and grade in keeping with the intent of these specifications.

3.2 SITE CONDITIONS

- A. All scaled dimensions are approximate. The Contractor shall check and verify all size dimensions and receive the Owner's Representative's approval prior to beginning work.
- B. Contractor shall be responsible for layout of all equipment and piping in the irrigation system. This layout shall be in conformance with notations on the Construction Drawings.
- C. Exercise extreme care in excavating and working near existing utilities. Contractor shall be responsible for damage to utilities which are caused by his operation or neglect. Contractor shall check existing utility drawings and contact Blue stake prior to any excavation.
- D. Coordinate installation of irrigation materials, including pipe so there shall be no interference with utilities or other construction or difficulty in planting trees, shrubs, and ground covers. Contractor shall coordinate with other trades to insure timely placing of necessary sleeves, wires and pipes under walks, curbs, and paving.
- E. Design Pressure: This irrigation system has been designed to operate with a minimum static inlet water pressure as shown on the drawings. The Contractor

shall take a pressure reading prior to beginning construction. If the pressure reading is less than indicated, the Contractor shall notify the Owner's Representative.

3.3 PREPARATION

- A. Prior to installation, the Contractor shall stake out all pressure supply lines, location of remote-control valves, sprinkler heads, controllers, backflow preventers, gate valves, quick coupling valves and other irrigation equipment.
- B. All layout shall be approved by the Owner's Representative prior to installation. Prior approval shall be obtained for valves, controllers, main line routing, quick coupling valves, backflow preventers, water meters and sprinkler locations.

3.4 WATER SUPPLY

- A. Irrigation system shall be connected to the new water mainline at the approximate location shown on the drawings. Contractor is responsible for minor changes caused by actual site conditions and tap locations.

3.5 EXCAVATION AND BACKFILL

- A. Trenching
 - 1. Dig trenches straight and support pipe continuously on bottom of trench. Lay pipe to an even grade. Trenching excavation shall follow the layout as approved by the Owner's Representative in the field. If the bottom of a pipe trench excavation is found to consist of rock, caliche, or any other material that, be reason of its hardness or sharpness, cannot be excavated to give a uniform bearing surface, said rock or other material shall be removed for at least three (3) inches below the specified trench depth and refilled to the specified trench depth with sand or other approved shading material.
- B. Burial of Pipe
 - 1. Depth of Pipe shall be as shown on the construction details.
- C. Backfilling
 - 1. The trenches shall not be backfilled until all the required tests are performed. Trenches shall be carefully backfilled in 8" lifts with the excavated materials, less any stone or clods of earth larger than 1/2" in any dimension. Backfill shall be mechanically compacted in landscape areas to a dry density equal to adjacent undisturbed soil. Backfill shall

conform to adjacent grades without dips, sunken areas, humps or other surface irregularities. Backfilling shall not be performed while trenches or backfill material is in a wet or muddy condition.

2. A fine granular material backfill will be initially placed on all lines to a depth of 3" over the top of the pipe. No foreign matter or particles larger than 1/2" in any one dimension will be permitted in this backfill. Existing site soil that conforms to this gradation requirement may be used for this initial backfill.
3. Flooding of trenches will be permitted only with approval of the Owner's Representative.
4. If settlement occurs and subsequent adjustments in pipe, valves, sprinkler heads, lawn or planting, or other construction are necessary, the Contractor shall make all required adjustments without cost to the owner. Contractor shall also make repairs or replacements to any item damaged by settlement of trenches or irrigation equipment, whether said item was part of the original scope of construction or not.
5. All buried private landscape sprinkler lines greater than 2" in diameter shall have a purple #18 insulated tracer wire securely attached to it at 8' o.c. and shall have 12" of tracer wire accessible above grade at the termination and be securely attached at that point.

