

SECTION 01011

SPECIAL CONDITIONS OF THE LANDSCAPE WORK

PART 1: GENERAL

1.01 SUMMARY

A. WORK INCLUDED:

1. Definitions.
2. Submittals.
3. Field Quality Control.
4. Contract Close Out.

B. RELATED SECTIONS

1. Section 02111: Tree and Plant Protection.
2. Section 02815: Irrigation System.
3. Section 02920: Landscape Systems.
4. Section 02923: Landscape Fine Grading.
5. Section 02940: Lawn Sodding.
10. Section 02950: Trees, Shrubs and Groundcover.

1.02 DEFINITIONS

- A. PUNCHLIST: List of items of Work to be completed or corrected by the Contractor. (AIA)
- B. DATE OF SUBSTANTIAL COMPLETION: The date certified by the Architect when the Work of a designated portion thereof is sufficiently complete, in accordance with the Contract Documents, so the Owner can occupy the Work of designated portion thereof for the use for which it is intended. (AIA) Warranty period begins at this time.
- C. FINAL INSPECTION: Final review of the Project by the Architect to determine final completion, prior to issuance of the final Certificate for Payment. (AIA)
- D. FINAL COMPLETION: Term denoting that the Work has been completed in accordance with the terms and conditions of the Contract Documents (AIA) and there are no outstanding items which the Contractor needs to complete.
- E. FINAL ACCEPTANCE: The Owner's acceptance of the Project from the Contractor upon certification by the Architect of final completion. Maintenance ends upon Final Acceptance. Final acceptance is confirmed by the making of final payment unless otherwise stipulated at the time of making such payment. (AIA)
- F. WARRANTY: Legally enforceable assurance of quality or performance of a product or Work, or of the duration of satisfactory performance. (AIA)

1.03 SUBMITTALS

- A. Comply with Section 700 City of Colorado Springs Engineer Division Standard Specifications. All submittals shall be accepted by the Architect in writing before planting commences.
- B. PLANTING SCHEDULE: Submit in writing two copies of proposed planting schedule, indicating dates for topsoil placing, site preparation, herbicide treatments, soil

preparation, sodding, and coordination with plant procurement, planting soil preparation, plant delivery and planting. Schedule all Work during specified planting seasons. Once accepted, revise dates only as approved in writing, after documentation of reasons for delays.

1.04 FIELD QUALITY CONTROL

- A. **REVIEWS:** Work will be subject to review at all times by the Architect. The Architect reserves the right to engage an independent testing agency to analyze and test materials used in the construction of the Work. Where directed by the Architect, the testing agency will make material analyses and report to the Architect whether materials conform to the requirements of the Specification.

1.05 CONTRACT CLOSEOUT PROCEDURE

- A. **GENERAL:** Comply with Contract.
- B. **SUBSTANTIAL COMPLETION**
 - 1. At the completion of the Work and prior to the beginning of the warranty period, the walk-through for Substantial Completion shall be performed.
 - 2. The Contractor shall have completed the Work in accordance with the Drawings and Specifications. Refer to individual sections for specific Substantial Completion conditions.
 - 3. The Contractor shall give the Architect 48 hours notice prior to this walk-through.
 - 4. A Punchlist outlining Work requiring corrective action will be provided to the Contractor by the Architect within 48 hours of the walk-through. This Work shall be performed within the first 10 working days after the walk-through. Corrective work and materials shall be made in accordance with the Contract Documents, and shall be made by the Contractor at no cost to the Owner. Work not performed in this period shall require an equivalent extension of the warranty and maintenance period.
 - 5. If in the opinion of the Architect the extent of the Punchlist precludes issuance of Substantial Completion at the time of the Punchlist walk-through, the Contractor shall schedule a second walk-through for Substantial Completion once the punchlist Work is completed.
 - a. If after Contractor's request to Consultant for second walk-through for Substantial Completion, Consultant finds a significant number of items which have not been properly adjusted, reworked, or replaced as indicated on punchlist of incomplete items from previous walk-through, Contractor shall be charged for all subsequent walk-throughs. Funds will be withheld from final payment and/or retainage to Contractor, in an amount equal to additional time and expenses required by Consultant to conduct and document further walk-throughs as deemed necessary to establish Substantial Completion.
 - 6. The Work may be accepted in parts when the Owner deems it to be in his best interest, and when written permission is given to the Contractor to complete the Work in parts. Acceptance and use of such areas by the Owner shall not waive any other provisions of this Specification.
 - 7. Warranty period shall begin on date of Substantial Completion. Refer to paragraph F this Section for Warranty Information.

C. FINAL COMPLETION

1. Final Completion is the point at which all work has been installed according to plans and specifications and there are no outstanding items which the Contractor needs to complete. If there is no punchlist issued by the Architect during the walk-through for Substantial Completion, the Architect shall recommend in writing that Final Completion be given at that time.
2. At the time of the walk-through for Final Completion, the Contractor shall have completed all punchlist items.
3. The Contractor shall give the Owner and Architect 48 hours notice prior to walk-through for Final Completion.
4. Architect shall re-inspect the site for conformance.
 - a. If all items have been corrected, then Final Completion shall be given.
 - b. Items deemed not acceptable by Architect shall be reworked to complete satisfaction of Architect. Final Completion shall not be given until all deficiencies have been corrected.
5. If after request to Consultant for walk-through for Final Completion, Consultant finds items during walk-through which have not been properly adjusted, reworked, or replaced as indicated on punchlist of incomplete items from previous walk-through, Contractor shall be charged for all subsequent walk-throughs. Funds will be withheld from final payment and/or retainage to Contractor, in an amount equal to additional time and expenses required by Consultant to conduct and document further walk-throughs as deemed necessary to insure compliance with Contract Documents.

D. CLOSEOUT DOCUMENTS: Comply with Contract.

E. START UP AND INSTRUCTIONS: Comply with Contract.

F. WARRANTY AND REPLACEMENT

1. General
 - a. Comply with Section 01011.
 - b. Warranty Period: Warranty Period extends one year from the date of Substantial Completion. The warranty period begins anew for each replaced area or item and extends each time the area or item requires replacement.
2. Warranty Conditions: Warranty all areas against defects due to any cause except vandalism and acts of God. Refer to individual sections for specific warranty conditions.
3. Partial Acceptances for Substantial Completion: When the work is accepted in parts, the warranty period shall extend from each of the partial acceptances to the terminal date of the last warranty period such that all warranty periods terminate at one time.

G. POST CONSTRUCTION INSPECTION (Review for FINAL Warranty Compliance)

1. The Contractor shall give 48 hour notice to the Architect to request a Final Warranty Inspection. Schedule Final Warranty Inspection 3 weeks before the completion of the warranty period.

2. If, after the inspection, the Architect is of the opinion that all work has been performed according to the Contract Documents, and that all items are in satisfactory condition, he will give the Contractor written notice of Final Warranty Compliance. This indicates termination of the warranty period for original installation.
3. Renewed warranties resulting from warranty replacements during the original warranty period shall remain in effect until their individual termination.

PART 2 - PRODUCTS **None.**

PART 3 - EXECUTION **None.**

END OF SECTION

PART 1: GENERAL

- 1-1 DESCRIPTION: The work of this section consists of furnishing, installing and maintaining barricades, signage, temporary detours, etc., for control of automobile, bicycle and pedestrian traffic during construction. Also included in the work is furnishing, installing and maintaining suitable barriers to prevent public entry and to protect existing facilities, existing landscaping (identified to remain) and the public from construction operations.
- 1-2 SCHEDULE OF CONSTRUCTION AND TRAFFIC CONTROL:
- A. GENERAL: Any work within a public thoroughfare that involves the temporary closure of a lane of traffic shall be approved by the Owner in advance of the work and shall be completed between the hours of 8:30 A.M. and 3:30P.M., at which time all barricades removed and the roadway completely opened to traffic. All requirements herein shall be in accordance with the "Manual on Uniform Traffic Control Devices (MUTCD), latest revision, as well as any additional requirements of the Owner.
- 1-4 SUBMITTALS:
- A. Submit a traffic control plan for all phases of construction describing traffic patterns, control measures, and daily maintenance and cleanup measures. Improve and implement as directed by the Owner.

PART 2: MATERIALS

- 2-1 GENERAL: Material may be new or used, but shall be suitable for intended purpose. Fences and barriers shall be structurally adequate and neat in appearance.
- 2-2 FENCING: Minimum height, 6 feet, unless authorized otherwise by the Owner.
- 2-3 BARRICADES AND SIGNS: MUTCD, Part VI, Traffic Controls for Street and Highway Construction and Maintenance Operations, and Colorado Department of Transportation (CDOT) "S" Standards. Where CDH Type 4 precast concrete barriers are utilized, they shall have reflectors as specified in Standard S-614-51.
- 2-4 WOOD PLANKING: Lumber, free of nails, large knotholes and splinters.
- 2-5 MATERIAL FOR SURFACE OF STABILIZED CONSTRUCTION ENTRANCE: AASHTO Designation M43, Size No. 2 (8-1/2" to 1-1/2").

PART 3: EXECUTION

- 3-1 TRAFFIC CONTROL: Comply with specific requirements at major thoroughfares as specified in the CDOT permit, herein or otherwise directed by the Engineer or the City of Fountain.
- 3-2 BARRICADES, FLAGGING AND WATCHMEN: The Contractor shall erect and maintain barricades and sufficient safeguards around all excavations, embankments and obstructions;

shall provide suitable warning lights near the work and keep them lighted at night or other times when visibility is limited and shall employ such watchmen as may be necessary for the protection of the public. When a traffic lane is temporarily closed and two way traffic must be maintained the Contractor shall use flag personnel to control traffic movement.

- 3-3 **STREET/ALLEY CLOSURES:** No street or alley shall be closed to the public by the Contractor except as authorized by the Owner and in accordance with procedures outlined herein. Wherever, in the prosecution of the work, the Contractor finds it necessary to close a street to traffic, he shall advise the Police and Fire Departments forty-eight (48) hours in advance of the time when the street will require closing. The forty-eight (48) hour notice will be required in all cases involving the normal prosecution of the work and convenience of the Contractor. Twenty-four (24) hours prior to commencement of work, the Contractor shall furnish and install approved "No Parking" signs giving day of the week; i.e. "No Parking in this block on Thursday". At time of posting, verbal notice of intent shall be given to occupants of premises involved. In cases of emergency, involving conditions over which the contractor has no control, the street may be closed. In these cases, the Contractor is required to immediately notify the Police and Fire Departments and the Engineer.
- 3-4 **DETOURS:** Wherever streets or alleys are closed as provided herein, it will be the sole responsibility of the Contractor to adequately mark and light the detours as determined by the Contractor and the Owner after consultation with the Police and Fire Departments, Traffic Engineer, and in accordance with standard details indicated on plans for this project.
- A. Wherever detours are required over areas other than on established Owner streets it shall be the responsibility of the Contractor to secure all necessary permission from the property owners involved, prior to establishing such detours. Traffic shall not be routed over such detour until it has been bladed and shaped (and paved, where required) in such a way as to provide a reasonably safe and convenient roadway to the traveling public. Where detours are established over such areas or over unpaved streets, it shall be the responsibility of the Contractor to maintain such detours with a minimum of inconvenience to the adjoining property owners. Full provision shall be made by the Contractor for minimizing inconvenience from dust.
- 3-5 **TRAFFIC MAINTAINED OVER CONSTRUCTION:** Where traffic is maintained along the street or alley under construction, particular care shall be used to shape and maintain the roadbed so that a safe and convenient roadway is available to the traveling public. Ramps from undisturbed streets into excavated areas shall be maintained for traffic on gradual grades and in no case shall a ramp be steeper than a 10:1 slope. The Contractor shall make full provisions for minimizing inconvenience from dust. Marking and lighting the route shall be in accordance with standard details referenced in Part 2-3. During periods when actual construction is not in progress, streets shall be properly maintained and dust control measures shall be employed.
- 3-6 **PROTECTION OF STREET SIGNS, TRAFFIC SIGNS, AND SIGNALS:** Street signs, traffic signs, signals and other traffic control devices already in place for information and to safeguard traffic must be protected by the contractor. Where it is necessary to disturb or remove any of these items, the Contractor shall secure approval of the Owner prior to any such work, this approval to be based on concurrence and requirements from the Traffic Engineer.

3-7 PROTECTION OF PUBLIC:

- A. Fence, barricade, or otherwise block off the immediate work area to prevent unauthorized entry to the work area.
- B. Erect and maintain barricades, lights, danger signals, and warning signs in accordance with ANSI/ANSI D6.1.
- C. Illuminate barricades and obstructions at night; keep safety lights burning from sunset to sunrise.
- D. Adequately barricade and post all open cuts including special provisions for those adjacent to thoroughfares.
- E. Protect pedestrian traffic by fences to channelize and direct pedestrian traffic along approved routes.
- F. When pedestrian traffic is detoured into a roadway, provide temporary walkways with any necessary protection at ends and overhead. For walkways, use lumber running parallel to direction of traffic movement and provide ramps at changes of elevation.
- G. Cover pipes, hoses, and power lines crossing sidewalks and walkways with troughs using beveled edge boards.
- H. Erect and maintain sufficient detour signs at road closures and along detour routes.

3-8 TREE AND PLANT PROTECTION:

- A. Preserve and protect existing trees and plants identified to remain.
- B. Do not remove, injure, or destroy trees or other plants without prior approval. Consult with the Owner and remove agreed-upon roots and branches that interfere with construction. Remove roots and branches and treat cuts according to good horticultural practice.
- C. Provide temporary barriers around trees and plants protecting root zones.
- D. Do not fasten ropes, cables, or guys to existing trees.
- E. Carefully supervise excavating, grading, filling, and other construction operations in the vicinity of trees to prevent damage.
- F. Replace, or suitably repair, trees and plants that are damaged or destroyed due to construction operations at no additional expense to the Owner.

3-9 REMOVAL: Completely remove barriers no longer needed and when approved by the Owner and/or Engineer.

END OF SECTION

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Examination
- B. Preparation.
- C. Installation of Fencing.
- D. Installation of Boxing.
- E. Siltation Control.
- F. Transplanting.
- G. Tree Removals.
- H. Root Pruning and Protection.
- I. Construction Branch Pruning.
- J. Temporary Tree Guying.
- K. Aeration.
- L. Watering.
- M. Excavation Insulation.
- N. Chemicals, Fertilization, and Insect Spraying.
- O. Concrete Washout.
- P. Grading at Tree Protection Areas.
- Q. Field Quality Control/Damage Penalties.
- R. Cleaning.
- S. Protection.

1.02 RELATED SECTIONS

- A. Section 02518: Concrete Unit Paving.
- B. Section 02520: Portland Cement Concrete Paving.
- C. Section 02815: Landscape Irrigation.
- D. Section 02920: Landscape Systems.
- E. Section 02923: Landscape Grading.
- F. Section 02940: Sodding.
- G. Section 02950: Trees, Shrubs, Groundcovers and Perennials.
- H. Section 630: Storm Drains and Culverts

1.03 SUPPLEMENTAL UNIT PRICES - MEASUREMENT AND PAYMENT

- A. The following items are listed for detailed description and unit pricing in case of addition work needed.
- B. TREE PROTECTION
 - 1. Basis of Measurement: Per tree.
 - 2. Basis of Payment: Includes materials and labor to install posts, and fencing around each tree designated to remain, and necessary root pruning, branch pruning, aeration, protection during construction and maintenance. Include adjusting of fencing during construction and replacement of damaged fence during construction and removal of fence at conclusion of Work.

C. TREE REMOVALS

1. Basis of Measurement: On a per tree basis.
2. Basis of Payment: Includes removal and disposal, including stump removal.

1.04 REFERENCES

- A. ANSI Z133.1 Safety Requirements for Pruning, Trimming, Repairing, Maintaining and Removing Trees, and for Cutting Brush.
- B. International Society of Arboriculture (ISA): Guide for Establishing Values of Trees and Other Plants.
- C. International Society of Arboriculture (ISA): Tree and Shrub Transplanting Manual.
- D. National Arborist Association (NAA) Book of Standards, most recent edition.

1.05 DEFINITIONS

- A. TREE PROTECTION FENCING: Temporary fencing installed prior to site preparation and demolition which protects a group of trees or shrubs.
- B. ROOT PRUNING: Physical cutting of plant roots to minimize root damage and promote healing.
- C. CONSTRUCTION BRANCH PRUNING: Physical cutting of any branch which interferes with construction.

1.06 SUBMITTALS

- A. All submittals shall be accepted by the Landscape Architect in writing before Work commences.
- B. SCHEDULE: Submit construction schedule which includes time frame for work near existing plant material. Provide transplanting and tree removal schedule including tree transplants and locations. Obtain approval by Landscape Architect and City Forester prior to beginning of transplanting work and construction near restricted area.
- C. WORK METHODS: Submit proposed methods and schedule for effecting tree and plant protection for approval, including proposed methods, materials, and schedule for root pruning, construction pruning, aeration and subsequent tree fertilization. Mark plan location of root pruning in field with paint for approval by City Forester Landscape Architect. Any root pruning which is required due to construction work adjacent to existing trees and shrubs designated to remain shall occur any time ground can be worked except when tree or shrubs are in leaf. Root pruning when tree or shrubs are in leaf may occur only with approval by City Forester and Landscape Architect.
- D. SAMPLE: Submit material sample and description of aeration filler for approval by Landscape Architect and City Forester.

1.07 QUALITY ASSURANCE

- A. QUALIFICATIONS

1. Arborist: Company having adequate capacity and facilities to meet the specified requirements. All tree pruning and cleaning shall be performed by a licensed arborist with a minimum 5 years documented experience. Evidence to this effect shall be provided by the supplier if required by the Landscape Architect.
- B. REGULATORY REQUIREMENTS: City permits are necessary for pruning or removal of all trees in the right-of-way.
- C. MOCK-UP
1. Provide representative field sample of all specified pruning and cleaning. Mock-up shall:
 - a. Be located where directed by Landscape Architect.
 - b. Represent workmanship of finish work indicated for project work.
 2. Make necessary adjustments to gain acceptance from the City Forester and Landscape Architect.
 3. Retain and protect mock-up during construction as a standard for judging completed work.
- E. Pre-Installation Conference
1. Conduct pre-installation conference prior to construction.
 2. Attendance required by: Landscape Architect, City Forester, Contractor(s), Manufacturer(s)/Supplier(s), other parties who are involved.

1.08 PROJECT/SITE CONDITIONS

- A. All plant materials to remain or be moved as part of this project will be tagged by the Landscape Architect and City Forester to assist the Contractor in identifying the trees.
- B. Maintain all plant materials within protection areas. Designated protection areas of trees, shrubs, and grasses are to remain untouched and unharmed.
- C. Construction activities in tree protection areas are prohibited.
- D. Work within the drip area of a tree shall be restricted of the following items:
 1. Vehicular traffic or parking.
 2. Storage of materials or products.
 3. Dumping of refuse or chemically injurious materials or liquids.
 4. Puddling or continuous running water.
 5. Diesel or gasoline equipment running adjacent to the area.

1.09 SEQUENCING AND SCHEDULING

- A. ROOT PRUNING and CANOPY AND CONSTRUCTION PRUNING: Immediately prior to start of construction.

1.10 MAINTENANCE

- A. MAINTENANCE SERVICES: Performed by installing licensed arborist throughout construction period up until final acceptance of all site construction.
- B. MAINTENANCE PERIOD: Begin maintenance immediately upon start of construction. Continue maintenance until final acceptance of all site construction.
- C. MAINTENANCE TO INCLUDE:
 - 1. Monthly review and monitoring of tree conditions.
 - 2. Maintaining guying. Repair or replace when required.
 - 3. Water at a sufficient frequency to saturate root system and keep soil moist.
 - 4. Pruning, including removal of dead or broken branches, and treatment of pruned areas or other wounds.
- D. PESTICIDES: No chemicals shall be applied. Notify City Forester if insects are observed on trees.

PART 2 - PRODUCTS

2.01 TREE PROTECTION FENCING

- A. Fencing: Galvanized chain link fencing, 6 ft. high.
 - 1. Tree protection fencing is the property of the Contractor.
- B. METAL FENCE POSTS: 9 ft. galvanized steel posts, driven a minimum of 3 ft. into the ground. Space 10 ft. o.c. maximum.

2.02 SOIL AMENDMENTS/MULCH

- A. HUMUS WOOD CHIPS: Nitroified aspen humus suitable for use as a soil amendment. Comply with Section 02950.
- B. WOOD MULCH: Shredded bark mulch complying with Section 02920.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. VERIFICATION OF CONDITIONS: Examine areas and conditions under which the Work of this Section will be performed. Report unsatisfactory or questionable conditions to the Landscape Architect. Do not proceed with the Work until unsatisfactory conditions have been corrected. Commencement of work implies acceptance of all areas and conditions.
- B. Verify all utility locations in the field prior to digging.

3.02 PREPARATION

- A. PROTECTION: Protect areas in accordance with paragraph 3.18 this Section.

B. MARKING OF CONSTRUCTION/DEMOLITION/TREE PRESERVATION LIMITS

1. Clearly mark the tree protection fence locations and all construction/demolition limits in the field as indicated on the Drawings.
2. Mark individual tree root pruning areas with paint.
3. Verify all trees to be removed, transplanted, or protected with Landscape Architect and City Forester. Tag all plant material with appropriate tags noting action to be taken with each plant.
4. Contact and accompany Landscape Architect and City Forester on a joint review of construction/demolition limits, tagging and painting before prior to the installation of the tree protection fencing and start work.
5. Limit of construction is generally defined as the limit of demolition. Contractor to immediately notify Landscape Architect if work will occur outside the construction/demolition limits.