D. Trenching and backfill under paving

1. Trenches located under areas where paving, asphaltic concrete or concrete will be installed shall be backfilled with sand for a depth of 3" below the bottom of the pipe (or sleeve) and 3" above the top of the pipe (or sleeve). and compacted to 90% compaction or the required subgrade compaction for that area (whichever is greater), using manual or mechanical tamping devices. All trenches shall be left flush with the adjoining grade. The Contractor shall set in place, cap, and pressure test all piping under paving prior to the paving work.
2. Provide for a minimum cover of 18" between the top of the pipe and the bottom of the aggregate base for all pressure and non-pressure piping installed under asphaltic concrete paving.

E. Assemblies

1. Routing of sprinkler irrigation lines as indicated on the drawings is diagrammatic. Install lines and various assemblies to conform with the details shown on drawings and in accordance with the manufacturer's recommendations.
2. Install no multiple assemblies on plastic lines. Provide each assembly with its own outlet.
3. Install all assemblies specified herein in accordance with respective detail. In absence of detail drawings or specifications pertaining to specific items required to complete work, perform such work in accordance with best standard practice with the prior approval of the Owner's Representative.

4. PVC pipe and fittings shall be thoroughly cleaned of dirt, dust and moisture before installation. Installation and solvent-welding methods shall be recommended by the pipe and fitting manufacturer. Primer shall be used on all solvent weld joint. No solvent weld joint shall be submitted to water pressure until curing for 24 hours minimum.
5. On PVC to metal connections, the Contractor shall work the metal connections first. Teflon paste shall be used on all threaded PVC to PVC joints, and on all threaded PVC to metal joints. Light wrench pressure is all that is required. Where threaded PVC connections are required, use threaded PVC adapters into which the pipe may be welded. Teflon tape shall not be accepted.
6. Gasket pocket pipe and fittings shall be assembled in strict accordance with the manufacturer's recommendations. Only recommended lubricant will be permitted.

F. Concrete thrust blocks

1. Installed at specific locations per manufacturer's recommendations and instructions. Thrust blocks shall be installed for main lines at all changes in direction, tees, and gate valves.

G. PVC Pipe Installation:

2. Piping shall be snaked in the trench to allow for thermal expansion and contraction.
2. After all curing of solvent weld joints and after having received the approval of the Owner's Representative, the mainline shall be filled. Extreme care will be taken to slowly fill the piping while releasing entrapped air at the ends of the main line.
3. All lines shall have a minimum clearance of six inches from each other, and from lines of other trades. This clearance shall not supersede any clearance required by local, regional or national building, health or safety codes. Parallel lines shall not be installed directly over one another.
4. Manufacturer's installation recommendations shall be strictly adhered to.

H. Flushing of System

1. After all new sprinkler pipelines and risers are in place and connected, all necessary diversion work has been completed, and prior to installation of sprinkler, heads, the control valves shall be opened, and a full head of water used to flush out the system.
2. Sprinkler shall be installed only after flushing of the system has been accomplished to the complete satisfaction of the Owner's Representative.

I. Temporary Repairs

1. The Owner reserves the right to make temporary repairs as necessary to keep the sprinkler system equipment in operating condition. The exercise of this right by the Owner's Representative shall not relieve the Contractor of his responsibilities under the terms of the guarantee as herein specified.

J. Pressure Regulator

1. Install in a valve box in conformance with the project details.

K. Emitter Assembly

1. The emitter and distribution tubing shall be assembled using the manufacturer's recommended tools and accessories.
2. The maximum length of the .22" distribution tubing shall be 8'. In the event the distance in the field exceeds the maximum length, the Contractor shall extend the poly tubing as required by adding a tee and shall add a hose end cap to this extension at the Contractor's expense.
3. The Contractor shall assemble the emitter assembly in conformance with the applicable detail on the project plans. This detail will depend on whether the emitter is irrigating a tree in turf or other ground plane material.

L. Emitter Hose

1. The emitter hose location, as shown on the plans, is diagrammatic. The Contractor shall layout this hose to conform to the maximum distance requirements as specified under the emitter assembly section of these specifications.
2. The Contractor shall flush the emitter hose prior to and after installation of the emitter assemblies.

3.6 FIELD QUALITY CONTROL

A. Adjustment of the system

1. The Contractor shall flush and adjust all sprinkler heads for optimum performance and to prevent, as much as possible, over spray into walks, roadways and buildings.
2. If it is determined that adjustment in the irrigation equipment will provide proper and more adequate coverage, the Contractor shall make such adjustments prior to planting. Adjustments may also include changes in nozzle sizes and degrees of arc as required. Such changes shall be approved in advance by the Owner's Representative, at no cost to the Owner.

3. Lowering raised sprinkler heads by the Contractor shall be accomplished within 10 days after notification by the Owner.
4. All sprinkler heads shall be set perpendicular to finished grades unless otherwise designated on the plans. On slopes, heads shall be angled for optimum coverage and performance.
5. Owner's Representative to approve all head locations and reserves the right to request the contractor to make minor adjustments to head placement or nozzle selection at no cost to the Owner.
6. All parts of the irrigation system and associated equipment shall be adjusted to function properly and shall be turned over to the Owner in operating condition.

B. Testing of the Irrigation System

1. The Contractor shall request the presence of the Owner's Representative at least 48 hours in advance of testing.
2. Test all pressure lines under hydrostatic pressure of 150 lbs. per square inch and prove watertight.
3. All piping under paved areas shall be tested under hydrostatic pressure of 150 lbs. per square inch and proved watertight prior to paving.
4. All PVC lateral line pipe shall be tested at working line pressures with coupling exposed and swing joints and other outlets capped.
5. Sustain pressure in the lines for not less than two hours. Pipe sections shall be center loaded and all coupling shall be exposed. Before testing, the line shall have been filled with water for at least four (4) hours and provisions made for thoroughly bleeding the line of air.
6. All hydrostatic tests shall be made only in the presence of the Owner's Representative. No pipe shall be backfilled until it has been inspected, tested and approved in writing.
7. Furnish necessary force pump and all other equipment necessary to perform test.
8. When the sprinkler irrigation system is completed, perform a coverage test in the presence of the Owner's Representative to determine if the water coverage for the planting areas is complete and adequate. Furnish all materials and perform all work required to correct any inadequacies of coverage due to deviations from plans or where the system has been willfully installed as indicated on the drawings when it is obviously inadequate without bringing this to the attention of the Owner's Representative. This test shall be accomplished before any planting or turf has been installed.

9. Upon completion of each phase of work, entire system shall be tested and adjusted to meet site requirements.

3.7 MAINTENANCE

- A. The entire irrigation system shall be under fully automatic operation for a period of seven days prior to planting.
- B. The Owner's Representative reserves the right to waive or shorten this operation period.
- C. Contractor shall provide job maintenance of the entire irrigation system and shall continue until job acceptance by the Owner. Maintain all system components and assure proper watering of all plants. Repair all leaks and replace any defective components. After all landscape and irrigation operations are complete and in conformance with the contract documents, the Owner shall grant provisional acceptance.
- D. Following provisional acceptance, the Contractor shall provide job maintenance daily consisting of all items covered under maintenance specification. Following the 90-day maintenance period, the Owner shall grant final job acceptance after verifying all work and system components are in conformance with the Contract Documents.

3.8 CLEANUP

- A. Cleanup shall be made as each portion of work progresses. Refuse and excess dirt shall be removed from the site, all walks and paving shall be broomed or washed down, and any damage sustained to the work of others shall be repaired to the original conditions acceptable to the Owner's Representative.

3.9 FINAL OBSERVATION PRIOR TO ACCEPTANCE

- A. The Contractor shall operate each system in its entirety for the Owner's Representative at the time of final observation. Any items deemed not acceptable shall be reworked to the complete satisfaction of the Owner's Representative.
- B. The Contractor shall show evidence to the Owner's Representative that the owner has received all accessories, charts, record drawings, and equipment as required before final observation can occur.