3.03 INSTALLATION OF FENCING

A. FENCING: Install tree protection fencing prior to start of demolition work and clearing and grubbing operations in accordance with the following:

1. Following approval of staking by the Landscape Architect and City Forester, install fencing at the tree protection areas.
2. Install posts 5'-0" o.c. maximum.

3.04 TRANSPLANTING

A. SCHEDULE: Obtain approval of schedule prior to starting transplanting work. Transplanting shall occur within the following schedule:

Deciduous plant material	October 15 thru March 15.
Evergreen plant material	September 1 thru March 15.

B. NOTIFICATION: Trees to be transplanted according to the Demolition Plans shall be tagged by the Contractor and approved by the Landscape Architect and City Forester prior to transplanting. Trees to be transplanted shall be transplanted to locations directed by the Landscape Architect. Notify Landscape Architect at least 72 hours in advance of transplanting any trees so new locations for the trees can be staked and so transplanting operation can be observed.

C. MARKING ORIENTATION: Prior to digging, mark the north side of each tree with a flag so that the tree can be planted with the same orientation to prevent sun scald on the bark.

D. EQUIPMENT: Transplant trees using a 90" tree spade with sharp blades which cuts roots cleanly. Moving trees with a backhoe, end loader, or other similar equipment is not allowed. If any circumstances are encountered that preclude the use of a 90" tree spade, recommend alternative method of transplant for Landscape Architect's and City Forester's approval.

E. TRANSPLANTING

1. Center tree in the tree spade.
2. Scarify sides of the tree pit prior to placement of tree.

3. Plant vertically in the new location.
 4. Stake and guy in accordance with Section 02950.
 5. After the tree has been guyed, fill hole with good, friable topsoil. The loose topsoil shall be worked down into the hole with a hand spade while being watered to assure that all air pockets are eliminated and filled with muddy soil.
 6. Build soil berm around the newly transplanted trees in accordance with Section 02950. Fill area with 4" depth of wood mulch - see planting detail.
- F. **MAINTENANCE:** The 90 day maintenance and watering requirements of the Standard Landscape Specifications apply, except that watering quantities shall be increased by 10 gallons per tree for each caliper inch greater than 1". Contractor will not be required to replace trees which, in the opinion of the Owner and Landscape Architect, have died at the end of the 90 day period, however, the Contractor will be required to remove any trees that have died and regrade and reseed the disturbed areas. Contractor responsible to repair any damage to public or private property during the transplant process at no extra cost to the contract.
- G. **PROTECTION:** Contractor responsible for protection of all trees designated to remain or be transplanted during transplanting procedures.

3.05 TREE REMOVALS

- A. **SCHEDULE:** Obtain approval of schedule prior to starting work.
- B. **NOTIFICATION:** Trees to be removed according to the Demolition Plans shall be tagged by the Contractor and approved by the Landscape Architect and City Forester prior to removal.
- C. **STUMP REMOVAL:** Remove tree stumps by a Landscape Architect and City Forester approved means to a depth of 12" below the proposed finished grade surface in lawn areas and 36" below finish grade in paved areas as determined by the Landscape Architect. Remove wood chips from site. Fill stump removal areas with existing soil. Chemicals which will harm future landscape above stumps may not be applied to aid in stump removal.
- D. **DISPOSAL:** Dispose of all removals from the site at an approved disposal or recycling facility. Removals or mulch become the property of the Contractor.
- E. **PROTECTION:** Contractor responsible for protection of all trees designated to remain or transplanted during removal procedures.

3.06 ROOT PRUNING AND PROTECTION

A. ROOT PRUNING

1. Prune roots where construction will sever roots.
2. Only clean cutting methods are acceptable. Root pruning is the physical cutting of tree roots to minimize root damage and promote healing. Unsuitable means for root pruning include trenching, vibrating plow, stump grinder. Any method which tears roots or disturbs the soil beyond the grading limit is unacceptable.
3. Hand trim roots and trench walls. Make clean cuts through roots.

4. Prune tree roots to a depth no greater than required by construction excavation, by approved means only. All roots shall be pruned by an approved method.
- B. **BACKFILL:** Close trenches within 24 hours. Backfill root pruning trench with existing soil. Tamp lightly to set soil.
1. When trench closing is not possible within 24 hours, protect trench side in accordance with paragraph 3.11 this Section.
- C. **MULCHING:** Apply wood mulch to a depth of 4 in. to 5 in. at minimum 10 ft. to 15 ft. radius around tree to reduce compaction and increase moisture retention. Soil shall be kept moist in root pruning areas.
- D. **ROOT PROTECTION:** If tree roots larger than two (2) inches in diameter are encountered with digging or trenching, tunnel under for any improvements if possible. Dig trench by hand only.
1. Notify Landscape Architect and City Forester to allow physical inspection of excavation around root zones to determine damage and health of tree. Do not tear the roots out. Removal of two (2) inches or larger diameter roots encountered during construction is not allowed without permission of Landscape Architect or City Forester.
 2. Upon approval by Landscape Architect, wrap cut roots 2 inches and larger with burlap to prevent scarring or excessive drying.

3.07 CONSTRUCTION BRANCH PRUNING

- A. Prune any branches of trees to be preserved which interfere with construction only at the direction of the Landscapae Architect or City Forester. Approval of all proposed pruning is required prior to start of work. Pruning is an incidental pay item associated with the transplanting of existing trees, the planting of new trees, and the protection of existing trees to remain.
- B. Remove any branches which are weak or dead.
- C. Any pruning included as part of the project shall be done by a licensed tree company and in accordance with good pruning practices as approved by the Landscape Architect and City Forester. Pruning shall maintain balance, form and function of tree.

3.08 TEMPORARY TREE GUYING

- A. Upon review of on-site root pruning and construction grading limits, the Landscape Architect and City Forester shall determine whether the existing trees designated to remain should be temporarily guyed.
- B. Complete tree guying using materials and techniques designated by the Landscape Architect and City Forester and complete in a timely manner.

3.09 AERATION

- A. If areas inside the restricted area become compacted as determined by the Landscape Architect and City Forester, aerate to a 20 inch depth using an aeration "grow gun," avoiding damage to surface absorbing feeder roots. Inject filler material to hold aeration fractures open.

3.10 WATERING

- A. Apply supplemental watering to a depth of 10-12" (18" max) with a deep root feeder if loss of grasses or heating of the roots occurs during construction or as directed by Engineer. Approximately 100 gallons per tree shall be applied.
- B. Contractor to water existing trees as determined by Landscape Architect and City Forester to promote healthy, thriving plant material.
- C. Contractor and Landscape Architect and City Forester to determine appropriate water pressure.

3.11 EXCAVATION INSULATION

- A. Provide mitigation from moisture and temperature fluctuations by pinning 3 layers of burlap onto the entire face of excavations exposed for more than 24 hours.
- B. Wet burlap insulation immediately following installation.
- C. Keep moist for the entire period the excavation remains open.
- D. Remove insulation prior to backfilling.

3.12 CHEMICALS, FERTILIZATION AND INSECT SPRAYING

- A. No chemicals shall be applied or used around or near existing trees.
- B. No fertilizers, insect sprays or other chemicals shall be applied before or during root or branch pruning process.

3.13 CONCRETE WASHOUT

- A. Provide concrete washout in areas which drain away from the Tree Protection Areas. The Landscape Architect and City Forester shall approve concrete washout area prior to the start of any site work.

3.14 GRADING AT TREE PROTECTION AREAS

- A. All grading within protected areas shall proceed only after review and approval by the Landscape Architect and City Forester.
- B. No more than 3" of fill earth shall be allowed without approval by the Landscape Architect and City Forester. Tamping of fill earth shall be allowed; compaction of fill earth shall not be allowed. No "cutting" of grades in root area shall be allowed.

3.15 FIELD QUALITY CONTROL/DAMAGE PENALTIES

- A. Trees labeled as requiring "Special Protection" adjacent to construction areas and in other key locations are identified on the Drawings. Loss of any of these trees due to Contractor neglect or improper construction activities will result in liquidated damages for the assessed value of the tree as determined by the City Forester. Damage to a portion of these trees will be assessed by the City Forester and a portion of the liquidated damages will be assessed to the Contractor. A list of tree values for the project will be on file in the Landscape

- Architect's and City Forester's office. Any damaged tree not on this list shall be evaluated by the City Forester as necessary to comply with this penalty.
- B. A fine of \$1,000 will be levied against the Contractor for each incident of construction (including construction traffic) inside tree protection areas.
 - C. Trees or roots visibly damaged will cause the Owner to withhold from the Contractor an assessed amount conforming to the requirements stipulated above, for a period of two years. After that period the impact of the damage to any tree will be assessed by the City Forester.
 - D. If any trees designated to be saved are damaged and replacement is required, a number and diameter of trees or shrubs of the same species and variety, as specified by the Landscape Architect and City Forester, shall be furnished and planted by the Contractor. The total inch diameter of the replacement trees or shrubs shall equal the diameter of the tree or shrub to be replaced as measured by The Guide For Establishing Value of Trees and Other Plants, published by the International Society of Arboriculture. The Contractor shall not be liable for any loss or damage which occurs while the Contractor is complying with instructions given by the Landscape Architect and City Forester working on the Project.

3.16 ADJUSTING

- A. **TREE PROTECTION AREA ACCESS:** When construction traffic is unavoidable as concurred by the Contractor and Landscape Architect and City Forester, the following procedure shall be followed:
 1. Obtain approval from the Landcape Architect and City Forester for Tree Protection Area access.
 2. Install protective fencing by hand to delineate the construction corridor. Fencing location must be approved on site by the Landscape Architect and City Forester.
 3. Install a 12" layer of wood chips overlaid with continuous 3/4" plywood sheets on the existing grade for the entire area of the traffic route to allay rutting and slightly reduce soil compaction.
 4. Remove all materials and return area to preconstruction condition within one week of the work.
- B. **EXCAVATION INSULATION:** If in the Contractor's opinion, climate condition do not necessitate the installation of burlap insulation at an excavation, he may submit to the Landscape Architect and City Forester a written request to omit the burlap insulation. Submit request to the Landscape Architect and City Forester 24 hours prior to excavation.

3.17 CLEANING

- A. **REMOVAL OF PROTECTION:** Except as otherwise indicated or requested by Landscape Architect, temporary protection devices and facilities installed during course of the work shall be removed only after all work which may injure or damage trees and plants is completed.
- B. **REMOVAL:** Remove all excess material during construction period and haul off-site.

- C. REPAIR: Repair surface damage caused by fence posts. Restore to match surrounding conditions.

3.18 PROTECTION

- A. Protect planting areas, plants, and associated irrigation systems at all times against damage of any kind for the duration of the maintenance. If any plants become damaged or injured, they shall be treated or replaced as directed by the Landscape Architect and City Forester at no additional cost to the Owner. The contractor shall not be responsible for acts of vandalism or acts of God during the maintenance period.
- B. Protect tree roots in accordance with paragraph 3.06 this Section.
- C. BRANCH PROTECTION: Contact Landscape Architect and City Forester if it appears that construction will damage to the branches of any tree. The Landscape Architect and City Forester will determine action to be taken. If pruning is required, perform in accordance with paragraph 3.07 this Section.

END OF SECTION

PART 1 – GENERAL**1.01 SUMMARY****A. WORK INCLUDED:**

1. Examination
2. Soil Mixing
3. Quality Control
4. Installation
5. Fine Grading
6. Clean-Up

B. RELATED SECTIONS

1. Section 02200: Earthwork
2. Section 02518: Concrete Unit Paving
3. Section 02518: Concrete Paving
4. Section 02815: Irrigation System
5. Section 02920: Landscape Systems
6. Section 02923: Landscape Grading
7. Section 02950: Trees, Plants & Groundcovers
8. Section 500: Concrete
9. Section 630: Storm Drains & Culverts

1.02 SUPPLEMENTAL UNIT PRICES – MEASUREMENT AND PAYMENT

A. The following items are listed for detailed description and unit pricing in case of addition work needed.

B. STRUCTURAL SOIL

1. Basis of Measurement: Cubic Yard
2. Basis of Payment: Structural Soil will be paid for at the respective Contract unit price per cubic yard, including mixing, quality control protection, filter fabric, structural soil, fine grading, clean-up, and temporary protection of the structural soil.

1.03 REFERENCES

A. The following references are used herein and shall mean:

1. ASTM: American Society of Testing Materials.
2. USDA: United States Department of Agriculture.
3. AASHTO: American Association of State Highway and Transportation Officials.
4. Standard Specifications: Regional or Municipal Standard Specifications Documentation for the location of proposed usage
5. AOAC: Association of Official Agricultural Chemists

1.04 SUBMITTALS

A. At least 30 days prior to ordering materials, the Contractor shall submit to the Landscape Architect samples, certificates, manufacturer's literature and certified

tests for materials specified below. No materials shall be ordered until the required samples, certificates, manufacturer's literature and test results have been reviewed. Delivered materials shall closely match the approved samples. Approval shall not constitute final acceptance. The Landscape Architect reserves the right to reject, on or after delivery, any material that does not meet these specifications.

- B. Submit two – one half (1/2) cubic foot representative samples of all Clay Loam and two - two (2) cubic foot representative samples Structural Soil mixes in this section for testing, analysis and approval. Submit one set of samples for every 500 CY of material to be delivered. In the event of multiple source fields for Clay Loam, submit a minimum of one set of samples per source field or stockpile. Samples shall be taken randomly throughout the field or stockpile at locations as directed by the Landscape Architect and packaged in the presence of the Landscape Architect. Contractor shall deliver all samples to testing laboratories and shall have the test results sent directly to the Landscape Architect. Samples shall be labeled to include the location of the source of the material, the date of the sample and the Contractor's name. One of the two samples is to be used by the testing laboratory for testing purposes. The second sample of all Clay Loam and Structural Soil shall be submitted to the Landscape Architect at the same time as test analysis as a record of the soil color and texture.
 - 1. Submit the locations of all source fields for Clay Loam.
 - 2. Submit a list of all chemicals and herbicides applied to the Clay Loam for the last five years and a list of all crops grown in the Clay Loam source fields for the last three years.

C. Submit soil test analysis reports for each sample of Clay Loam and Structural Soil from an approved soil testing laboratory. The test results shall report the following:

- 1. The soil testing laboratory shall be approved by the Landscape Architect. The testing laboratory for particle size and chemical analysis may be a public agricultural extension service agency or agricultural experiment station.
- 2. Submit a bulk density of the sample and particle size analysis including the following gradient of mineral content:

<u>USDA Designation</u>	<u>Size in mm.</u>
Gravel	+2mm
Sand	0.05 -2 mm
Silt	0.002-0.05 mm
Clay	minus 0.002 mm

- a. Sieve analysis shall be performed and compared to USDA Soil Classification System. Sieve analysis shall be by a combined hydrometer and wet sieving using sodium hexametaphosphate as a dispersant in compliance with ASTM D422 after destruction of organic matter by hydrogen peroxide.
- 3. Submit a chemical analysis, performed in accordance with current AOAC Standards, including the following:
 - a. pH and Buffer pH.

- b. Percent organic matter as determined by the loss of ignition of oven dried samples. Test samples shall be oven dried to a constant weight at a temperature of 230 degrees F, plus or minus 9 degrees.
 - c. Analysis for nutrient levels by parts per million including nitrate nitrogen, ammonium nitrogen, phosphorus, potassium, magnesium, manganese, iron, zinc, calcium and extractable aluminum. Nutrient test shall include the testing laboratory recommendations for supplemental additions to the soil as calculated by the amount of material to be added per volume of soil for the type of plants to be grown in the soil.
 - d. Analysis for levels of toxic elements and compounds including arsenic, boron, cadmium, chromium, copper, lead mercury, molybdenum, nickel, zinc and PCB. Test results shall be cited in milligrams per kilogram.
 - e. Soluble salt by electrical conductivity of a 1:2 soil/water sample measured in Millimho per cm.
 - f. Cation Exchange Capacity (CEC).
 - g. Carbon/Nitrogen Ratio.
4. Submit 5 point minimum moisture density curve AASHTO T 99 test results for each Structural Soil sample without removing oversized aggregate.
 5. Submit California Bearing Ratio test results for each Structural Soil sample indicating a soaked CBR minimum of 50 at peak standard density.
 6. Submit Clay Loam-Crushed Stone ratio by splitting a known weight of oven dried material on a #4 sieve for each Structural Soil sample.
 7. The approved Structural Soil samples shall be the standard for each lot of 500 cubic yards of material.
 8. All testing and analysis shall be at the expense of the Contractor.
- D. Maintenance Instructions: Prior to the time of Final Acceptance of the Work, submit maintenance instructions for the use, removal and replacement of Structural Soil for the Owner's use. The instructions shall be reviewed by the Architect as a pre-condition for Final Acceptance of the Work.
- E. Submit to the Architect for review a proposed plan and vertical section layout of all Structural Soil.
- F. Submit one cubic foot sample per each 500 cubic yards of required material and for each sample, the following analysis for all Crushed Stone. The soil testing laboratory shall be approved by the Architect.
1. Provide a particle size analysis including the following gradient of mineral content:

<u>USDA Designation</u>	<u>Size in mm.</u>
3"	+76mm
2-1/2" 63-76mm	
2"	50-63mm
1-1/2" 37-50mm	
1"	25-37mm
3/4"	19-25mm
Fine gravel	2-19mm
Sand	0.05 -2 mm

Silt	0.002-0.05 mm
Clay	minus 0.002 mm

2. Provide the manufacturers analysis of the following:
 - a. Loose and rodded unit weight.
 - b. Bulk specific gravity and absorbence.
 - c. Stone dimension and surface texture description.
 - d. Aggregate soundness and L.A. abrasion.

3. Provide a percent pore space analysis defined as follows:

(1-Rodded Unit Weight divided by the Buik Specific Gravity)X 100

- G. Submit one pound sample of each type of fertilizer and 6 certificates showing composition and analysis. Submit the purchasing receipt for each fertilizer showing the total quantity purchased for the project prior to installation.
- H. Submit the Landscape or Pavement Material Contractor's qualifications outlining projects of similar quality, schedule requirements and construction detailing over the last 5 years. Qualifications shall include: The names of all similar projects, year completed, location, description of the scope of work including the types and quantities of planting mix / pavement material installed and the name, address and telephone number of the owner or the owner's representative.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver or place soils in frozen, wet, or muddy conditions. Material shall be delivered at or near optimum compaction moisture content as determined by AASHTO T 99 (ASTM D 698). Do not deliver or place materials in an excessively moist condition (beyond 2 percent above optimum compaction moisture content as determined by AASHTO T 99 (ASTM D 698).
- B. Protect soils and mixes from absorbing excess water and from erosion at all times. Do not store materials unprotected from large rainfall events. Do not allow excess water to enter site prior to compaction. If water is introduced into the material after grading, allow material to drain to near optimum compaction moisture content.

1.06 EXAMINATION OF CONDITIONS

- A. All areas to receive Structural Soil shall be inspected by the Contractor before starting work and all defects such as incorrect grading, compaction and inadequate drainage etc. shall be reported to the Architect prior to beginning this work.
- B. The Contractor shall be responsible for judging the full extent of work requirements involved, including but not limited to the potential need for temporary storage and staging of soils, including moving soil stock piles at the site to accommodate scheduling of other work and the need to protect installed soils from compaction, erosion and contamination.

1.07 QUALITY ASSURANCE

- A. Qualifications of Landscape or Pavement Material Contractor: The work of this section shall be performed by a Landscape Contracting firm which has a minimum of 5 years experience successfully installing planting mix of a similar

quality, schedule requirement and construction detailing to this project. Proof of this experience shall be submitted as per paragraph 1.04 G, of this Section.

PART 2 - PRODUCTS

2.01 CLAY LOAM

- A. Clay Loam shall be a "clay loam" based on the "USDA classification system" as determined by mechanical analysis (ASTM D-422) and it shall be of uniform composition, without admixture of subsoil. It shall be free of stones greater than one-half inch, lumps, plants and their roots, debris and other extraneous matter over one inch in diameter or excess of smaller pieces of the same materials as determined by the Landscape Architect. It shall not contain toxic substances harmful to plant growth. It shall be obtained from naturally well drained areas which have never been stripped of top soil before and have a history of satisfactory vegetative growth. Clay Loam shall contain not less than 2% nor more than 5% organic matter as determined by the loss on ignition of oven-dried samples. Test samples shall be oven-dried to a constant weight at a temperature of 230 degrees F., plus or minus 9 degrees.

- B. Mechanical analysis for Clay Loam shall be as follows:

<u>Textural Class</u>	<u>% of total weight</u>
Gravel	less than 5%
Sand	25 - 30%
Silt	20 - 40%
Clay	25 - 40%

- C. Chemical analysis: Meet or be amended to meet the following criteria.

1. pH between 5.5 to 6.5
2. Percent organic matter 2 -5% by dry weight.
3. Nutrient levels as required by the testing laboratory recommendations for the type of plants to be grown in the soil.
4. Toxic elements and compounds below the United States Environmental Protection Agency Standards for Exceptional Quality sludge or local standard; whichever is more stringent.
5. Soluble salt less than 1.0 Millimho per cm.
6. Cation Exchange Capacity (CEC) greater than 10
7. Carbon/Nitrogen Ratio less than 33:1.