3.10 OBSERVATION SCHEDULE

- A. Contractor shall be responsible for notifying the Owner's Representative in advance for the following observations according to the time indicated:
 - Pre-job conference - 7 days
 - Pressure supply line installation and testing - 48 hours
 - Automatic controller installation - 48 hours
 - Control wire installation - 48 hours
 - Lateral line and sprinkler installation - 48 hours
 - Coverage test - 48 hours
 - Final observation - 7 days
- B. When the inspections have been conducted by other than the Owner's Representative, show evidence and by whom these inspections were made.
- C. No observation shall commence without as-built drawings.
 - 1. In the event the Contractor calls for an observation without as-built drawings, without completing previously noted corrections, or without preparing the system for observations, he shall be responsible for reimbursing the Owner's Representative at the hourly rate in effect at the time of the observation, portal to portal (plus transportation cost) for the inconvenience. No further inspections will be scheduled until this charge has been made. Delays in schedules caused by Contractor's non-payment of these charges shall not be grounds for extension of the construction schedule.

END OF SECTION

SECTION 32 9119 – LANDSCAPE GRADING

PART 1 - GENERAL

1.1 SUMMARY

A. Related Sections

1. General Conditions and Division 01 apply to this Section.

PART 2 – PRODUCTS

Not Used.

PART 3 - EXECUTION

3.1 PERFORMANCE

- A. The Contractor shall not begin the work of this Section until the rough grading has been completed and certification of volumes and elevations have been obtained.
- B. Redistribute soil stored on site and provide additional soil required to bring surface to "X" grade pending proposed top-dressing material shown on the landscape plans. "X" depth is reflected on landscape and civil for proposed material and installation thickness.
- C. No slopes greater than 4:1.
- D. Slope grade away from building for 10 feet minimum from walls at slope of X% minimum as indicated on the civil plans unless otherwise directed.
- E. Slope grade away from building for 5 feet minimum from walls at slope of X% minimum as indicated on the civil plans unless otherwise directed.
- F. The intent of the landscape grading is to provide final shaping and contouring on site addressing; site transitions adjacent to building, walls, hardscape components and blending of landscape areas with planting materials adjacent to all hardscape. Provide berming and provide passive water harvesting as required within the contract documents. Contractor shall shape site areas in general conformance with the project plans while accounting for an all-finish material including hardscape materials, depressions and water harvesting areas, riprap and splash pads, decorative rock, hydro-seed and other top-dressing materials. Grading shall be done so low spots will provide passive water harvesting at depressions in all landscape areas as indicated on plans from civil spot grades or as indicated on the landscape plans indicating; 'low point, high point, inlet, outlet, rain garden water harvesting basin, etc. delineations.
- G. Landscape sub-contractor shall evaluate subgrade provided to them at time of start of Landscape installation and indicate if grade is acceptable as presented. Contractor shall identify if grade is high, low and indicate actions need to bring grade into conformance with grading, landscape plans and associated contract documents to ensure that proposed irrigation trenching, plant material, decorative rock, riprap, turf, stabilized decorative rock, turf and hydro-seed can be installed per the associated plans at finish grades identified on the grading plans.

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- H. The Contractor shall expect grading will be accomplished by means of mechanical and finished out through hand rake work or other means to complete finish site.
- I. Swales shall be constructed in the approximate locations as shown on grading plan. The invert of the swales shall be deep enough to intercept surface water and to direct it to the nearest catch basin or drainage outlet. Inverts shall have rock and other erosion control material set below invert elevation. Contractor shall set all rough grading at or below inverts to allow for top dressing materials. Swales shall be graded smoothly to permit ease of maintenance. All areas within the limit of work shall be graded to a smooth condition compatible with surrounding areas. During preliminary grading, dig out weeds from planting areas by their roots and remove from site.
- J. Remove from site rocks larger than 1 inch in size and foreign matter such as building rubble, wire, cans, sticks, concrete, etc., before placing topsoil.
- K. All spoils from additional landscape work shall be removed from site with grade acceptance.
- L. Top-dress materials; decorative rock, stabilized decorative rock, turf, hydro-seed, etc. shall not be installed until inspected and approved by agency for general site grading and passive water harvesting areas.
- M. It is the intent of documents that finished site will be well-drained. Additional swales, depressions, auger pits and drainage sumps shall be provided over and above those shown on the plans when site does not properly drain at no additional cost to the owner.
- N. Final site approval shall not occur until after review of drainage performance from natural rain fall of 1/16" or greater occurring during the warrantee and maintenance period and accepted in writing by owner representative.