- D. Clay Loam shall be the product of a commercial processing facility specializing in production of stripped natural topsoil. No topsoil shall come from USDA - classified prime farmland.

2.02 FILTER FABRIC

- A. Woven, UV stabilized, polypropylene geotextile with the following properties.
1. Grab Tensile Strength (ASTM D 4632) 140 lb. min.
 2. Mullen Burst Strength (ASTM D 3786) 325 psi. min. Puncture Strength (ASTM D 4833) 60 lb. min. Apparent opening size (ASTM D 4751) 0.600 mm min.

- B. All Filter Fabric shall be delivered in 12' (min.) wide rolls.
- C. Filter Fabric shall be Mirafi 500 XL as Manufactured by TC Mirafi, Pendergrass, GA. or approved equal.

2.03 FERTILIZER

- A. Commercial fertilizer complying with State and United States fertilizer laws. Deliver fertilizer in original unopened containers which shall bear the manufacturer's certificate of compliance covering analysis which shall be furnished to the Landscape Architect. Fertilizer shall be formulated for mixing into the soil and be certified by the manufacturer to provide controlled release of nitrogen continuously for a period of no less than 9 months and no more than 12 months.
- B. Fertilizer percentages of weight of ingredients and application rates shall be as recommended by the soil testing results.

2.04 SULFUR

- A. Sulfur shall be commercial granular, 96% pure sulfur, delivered in containers with the name of the manufacturer, material and analysis appearing in the container.
- B. Sulfur used to lower soil pH above 6.5 shall be ferrous sulfate formulation.

2.05 LIME

- A. Agricultural limestone containing a minimum of 85% carbonates. Minimum gradation: 100% passing 10 mesh sieve; 98% passing 20 mesh sieve; 55% passing 60 mesh sieve and 40% passing 100 mesh sieve.

2.06 CRUSHED STONE

- A. Crushed Stone shall be a 1/2 inch diameter crushed granite stone; no limestone or sandstone or fines shall be used.
- B. Acceptable aggregate dimensions will not exceed 2.5:1.0 for any two dimensions chosen.
- C. Statement of angularity or % rounded edges
- D. Results of the Aggregate soundness loss test will not exceed 18%.
- E. Losses from L.A. Abrasion tests will not exceed 40%.

2.07 HYDROGEL

- A. Hydrogel shall be a potassium propenoate-propenamide copolymer Hydrogel as manufactured by Gelscape by Amereq Corporation, 19 Squadron Blvd., New York City, New York, 10956, 1-800-832-8788, (914)634-2400.

2.08 WATER

- A. The Contractor shall be responsible to furnish his own supply of water to the site at no extra cost. All work injured or damaged due to the lack of water, or the use of too much water, shall be the Contractor's responsibility to correct. Water shall be free from impurities injurious to vegetation.

2.09 STRUCTURAL SOIL

- A. A uniformly blended mixture of Crushed Stone, Clay Loam and Hydrogel, mixed to the following proportion:

<u>MATERIAL</u>	<u>UNIT OF WEIGHT</u>
Crushed Stone	100 dry weight
Loam	As determined by the test of the mix (Approx. 18 +/-)
Hydrogel	0.03 dry weight
Total moisture	10 (AASHTO T -99 optimum moisture)

- B. The initial mix design for testing shall be determined by adjusting the ratio between the Crushed Stone and the Clay loam such that the volume percent of Clay Loam in the mix is less than 80% and more than 60% of the percent of voids in the Crushed Stone as determined from the stone rodded unit weight (1.04 F 3) and the bulk density of the soil. Adjust final mix dry weight mixing proportion to decrease soil in mixture if CBR test results fail to meet acceptance (CBR \geq 50).

PART 3 - EXECUTION

3.01 EXAMINATION

- A. VERIFICATION OF CONDITIONS: Examine areas and conditions under which the Work of this Section will be performed. Report unsatisfactory or questionable conditions to the Landscape Architect. Do not proceed with the Work until unsatisfactory conditions have been corrected. Commencement of Work implies acceptance of all areas and conditions.
1. Verify that during grading, topsoil spreading and landscape grading operations, the ground surface was cleaned of materials which might hinder final operations.

3.02 MIX DESIGN

- A. Prepare sample Structural Soil mixes to determine the ratio of mix components. Submit for approval.
1. Submit samples and the test results of each mix component for approval. Based on samples and the analysis of the mix components, the Landscape Architect and the Contractor will jointly determine a mix ratios to be tested for conformance with the requirements of the specifications. For Structural Soil quantities greater than 500 cubic yards, test the mix ratio for each Clay Loam or Crushed Stone where the testing indicates a significant difference in physical analysis of the Clay Loam or Crushed Stone as determined by the Architect.
 2. The Contractor shall prepare the samples of the proposed mix ratio options and obtain soil test as described in paragraph 1.05. C. Submit the samples of each of the mixes with the test results.
 3. The Landscape Architect may request additional Structural Soil mix ratio samples to be tested in the event that further refinement of the mix is necessary.
 4. Submit to the Landscape Architect proposed fertility amendment recommendations including amounts and types of fertilizers and pH

adjustments for each mix ratio. Fertility adjustments shall be included as part of the mixing process.

3.03 SOIL MIXING AND QUALITY CONTROL TESTING

- A. All Structural Soil mixing shall be performed at the Contractor's yard using appropriate soil measuring, mixing and shredding equipment of sufficient capacity and capability to assure proper quality control and consistent mix ratios. No mixing of Structural Soil at the project site shall be permitted. Portable pugging may be the exception
1. Maintain adequate moisture content during the mixing process. Soils and mix components shall easily shred and break down without clumping. Soil clods shall easily break down into a fine crumbly texture. Soils shall not be overly wet or dry. The contractor shall measure and monitor the amount of soil moisture at the mixing site periodically during the mixing process.
 2. A Mixing procedure for front-end loader shall be as follows:
 - a. On a flat asphalt or concrete paved surface, spread an 8 inch to 12 inch layer of Crushed Stone.
 - b. Spread evenly over the stone a proportional amount of dry Hydrogel.
 - c. Spread over the dry Hydrogel and Crushed Stone a proportional amount of Clay Loam.
 - d. Blend the entire amount by turning using a front end loader or other suitable equipment until a consistent blend is produced.
 - e. Add moisture gradually and evenly during the blending and turning operation as required to achieve the required moisture content . Delay applications of moisture for 10 minutes prior to successive applications. Once established, mixing should produce a material within 1% of the optimum moisture level for compaction.
 3. A pugging operation mixing procedure may be as follows:
 - a. Feed a known weight of crushed stone into the mixing trough.
 - b. Add hydrogel as a slurry into trough and mix slurry and stone into a uniform blend.
 - c. Meter in soil in proper proportion of Clay loam Soil while stone-slurry mixture is in motion.
 - d. Add water to bring mixture to target moisture content after factoring in water from the slurry and the Clay-loam moisture.
 - e. Auger out to stocking pile or transport vehicle (or into pit if using a portable pugging operation).
 4. Add soil amendments to alter soil fertility including fertilizers and pH adjustment at the time of mixing at the rates recommended by the soil test.
 - a. Soil pH shall be adjusted to fall within a rate of 5.5 and 6.5 two months after mixing if the material is stored, unless mixing with a high pH stone. Once pavement is layed, no adjustment should be imposed.

- b. Soil component Carbon / nitrogen ratio shall be adjusted to be less than 1:33 within two months after mixing.
- B. The Contractor shall mix sufficient material in advance of the time needed at the job site to allow adequate time for final quality control testing as required by the progress of the work. Structural Soil shall be stored in piles of approximately 500 cubic yards and each pile shall be numbered for identification and quality control purposes. Storage piles shall be protected from rain and erosion by covering with plastic sheeting.
 - C. During the mixing process, the Contractor shall take two – one cubic foot quality control samples per 500 cubic yards of production from the final Structural Soil. The samples shall be taken from random locations in the numbered stockpiles as required by paragraph 1.05.B of this specification. Each sample shall be tested for particle size analysis and chemical analysis as described in Paragraph 1.04.C.2 and 3 above. Submit the results directly to the Architect for review and approval.
 - D. The quality control sample Clay Loam-Crushed Stone ratio's shall be no greater or less than 2% of the approved test sample as determined by splitting a known weight of oven dried material on a #4 sieve. In the event that the quality control sample varies significantly from the approved Structural Soil sample, as determined by the Landscape Architect, remix and retest any lot of soil that fails to meet the correct analysis making adjustments to the mixing ratios and procedures to achieve the approved consistency.

3.04 UNDERGROUND UTILITIES AND SUBSURFACE CONDITIONS

- A. Notify the Landscape Architect of any subsurface conditions which will effect the Contractor's ability to complete the work.
- B. Locate and confirm the location of all underground utility lines and structures prior to the start of any excavation.
- C. Repair any underground utilities or foundations damaged by the Contractor during the progress of this work. The cost of all repair shall be at the Contractor's expense.

3.05 SITE PREPARATION

- A. Do not proceed with the installation of the Structural Soil material until all walls, curb footings and utility work in the area has been installed. For site elements dependent on Structural Soil for foundation support, postpone installation until immediately after the installation of Structural Soil.
- B. Install subsurface drain lines as shown on the Drawings prior to installation of Structural Soil material.
- C. Excavate and compact the proposed subgrade to depths, slopes and widths as shown on the Drawings. Maintain all required angles of repose of the adjacent materials as shown on the drawings. Do not over excavate compacted subgrades of adjacent pavement or structures.
- D. Confirm that the subgrade is at the proper elevation and compacted as required. Subgrade elevations shall slope parallel to the finished grade and or toward the subsurface drain lines as shown on the drawings.
- E. Clear the excavation of all construction debris, trash, rubble and any foreign material. In the event that fuels, oils, concrete washout silts or other material harmful to plants has been spilled into the subgrade material, excavate the soil sufficiently to remove the harmful material. Fill any over excavation with approved fill and compact to the required subgrade compaction.

- F. Do not proceed with the installation of Structural Soil until all utility work in the area has been installed. All subsurface drainage systems shall be operational prior to installation of Structural Soils.
- G. Protect adjacent walls, walks and utilities from damage or staining by the soil. Use 1/2" plywood and or plastic sheeting as directed to cover existing concrete, metal and masonry work and other items as directed during the progress of the work.
 - 1. Clean up all trash and any soil or dirt spilled on any paved surface at the end of each working day.
 - 2. Any damage to the paving or architectural work caused by the soils installation contractor shall be repaired by the general contractor at the soils installation contractor's expense.
- H. Maintain all silt and sediment control devices required by applicable regulations. Provide adequate methods to assure that trucks and other equipment do not track soil from the site onto adjacent property and the public right of way.

3.06 INSTALLATION OF FILTER FABRIC

- A. Install Filter Fabric as shown on the Drawings and whenever the underlying subgrade fill material is sufficiently coarse to permit significant migration of particles from Structural Soil into the subgrade material below. This condition is defined by the following formula:

 Particle migration will occur when the D-15 of the subgrade material particles is equal to or larger than 5 times the D-85 of the Clay Loam particles in the Structural Soil above. The D-15 of the subgrade material is defined as the diameter through which the smallest 15% of the subgrade particles (by weight) would pass. The D-85 of the Structural Soil particles is defined as the diameter through which the smallest 85% of the soil particles (by weight) would pass.
- B. Maintain a minimum of 24 inch overlap at all Filter Fabric joints.
- C. Install first 6 inch lift of Structural Soil material without damage to Filter Fabric at bottom and sides of trenches.

3.07 INSTALLATION OF STRUCTURAL SOIL MATERIAL

- A. Install Structural Soil in 6 inch lifts and compact each lift.
- B. Compact all materials to not less than 95% of peak dry density from a standard AASHTO compaction curve (AASHTO T 99). No compaction shall occur when moisture content exceeds maximum as listed herein. Delay compaction 24 hours if moisture content exceeds maximum allowable and protect Structural Soil during delays in compaction with plastic or plywood as directed by the Architect.
- C. Bring Structural Soils to finished grades as shown on the Drawings. Immediately protect the Structural Soil material from contamination by toxic materials, trash, debris, water containing cement, clay, silt or materials that will alter the particle size distribution of the mix with plastic or plywood as directed by the Architect.
- D. The Architect may periodically check the material being delivered and installed at the site for color and texture consistency with the approved sample provided by the Contractor as part of the submittal for Structural Soil. In the event that the installed material varies significantly from the approved sample, the

Architect may request that the Contractor test the installed Structural Soil. Any soil which varies significantly from the approved testing results, as determined by the Architect, shall be removed and new Structural Soil installed that meets these specifications.

3.08 FINE GRADING

- A. After the initial placement and rough grading of the Structural Soil but prior to the start of fine grading, the Contractor shall request review of the rough grading by the Architect. The Contractor shall set sufficient grade stakes for checking the finished grades.
- B. Adjust the finish grades to meet field conditions as directed.
 - 1. Provide smooth transitions between slopes of different gradients and direction.
 - 2. Fill all dips and remove any bumps in the overall plane of the slope.
 - a. The tolerance for dips and bumps in Structural Soil areas shall be a 2" deviation from the plane in 10'.
 - 3. All fine grading shall be inspected and approved by the Architect prior to the installation of other items to be placed on the Structural Soil.
- C. The Architect will inspect the work upon the request of the Contractor. Request for inspection shall be received by the Architect at least 48 hours before the anticipated date of inspection.

3.09 ACCEPTANCE STANDARDS

- A. The Landscape Architect will inspect the work upon the request of the Contractor. Request for inspection shall be received by the Landscape Architect at least 48 hours before the anticipated date of inspection.

3.10 CLEAN-UP

- A. Upon completion of the Structural Soil installation operations, clean areas within the contract limits. Remove all excess fills, soils and mix stockpiles and legally dispose of all waste materials, trash and debris. Remove all tools and equipment and provide a clean, clear site. Sweep, do not wash, all paving and other exposed surfaces of dirt and mud until the paving has been installed over the Structural Soil material. Do no washing until finished materials covering Structural Soil material are in place.

END OF SECTION

PART 1 - GENERAL**1.01 SECTION INCLUDES**

- A. Examination.
- B. Preparation.
- C. Laying Unit Pavers - Sand Set.
- D. Cleaning and Repairing.
- E. Protection.

1.02 RELATED SECTIONS

- A. Section 02111: Tree and Plant Protection.
- B. Section 02200: Earthwork.
- C. Section 02220: Structural Soil.
- D. Section 02520: Concrete Paving.
- E. Section 02815: Irrigation System.
- F. Section 02850: Wayfinding Signage
- G. Section 02870: Site Furnishings
- H. Section 02920: Landscape Systems.
- I. Section 02923: Landscape Grading.
- J. Section 02950: Trees, Shrubs, and Groundcover.
- K. Section 03300: Cast-In-Place Concrete.

1.03 REFERENCES

- A. Concrete Paver Institute (CPI), a Division of National Concrete Masonry Association (NCMA), Shapes and Sizes Directory.
- B. ASTM C33 - Specification for Concrete Aggregates.
- C. ASTM C67 - Method for Testing brick and Structural Clay Tile.
- D. ASTM C 136 - Method for Sieve Analysis of Fine and Coarse Aggregates.
- E. ASTM C140 - Method of Sampling and Testing Concrete Masonry Units.
- F. ASTM C902 - Standard Specification for Pedestrian and Light Traffic Paving Brick.
- G. ASTM C936 - Specification for Solid Concrete Interlocking Paving Units.
- H. ASTM C979 - Specification for Pigments for Integrally Colored Concrete.
- I. ANSI A108.

1.04 SUBMITTALS

- A. Submit manufacturer's product data and installation instructions for interlocking concrete paver units and sealant.
- B. Submit manufacturer's certification that paver units comply with specified material and physical requirements.
- C. Submit material certificates for base and bedding materials.
- D. Submit paver samples for Owner's Representative's approval that will represent finish and color range.
- E. Mock-up as stated in paragraph 1.05C of this section
- F. Test Reports: Submit compliance reports for interlocking concrete pavers indicating that materials meet requirements in paragraph 2.01 this Section. Testing shall be in accordance with the American Society for Testing and Materials (ASTM), and manufacturer's printed recommendations.

- G. **Manufacturer's Instructions:** Submit manufacturer's printed instructions and cut sheets for each product, including applicable temperature ranges.
- H. **Maintenance Data:** Submit manufacturer's recommended cleaning and stain removal methods and cleaning materials.
- I. **WARRANTY DOCUMENTATION:** Submit warranty documentation in accordance with paragraph 1.09.B.6 this Section.
- J. **Substitutions:** Prior to start of any work in this Section contractor shall submit all pertinent data to allow for complete review of all substitutions of product. Once work has started in this Section, no substitutions without prior approval by the Landscape Architect will be allowed.
 - 1. Submit shop drawings for substitutions which differ in materials or layout from the Drawings. Include details of setting methods, material, jointing, location and accessories for all non-specified products.

1.05 QUALITY ASSURANCE

A. QUALIFICATIONS

- 1. **Supplier:** Company equipped to perform manufacturing and finishing and equipped to process the material promptly on order and in strict accordance with specifications. Company shall be a member of the Concrete Paver Institute (CPI). Evidence to this effect shall be provided by the supplier if required by the Landscape Architect.
 - a. **Single Source Responsibility:** Obtain each color, type, and variety of unit pavers from single sources with resources to provide products and materials of consistent quality, appearance and physical properties without delaying progress of Work.
- 2. **Installer:** Company with minimum five (5) years successful experience in the installation of unit paving areas similar in size and scope to this project, including installation over structural soil.
 - a. **Superintendent:** Shall be satisfactory to the Owner and shall not be changed, except with consent of the Owner. Shall be authorized to represent the Contractor. Shall be present at all times during the Work.
 - b. **Personnel:** Shall be skilled persons, proficient in the trades required with recognized standards of workmanship.

B. MOCK-UP

- 1. Provide field constructed sample of each type of paving and setting condition as indicated and specified. Each mock-up shall:
 - a. Be approximately 30 square feet.
 - b. Be located where directed by Landscape Architect.
 - c. Represent workmanship of finish work using materials, all colors, finishes, patterns and joint treatment, including special features for expansion joints and contiguous work, indicated for project work.

2. Make necessary adjustments to gain acceptance from the Landscape Architect.
3. Obtain approval from the Landscape Architect of each paver mock-up in the presence of factory representative before proceeding with the Work.
4. Retain and protect mock-up during construction as a standard for judging completed unit paver work. Do not move or destroy mock-up until work is completed.
5. Accepted and properly maintained sample installations may remain in completed work if approved in writing by Landscape Architect.
6. All Work shall match accepted field mock ups.

C. PRE-INSTALLATION CONFERENCE

1. Conduct pre-installation conference prior to construction.
2. Attendance required by: Owner, Landscape Architect, Contractor(s), Manufacturer(s)/Supplier(s), other parties who are involved.

1.06 DELIVERY, STORAGE AND HANDLING

A. PACKAGED MATERIALS: Deliver packaged materials in containers showing weight, analysis and name of manufacturer. Protect materials from weather, moisture, deterioration and contamination during delivery, installation and site storage. Store cementitious materials off the ground, under cover and in a dry location.

B. UNIT PAVERS

1. Protect unit pavers during storage and construction against moisture, soiling, staining and physical damage.
2. Delivery: Deliver unit pavers on factory loaded pallets, clearly marked with source and manufacturer's designation.
3. Handling: Handle unit pavers to prevent chipping, breakage, soiling or other damage. Do not use pinch or wrecking bars without protecting edges of pavers with wood or other rigid materials. Lift with wide-belt type slings wherever possible; do not use wire rope or ropes containing tar or other substances which cause staining. If required, use wood rollers and provide cushion at end of wood pieces.
4. Storage: Store unit pavers on factory-loaded pallets, clearly marked with source and manufacturer's designation, covered with non-staining, waterproof membrane. Place and stack skids and unit pavers to distribute weight evenly and to prevent breakage or cracking of pavers. Protect stored unit pavers from weather with waterproof, non-staining covers or enclosures, but allow air to circulate around unit pavers.
5. Replace damaged units with new as directed.

C. ACCESSORIES: Protect materials from weather, moisture, deterioration and contamination during delivery, installation and site storage. Sand shall be covered with waterproof covering. The covering shall be secured in place.

1.07 PROJECT/SITE CONDITIONS

A. ENVIRONMENTAL REQUIREMENTS

1. Comply with requirements of referenced standards and recommendations of material manufacturers for environmental

conditions before, during, and after installation. Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.

2. Cold Weather Conditions

- a. Remove any ice or snow formed on paver bed by carefully applying heat until top surface is dry to touch. Remove pavers determined to be frozen or damaged by freezing conditions.
- b. Do not use frozen materials or materials mixed or coated with ice or frost.
- c. Protect paver work against freezing when temperature is 40° F and falling.
- d. Comply with International Masonry All-Weather Council's "Guide Specification for Cold-Weather Masonry Construction."

B. EXISTING CONDITIONS

1. Existing Plants: Do not damage any existing plantings indicated to remain in accordance with Section 02111: Tree and Plant Protection.
2. Utilities: Determine location of underground utilities. Perform work in a manner to avoid possible damage. Hand excavate, as required.
3. Excavation: Maintain grade stakes set by others until removal is mutually agreed upon by parties concerned. When conditions detrimental to Work are encountered, such as rubble fill, adverse drainage conditions, noxious materials or obstructions, notify Landscape Architect before proceeding.

1.08 SEQUENCING AND SCHEDULING

A. WORK SCHEDULING: Proceed with and complete Work as rapidly as portions of the site become available, working within the specified environmental requirements.

B. COORDINATION

1. Coordinate with Contractors work requiring access to site over paving areas.
2. Coordinate with installation of other work including structural soil, site furniture, lighting, planting underground irrigation system, electrical conduit, and drain pipe.
3. Coordinate unit paving installation to provide maintenance up to date of Substantial Completion.

1.09 WARRANTY AND REPLACEMENT

A. GENERAL: Refer to Section 01011.

1. Warranty Period: Warranty Period extends one (1) year from the date of Substantial Completion. The warranty period begins anew for the replaced area and extends each time the area requires replacing.
2. Partial Acceptances: When the work is accepted in parts, the warranty period shall extend from each of the partial acceptances to the terminal date of the last warranty period such that all warranty periods terminate at one time.

- B. **UNIT PAVING WARRANTY CONDITIONS:** Warranty all unit paving areas against defects due to any cause except vandalism and acts of God. The following warranty conditions apply:
1. The contractor, by commencing the work of this Section, assumes overall responsibility, as part of his warranty of the work, to assure that all assemblies, components, and parts shown or required within the Work of this Section, comply with contract documents. The contractor shall further warrant:
 - a. That all components, specified or required to satisfactorily complete the installation, are compatible with each other and with the conditions of installation and expected use.
 - b. The overall effective integration and correctness of individual parts and the whole of the system.
 - c. Compatibility with adjoining existing substrates, materials and work by other trades.
 - d. There shall be no material failure due to improper design or installation of unit pavers. All materials are to fully perform to their normal life expectancy.
 2. Inspect pavers within one month of placement and reset any units or areas which are out of plane, cracked, chipped or rocking. Re-set any units or areas which have settled. Apply additional sand between joints as required to fill joints. Clean up excess sand. Settling tolerance at joints shall be:
 - a. Sand Setting Bed: Maximum 1/8" differential between any pavers or surrounding edge materials.
 3. If unit paving areas fail after having been replaced previously, area shall be replaced until it is approved. The warranty period begins anew and extends each time an area requires replacing. Replacement unit pavers shall be of the same kind, condition and quality as original unit pavers and subject to all requirements in this specification.
 4. All expenses incurred in the replacements shall be borne by the Contractor.
 5. Make replacements within seven days of notification by Landscape Architect.
 6. Warranty: Furnish manufacturer's warranty co-signed by Contractor which includes all labor and materials to replace all cracked, damaged, failed or spalled pavers and reset any unit or area which has settled or heaved out of plane within a period of one (1) year from date of final acceptance. Make final repairs/replacements before the expiration of the warranty period as directed by the Owner and/or Landscape Architect.

individual unit under 7,200 psi. Absorption level less than 5% when tested in accordance with ASTM C140. Density of 155 lbs/cubic foot. Flexual strength of 1,100 psi. After 50 cycles of freeze-thaw of 3-day application of rock salt (wet) weight loss shall be less than 3% with no visual signs of deterioration in accordance with ASTM C67 Pigment shall conform to ASTM C979. Top edges of cut pavers shall be hand finished with matching bevel. Include 100 square feet of additional brick for Owner's stock.

- B. Size: Determined by Owner
- C. Color and Finish: Determined by Owner.
- D. Manufacturer: Pavestone Company, 9401 East 96th Ave. Henderson, Co. 80640, (303).287.3700..

2.02 SETTING BED

- A. BASE COURSE: In accordance with Section 02220: Structural Soil or Section 02200: Earthwork, as indicated on plans.
- B. SAND: Sand setting and joint material shall be clean, sharp, washed concrete sand to conform to ASTM C33 with the following gradation:

<u>Sieve Size</u>	<u>% Passing</u>
3/8"	100
#4	95-100
#8	80-100
#16	50-85
#30	40-75
#50	10-30
#100	5-15
#200	0-10

- C. BITUMINOUS SETTING BED (OVER VAULTS): See 2.03 Sealant

2.03 SEALANT

- A. Sealant shall be penetrating type sealant as recommended by paver manufacturer to be compatible with pavers. Submit type for approval.

2.04 FILTER FABRIC

- A. FILTER FABRIC: Mirafi 140N, non-woven filter fabric, or approved equal, conforming to the following physical requirements:
 1. Permeability Rating 10 times greater than that of soil.
 2. Apparent Opening Size (AOS). Small enough to prevent passage of fines from setting bed into subgrade.

2.05 FABRICATION TOLERANCES

- A. CONCRETE UNIT PAVERS
 1. Length and Width Dimension: $\pm 1/16"$.
 2. Thickness Dimension: $\pm 1/8"$.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. VERIFICATION OF CONDITIONS: Examine areas and conditions under which the Work of this Section will be performed. Report unsatisfactory or questionable conditions to the Landscape Architect. Do not proceed with the Work until unsatisfactory conditions have been corrected. Commencement of work implies acceptance of all areas and conditions.
 - 1. Verify areas to be paved are excavated to depth, line and grade indicated, allow dimension to install full pavement depth to specified finish grade, provide proper drainage, and achieve a minimum density of 95% in accordance with Section 02200: Earthwork and Section 02220: Structural Soil.

3.02 PREPARATION

- A. Do not use paving units with chips, cracks, voids, discolorations, or other visible defects.
- B. Concrete unit pavers shall be clean and free of foreign material, stains, dust, or dirt before installation.
- C. Cut paving units with block splitter or motor-driven saw equipment designed to cut masonry with clean, sharp unchipped edges. Cut units as required to provide pattern shown and to fit adjoining work neatly. Use full units without cutting wherever possible. Where cutting is required, use the largest size units possible. Avoid the use of small pieces of pavers or large joint spaces.
- D. Set interlocking concrete unit pavers in patterns indicated with level surface and uniform joints of widths indicated.

3.03 PREPARATION OF SETTING BEDS

- A. Sand Setting Bed over Sub-Grade
 - 1. Compact subgrade to density as per Section 02200: Earthwork
 - 2. Install 6" aggregate base course, in areas where structural soil is not called for on plans, compacted to 95% in accordance with Section 300 of the Standard Specifications.
 - 3. Install structural soil in areas as indicated on plan in accordance with Section 02220.
 - 4. Install single layer soil separator fabric lapped min. 6", over compacted aggregate base course or structural soil as indicated on plans.
 - 5. Install sand setting bed. Compact and screed to the depth required.
- B. BITUMINOUS SETTING BED OVER CONCRETE SUB-SLAB AND OVER CONCRETE STRUCTURAL SLAB
 - 1. Clean concrete base. Remove dirt and debris. The concrete base shall be free of cracks, grease, or sealing agents which would inhibit bonding.
 - 2. Apply emulsified asphalt prime coat (RS-1 or CRS-1) at a rate of 1 gallon per 40 SF. Allow to dry and cure as required.

3. Install ¼" deep control bars directly on base. Adjust control bars to proper elevations. Provide control bars parallel to each other and approximately 11'-0" apart to serve as striking board guides.
4. Apply bituminous setting bed to a depth of ¾" min. to 1" max. after compaction.
5. After advancing the control bars to the next position, fill any depressions that remain.
6. Apply tack coat at a rate of 1/10 gal./square yard surface per coating. If troweled use trowel with serrations not to exceed 1/16 inches.

3.04 LAYING UNIT PAVERS

A. SETTING BED

1. Screed sand setting bed to a loose thickness of 1 inch to 1.25 inch for a uniform and approximately level appearance. Maintain moisture content. Do not disturb or pre-compact sand after screeding.
 - a. When calculating bed levels, consider pavers will be compacted into the setting bed. Test depth of compaction with sand to be used.

- #### B. UNIT PAVER CLEANING:
- Unit paving units to be free from stain, dirt, or dust. If necessary scrub face with mild soap and clean water applied with stiff fiber brushes. Rinse well with clean water.

C. LAYING UNIT PAVERS

1. Installation: Set paving in strict accordance with pattern requirements of Drawings. Set units straight and true to required line. Lay pavers hand tight, with care taken to maintain level, straight and true lines.
 - a. Minimum Joint Offset: 2 1/2"
2. Balance Cuts: Layout a single row of unit pavers in each direction perpendicular to the surrounding edges. Adjust the location of each row so as to create cut pieces which are approximately equal in size. Do not use small slivers of pavers to fill poorly laid out patterns. Incorporate smaller pavers with oversized pavers; sawcut dummy joint to maintain jointing appearance.
 - a. Minimum Cut Paver Length: 5 1/2".
3. Cut pavers as needed to meet the placement conditions and patterns as indicated. Perform all cutting using a diamond blade masonry saw. Unit pavers shall meet fixed structures as indicated on the Drawings. Top edges of cut pavers shall be hand finished with matching bevel. Place cut pavers in areas of least visibility as reviewed by Landscape Architect.
4. Keep units clean and rake out joints between pavers for joint material.
5. Set pavers on prepared sand setting bed higher than finished grade to allow for final compaction. Final elevation of pavers shall be 1/8" above surrounding surfaces except at doorways.
6. Adjust to obtain uniform joints tight against spacer bars.

- a. Minimum Joint Dimension: 1/16".
 - b. Maximum Joint Dimension: 3/16".
7. Reset units having a hollow sound after being laid to provide solid backing. Reset units disturbed in making replacement or correcting variations.
 8. Compaction: Following complete placement and laying of the pavers, compact pavers into the sand bed with a plate-type vibrating compactor capable of 3,000 to 5,000 pound compaction force, one pass on all areas. Vibrate installed pavers within 3 feet of the laying face.

D. JOINTS

1. Sweep sand into paver joints until all joints are filled to top of chamfer on pavers.
2. Smooth, continuous surface shall be acquired, meeting grades indicated. Uneven planes, low and high area will not be accepted.
3. Sweep off excess sand and remove from site.

3.05 INSTALLATION TOLERANCES

A. Offset Tolerances at Joints shall be:

1. Sand Setting Bed: Maximum 1/8" differential between any pavers or surrounding edge materials.

B. Variation of Slope and Grade: Within 1/8" in 10 ft. of level or true plane as applicable when checked with a 10 foot straightedge.

3.06 FIELD QUALITY CONTROL

A. INSPECTIONS

1. General: All unit pavers are subject to the Landscape Architect's approval prior to, during and after installation. Replace rejected pavers with satisfactory material.
2. Landscape Architects or Owners representative inspection of the unit paving does not release the Contractor from her/his responsibility to provide all the work in accordance with the specifications and Drawings.

3.07 CLEANING AND REPAIRING

- A. **CLEANING:** Do no cleaning after initial installation of Work, until after the unit paving has set at least 6 days.
- B. Repair defective Work in accordance with CPI Custom Interlocking Pavers Specification.
- C. After completion of repair work, clean exposed surfaces with clean water and stiff fiber brushes until all dirt, stains, efflorescence, mortar, and other defacement are removed. Use cleaner and procedures recommended by manufacturer. Do not use wire brushes, metal scrapers or acids. Protect adjacent surfaces from damage during cleaning operations.
- D. Prepare small sample areas in presence of Landscape Architect for acceptance of procedures.

- E. REPAIR: After cleaning, examine work and repair unacceptable conditions. Replace defective, broken, permanently stained, or damaged units. Repair unfilled or defective joints. Remove and replace defective setting beds.
- F. At completion of construction work, remove all temporary protection from the Work of this Section.
- G. Apply penetrating sealant to work in strict accordance with manufacturer's recommendations.

3.08 PROTECTION

- A. Protect adjacent surfaces during progress of the Work in this Section.
 - 1. Protect base of walls from rain-slashed mud and mortar splatter by means of coverings spread on ground and over wall surface.
- B. Barricade work areas during setting.
- C. Prevent staining of unit pavers. Immediately remove foreign materials from pavers without damage to latter.
- D. After installation and cleaning, protect work from damage during subsequent construction activities until Work is accepted.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. 4" Concrete Sidewalks
- B. 8" Concrete sidewalks at alleys

1.02 RELATED SECTIONS

- A. Section 02200: Earthwork
- B. Section 02220: Structural Soil
- C. Section 02518: Concrete Unit Paving
- D. Section 02850: Wayfinding Signage
- E. Section 02870: Site Furnishings
- F. Section 02923: Landscape Grading.
- G. Section 03100: Concrete Formwork.
- H. Section 03200: Concrete Reinforcement.
- I. Section 03300: Cast-in-Place Concrete.
- J. Section 05500: Metal Fabrication and Finishes
- K. Section 07900: Joint Sealants.

1.03 SUPPLEMENTAL UNIT PRICES

- A. The following items are listed for detailed description and unit pricing in case of additional work is needed. Refer to Bid Form for unit pricing submission:
- B. CONCRETE SIDEWALK, 4 or 8 INCH:
 - 1. Basis of measurement: Square Foot
 - 2. Basis of payment: Includes examination, preparation, fine grading of subgrade, formwork, reinforcement, concrete, finishing, curing, and sealant for pavements and ramps.

1.04 REFERENCES

- A. ACI 301: Specifications for Structural Concrete for Buildings.
- B. ACI 305R-91: Hot Weather Concreting.
- C. ACI 306R-88: Cold Weather Concreting.
- D. ASTM C979-82 (Reapproved 1986): Standard Specifications for Pigments for Integrally Colored Concrete.
- E. ANSI/ASTM D994: Preformed Expansion Joint Filler for concrete (Bituminous Type).
- F. Section 500: City of Colorado Springs Standard Specifications.

1.05 SUBMITTALS

- A. Product Data: Provide data under requirements of Section 03300.
- B. TEST PANELS

1. Schedule test panel castings for acceptance 30 days prior to casting of the concrete represented by the mock-ups.
2. Locate test panels in non-public areas accepted by the Landscape Architect.
3. Use the same concrete mixes and placement procedures, accepted in test panels, in the final work, unless otherwise directed by the Landscape Architect.
4. If sample disapproved, cast additional samples until approval is obtained. Protect and maintain test panel on site until finished work represented by the test panel is accepted. Test panel will represent minimum standard for color, texture, and workmanship.
5. Remove test panels from site at completion of project, as directed by the Landscape Architect.

1.06 QUALITY ASSURANCE

- A. Perform work in accordance with ACI 301 and requirements of Sections 03100, 03200 and 03300
- B. Obtain cementitious materials from same source throughout job.
- C. Conform to ACI 305R and additional requirements under Section 03300 when concreting during hot weather.
- D. Refer to ACI 306R and additional requirements under Section 03300 when concreting during cold weather.

1.07 REGULATORY REQUIREMENTS

- A. Conform to applicable standards for paving work on public property.

PART 2 PRODUCTS

2.01 MATERIALS

- A. FORM MATERIALS: As specified in Section 03100.

2.02 REINFORCEMENT

- A. REINFORCING STEEL: Type specified in Section 03200.

2.03 CONCRETE MATERIALS

- A. CONCRETE MATERIALS: As specified in Section 03300.

2.04 ACCESSORIES

- A. CURING COMPOUND: As specified in Section 03370.

2.05 CONCRETE MIX - BY PERFORMANCE CRITERIA

- A. Mix and deliver concrete in accordance with Section 03300.

2.06 JOINT FILLER MATERIAL

- A. Joint filler material as specified in Section 03300.

2.07 SOURCE QUALITY CONTROL

- A. Provide mix design in accordance with Section 03300.
- B. Submit proposed mix design of each class of concrete under requirements of Section 03300.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify base conditions.
- B. Verify compacted subgrade is acceptable and ready to support paving and imposed loads in accordance with Section 02200 or 02220 as indicated on plans.
- C. Verify gradients and elevations of base are correct.
- D. Verify formwork line, elevation dimension and acceptance by Landscape Architect under requirements of Section 03100. Verify joint filler is secured to formwork as necessary.
- E. Verify that reinforcement, dowels, and any other items to be cast into concrete pavement are accurately placed, positioned securely and will not cause hardship in placing concrete in accordance with Section 03200.

3.02 PREPARATION

- A. Moisten base to minimize absorption of water from fresh concrete.
- B. Coat surfaces of frames to be cast in pavement with oil to prevent bond with concrete pavement.
- C. Notify Landscape Architect minimum 24 hours prior to commencement of concreting operations.

3.03 REINFORCEMENT

- A. Comply with Section 03200.
- B. Interrupt reinforcement at expansion joints as shown in Details.

3.04 JOINTS

- A. Construct all joints in locations as shown on drawings, providing straight lines or smooth continuous curves as indicated.
- B. Align curb and gutter and sidewalk joints. Align pavement and adjacent wall joints in accordance with Section 03300.
- C. Place joint filler vertical in position. Secure to formwork as necessary during concrete placement.

- D. Place joint filler between paving components and building or other appurtenances. Recess top of filler 1/2 inch, for joint sealant placement by Section 07900.
- E. Provide tooled control joints in locations as shown on Drawings. Tool joint to a depth of 1/4 total depth of slab. If specified depth is not achieved, sawcut joint to specified depth at Contractors expense. Tool joint radius as shown on drawings.

3.05 PLACING CONCRETE

- A. Place concrete in accordance with Section 03300.

3.06 FINISHING

- A. SIDEWALK PAVING: Trowel edges and joint, light broom finish.
- B. Cure exposed concrete surfaces immediately after finishing in accordance with Section 03370.

3.07 PROTECTION

- A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.

3.08 SCHEDULES

- A. Refer to Section 03300.
- B. SIDEWALK PAVING: 4,000 psi 28 day concrete, 4 or 8 inches thick, plain grey color, no color additive, Portland cement, fibrous reinforcement, light broom finish.

END OF SECTION

PART 1 - GENERAL

1.01 WORK INCLUDED - Work of this Section generally includes provisions for the design and installation of an underground irrigation system including the following:

- A. Static pressure verification and coordination with landscape material installation.
- B. Trenching, stockpiling excavation materials, refilling and compacting trenches.
- C. Complete irrigation system including but not limited to irrigation system design, piping, backflow preventer assemblies, valves, fittings, heads, controllers and wiring, and final adjustments to insure complete coverage.
- D. Water connections.
- E. Replacement of unsatisfactory materials.
- F. Tests, Clean-up, inspections, and approval.

1.02 RELATED SECTIONS

- A. Examine all sections related to project work.

1.03 REFERENCES

- A. Perform Work in accordance with requirements of Conditions of the Contract and Division 01 - General requirements as well as provisions of all applicable laws, codes, ordinances, rules, and regulations.
- B. Conform to requirements of reference information listed below except where more stringent requirements are shown or specified in Contract Documents.
 - 1. American Society for Testing and Materials (ASTM) - Specifications and Test Methods specifically referenced in this Section.
 - 2. Underwriters Laboratories (UL) - UL Wires and Cables.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications - Installer shall have had considerable experience and demonstrate ability in the installation of irrigation system(s) of specific type(s) in a neat orderly, and responsible manner in accordance with recognized standards of workmanship. To demonstrate ability and experience necessary for this Project, and financial stability, submit if requested by Owners Representative, prior to contract award the following:
 - 1. List of 3 projects completed in the last 2 years of similar complexity to this Project. Description of projects shall include:
 - a. Name of project.
 - b. Location.
 - c. Owner.

- d. Brief description of work and project budget.
2. Current company financial statement.

B. Special Requirements:

1. Work involving substantial plumbing for installation of copper piping, backflow preventer(s), and related Work shall be executed by licensed and bonded plumber(s). Secure a permit at least 48 hours prior to start of installation.
2. Tolerances - Specified depths of mains and laterals and pitch of pipes are minimums. Settlement of trenches is cause for removal of finish grade treatment, refilling, compaction, and repair of finish grade treatment.
3. Coordination With Other Contractors - Protect, maintain, and coordinate Work with Work under other Section.
4. Damage To Other Improvements - Contractor shall replace or repair damage to grading, soil preparation, seeding, sodding, or planting done under other Sections during Work associated with installation of irrigation system at no additional cost to Owner.

C. Pre-Construction Conference - Contractor shall schedule and conduct a conference to review in detail quality control and construction requirements for equipment, materials, and systems used to perform the Work. Conference shall be scheduled not less than 10 days prior to commencement of Work. All parties required to be in attendance shall be notified no later than 7 days prior to date of conference. Contractor shall notify qualified representatives of each party concerned with that portion of Work to attend conference, including but not limited to Architect, Owners Representative, Contractor's Superintendent, and Installer.

1. Minutes of conference shall be recorded and distributed by Contractor to all parties in attendance within five days of conference.

1.05 SUBMITTALS - Prepare and make submittals in accordance with conditions of the Contract.

A. Irrigation Design - Contractor shall prepare a complete irrigation system design providing 100% coverage to all landscaped areas. Design shall follow these specifications and attached details and shall be based on the following. Final design shall be submitted to Owners Representative for review and approval prior to commencement of construction.

1. Static pressure verification - Prior to beginning design work, Contractor shall field verify the pressure available at the site. This pressure shall be clearly indicated on the irrigation design drawing. If pressure is greater than 85 PSI, a pressure regulating valve shall be included at the tap location.
2. Mainline system - Mainline shall be designed such that velocities within the piping do not exceed five feet per second. No pressurized mainline shall be installed within ten feet of building foundations without written permission from the project Owner.
3. Turf areas
 - a. small turf areas (25 feet wide or less) shall be irrigated with fixed nozzle pop-up spray heads with matched precipitation rate nozzles. Nozzles shall be sized to match head spacing.
 - b. large turf areas (wider than 25 feet) shall be irrigated with gear driven rotors with a minimum precipitation rate of .45" per hour for a full circle rotor.
4. Shrub bed areas (plant material one gallon in size and larger) shall be drip irrigated. Drip valves shall be piped and zoned such that the east and north sides of buildings are on separate zones from the west and south sides of buildings.