END OF SECTION

SECTION 32 9219 – HYDRAULIC SEEDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Furnish and install hydroseed as described in these specifications and on the Contract Documents.

1.3 QUALITY ASSURANCE

- A. All work under this section shall be done by a licensed landscape contractor with a minimum of 5 years experience.

1.4 SEQUENCING

- A. Do not commence work of this Section until work of Sections 32 84 23, and 32 93 13 has been completed and approved.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Seed mixes shall be as listed on the project plans. Submit certificates of each seed species and quantity in pounds of use in mix prior to application.
- B. Fertilizer shall be commercially produced, pelleted granular form ammonium phosphate 16-20-0 (N-P-K) by weight, delivered to site in fully labeled bags in accordance with the State Fertilizer Laws.
- C. Mulch shall be composted ground or shredded fir or pine bark or shavings, max. pH 7.5, 85% passing a one-quarter inch screen, hygroscopic or containing a wetting agent, 1% min. nitrogen stabilized.
- D. Soil Sulfur shall be granular or prilled agricultural grade, 99.5% sulfur.
- E. Tacking Agent shall contain a plantago organic muciloid base, with the active ingredient comprising 70-80% of the agent. The plantago organic muciloid base shall meet the following standards:

Moisture	Less than 9%
Ash	Less than 3%
Swell Volume	40 ml/gr
Muciloid purity	75%

PART 3 - EXECUTION

3.1 PROTECTION

- A. Take care and precautions in work to avoid conditions which will create hazards. Post signs or barriers as required.
- B. Provide adequate means for protection from damage through excessive erosion, flooding, heavy rains, etc. Repair or replace damaged areas.

3.2 SURFACE PREPARATION

- A. Check to assure that the existing grade is within 0.1 feet of required subgrade.
- B. Remove all rocks, roots and other foreign materials 2" and larger in diameter, after cultivation.
- C. Soil amendments shall be thoroughly mixed in suspension with the seed so that application will be at the following rates:

Mulch	1800 lbs./acre
Fertilizer	300 lbs./ acre
Soil Conditioner - Gro-Power or equal	20 lbs./1000 SF
Tacking Agent	Per Manufacturer's recommendation for specific slope
- D. The slurry mix shall be applied so that the seed and amendments are applied at the previously specified rates.
- E. The slurry mix shall be applied to form a blotter-like cover, uniformly impregnated with seed.

END OF SECTION

SECTION 32 9313 - PLANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Furnish and install landscaping plants as described in Contract Documents.

1.3 SUBMITTALS

- A. Submit technical data on soil amendments.
- B. Submit pdf photographs along with spread sheet inclusive of entire proposed plant material list. Submittal shall include, Scientific Name, Common Name, Container size, Quantity and Supplier.
- C. All tree species shall be selected by contractor with representative photo including measurement of canopy height width and caliper size for approval.
- D. Any plant species not available during the time of bidding and anticipated installation shall be submitted in writing for a request of alternative species. No contractor substitutions will be permitted after bid is awarded.

1.4 QUALITY ASSURANCE

- A. All work shall be performed by a licensed landscape contractor with a minimum of 5 years experience.

1.5 SEQUENCING

- A. Do not install plant material until major construction operations are completed and grade is accepted by owner representative.
- B. Do not install plant material until the irrigation system is complete and functional.

1.6 WARRANTY

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- A. Guarantee furnished all plant materials to live and remain in healthy condition for 365 days minimum from date landscape installation is accepted as complete.

1.7 OWNER'S INSTRUCTIONS

- A. Provide written instructions on maintenance requirements after the end of the maintenance period. Refer to section 32 01 80 Operation and Maintenance of Landscape and Irrigation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Plants

1. Conform to requirements of Plant List and Key on Drawings and to "Horticultural Standards" of American Association of Nurserymen as to kind, size, age, etc.
2. Nomenclature - Plant names used in Plant List conform to "Standardized Plant Names" by American Joint Committee on Horticultural Nomenclature except in cases not covered. In these instances, follow custom of nursery trade. Plants shall bear a tag showing the genus, species, and variety of at least 10% of each species delivered to site.
3. Plants shall be sound, healthy, vigorous, free from plant disease, insect pests or their eggs, noxious weeds, and have healthy, normal root systems. Container stock shall be well established and free of excessive root-bound conditions.
4. Do not prune plants or top trees prior to delivery.
5. Plant materials shall be subject to approval by Architect as to size, health, quality, and character.
6. Bare root trees, ocotillo are not acceptable.
7. Provide plant materials from a licensed nursery.
8. Plant materials larger than those specified may be supplied with approval of Architect, if the material complies in all other respects and if the material is at no additional cost to the Owner.
9. Plant materials shall be symmetrical or typical for variety and species.

- B. Planting Mix shall consist of a mixture of two parts site soil and one-part mulch.

- C. Planting Tablets shall be 21-gram Agri form (20-10-5).

- D. Tree Stakes shall be 2" x 2" x 8'0" Fir or 2-inch diameter 8-foot-long Lodgepole Pine stakes.

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- E. Tree Staking Ties shall be 16 ga. wire with new rubber hose or strap to protect tree.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Check and verify dimensions and quantities before proceeding with any work under this section. Report variations between Drawings and site to Architect before proceeding with work of this Section.
- B. Verify quantities shown on Drawings, they are provided for convenience only and are not guaranteed. Contractor shall be responsible for all planting indicated on Drawings unless indicated otherwise.

3.2 PROTECTION

- A. Take care and precautions in work to avoid conditions which will create hazards. Post signs or barriers as required.
- B. Provide adequate means for protection from damage through excessive erosion, flooding, heavy rains, etc. Repair or replace damaged areas.

3.3 EXCAVATION

- A. Layout individual tree locations and areas for multiple plantings. Stake locations and outline areas. Secure Architect's approval before planting. Make minor adjustments as may be requested.
- B. If underground obstructions are encountered in excavation of tree holes, Architect will select alternate locations.
- C. Excavate holes in accordance with the sizes shown on the Contract Documents.
- D. Roughen sides and bottom of excavations.
- E. Once hole is dug, bore 4" dia. hole 3 feet to 6 feet below bottom of plant pit to ensure deep root growth development, and positive drainage can occur.
- F. Fill hole with good, tamped planting mix (backfill mix) sufficient to bring plant to proper elevation after watering and settling.
- G. Fill bottom half of hole with crushed rock and top half with amended topsoil.

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- H. Fill hole with water and verify that water drains away within two hours so there will be no drainage problem after tree or shrub is planted. Inform Landscape Architect in writing if water does not drain properly. Do not plant trees or shrubs in holes that do not properly drain.

3.4 PLANTING

- A. Plant immediately after removing plant from container.
- B. Place trees and shrubs in holes so, after watering and settling and in relation to finished grade, plant shall be equal to the grade around the plant in the container.
- C. Cut off broken or frayed roots in a neat, even manner in accordance with accepted horticultural practice.
- D. Center plant in hole and backfill with specified planting mix making ring of mounded soil around the hole's perimeter to form watering basin. Do not backfill with soil in a muddy condition.
- E. Add fertilizer tablets in plant pit as follows:

One (1) Gallon Shrub	- 1 tablet
Five (5) Gallon Shrub/Tree	- 3 tablets
Fifteen (15) Gallon Tree and Larger size	- 4 tablets
- F. Settle by firming and watering to bring ball down to proper level, just slightly higher than surrounding soil.
- G. Thoroughly water all plantings immediately after planting with the automatic irrigation system.
- H. Install tree stakes in accordance with the Construction Details. Trees less than 4' tall shall be reviewed and only staked when not self-supported. Contractor shall review tree plantings and stake any tree during warranty period to promote vertical growth and development.
- I. Space groundcovers evenly to produce a uniform effect, staggered in rows and intervals shown.

END OF SECTION