Install Hardie drip emitters in the quantities listed below;

<u>Plant)</u>	<u>Plant Material Size</u>	<u>Emitters required (per</u>
	One Gallon Material	One DPJ-02
	Five Gallon Material	Two DPJ-04
	2" to 4" Caliper Tree	Four DPJ-04
	6" Caliper Tree	Six DPJ-04
	8" Caliper Tree	Eight DPJ-04
	6 ft. to 8 ft. Evergreen	Three DPJ-04
	10 ft. to 12 ft. Evergreen	Four DPJ-04
	14 ft. to 18 ft. Evergreen	Six DPJ-04

5. Perennial and Annual bed areas shall be spray irrigated with 12" pop-up heads with a maximum spacing of 10 ft. O.C.

C. Record Drawings (As-Built):

1. At onset of irrigation installation provide mylar sepias of original irrigation design to Owner. At the end of every day, revise prints for Work accomplished that day in red ink. As-built sepias shall be brought up-to-date at the close of the working day every Friday by a qualified draftsman. A print of record plan(s) shall be available at Project Site. Indicate zoning changes on weekly as-built drawings. Indicate non-pressure piping changes on as-builts. Upon completion of Project, submit for review, prior to final acceptance, final set of as-built mylar sepias. Dimensions, from two permanent points of reference (building corners, sidewalk, road inter-sections or permanent structures), location of following items:

- a. Connection to existing water lines.
- b. Routing of sprinkler pressure lines
- c. Control valves.
- d. Quick coupling valves.
- e. Drain valves.
- f. Drip line blow-out stubs.
- g. Control wire routing if not with pressure mainline.
- h. Gate valves.

2. Owners Representative will not certify any pay request submitted by the Contractor if the as-built drawings are not current, and processing of pay request will not occur until as-builts are up-dated.

C. Operation Instructions - Submit 3 written operating instructions including winterization procedures and start-up, with cut sheets of products, and coordinate controller/watering operation instruction with Owner maintenance personnel.

1. Controller Charts:

- a. Do not prepare charts until record (as-built) drawings have been reviewed by Owners Representative.
- b. Provide one controller chart for each automatic controller installed.
 - 1) Chart may be reproduction of record drawing, if scale permits fitting of controller door. If photo reduction prints are required, keep reduction to maximum size possible to retain full legibility.

- 2) Chart shall be blue-line print of actual "as-built" system, showing area covered by that controller.
 - c. Identify area of coverage of each remote control valve, using a distinctly different pastel color drawing over entire area of coverage.
 - d. Following review of charts by Owners Representative, they shall be hermetically sealed between two layers of 20 mm thick plastic sheet
 - e. Charts shall be completed and reviewed prior to final review of irrigation system.
- D. Shop Drawings - Submit Shop Drawings if noted on construction drawings, include a complete materials list indicating manufacturer, model number, and description of all materials and equipment to be used. Show appropriate dimensions and adequate detail to accurately portray intent of construction.

1.06 DELIVERY, STORAGE, AND HANDLING - Deliver, unload, store, and handle materials, packaging, bundling, products in dry, weatherproof, condition in manner to prevent damage, breakage, deterioration, intrusion, ignition, and vandalism. Deliver in original unopened packaging containers prominently displaying manufacturer's name, volume, quantity, contents, instructions, and conformance to local, state, and federal law. Remove and replace cracked, broken, or contaminated items or elements prematurely exposed to moisture, inclement weather, snow, ice, temperature extremes, fire, or jobsite damage.

- A. Handling of PVC Pipe - Exercise care in handling, loading and storing, of PVC pipe. All PVC pipe shall be transported in a vehicle which allows length of pipe to lie flat so as not to subject it to undue bending or concentrated external loads. All sections of pipe that have been dented or damaged shall be discarded, and if installed, shall be replaced with new piping.

1.07 JOBSITE CONDITIONS:

A. Protection of Property:

- 1. Preserve and protect all trees, plants, monuments, structures, and paved areas from damage due to Work of this Section. In the event damage does occur, all damage to inanimate items shall be completely repaired or replaced to satisfaction of Owner, and all injury to living plants shall be repaired by Owner. All costs of such repairs shall be charged to and paid by Contractor.
- 2. Protect buildings, walks, walls, and other property from damage. Flare and barricade open ditches. Damage caused to asphalt, concrete, or other building material surfaces shall be repaired or replaced at no cost to Owner. Restore disturbed areas to original condition.

B. Existing Trees:

- 1. All trenching or other Work under limb spread of any and all evergreens or low branching deciduous material shall be done by hand or by other methods so as to prevent damage to limbs or branches.
- 2. Where it is necessary to excavate adjacent to existing trees use all possible care to avoid injury to trees and tree roots. Excavation, in areas where 2 inch and larger roots occur, shall be done by hand. Roots 2 inches or larger in diameter, except directly in the path of pipe or conduit, shall be tunneled under and shall be heavily wrapped with burlap to prevent scarring or excessive drying. Where a trenching machine is operated close to trees having roots smaller than 2 inches

in diameter, wall of trench adjacent to tree shall be hand trimmed, making clean cuts through roots. Trenches adjacent to trees shall be closed within 24 hours, and when this is not possible, side of trench adjacent to tree shall be kept shaded with moistened burlap or canvas.

C. Protection and Repair of Underground Lines:

1. Request proper utility company to stake exact location (including depth) of all underground electric, gas, or telephone lines. Take whatever precautions are necessary to protect these under-ground line from damage. If damage does occur, all damage shall be repaired by Utility Owner. All costs of such repairs shall be paid by Contractor unless other arrangements have been made.
2. Request Owner, in writing, to locate all private utilities (i.e., electrical service to outside lighting) before proceeding with excavation. If, after such request and necessary staking, private utilities which were not staked are encountered and damaged by Installer, they shall be repaired by Owner at no cost to Installer. If Contractor damages staked or located utilities, they shall be repaired by Utility Owner at Contractor's expense unless other arrangements have been made.

D. Replacement of Paving and Curbs - Where trenches and lines cross existing roadways, paths, curbing, etc., damage to these shall be kept to a minimum and shall be restored to original condition.

1.08 WARRANTY/GUARANTY: - Manufacturer shall warrant materials against defects for a period of one year from date of Substantial Completion. Installer(s) shall guaranty workmanship for similar period.

- A. Settling of backfilled trenches which may occur during guaranty period shall be repaired at no expense to Owner, including complete restoration of damaged property.
- B. Expenses due to vandalism before substantial completion shall be borne by Contractor.
- C. Owner will maintain turf and planting areas during warranty period, so as not to hamper proper operation of irrigation system.

1.09 MAINTENANCE:

- A. Furnish the following maintenance items to Owner prior to final Acceptance:
 1. 2 Sets of special tools required for removing, disassembling, and adjusting each type of sprinkler head and valve supplied on this Project.
 2. Two 6 foot valve keys for operation of gate valves or stop and waste valves (if applicable).
 3. 2 keys for each automatic controller.
 4. 4 quick coupler keys and 2 matching hose swivels for each type of quick coupling valve installed.
 5. 2 aluminum drain valve keys of sufficient length for operation of drain valves.
- B. Winterization - include cost in bid for winterizing complete system at conclusion of sprinkling season (in which system received final acceptance) within 3 days notification by the Owner. System shall be voided of water using compressed air or similar method reviewed by Owners Representative. Reopen, operate, and adjust system malfunctions accordingly during April of following season within 3 days of notification by Owner.

1.10 EXTRA STOCK - In addition to installed system furnish the following items to Owner:

- A. 10 Pop-up spray heads with nozzles of each type used.
- B. 4 Rotor heads of each type used.
- C. 30 Drip emitters of each type used.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. General Piping:
 - 1. Pressure Supply Line (from point of connection through backflow prevention unit) - Type "k" Hard Copper.
 - 2. Pressure Supply Lines (downstream of backflow prevention units) - Class 200 PVC BE.
 - 3. Non-pressure Lines - Class 200 PVC BE.
 - 4. PVC Sleeving - Class 160 PVC.
 - 5. Drip Tubing - Hardie Dura-Pol EHD 1645 3/4" with .050 inch wall thickness.
 - 6. Emitter Tubing - As recommended by emitter manufacturer.
- B. Copper Pipe and Fittings:
 - 1. Copper Pipe - Type K, hard tempered.
 - 2. Fittings - Wrought copper, solder joint type.
 - 3. Joints - Soldered with solder, 45% silver, 15% copper, 16% zinc, and 24% cadmium and solidus at 1125~F and liquids at 1145~F.
- C. Brass Pipe and Fittings:
 - 1. Brass Pipe - 85% red brass, ANSI Schedule 40 screwed pipe.
 - 2. Fittings - Medium brass, screwed 125 pound class.
- D. Plastic Pipe and Fittings:
 - 1. Identification Markings:
 - a. Identify all pipe with following indelible markings:
 - 1) Manufacturer's name.
 - 2) Nominal pipe size.
 - 3) Schedule of class.
 - 4) Pressure rating.
 - 5) NSF (National Sanitation Foundation) seal of approval.
 - 6) Date of extrusion.
 - 2. Solvent Weld Pipe - Manufactured from virgin polyvinyl chloride (PVC) compound in accordance with ASTM D2241 and ASTM D1784; cell classification 12454-B, Type 1, Grade 1.
 - a. Fittings - Standard wright, Schedule 40, injection molder PVC; complying with ASTM D1784 and D2466, cell classification 12454-B.
 - 1) Threads - Injection molded type (where required).
 - 2) Tees and ells - Side gated.

- b. Threaded Nipples - ASTM D2464, Schedule 80 with molded threads.
- c. Joint Cement and Primer - Type as recommended by manufacturer of pipe and fittings.

E. Drip Irrigation Systems:

- 1. Drip Tubing - Manufactured of flexible vinyl chloride compound conforming to ASTM D1248, Type 1, Class C, Category 4, P14 and ASTM D3350 for PE 122111C.
- 2. Fittings - Type and make recommended by tubing manufacturer.
- 3. Drip Valve Assembly - Type and size shown on Drawings.
 - a. Wye Strainer - Plastic construction with 120 mesh nylon screen and 1/2 inch blow-out assembly.
 - b. Control Valve - 2 way, solenoid pilot operated type made of synthetic, non-corrosive material; diaphragm activated and slow closing. Include freely pivoted seat seal; retained (mounted) without attachment to diaphragm. Hardie 700 series.
 - c. Pressure Reducing Valve - Plastic construction as detailed.
- 4. Emitters - Single port, pressure compensating, press on type by Hardie.

F. Gate Valves:

- 1. Gate Valves for 3/4 inch through 2-1/2 Inch Pipe - Brass construction; solid wedge, IPS threads, and non-rising stem with wheel operating handle.

G. Quick Coupling Valves - Brass two-piece body designed for working pressure of 150 PSI; operable with quick coupler. Equip quick coupler with locking rubber cover. Key size and type as shown on Drawing. Rain Bird 44LRC

H. Valve Boxes:

- 1. Gate Valves, Drip Line Blow-out Stubs, and Wire Stub Box - Carson #910-12, Brooks #1100, box as detailed.
- 2. 3/4 inch through 2 inch Control Valves - Carson #1419-13B, Brooks #1419 box.
- 3. Drip Valve Assemblies - Carson #1320-13B as detailed.

I. Electrical Control Wiring:

- 1. Low Voltage:
 - a. Electrical Control Wire - AWG UFUL approved No. 14 direct burial copper wire or larger, if required to operate system as designed.
 - b. Wire Colors:
 - 1) Control Wires - Red.
 - 2) Common Wires - White.
 - 3) Master Valve Wires - Blue.
 - 4) Spare Control Wires - Black.
 - 5) Spare Common Wires - Yellow.
 - c. If multiple controllers are utilized, and wire paths of different controllers cross each other, both common and control wires from each controller shall be different colors approved by Owners Representative.
 - d. Control Wire connections and splices shall be made with 3M direct bury splice, Rain Bird Pentite connectors, or similar dry splice method.

- 2. High Voltage - Type required by local codes and ordinances, of proper size to accommodate needs of equipment serviced.
- J. Automatic Controller - Size and type shown on Drawings; mounted as detailed. Rainmaster RME series or Irritrol MC-B-Plus series.
- K. Electric Control Valves - Size and type shown on Drawings having manual flow adjustment (except drip valves) and manual bleed nut. Rain Bird PEB series.
- L. Sprinkler Heads - As indicated on Drawings. Fabricated riser units in accordance with details on Drawings - with riser nipples of same size as riser opening in sprinkler body. Pop-up and Hi-pop spray heads Rain Bird 1804-SAM-PRS and 1812-SAM-PRS. Gear driven rotors Hunter I-20 and I-25.
- M. Backflow Preventer - Size and type indicated on Drawings; Brass construction with 150 psi working pressure.

PART 3 - EXECUTION

3.01 LANDSCAPE PLAN REVIEW AND COORDINATION - Contractor will be held responsible for coordination between landscape and irrigation system installation. Landscape material locations shown on the Landscape Plan shall take precedence over the irrigation system equipment locations. If irrigation equipment is installed in conflict with the landscape material locations shown on the Landscape Plan, the Contractor will be required to relocate the irrigation equipment, as necessary, at Contractor's expense.

3.02 INSPECTION - Examine areas and conditions under which Work of this Section is to be performed. Do not proceed with Work until unsatisfactory conditions have been corrected.

- A. Grading operations, with the exception of final grading, shall be completed and approved by Owner before staking or installation of any irrigation system begins.

3.03 PREPARATION:

- A. Staking shall Occur as Follows:

- 1. Mark, with powdered lime, routing of pressure supply line and flag heads for first few zones. Contact Owners Representative 48 hours in advance and request review of staking. Owners Representative will advise installer as to the amount of staking to be prepared. Owners Representative will review staking and direct changes if required. Review does not relieve installer from coverage problems due to improper placement of heads after staking.
- 2. If Project has significant topography, freeform planting beds, or other amenities which could require alteration of irrigation equipment layout as deemed necessary by Owners Representative, do not install irrigation equipment in these areas until Owners Representative has reviewed equipment staking.

- B. Install sleeving under asphalt paving and concrete walks, prior to concreting and paving operations, to accommodate piping and wiring. Compact backfill around sleeves to 95% Modified Proctor Density within 2% of optimum moisture content in accordance with STM D1557.

- C. Trenching - Trench excavation shall follow, as much as possible, layout shown on Drawing. Dig trenches straight and support pipe continuously on bottom of trench. Trench bottom shall be clean and smooth with all rock and organic debris removed.
 - 1. Clearances:
 - a. Piping 3 Inches and Larger - Make trenches of sufficient width (14 inches minimum) to properly assemble and position pipe in trench. Minimum clearance of piping 3 inches or larger shall be 5 inches horizontally on both sides of the trench.
 - b. Piping Smaller than 3 Inches - Trenches shall have a minimum width of 7 inches.
 - c. Line Clearance - Provide not less than 6 inches of clearance between each line, and not less than 12 inches of clearance between lines of other trades.
 - 2. Pipe and Wire Depth:
 - a. Pressure Supply Piping - 18 inches from top of pipe.
 - b. PVC Sleeving - 18 inches from top of pipe.
 - c. Non-pressure Piping (rotor) - 18 inches from top of pipe.
 - d. Non-pressure Piping (pop-up) - 12 inches from top of pipe.
 - e. Control Wiring - Side of pressure main.
 - f. Drip Tubing - 12 inches from top of pipe.
 - g. Emitter Tubing (Micro-tubing) - 8 inches from top of pipe.
 - 3. Boring will be permitted only where pipe must pass under obstruction(s) which cannot be removed. In backfilling bore, final density of backfill shall match that of surrounding soil. It is acceptable to use sleeves of suitable diameter installed first by jacking or boring, and pipe laid through sleeves. Observe same precautions as though pipe were installed in open trench.

3.04 INSTALLATION - Locate other equipment as near as possible to locations designated. Deviations shall be reviewed by Owners Representative prior to installation.

- A. PVC Piping - Snake pipe in trench as much as possible to allow for expansion and contraction. Do not install pipe when air temperature is below 40~F. Place manual drain valves at low points and dead ends of pressure supply piping to insure complete drainage of system. When pipe laying is not in progress, or at end of each day, close pipe ends with tight plug or cap. Perform Work in accordance with good practices prevailing in piping trades.
 - 1. Solvent Weld PVC Pipe - Lay pipe and make all plastic to plastic joints in accordance with manufacturer's recommendations.
- B. Drip Tubing:
 - 1. Make all fitting connections as per manufacturers recommendations.
 - 2. Use only manufacturer provided or recommended hole punch when making penetrations in drip tubing for insert fittings. Use of any other hole punch shall be cause for immediate removal and replacement of all installed drip tubing.
 - 3. Install drip line blow-out stubs at all dead ends of drip tubing.
- C. Control Wiring:
 - 1. Low Voltage Wiring:
 - a. Bury control wiring between controller and electric valves in pressure

- supply line trenches, strung as close as possible to main pipe lines with such wires to be consistently located below and to one side of pipe, or in separate trenches.
 - b. Bundle all 24 volt wires at 10 foot intervals and lay with pressure supply line pipe to one side of the trench.
 - c. Provide an expansion loop at every pressure pipe angle fitting, every electric control valve location (in valve box), and every 500 feet. Form expansion loop by wrapping wire at least 8 times around a 3/4 inch pipe and withdrawing pipe.
 - d. Make all splices and E.C.V. connections using Rain Bird Pentite connectors or similar dry splice method.
 - e. Install all control wire splices not occurring at control valve in a separate splice valve box.
 - f. Install one control wire for each control valve.
 - g. Run two spare #14 AWG UFUL control wires and one common wire from controller pedestal to the end of each and every leg of mainline. Label spare wires at controller and wire stub box.
2. High Voltage Wiring for Automatic Controller:
- a. Provide 120 volt power connection to automatic controller.
 - b. All electric work shall conform to local codes, ordinances, and authorities having jurisdiction. All high voltage electrical work shall be performed by licensed electrician.
- D. Automatic Controller:
- 1. Install controller in accordance with manufacturer's instructions as detailed and where shown on Drawings.
 - 2. Connect remote control valves to controller in numerical sequence as shown on Drawings.
 - 3. Final location of controller shall be approved by Owners Representative prior to installation.
 - 4. Each controller shall be a dedicated separate ground wire and grounding rod as detailed.
 - 5. All above ground conduit shall be rigid galvanized with appropriate fittings. All below ground conduit shall be schedule 40 PVC.
- E. Electric Control Valves - Install cross-handle 3 inches below finished grade where shown on Drawings as detailed. When grouped together, allow at least 12 inches between valve box sides. Install each remote control valve in a separate valve box. Install individual valve box flush with grade.
- F. Quick Coupling Valves - Install quick couplers on double swing-joint assemblies of Schedule 80 PVC pipe; plumb and flush to grade. Angled nipple relative to pressure supply line shall be no more than 45 degrees and no less than 10 degrees. Install quick coupling valves as detailed at all ead-ends of the pressure mainline and spaced at 300 ft. O.C. through-out mainline system.
- G. Drip Valve Assemblies - Install drip valve assembly as detailed.
- H. Drip Emitters - Stake all surface emitters as detailed and staked with acceptable tubing stakes.
- I. Drain Valves - Install manual drain valves at all low points in pressure supply line as detailed. Provide one three cubic foot gravel drainage sump for each drain valve

installed.

J. Valve Boxes:

1. Install one valve box for each type of valve installed as detailed. Valve box extensions are not acceptable except for master valves. Install gravel sump after compaction of all trenches. Place final portion of gravel inside valve box after valve box is backfilled and compacted.
2. Brand controller letter and station number on lid of each valve box. Letter and number size shall be no smaller than 1 inch and no greater in size than 1 1/2 inches. Depth of branding shall be no more than 1/8 inch into valve box lid.

K. Gate Valves - Install as detailed to isolate the mainline system. Mainline system shall be isolated such that one half of the system can remain operational at any time

L. Sprinkler Heads - Install sprinkler heads where designated on Drawings or where staked. Set to finish as detailed. Spacing of heads shall not exceed the maximum indicated on Drawing unless re-staked as directed by Owners Representative. In no case shall the spacing exceed maximum recommended by manufacturer. Install heads on double swing-joint risers of schedule 40 PVC pipe. Angled nipple relative to non-pressure line shall be no more than 45 degrees or less than 10 degrees. Adjust part circle heads for proper coverage. Adjust heads to correct height after sod is installed. Plant placement shall not interfere with intended sprinkler head coverage, piping, or other equipment. Owners Representative may request nozzle changes or adjustments without additional cost to the Owner.

M. Backflow Preventer - Install as detailed at location designated on Drawings.

N. Backfilling - Do not begin backfilling operations until required system tests have been completed. Backfill shall not be done in freezing weather except with review by Owners Representative. Leave trenches slightly mounded to allow for settlement after backfilling is completed. Trenches shall be finish graded prior to walk-through of system by Owners Representative.

1. Materials - Excavated material is generally considered satisfactory for backfill purposes. Backfill material shall be free of rubbish, vegetable matter, frozen materials, and stones larger than 1 inch in maximum dimension. Do not mix subsoil with topsoil. Material not suitable for backfill shall be hauled away. Contractor shall be responsible for providing suitable backfill if excavated material is unacceptable or not sufficient to meet backfill, compaction, and final grade requirements.
2. Do not leave trenches open for a period of more than 48 hours. Open excavations shall be protected in accordance with OSHA regulations.
3. Compact backfill to 90% maximum density, determined in accordance with ASTM D155-7 utilizing the following methods:
 - a. Mechanical tamping.
 - b. Puddling or ponding. Puddling or ponding and/or jetting is prohibited within 20'-0" of building or foundation walls.

O. Piping Under Paving:

1. Provide for a minimum cover of 18 inches between the top of the pipe and the bottom of the aggregate base for all pressure and non-pressure piping installed under asphaltic concrete or concrete paving.

2. Piping located under areas where asphalt or concrete paving will be installed shall be bedded with sand (a layer 6" below pipe and 6" above pipe).
 3. Compact backfill material in 6" lifts at 90% maximum density determined in accordance with ASTM D155-7 using manual or mechanical tamping devices.
 4. Set in place, cap, and pressure test all piping under paving, in presence of Owner prior to backfilling and paving operations.
 5. Piping under existing walks or concrete pavement shall be done by jacking, boring, or hydraulic driving, but where cutting or breaking of walks and/or concrete is necessary, it shall be done and replaced at not cost to Owner. Obtain permission to cut or break walks and/or concrete from Owner.
- P. Water Supply and Point of Connection - Water supply shall be extended as shown from water supply lines.

3.05 FIELD QUALITY CONTROL:

- A. Flushing - After piping, risers, and valves are in place and connected, but prior to installation of sprinkler heads, quick coupler assemblies, and hose valves, thoroughly flush piping system under full head of water pressure from dead end fittings. Maintain flushing for 5 minutes through furthest valves. Cap risers after flushing.
- B. Testing - Conduct tests in presence of Owners Representative. Arrange for presence of Owners Representative 48 hours in advance of testing. Contractor shall supply force pump and all other test equipment.
1. After backfilling, and installation of all control valves, fill pressure supply line with water, and pressurize to 40 PSI over the designated static pressure or 120 PSI, whichever is greater, for a period of 2 hours.
 2. Leakage, Pressure Loss - Test is acceptable if no loss of pressure is evident during the test period.
 3. Leaks - Detect and repair leaks.
 4. Retest system until test pressure can be maintained for duration of test.
 5. Before final acceptance, pressure supply line shall remain under pressure for a period of 48 hours.
- C. Walk-Through for Substantial Completion:
1. Arrange for Owners Representative's presence 48 hours in advance of walk-through.
 2. Entire system shall be completely installed and operational prior to scheduling of walk-through.
 3. Operate each zone in its entirety for Owners Representative at time of walk-through and additionally, open all valve boxes if directed.
 4. Generate a list of items to be corrected prior to Final Completion.
 5. Furnish all materials and perform all work required to correct all inadequacies of coverage due to deviations from Contract Documents.
 6. During walk-through, expose all drip emitters under operations for observation by Owners Representative to demonstrate that they are performing and installed as designed, prior to placing of all mulch material. Schedule separate walk-through if necessary.
- D. Walk-Through for Final Completion:

1. Arrange for Owners Representative's presence 48 hours in advance of walk-through.
2. Show evidence to Owners Representative that Owner has received all accessories, charts, record drawings, and equipment as required before Final Completion walk-through is scheduled.
3. Operate each zone, in its entirety for Owners Representative at time of walk-through to insure correction of all incomplete items.
4. Items deemed not acceptable by Owners Representative shall be reworked to complete satisfaction of Owners Representative.
5. If after request to Owners Representative for walk-through for Final Completion of irrigation system, Owners Representative finds items during walk-through which have not been properly adjusted, reworked, or replaced as indicated on list of incomplete items from previous walk-through, Contractor shall be charged for all subsequent walk-throughs. Funds will be withheld from final payment and/or retainage to Contractor, in amount equal to additional time and expenses required by Owners Representative to conduct and document further walk-throughs as deemed necessary to insure compliance with Contract Documents.

3.06 ADJUSTING - Upon completion of installation, "fine-tune" entire system by regulating valves, adjusting patterns and break-up arms, and setting pressure reducing valves at pro-per and similar pressure to provide optimum and efficient coverage. Flush and adjust all sprinkler heads for optimum performance and to prevent overspray onto walks, roadways, and buildings as much as possible. Heads of same type shall be operating at same pressure +/- 7%.

- A. If it is determined that irrigation adjustments will provide proper coverage, and improved water distribution as determined by Owners Representative, contractor shall make such adjustments prior to Final Acceptance, as directed, at no additional cost to Owner. Adjustments may also include changes in nozzle sizes, degrees of arc, and control valve throttling.
- B. All sprinkler heads shall be set perpendicular to finish grade unless otherwise designated.
- C. Areas which do not conform to designated operation requirements due to unauthorized changes or poor installation practices shall be immediately corrected at no additional cost to the Owner.

3.07 CLEANING - Maintain continuous cleaning operation throughout duration of work. Dispose of, off-site at not additional cost to Owner, all trash or debris generated by installation of irrigation system.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Examination.
- B. Preparation.
- C. Benches
- D. Trash Receptacles.
- E. Bicycle Racks.
- F. Newspaper Dispensers
- G. Concrete Planter Pots
- H. Tree Grates
- I. Chase Drain Covers
- J. Excavation, Foundations and Backfilling.
- K. Cleaning and Repairing.
- L. Protection.

1.02 RELATED SECTIONS

- A. Section 01011: Special Conditions of the Landscape Work
- B. Section 02111: Tree and Plant Protection.
- C. Section 02200: Earthwork.
- D. Section 02220: Structural Soil
- E. Section 02518: Unit Pavement
- F. Section 02520: Concrete Pavement.
- G. Section 02815: Irrigation System.
- H. Section 02920: Landscape Systems.
- I. Section 02923: Landscape Grading.
- J. Section 02950: Trees, Shrubs and Groundcover.
- K. Section 03300: Cast-in Place Concrete.

1.03 SUPPLEMENTAL UNIT PRICES - MEASUREMENT AND PAYMENT

- A. The following items are listed for detailed description and unit pricing in case of addition work needed
- B. BENCH
 - 1. Basis of Measurement: Per Unit.
 - 2. Basis of Payment: Includes examination, site preparation, excavation, provide and install bench, backfill, clean up, protection, warranty and maintenance.
- C. Trash Receptacles
 - 1. *Basis of Measurement: Per Unit.*
 - 2. *Basis of Payment: Includes examination, site preparation, excavation, provide and install receptacle, backfill, clean up, protection, warranty and maintenance.*
- D. Bicycle Rack
 - 1. *Basis of Measurement: Per Unit.*

2. *Basis of Payment: Includes examination, site preparation, excavation, provide and install bicycle rack, backfill, clean up, protection, warranty and maintenance.*

E. Newspaper Rack Dispenser

1. *Basis of Measurement: Per Unit.*
2. *Basis of Payment: Includes examination, site preparation, excavation, provide and install newspaper rack dispenser, backfill, clean up, protection, warranty and maintenance.*

F. Concrete Planter Pots

1. *Basis of Measurement: Per Unit.*
2. *Basis of Payment: Includes examination, site preparation, excavation, provide and install concrete planter pots, backfill, clean up, protection, warranty and maintenance.*

G. Tree Grates

1. *Basis of Measurement: Per Unit.*
2. *Basis of Payment: Includes examination, site preparation, excavation, provide and install tree grates, backfill, clean up, protection, warranty and maintenance.*

H. Chase Drain Covers

1. *Basis of Measurement: Per Unit.*
2. *Basis of Payment: Includes examination, site preparation, excavation, provide and install chase drain covers, backfill, clean up, protection, warranty and maintenance.*

1.04 REFERENCES

- A. ASTM C33 - Specification for Concrete Aggregates.

1.05 SUBMITTALS

- A. All submittals shall be accepted by the Landscape Architect in writing before installation commences.
- B. MANUFACTURER'S PRODUCT DATA: Submit manufacturer's printed descriptions, instructions, test data and color samples for each product at the same time to coordinate colors.
- C. MAINTENANCE DATA: Submit manufacturer's recommended cleaning and stain removal methods and cleaning materials.
- D. WARRANTY DOCUMENTATION: Submit warranty documentation.
- E. SUBSTITUTIONS: Prior to start of any work in this Section contractor shall submit all pertinent data to allow for complete review of all substitutions of product. Once work has started in this Section, no substitutions without prior approval by the Landscape Architect will be allowed.
 1. Submit shop drawings for substitutions which differ in materials from the Drawings. Include details of setting methods, material, location and accessories for all non-specified products.

1.06 QUALITY ASSURANCE

A. QUALIFICATIONS

1. Supplier: Company equipped to perform manufacturing and fabrication and equipped to process the material promptly on order and in strict accordance with specifications. Evidence to this effect shall be provided by the supplier if required by the Landscape Architect.
2. Installer: Company with minimum five (5) years successful experience in the installation of products similar in size and scope to this project.

1.07 DELIVERY, STORAGE AND HANDLING

A. Packaged Materials: Deliver packaged materials in containers showing weight, analysis and name of manufacturer. Protect materials from weather, moisture, deterioration and contamination during delivery, installation and site storage. Store cementitious materials off the ground, under cover and in a dry location.

B. SITE FURNISHINGS

1. Protect site furnishings during storage and construction against moisture, soiling, staining and physical damage.
2. Delivery: Deliver all furnishings to job site in manufacturer's original packing materials.
3. Handling: Handle all furnishings to prevent chipping, breakage, soiling or other damage.
4. Storage: Store furnishings in manner so as to protect them from all forms of damage including weather and construction activities. Protect stored furnishings from weather with waterproof, non-staining covers or enclosures, but allow air to circulate.
5. Replace damaged furnishings with new as directed.
6. Where shop fabrication is indicated, comply with industry standards for storage of materials. Landscape Architect shall be allowed access to work in progress during all stages of fabrication during normal working hours. Protect all completed work and coordinate delivery to the site for final installation and acceptance. Materials delivered for field fabrication shall be delivered and stored in a clean, protected location.

C. ACCESSORIES: Protect materials from weather, moisture, deterioration and contamination during delivery, installation and site storage.

1.08 PROJECT/SITE CONDITIONS

A. ENVIRONMENTAL REQUIREMENTS

1. Comply with requirements of referenced standards and recommendations of material manufacturers for environmental conditions before, during, and after installation. Maintain environmental conditions and protect work during and after

installation to comply with referenced standards and manufacturer's printed recommendations.

B. EXISTING CONDITIONS

1. Existing Plants: Do not damage any existing plantings indicated to remain in accordance with Section 02111: Tree and Plant Protection.
2. Utilities: Determine location of underground utilities. Perform work in a manner to avoid possible damage. Hand excavate, as required.
3. Excavation: Maintain grade stakes set by others until removal is mutually agreed upon by parties concerned. When conditions detrimental to Work are encountered, such as rubble fill, adverse drainage conditions, noxious materials or obstructions, notify Landscape Architect before proceeding.

1.09 SEQUENCING AND SCHEDULING

- A. WORK SCHEDULING: Proceed with and complete Work as rapidly as portions of the site become available, working within the specified environmental requirements.

1.10 WARRANTY AND REPLACEMENT

A. GENERAL

1. Warranty Period: Refer to Section 01011.
2. Partial Acceptances: When the work is accepted in parts, the warranty period shall extend from each of the partial acceptances to the terminal date of the last warranty period such that all warranty periods terminate at one time.

- B. SITE FURNISHINGS WARRANTY CONDITIONS: Warranty all site furnishings against defects due to any cause except vandalism and acts of God. The following warranty conditions apply:

1. The contractor, by commencing the work of this Section, assumes overall responsibility, as part of his warranty of the work, to assure that all assemblies, components, and parts shown or required within the Work of this Section, comply with contract documents. The contractor shall further warrant:
 - a. That all components, specified or required to satisfactorily complete the installation, are compatible with each other and with the conditions of installation and expected use.
 - b. The overall effective integration and correctness of individual parts and the whole of the system.
 - c. Compatibility with adjoining existing substrates, materials and work by other trades.
 - d. There shall be no material failure due to improper design or installation of site furnishings. All materials are to fully perform to their normal life expectancy.
2. If site furnishings fail after having been replaced previously, item shall be replaced until it is approved. The warranty period begins anew and

extends each time an item requires replacing. Replacement site furnishings shall be of the same kind, condition and quality as original unit pavers and subject to all requirements in this specification.

3. All expenses incurred in the replacements shall be borne by the Contractor.
4. Make replacements within seven days of notification by Landscape Architect.
5. Warranty: Comply with Section 01011.

PART 2 - PRODUCTS

2.01 BENCHES

- A. Manufacturer: DuMor, Inc., as available from E.J. Renner & Associates, 1375 West Alameda, Denver, CO 80223, (303) 744-3631.
- B. *Catalog Number: Refer to Plans, Sheet L-9.*
- C. *Color: Refer to Plans, Sheet L-9. Submit samples*

2.02 BIKE RACKS

- A. Manufacturer: Columbia Cascade, Timber form as available from *Woods Site and Playscapes*, (303) 688-2132.
- B. *Catalog Number: Refer to Plans, Sheet L-9.*
- C. *Color: Refer to Plans, Sheet L-9. Submit samples*

2.03 TRASH RECEPTACLES

- A. Manufacturer: Victor Stanley, as available from Recreation Plus Ltd., 15207 West Ellsworth Place, Golden, CO 80401-5087, (303) 278-1455.
- B. *Catalog Number: Refer to Plans, Sheet L-9.*
- C. *Color: Refer to Plans, Sheet L-9. Submit samples*

2.04 NEWSPAPER DISPENSERS

- A. Manufacturer: Sho-Rack by Kaspar Wire Works, Inc., 1127 Sho-Rack Drive, P.O. Box 1127, Shiner, TX 77984, (800) 527-1134
- B. *Catalog Number: Refer to Plans, Sheet L-9.*
- C. *Color: Refer to Plans, Sheet L-9. Submit samples*

2.05 PLANTER POTS

- A. Manufacturer: Petersen Manufacturing Co., Inc., as available from: Recreation Plus, Ltd., 15207 West Ellsworth Place, Golden, CO 80401-5087, (303)278-1455.
- B. *Catalog Number: Refer to Plans, Sheet L-9.*
- C. *Color: Refer to Plans, Sheet L-9. Submit samples*

2.06 CHASE DRAIN COVERS

- A. Manufacturer: Urban Accessories, as available from: Recreation Plus, Ltd., 15207 West Ellsworth Place, Golden, CO 80401-5087, (303)278-1455.
- B. *Catalog Number: Refer to Plans, Sheet L-9.*

C. *Color: Refer to Plans, Sheet L-9. Submit samples*

2.07 TREE GRATES

- A. Manufacturer: Neenah Foundary, Regional Sales Office, Phoenix, Az., (602)225-9801, (602)220-0354 fax.
- B. *Catalog Number: Refer to Plans, Sheet L-9.*
- C. Finish: No color.
- D. Accessories: Eye bolts at thickened Edge shall be 1" diameter eye, 3/8" x 6" long, stainless steel.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. VERIFICATION OF CONDITIONS: Examine areas and conditions under which the Work of this Section will be performed. Report unsatisfactory or questionable conditions to the Landscape Architect. Do not proceed with the Work until unsatisfactory conditions have been corrected. Commencement of work implies acceptance of all areas and conditions.
 - 1. Verify areas to be paved are excavated to depth, line and grade indicated, allow dimension to install full pavement depth to specified finish grade, provide proper drainage, and achieve a minimum density of 95% in accordance with Section 02200: Earthwork.

3.02 PREPARATION

- A. PROTECTION: . Protect areas in accordance with paragraph 3.06 this Section.

3.03 PLACEMENT AND MOUNTING

- A. Place and bolt benches, trash containers, bicycle racks, and newspaper dispensers to pavement as per manufacturer's recommendations. All furnishings shall be mounted plumb.
- B. Tree grate and chase drain covers frames shall be installed with grates and drain covers in place prior to pouring of adjacent concrete. Comply with manufacturer's instructions, as shown on detail. Protect grates and frames from damage resulting from concrete operations.

3.04 FIELD QUALITY CONTROL

A. INSPECTIONS

- 1. General: All site furnishings are subject to the Landscape Architect's approval prior to, during and after installation. Replace rejected site furnishings with satisfactory items.
- 2. Landscape Architects or Owners Representative inspection of the dimensional site furnishings does not release the Contractor from his responsibility to provide all the work in accordance with the specifications and Drawings.

3.05 CLEANING AND REPAIRING

- A. Remove protective covering.
- B. Repair defective Work.
- C. After completion of repair work, clean exposed surfaces with clean water. Use cleaner and procedures recommended by manufacturer and fabricator. Do not use wire brushes, metal scrapers or acids. Protect adjacent surfaces from damage during cleaning operations.
- D. Prepare small sample areas in presence of Landscape Architect for acceptance of procedures.
- E. Repair: After cleaning, examine work and repair unacceptable conditions. Replace defective, broken, permanently stained, or damaged units. Repair unfilled or defective joints.
- F. At completion of construction work, remove all temporary protection from the Work of this Section.

3.06 PROTECTION

- A. Protect all furnishings from all forms of harm which might result from weather, transportation, loading and unloading and storage on or off-site.
- B. Protect all furnishings from harm due to the work of other trades until final acceptance in accordance with the general and supplementary conditions of this contract.
- C. Protect paving surfaces, other structures and plants from harm during transport or installation of site furnishings.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Examination.
- B. Preparation.
- C. Wood Mulch.
- D. Clean Up.
- E. Protection.
- F. Maintenance.

1.02 RELATED SECTIONS

- A. Section 02200: Earthwork.
- B. Section 02815: Irrigation System.
- C. Section 02920: Landscape Systems.
- D. Section 02923: Landscape Grading.
- E. Section 02940: Lawn Sodding.
- F. Section 02950: Trees, Shrubs and Groundcover.

1.03 SUPPLEMENTAL UNIT PRICES - MEASUREMENT AND PAYMENT

- A. The following items are listed for detailed description and unit pricing in case of addition work needed. Refer to Bid Form.
- B. WOOD MULCH
 - 1. Basis of Measurement: Square Foot.
 - 2. Basis of Payment: Includes examination, site preparation, providing mulch, installation, clean up, protection, warranty and maintenance.

1.04 REFERENCES

- A. ASTM D1557 - Test Method for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-lb Rammer and 18-inch Drop.

1.05 DEFINITIONS

- A. WEEDS: Includes but not limited to, Goatheads, Bindweed, Twitch, Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Weed, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Broom Grass.

1.06 SUBMITTALS

- A. All submittals shall be accepted by the Landscape Architect in writing before planting commences.

- B. **DESCRIPTIVE PRODUCT DATA:** Submit catalog cuts, brochures, and analyses of any manufactured items.
- C. **CERTIFICATES**
 - 1. Submit certificates of inspection as required by governmental authorities.
 - 2. Submit manufacturer's certified analysis packaged with standard products.
- D. **ANALYSIS AND STANDARDS:** Wherever applicable, for non packaged materials, provide analysis by recognized laboratory made in accordance with methods established by the Association of Official Agriculture Chemists.
- E. **MULCH SUBMITTAL:** Submit 1 quart sample of each mulch type to be installed, full color range. Attain Landscape Architect's approval prior to bulk delivery to site.

1.07 QUALITY ASSURANCE

- A. **REGULATORY REQUIREMENTS:** Comply with regulatory agencies concerning classification, transportation, handling and storage of landscape materials.

1.08 DELIVERY, STORAGE AND HANDLING

- A. **PACKAGED MATERIALS:** Deliver packaged materials in containers showing weight, analysis and name of manufacturer. Protect materials from deterioration during delivery, and while stored at site.
- B. **MULCH:** Exercise care in the storage of mulches on site to avoid mixing soil with mulch.
- C. **REJECTION OF MATERIAL**
 - 1. Evidence of inadequate protection or improper handling or storage, shall be cause for rejection.
 - 2. Any product or material exhibiting signs of damage due to nonconformity to specifications or due to delivery, storage or handling shall be rejected by the Landscape Architect. Contractor shall be responsible for hauling off-site and disposing of according to general conditions and codes of the governing jurisdiction.

1.09 PROJECT/SITE CONDITIONS

- A. **ENVIRONMENTAL REQUIREMENTS:** Work shall occur only when weather and soil conditions permit in accordance with locally accepted practice.
- B. **EXISTING CONDITIONS**
 - 1. **Utilities:** Determine location of underground utilities. Perform work in a manner to avoid possible damage. Hand excavate, as required.
 - 2. **Excavation:** Maintain grade stakes set by others until removal is mutually agreed upon by parties concerned.

1.10 SEQUENCING AND SCHEDULING

- A. **WORK SCHEDULING:** Proceed with and complete landscape work as rapidly as portions of the site become available, working within the specified planting season and approved schedule.

1.11 WARRANTY AND REPLACEMENT

- A. **GENERAL:** Refer to Special Conditions of Land Work (Section 01011).

1.12 MAINTENANCE

- A. **GENERAL:** Maintain Work in accordance with standard industry practice or as directed by the Landscape Architect.
- B. **MAINTENANCE PERIOD:** Begin maintenance immediately after Work is completed. Maintain areas until Final Acceptance.

PART 2 - PRODUCTS

2.01 WATER

- A. Clean, potable and free of substances or matter which could inhibit vigorous growth of plant material.
- B. Available on-site at no expense to Contractor. Landscape Contractor is responsible for coordination of water needs for watering and irrigation water with the General Contractor.

2.02 WOOD MULCH

- A. Shredded bark mulch, free from deleterious materials and suitable for top dressing of trees, shrubs and ground covers. Mulch shall be of a long fibrous nature capable of matting together and interlocking when moistened and settled. Shredded cedar bark mulch or accepted substitute.
- B. Submit samples prior to delivery to the site in accordance with paragraph 1.06.E this Section.
- C. **SUBSTITUTIONS:** Do not make substitutions: If specified wood mulch is not obtainable, submit proof of non-availability to Landscape Architect together with proposal for use of equivalent material for review and acceptance by Landscape Architect.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. **VERIFICATION OF CONDITIONS:** Examine areas and conditions under which the Work of this Section will be performed. Report unsatisfactory or questionable conditions to the Landscape Architect. Do not proceed with the

Work until unsatisfactory conditions have been corrected. Commencement of work implies acceptance of all areas and conditions.

1. Verify that during grading, topsoil spreading and landscape grading operations, the ground surface was cleaned of materials which might hinder final operations.

3.02 PREPARATION

- A. PROTECTION: Protect areas in accordance with paragraph 3.09 this Section.
- B. All areas within the limits of planting shall be sodded, planted with trees, shrubs, groundcovers, perennials or mulched as indicated in the Specifications.
- C. LAYOUT: Stake outline location of shrub bed edge in accordance with Drawings. Obtain Landscape Architect's approval prior to starting Work.

3.03 WOOD MULCH

- A. RAISED PLANTING BEDS: Place 3 inches thick. Cover entire area of planting bed.
- B. INDIVIDUAL TREE PITS: Mulch planted areas around individual trees. Provide minimum 3 inches of mulch. Finish level with adjacent finish grades.

3.04 FIELD QUALITY CONTROL

- A. TESTS: Costs of tests and material analyses made by the testing agency will be borne by the Owner when tests indicate compliance and by the Contractor when test indicated non-compliance.
- B. REVIEWS
 1. General: Comply with General Conditions of Landscape Work Section 01011.
 2. Pre-Planting Review
 - a. All mulch shall be inspected and accepted at the site by the Landscape Architect before they are used in planting operations.
 3. Substantial Completion
 - a. Comply with Section 01011.
 - b. At the time of this walk-through, the Contractor shall have :
 - 1) Installed all items in accordance with this Section.
 - 2) Cleaned all walkways and curbs of debris and litter and shall have cleaned areas of soil and debris left from planting operations.
 4. Final Completion: Comply with Section 01011.
 5. Closeout Documents: Comply with Special Provision Section 30.
 6. Start Up and Instructions: Comply with General Conditions Section 20.
 7. Warranty and Replacement: Comply with Section 01011.
 8. Post Construction Inspection: Comply with Section 01011.

3.06 CLEANUP

- A. **DURING LANDSCAPE INSTALLATION:** All areas shall be reasonably clean at the end of each work day. Sidewalks and other paved areas shall be swept or washed down as needed. Keep pavements clean and work area in an orderly condition.
- B. **PROJECT COMPLETION:** All debris, soil, trash, and excavated and/or stripped material resulting from landscape operations and unsuitable for or in excess of requirements for completing work of this Section shall be disposed of off-site. All paved areas shall be washed down.

3.07 PROTECTION

- A. Protect landscape work and materials from damage due to landscape operations, operations by other contractors and trades and trespassers.
- B. Maintain protection during installation and maintenance periods. Treat, repair or replace damaged landscape work as directed.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Examination.
- B. Preparation.
- C. Subsoil Preparation.
- D. Soil Tests.
- E. Coordination of Soil Amendments.
- F. Fine Grading.
- G. Adjusting.
- H. Cleaning
- I. Protection.

1.02 RELATED SECTIONS

- A. Section 02200: Earthwork.
- B. Section 02220: Structural Soil
- C. Section 02815: Irrigation System.
- D. Section 02920: Landscape Systems.
- E. Section 02940: Lawn Sodding.
- F. Section 02950: Trees, Shrubs and Groundcover.

1.03 REFERENCES

- A. Colorado Division of Labor Rules and Regulations: Excavation.
- B. State Department of Highways, Division of Highways, State of Colorado, Standard Specifications for Road and Bridge Construction, Section 207 of the latest edition.
- C. ANSI/ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb (2.49 Kg) Rammer and 12 inch (304.8 mm) Drop.
- D. ANSI/ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.
- E. Association of Official Agricultural Chemists: Topsoil Analysis.

1.04 DEFINITIONS

- A. WEEDS: Includes but not limited to, Goatheads, Bindweed, Twitch, Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Weed, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Broom Grass.

1.05 SUBMITTALS

- A. All submittals shall be accepted by the Landscape Architect in writing before planting commences.
- B. SOIL TESTING:
 - 1. Submit for Landscape Architect's approval, soil samples and test results from :
 - a. THREE locations as designated by the Landscape Architect.
 - b. Each off-site soil source.
 - 2. Each location submission shall include:
 - a. 1 qt. representative sample in air tight container.
 - b. Agricultural analysis by recognized laboratory made in accordance with methods established by the Association of Official Agricultural Chemists. Test shall include available nutrients, soil pH, soil texture, salt, and percentage organic matter, carbon-to-nitrogen ratio, and recommended fertilization and amendment rates for plant material types specified.
 - c. Location of borrow site, if applicable.
 - 3. Deliver copies of all test reports and samples to landscape contractor and Landscape Architect.
- C. CERTIFICATES: Submit certificates of inspection as required by governmental authorities.
- D. SAMPLES: Comply with paragraph 1.05.B this Section.

1.06 QUALITY ASSURANCE

- A. QUALIFICATIONS
 - 1. Installer: Company with minimum five (5) years successful experience in the placing on topsoil similar in scope and size to this project.
 - 2. Testing Agency: Certified soils laboratory with capability to analyze materials for conformance to specification requirements (where applicable).

1.07 PROJECT/SITE CONDITIONS

- A. ENVIRONMENTAL REQUIREMENTS
 - 1. Comply with requirements of referenced standards for environmental conditions before, during, and after installation. Maintain environmental conditions and protect work during and after installation to comply with referenced standards.
 - 2. Moisture Content: Topsoil and other materials shall not be placed, backfilled, or spread while in a wet or saturated condition. Moisture content shall not be so great that excessive compaction will occur, nor so

low that dust will form in the air or that clods will not break readily. Apply water if necessary to bring soil to optimum moisture content for tilling.

3. Do not work soil when muddy or frozen.

B. EXISTING CONDITIONS

1. Utilities: Determine location of underground utilities including irrigation system. Perform work in a manner to avoid possible damage. Hand excavate, as required.
2. Excavation: Maintain grade stakes set by others until removal is mutually agreed upon by parties concerned. When conditions detrimental to Work are encountered, such as rubble fill, adverse drainage conditions, noxious materials or obstructions, notify Landscape Architect before proceeding.
3. Topsoil: Protect existing topsoil which has been spread on site during overlot grading by other contractor.

1.08 SEQUENCING AND SCHEDULING

A. COORDINATION

1. Coordinate with seeding, sodding and landscape Contractor(s) approved schedule. Do not placenew soil more than 3 days prior to commencement of landscaping in the area. Limit fine grading to areas which can be planted within 24 hours after fine grading.
2. Coordinate with Contractors' work requiring access to site over topsoil areas.
3. Coordinate with installation of underground irrigation system and outlets.
4. Coordinate with construction of utilites on site. Do not begin placing topsoil until underground work is completed in the area.

1.10 MAINTENANCE

- A. Protect newly topsoiled and fine graded areas from erosion and traffic. Repair and reestablish grades in settled, eroded and disturbed areas to specified tolerances until landscape operations commence.

PART 2 - PRODUCTS

2.01 WATER

- A. Clean, fresh and free of substances or matter which could inhibit vigorous growth of plants.

2.02 TOPSOIL

- A. **IMPORTED TOPSOIL:** Fertile sandy loam, taken from a well drained site and free from clay subsoil, stones, lumps, stolons, plants, roots, sticks and seeds, high salt content and other materials/attributes harmful to plant life. Screen topsoil to achieve the following specification:

1.	Sieve/Screen Size	% Passing	% Retaining
	1" screen	100	0
	½" screen	97-100	0-3
	#100 mesh sieve	60-40	40-60
2.	pH before amendments between 5.5 and 7.5.		
3.	Refer to Sections 02940 and 02950 for topsoil amendment requirements.		

2.03 HERBICIDE

- A. **WEED HERBICIDE:** Round-up or approved equal.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. **VERIFICATION OF CONDITIONS:** Examine areas and conditions under which the Work of the Section will be performed. Report unsatisfactory or questionable conditions to the Landscape Architect. Do not proceed with the Work until unsatisfactory conditions have been corrected. Commencement of work implies acceptance of all areas and conditions.
1. Verify that during grading, the ground surface was cleaned of materials which might hinder final operations.

3.02 PREPARATION

- A. **PROTECTION:** Protect areas in accordance with paragraph 3.08 this Section.
- B. **HERBICIDE TREATMENT**
1. Confirm Landscape Architect's requirement to proceed with herbicide treatment of on site subsoil and existing sod removal. Herbicide treatment must be completed during the growing season.
 2. If plant growth is evident, treat site with Roundup herbicide in accordance with manufacturers recommendations. Protect existing trees in accordance with manufacturer's recommendations and Section 02111.
 3. Water subsoil 1/2" per week if natural precipitation does not supply this amount.
 4. Ten (10) days after Roundup application, review subsoil surface for evidence of plant growth.
 5. Repeat steps 2, 3 and 4, up to three(3) applications, until there is no evidence of plant growth after 10 day period.
 6. Obtain Landscape Architect's approval of subsoil fourteen (14) days after last herbicide application.

7. Herbicide treatments beyond three full site applications shall be at the agreed to unit price.
8. Remove plant debris from treated area.

3.03 SUBSOIL PREPARATION

- A. Verify subsoil base has been contoured and compacted and is free of contaminated material.
- B. Prepare subsoil to eliminate uneven areas and low spots. Maintain lines, levels, profiles, and contours. Make changes in grade gradual. Blend slopes into level areas.
- C. Remove foreign materials, stones exceeding 2 inches, weeds and undesirable plants and their roots.
- D. Scarify subsoil to a depth of 8 inches by discing or tilling where topsoil is to be placed. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted subsoil.
- E. Remove foreign materials, stones exceeding 2 inches, weeds and undesirable plants and their roots which came to the surface during subsoil scarification.
- F. Do not prepare soil under existing tree canopy or where tree surface roots are visible. Review these areas with Landscape Architect prior to commencing work.

3.04 PLACING TOPSOIL

- A. Place topsoil where sodding and planting are scheduled and in accordance with paragraph 1.09 this Section.
- B. Place topsoil during dry weather and on dry, unfrozen subsoil.
- C. Remove vegetative matter and foreign, non-organic material and debris larger than 1.5 inches in diameter at the time of placement.
- D. Place topsoil to the following depths:

Sod Areas	3"
Planters	Full depth, allowing for the addition of soil amendments
Tree Pits	Refer to Section 2950

3.05 SOIL TESTS

- A. Perform soil testing and submission in accordance with paragraph 1.06 this Section.

3.06 COORDINATION OF SOIL AMENDMENTS

- A. Coordinate soil amendments with landscape contractor in accordance with Sections 02940 and 02950.

3.07 FINE GRADING

- A. Fine grade topsoil to finished elevations with smooth, even surface with loose, uniformly fine texture.

- B. Remove foreign materials, stones exceeding 1.5 inches, weeds and undesirable plants and their roots which came to the surface during soil amending.
- C. Roll, rake and drag lawn areas, remove ridges and fill depressions, as required to meet finish grades. Limit fine grading to areas which can be planted immediately after grading. Compact sodded areas to 90%.
- D. Remove surplus subsoil and topsoil from site.
- E. Leave stockpile area and site clean and raked, ready to receive landscaping.

3.08 TOLERANCES

- A. **FINISH GRADE:** Finish grade elevations shall be within the following tolerances from elevations indicated on the drawings:
 1. Landscape Areas: $\pm 0.10'$.
 2. Adjacent to Paving and Curbs: $\pm 0.04'$ (1/2").

3.09 ADJUSTING

- A. **RECONDITIONING COMPACTED AREAS:** When completed topsoil areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.

3.10 CLEANUP

A. DURING LANDSCAPE INSTALLATION

1. All areas shall be reasonably clean at the end of each work day. Sidewalks and other paved areas shall be swept or washed down as needed. Keep pavements clean and work area in an orderly condition.
2. Contractor shall make a reasonable effort to clean up the project on a daily basis to maintain a neat and orderly site.

B. PROJECT COMPLETION

1. All debris, soil and trash resulting from landscape operations shall be removed from the site. Burning of waste material is prohibited. All paved areas shall be washed down.
2. Restore all areas outside the Contract limits which have been disturbed to their original condition at no cost to the Owner.

3.11 PROTECTION

- A. Protect landscape work and materials from damage due to landscape operations, operations by other contractors and trades and trespassers.
- B. Maintain protection during installation and maintenance periods. Treat, repair or replace damaged landscape work as directed.

END OF SECTION

PART 1 - GENERAL**1.01 SECTION INCLUDES**

- A. Examination.
- B. Preparation.
- C. General Planting Requirements.
- D. Trees and Shrubs Planted in Individual Plant Pits or Trenches.
- E. Shrubs Planted in Prepared Planting Beds.
- F. Clean Up.
- G. Protection.
- H. Maintenance.

1.02 RELATED SECTIONS

- A. Section 02200: Earthwork.
- B. Section 02220: Structural Soil.
- C. Section 02815: Irrigation System.
- D. Section 02920: Landscape Systems.
- E. Section 02923: Landscape Grading.
- F. Section 02940: Lawn Sodding.

1.03 SUPPLEMENTAL UNIT PRICES - MEASUREMENT AND PAYMENT

- A. The following items are listed for detailed description and unit pricing in case of addition work needed. Refer to Bid Form.
- B. PLANTS LISTED ON PLANT LIST
 - 1. Basis of Measurement: Per Unit.
 - 2. Basis of Payment: Includes examination, site preparation, soil preparation of planting pit, plant, plant installation, clean up, protection, warranty and maintenance.

1.04 REFERENCE

- A. American Standards for Nursery Stock (ANSI Z60.1 - most recent edition), American Association of Nurserymen, Washington D.C.
- B. Hortus III, L.H. Bailey Hortorium and Staff, MacMillan Co., New York, 1976.
- C. Manual of Woody Landscape Plants, M.A. Dirr, Stipes Publishing Co., Champaign, Illinois, 1990.
- D. A New Tree Biology, Alex L. Shigo, Shigo and Trees Associates, Durham, New Hampshire, 1986.
- E. A New Tree Biology Dictionary, Alex L. Shigo, Shigo and Trees Associates, Durham, New Hampshire, 1986.
- F. Landscape Policy Manual, City of Colorado Springs Planning Department.

1.05 DEFINITIONS

- A. WEEDS: Includes, but not limited to, Goatheads, Bindweed, Twitch, Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Weed, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, Pigweed, Kosher, and Broom Grass.
- B. PLANTS: Trees, shrubs, groundcovers, annuals, perennials, and bulbs specified in the plant list.

1.06 SUBMITTALS

- A. All submittals and plant materials shall be accepted by the Landscape Architect in writing before planting commences.
- B. CERTIFICATES
 - 1. Submit certificates of inspection as required by governmental authorities.
 - 2. Submit manufacturer's certified analysis packaged with standard products.
- C. ANALYSIS AND STANDARDS: Wherever applicable, for non packaged materials, provide analysis by recognized laboratory made in accordance with methods established by the Association of Official Agriculture Chemists.
- D. PLANTING SCHEDULE: Submit in accordance with Section 01011.
- E. PLANT PHOTOGRAPHS: Submit one color photograph or 35 mm color transparency of all trees over 2 inch caliper or 7 foot height for any plant materials which are located outside of 30 mile radius of Denver for approval by Landscape Architect prior to shipment to the site or the contractor's holding yard.
- F. TREE PLANTING MATERIAL SUBMITTAL: Submit 1 tree collar and 1 sample of tree wrap.
- G. SAMPLES: Submit 1 quart sample of wood chips for acceptance by Landscape Architect.
- H. CONTRACTOR QUALIFICATIONS: Submit nursery and installation company qualifications in accordance with paragraph 1.07.B this Section for acceptance by Landscape Architect.

1.07 QUALITY ASSURANCE

- A. QUALIFICATIONS
 - 1. Nursery: Company specializing in growing and cultivating the plants with minimum five (5) years experience, and certified by the State of Colorado Department of Agriculture.
 - 2. Installer: Company with minimum five (5) years successful experience in the installation of landscape areas similar in size and complexity to this project. Company shall be a member in good standing of one of the following organizations:
 - a. Associated Landscape Contractors of America.
 - b. American Association of Nurserymen.

- c. A member of the Nurserymen's Association of the state in which the work is being performed.

B. REGULATORY REQUIREMENTS

1. Comply with regulatory agencies concerning classification, transportation, handling and storage of plants, fertilizer, herbicide and pesticide materials.
2. Comply with regulatory agencies for fertilizer, herbicide and pesticide composition and application.

C. REJECTION OF MATERIALS

1. Evidence of inadequate or inappropriate protection after digging, transportation, or improper handling or storage, shall be cause for rejection.
2. Landscape Architect will inspect plants for proper shipping procedures upon arrival at the temporary storage location or the site. The Landscape Architect will reject injured plants including those with dried out roots, broken large branches, broken, or loosened balls or earth, split trunks or torn areas of bark.
3. The Contractor shall immediately removed and replace rejected plants.

- D. PLANT LIST:** Plant quantities are provided for the Contractor's convenience only. The Contractor shall provide all plants in quantities as shown on Drawings despite any discrepancies which may exist with quantities called for on the plant list.

1.08 DELIVERY, STORAGE AND HANDLING

- A. PACKAGED MATERIALS:** Deliver packaged materials in containers showing weight, analysis and name of manufacturer. Protect materials from deterioration during delivery, and while stored at site.

B. SHIPPING OF PLANTS

1. **Plant Names and Labeling:** Botanic and common names given in the plant list are in conformance with standard horticultural practice in the area. Deliver all plants to the site with tags bearing the botanical name and size as indicated in the plant list.
2. **Nursery Harvesting:** Provide freshly dug trees and shrubs. Do not prune prior to delivery unless otherwise approved by Landscape Architect. Plants shall be dug and prepared for shipment in a manner that will not cause damage to branches, shape and future development after planting. Trunks shall be wrapped for added protection. All balled and burlapped trees are to be dug during the appropriate time of year for the species listed, but in no case after buds have opened or prior to fall leaf drop. Do not bend or bind-tie trees or shrubs in such manner as to damage bark, break branches or destroy natural shape. Wounds, scars or damage shall be grounds for rejection. Do not drop balled and burlapped stock during delivery.

- a. If necessary obtain Landscape Architect's approval to dig plants in full leaf. Spray foliage with antidesiccant such as Wilt-proof or approved equal.
3. Transportation
- a. Open vehicles used to transport plants to the project shall be covered with tarpaulins or other suitable covers securely fastened to the vehicle to prevent damage to the plants. Closed vehicles shall be adequately ventilated to prevent overheating of the plants. Do not remove plants from refrigerated trucks into hot weather without allowing time for plants to adjust to heat.
 - b. Ship landscape materials with certificates of inspection required by governing authorities. Comply with regulations applicable to landscape materials.
 - c. Keep plants moist, fresh and protected at all times.
4. Contractor shall exercise care in the handling of plant materials to avoid damage or stress.
- C. ACCEPTANCE OF PLANTS AT SITE: Unless otherwise authorized by the Landscape Architect, the Contractor shall notify the Landscape Architect at least two working days in advance of the anticipated delivery date of any plant material. A legible copy of the bill of lading, showing the quantities, kinds, and sizes of materials included for each shipment shall be furnished to the Landscape Architect.
- D. STORAGE AND PROTECTION OF PLANTS
- 1. Keep plants moist, fresh and protected at all times, including entire period of transit, handling, and temporary storage.
 - 2. Deliver trees and shrubs after preparations for planting have been completed and plant immediately. If planting is delayed more than 6 hours after delivery, set trees and shrubs in shade, protect from weather and mechanical damage, and keep roots moist by covering with mulch, burlap or other acceptable means of retaining moisture. Duration and method of storage are subject to Landscape Architect's approval. Plants shall not remain on the site more than 3 days prior to planting unless specific authorization is obtained by the Landscape Architect.

1.09 PROJECT/SITE CONDITIONS

A. ENVIRONMENTAL REQUIREMENTS

- 1. Planting Season: Planting shall occur only after April 15 and before October 1 or as specified on the Drawings without written approval from Landscape Architect.
- 2. Planting shall occur only when weather and soil conditions permit in accordance with locally accepted practice. Do not plant during periods of prolonged cold or heat, or during excessively wet or dry periods.

B. EXISTING CONDITIONS

1. Utilities: Determine location of underground utilities. Perform work in a manner to avoid possible damage. Hand excavate, as required.
2. Excavation: Maintain grade stakes set by others until removal is mutually agreed upon by parties concerned. When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, noxious materials or obstructions, notify Landscape Architect before planting.

1.10 SEQUENCING AND SCHEDULING

A. WORK SCHEDULING: Proceed with and complete landscape work as rapidly as portions of the site become available, working within the specified planting season and approved schedule.

B. COORDINATION

1. Coordinate with Contractor's work requiring access to site through planting areas.
2. Coordinate with installation of underground irrigation system and outlets.
3. Coordinate Planting with Sodded Areas: Plant trees and shrubs after final grades are established and prior to sodding, unless otherwise acceptable by Landscape Architect. If planting occurs after seeding or sodding, protect areas and promptly repair damage resulting from planting operations.
4. Coordinate planting to provide maintenance up to date of Final Completion in accordance with Paragraph 1.12 this Section.

1.11 WARRANTY AND REPLACEMENT

A. GENERAL: Refer to Section 01011.

B. PLANT WARRANTY CONDITIONS: Warranty all plants against defects due to any cause except vandalism and acts of God. The following warranty conditions apply:

1. Replant when plants are no longer in a satisfactory growing condition as determined by the Landscape Architect for the entire warranty period.
2. If plants fail after having been replaced previously, plant shall be replaced until it is approved. Replacement plants shall be of the same kind, condition and quality as original plants and subject to all requirements in this specification.
3. Plants shall be healthy, and in flourishing condition at the end of the warranty period. Plants shall be free of dying branches and branch tips, and shall bear foliage of normal density, size and color.
4. All expenses incurred in the replacements shall be borne by the Contractor.
5. Make replacements within seven days of notification by Landscape Architect.

- C. **POST CONSTRUCTION INSPECTION (REVIEW FOR FINAL WARRANTY COMPLIANCE):** Comply with Section 01011.

1.12 MAINTENANCE

- A. **GENERAL:** Maintain plants by watering, fertilizing, pruning, restoring planting saucers, tightening and repairing stake supports, resetting trees and shrubs to proper grades or vertical position as required, spraying as required to keep trees and shrubs free of insects and disease, cultivating and weeding as required for healthy growth or as directed by the Landscape Architect.
 - 1. Monitor watering of plants and lawns to verify overwatering is not causing stress to trees.
 - 2. **Tree Wrap**
 - a. Apply a coating of insecticide and fungicide to the tree trunk area to be wrapped.
 - b. Apply wrap to overlap 1 1/2" from ground line up to the lowest branch. Wrap trunks in late fall (approximately November 15).
 - c. Tie securely in at least five places with jute twine, placed at least 12" apt.
 - d. Remove tree wrap the beginning of the growing season (approximately April 15).
- B. **WINTER WATERING:** Contractor shall water all plant materials once each month during December, January, February, and March until final acceptance. This watering shall be at a minimum, deep-root watering each shrub. Watering shall occur from sillcocks of the building and must include the cost of supplying all necessary hoses and fittings. If sillcocks are frozed or cannot be activated, Contractor shall utilize a water truck.
- C. **MAINTENANCE PERIOD:** Begin maintenance immediately after planting. Maintain plants until Final Acceptance.

PART 2 - PRODUCTS

2.01 SOIL AMENDMENTS

- A. **MANURE:** Dairy manure, free from lumps, stones, and other foreign matter. Free from mineral matter or chemical composition harmful to plant life. pH level to be 7 to 8. Aged at least one year. Submit analysis.
- B. **HUMUS WOOD CHIPS:** Nitrofied aspen humus suitable for use as a soil amendment; pH level to be 6 to 7.5, organic content to be 80-90%. Submit sample and analysis for Landscape Architect's approval.

2.02 STRUCTURAL SOIL: Refer to Section 02220.

2.03 COMMERCIAL FERTILIZER

- A. **ORGANIC FERTILIZER:** Provide fertilizer of neutral character, with some elements derived from organic sources and containing the percentages of available plant nutrients given below. Deliver fertilizers to the site fully labeled according to applicable state fertilizer laws and bearing the name, tradename, trademark and warranty of the supplier. Fertilizers which are mixed into soil shall be:
 - 1. **Gro-Power Plus:** Granular fertilizer meeting Gro-Power Plus analysis (5-3-1); with 50% humus, 15% humic acids, 1.25% soil penetrant, and bacterial culture included, containing no animal, human, or poultry waste. Submit manufacturer's guaranteed analysis. Guaranteed analysis shall conform to amendment requirements as given in Part 3 of this Section.
 - a. **Manufacturer:** So. California Organic Fertilizer Co., P.O. Box 769, Glendale, CA. 91029, 213-245-6849; 714-750-3830; and as distributed by Direct Landscape Supply, 1501 West Campus Drive, Unit D, Littleton, CO, 80120, 303-797-7733, or approved equal.
 - 2. **Fertilizer Tablets:** Provide tablets of Gro-Power 12/8/8 analysis with 20% humus, 4% humic acid, in 7 gram tablet, or approved equal.
 - 3. **Bone Meal:** Commercial, raw, finely ground ; 4% nitrogen and 20% phosphoric acid.
- B. **INORGANIC FERTILIZERS:** None.

2.04 WATER

- A. Clean, potable and free of substances or matter which could inhibit vigorous growth of plants.
- B. Landscape Contractor is responsible for coordination of water needs for watering and irrigation water with the General Contractor.

2.05 GENERAL PLANT REQUIREMENTS

- A. HEALTH: Plant materials provided shall:
1. Be healthy and vigorous.
 2. Be free from disease, injury, insects and their eggs, larvae.
 3. Have a well developed fibrous root system.
 4. Be free of physical damage such as scrapes, broken or split branches, scars, bark abrasions, sun scalds, fresh limb cuts, disfiguring knots, or other defects.
 5. Be free of weed roots.
- B. SIZE AND FORM: Plant materials provided shall:
1. Meet the sizes indicated on the Plant List. Where a size or caliper range is stated, at least 50% of the plants shall be closer in size to the top of the stated range. Plants larger or smaller than specified may be used only if accepted by the Landscape Architect.
 2. Meet the requirements of the reference standards for size, branching, condition, ball size, number of canes and all other conditions particular to each species.
 3. Be well branched and proportioned with respect to height and width relationships, and characteristic of the exact type called for in the plant list.
- C. BALLED AND BURLAPPED PLANTS: Nursery grown stock adequately balled with firm, natural balls of soil in sizes and ratios in accordance with the reference standards. Balls shall be firmly wrapped with non-treated burlap, secured with wire or jute. Broken balls will not be accepted.
- D. CONTAINER GROWN PLANTS: Nursery grown in fibrous, plastic or metal containers and shall have sufficient roots to hold the entire soil mass together after container removal without being root-bound.
- E. COLLECTED PLANTS: Plants collected from native stands or established plantings which have a root system greater than roots of nursery grown plants. Collected plants require a larger root ball than recommended for transplanted nursery stock as specified in reference standards. Collection tags shall be attached to each plant as required by regulatory agencies.
- F. SPADED PLANTS: Plants shall be dug with tree spade and directly planted on site, or temporarily burlapped and placed in a wire basket while plant pit is hand dug on site. Size of tree spade in proportion to plant shall be as specified in reference standard for collected plants.
- G. OPTIONS: If all other requirements are met, a balled and burlapped plant may be substituted for a container grown plant of the same or larger size at the Contractor's option upon acceptance of the Landscape Architect.
- H. Landscape Architect shall inspect and tag all deciduous and evergreen trees at tree sources, within 30 miles of Denver, prior to digging and shipment to site. Approval of plant material from sources outside the 30 mile radius shall be reviewed in accordance with paragraph 1.06.F this Section.
- I. SUBSTITUTIONS: Do not make substitutions: If specified landscape material is not obtainable, submit proof of non-availability to Landscape Architect together with proposal for use of equivalent material for review and acceptance by Landscape Architect.

2.06 DECIDUOUS TREES AND SHRUBS

- A. Provide plants of height, size, condition and recommended branching configuration scheduled. Trees shall be uniformly shaped, quality plants with single leader, and evenly distributed branching in all directions.
- B. If in leaf, trees shall be fully leafed-out with healthy, full and vigorous growth. Leaf damage caused by insects, hail and/or transplant shock shall be cause for rejection. If dormant, tree shall have pliable, green twigs and viable buds to indicate the healthy condition of plants, as appropriate to the species.
- C. Adjacent plants of the same variety and size shall be consistent in size, shape, and overall appearance. Particular emphasis will be placed on this requirement for trees which occur in a straight row or otherwise formal relationship.
- D. Trees with branch attachments with included bark will not be accepted.
- E. All street trees including American Hornbeam, Western Hackberry, Swamp White Oak, Shademaster, Skyline Honeylocust, Redmond Linden, and Greenspire Linden must be "specimen" street trees, high branching and limbed up a height of 7 feet. All tree varieties must be from same species and same stock with consistent size, color and shape.

2.07 EVERGREEN TREES AND SHRUBS

- A. Provide plants of height, size, condition and recommended branching configuration scheduled. Trees shall be uniformly shaped, quality plants with single leader and evenly distributed branching in all directions.
- B. Coniferous trees shall be heavily branched, full needled, low branching, specimen quality plants. Evidence of dormant buds and secondary needles shall be present. Damage caused by excessive pruning, insect infestation, galls or other plant disorders or damage shall be cause for rejection. Container grown evergreens will be acceptable subject to paragraph 2.04.D this Section.
- C. Adjacent plants of the same variety and size shall be consistent in size, shape, and overall appearance. Particular emphasis will be placed on this requirement for trees which occur in a straight row or otherwise formal relationship.

2.08 GROUND COVERS, VINES AND PERENNIALS

- A. Provide plants established and well-rooted in removable containers or integral peat pots with not less than minimum number and length of canes, runners or blades as required by the reference standard.

2.09 ACCESSORIES

- A. TREE STAKES: Two-inch diameter lodgepole stake, straight and true, treated for resistance to rot, 8 foot length.
- B. STAKING WIRE: Annealed, galvanized steel, 12 gauge wire.
- C. TREE COLLAR: Non-stretch fabric with grommets, 1.5 inch wide by 12 inches length.
 - 1. Supplier: Central Bag and Burlap Co., 2715 Blake Street, Denver, CO 80205, (303)297-9955, or approved equal.

- D. WRAPPING MATERIAL: First quality 4 inch wide, bituminous impregnated tape, corrugated or crepe paper, specifically manufactured for tree wrapping and having qualities to resist insect infestation.
- E. PVC: 3/4" diameter PVC pipe.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. VERIFICATION OF CONDITIONS: Examine areas and conditions under which the Work of this Section will be performed. Report unsatisfactory or questionable conditions to the Landscape Architect. Do not proceed with the Work until unsatisfactory conditions have been corrected. Commencement of Work implies acceptance of all areas and conditions.
 - 1. Verify that during grading, topsoil spreading and landscape grading operations, the ground surface was cleaned of materials which might hinder final operations.

3.02 PREPARATION

- A. HERBICIDE TREATMENT
 - 1. Confirm Landscape Architect's requirement to proceed with herbicide treatment of on site topsoil in accordance with Section 02923. Herbicide treatment must be completed during the growing season.
 - 2. Obtain Landscape Architect's approval of topsoil fourteen (14) days after last herbicide application prior to planting in accordance with Section 02923.
- B. PROTECTION: Protect areas in accordance with paragraph 3.08 this Section.
- C. LAYOUT: Stake locations of individual plants and outline areas for multiple plantings. Secure Landscape Architect's approval prior to starting Work.

3.03 GENERAL PLANTING REQUIREMENTS

- A. PLANTING SEASON: Plant in accordance with paragraph 1.09.A this Section.

3.04 TREES AND SHRUBS PLANTED IN INDIVIDUAL PLANT PITS OR TRENCHES

- A. EXCAVATION FOR TREES AND SHRUBS IN INDIVIDUAL PLANT PITS OR TRENCHES
 - 1. Excavate pits, beds and trenches with sides shaped and sized as detailed. Scarify subsoil on bottom and sides of excavation.
 - 2. Fill each pit with water to test drainage. Pits shall drain within 24 hours.
 - a. In the event non-draining soil are encountered, recommend to the Landscape Architect method to achieve subsurface drainage.

- b. Drainage system shall be approved by Landscape Architect prior to installation.
 - c. Payment for subsurface drainage not included in the original Drawings shall be in accordance with the unit price to be submitted
3. For balled and burlapped and container grown stock, excavate as shown on the Drawings. Adjust excavation to size of container width and depth, shaping excavation as indicated.
 4. Preserve soil removed from tree and shrub planting excavations for reuse as tree and shrub planting soil.

B. PLANT PREPARATION FOR TREES AND SHRUBS IN INDIVIDUAL PLANT PITS

1. Clean soil in plant pits of roots, plants, sods, stones over 1.5 inches, clay lumps, asphaltic materials, concrete, metal and wire fragments and other extraneous materials harmful or toxic to plant growth. Remove contaminated subsoil.

C. PLANTING TREES AND SHRUBS IN INDIVIDUAL PLANT PITS

1. Plant container grown and balled and burlapped (B&B) material in same manner except where noted.
2. Place structural soil mix in pit as specified in Section 02220 and compact to depth which will place top of rootball at specified height above surrounding grade. Set plants slightly high, as detailed and accepted by the Landscape Architect.
3. Set plant on layer of compacted structural soil mix, plumb and in center of pit or trench with top of ball at required elevation.
4. Place plant for best appearance for review and final orientation by the Landscape Architect.
5. Remove non-biodegradable root containers.
 - a. Wire Baskets: Cut and remove top 2/3 of wire baskets.
 - b. Containers: Cut container cans on 2 sides with an approved can cutter; remove container so as not to damage root balls; A spade shall not be used.
 - c. Burlap: Cut and remove all burlap on root ball.
6. Space fertilizer tablets evenly around root ball no higher than 1/3 of the way up the root ball. Place approximately 2 inches away from root tips for container stock, and adjacent to ball for B&B stock. Use the following number of tablets:
 - 3 for 1 gallon containers.
 - 9 for 5 gallon containers.
 - 13 for balled and burlapped stock.
7. When set, place additional structural soil mix around base and sides of root ball, and work each layer to settle backfill and eliminate voids and

- air pockets. When excavation is approximately 2/3 full, water thoroughly. Repeat watering until no more is absorbed.
8. Place remaining structural soil mix and tamp firmly. Water again after placing final layer of planting soil mix.
 9. Dish top of backfill to allow for mulching as indicated.
 10. Unless otherwise directed by Landscape Architect, do not cut tree leaders and remove only injured or dead branches from trees and shrubs, if any. Make flush cuts perpendicular to the secondary branches being removed in accordance with the References.
 11. Remove and replace excessively pruned or stock.
 12. Stake trees not using tree grates. Use two stakes per tree. Guy trees when used with a tree grate as detailed. PVC to be used over all exposed staking/guying wire.

3.05 TREES, SHRUBS, PERENNIALS PLANTED IN PREPARED PLANTING BEDS

A. SOIL PREPARATION FOR SHRUBS, PERENNIALS AND GROUNDCOVERS PLANTED IN PREPARED PLANTING BEDS

1. Prior to placing topsoil, disc or scarify existing subsoil in planting beds to a minimum depth of 6 inches or to a depth as indicated in drawings using a cultimulcher or similar equipment. Remove roots, plants, sods, stones over 1.5 inches, clay lumps, asphaltic materials, concrete, metal and wire fragments and other extraneous materials harmful or toxic to plant growth. Remove contaminated subsoil.
2. Soil Preparation for Planting Beds
 - a. Soil Amendment Rates for Planting Beds
 - 1) Organics: Apply 5 cubic yards per 1,000 square feet of 50% wood chips by volume and 50% manure by volume.
 - 2) Fertilizer: Apply 150 pounds of Gro-Power Plus per 1,000 square feet. Verify application rate after reviewing soils analysis.
 - 3) Substantiate quantities with delivery tickets and empty manufacturer's bags on a daily basis to Landscape Architect.
 - b. Incorporate 50% of the required soil amendments and fertilizer. Thoroughly rototill into existing subsoil to a depth of 5 inches to achieve a uniform, evenly blended consistency free of all pockets of unblended materials and any clods or stones greater than 1.5 inches.
 - c. Spread stockpiled topsoil in accordance with Section 02923 over amended subsoil in all planting bed areas. Remove roots, plants, sods, stones over 1.5 inches, clay lumps, asphaltic materials, concrete, metal and wire fragments and other extraneous materials harmful or toxic to plant growth.
 - d. Incorporate remaining 50% of the required soil amendments and fertilizer with topsoil and existing soil. Rototill to a depth of 7

inches. Apply and rototill in fertilizer no more than 48 hours before planting.

e. Fill prepared planting bed with water and allow to percolate out before planting. If water does not drain out in 24 hours, notify Landscape Architect.

- 1) In the event non-draining soil are encountered, recommend to the Landscape Architect method to achieve subsurface drainage.
- 2) Drainage system shall be approved by Landscape Architect prior to installation.
- 3) Payment for subsurface drainage not included in the original Drawings shall be negotiated.

f. Total depth of soil mixture shall be a uniform 10 inches in all planting beds after light rolling and natural settlement. Compact soil in planting beds to 90%.

C. PLANTING SHRUBS AND PERENNIALS IN PREPARED PLANTING BEDS

1. Plant container grown and balled and burlapped (B&B) material in same manner except where noted.
2. Space plants as shown on the Drawings.
3. Place plant for best appearance for review and final orientation by the Landscape Architect.
4. Remove non-biodegradable root containers, including wire baskets. Cut container cans on 2 sides with an approved can cutter; remove stock so as not to damage root balls. A spade shall not be used.
5. Dig holes large enough to allow for rootball container and backfill with amended soil in the plant beds or soil mix in planters.
6. Space fertilizer tablets evenly around root ball no higher than 1/3 of the way up the root ball. Place approximately 2 inches away from root tips for container stock, and adjacent to ball for B&B stock. Use the following number of tablets:

3 for 1 gallon containers.
9 for 5 gallon containers.
13 for balled and burlapped stock.
7. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water. Water thoroughly after planting, taking care not to cover crowns of plants with wet soils.
8. Dish top of backfill to allow for mulching as indicated.
9. Unless otherwise directed by Landscape Architect, remove only injured or dead branches from shrubs, if any. Make flush cuts perpendicular to the secondary branches being removed.
10. Remove and replace excessively pruned or stock.

3.06 FIELD QUALITY CONTROL

A. TESTS: Costs of tests and material analyses made by the testing agency will be borne by the Owner when tests indicate compliance and by the Contractor when test indicated non-compliance.

B. REVIEWS

1. Pre-Planting Review

a. Plant Procurement Inspection

- 1) Contractor shall notify Landscape Architect upon selection of all trees and shall designate source and location for inspection. Proposed materials shall be flagged by the Contractor to facilitate inspection.
- 2) Landscape Architect may choose to attach his seal to each tree or to representative samples. Inspection and/or sealing of plants by the Landscape Architect at the source does not preclude his rejection of trees for improper handling, transportation, storage, damage, insects or disease or otherwise not meeting this specification at the site of planting.
- 3) Do not ship trees to site without the Landscape Architect's approval.

b. Plant Inspection

- 1) All plant materials must be inspected by the Landscape Architect at supplier's or contractor's nursery and at the site before planting commences. Tag acceptable plant material with Contractor's numbered tag and verify upon arrival at the project site. Notify Landscape Architect 48 in advance to request inspection of plant material. Any materials planted prior to acceptance are subject to rejection. Inspection of plant materials may be sequenced by major planting areas to accommodate efficient planting operations. All rejected materials must be removed from the site, replaced and reinspected before any additional inspections are made.
- 2) The Landscape Architect may elect to inspect trees and shrubs at place of growth before planting, for compliance with requirements for genus, species, variety, size and quality. Landscape Architect retains the right to further inspect trees and shrubs for size and conditions of balls and root systems, insects, injuries and latent defects, and to reject unsatisfactory or defective material at any time during progress of work.
- 3) If, in the opinion of the Landscape Architect, there is probable cause to suspect root damage, root binding, or disease conditions in the container stock plants, the Contractor will remove the container for the Landscape Architect's inspection before planting.

- c. Grading: All finish grading shall be inspected by Landscape Architect prior to planting commencing. Correct any discrepancies prior to planting.
- d. Staking: Stake all tree and shrub locations with flags. Landscape Architect shall inspect the staked locations before digging shall occur. The Contractor shall give the Landscape Architect 48 hours notice to request inspection of staked locations.

2. Substantial Completion

- a. Comply with Section 01011.
- b. At the time of this walk-through, the Contractor shall have:
 - 1) Established all planted areas free of weeds, and neatly cultivated. All plant basins shall be in good repair. Pruning shall be completed.
 - 2) Verified installed irrigation system is fully operational with heads properly adjusted.
 - 3) Cleaned all walkways and curbs of debris and litter and shall have cleaned areas of soil and debris left from planting operations.

- 3. Final Completion: Comply with Section 01011.
- 4. Closeout Documents: Comply with Section 01011.
- 5. Start Up and Instructions: Comply with Section 01011.
- 6. Warranty and Replacement: Comply with Section 01011.
- 7. Post Construction Inspection: Comply with Section 01011.

3.07 CLEANUP

- A. DURING LANDSCAPE INSTALLATION - All areas shall be reasonably clean at the end of each work day. Sidewalks and other paved areas shall be swept or washed down as needed. Keep pavements clean and work area in an orderly condition.
- B. PROJECT COMPLETION: All debris, soil and trash resulting from landscape operations shall be removed from the site. All paved areas shall be washed down. All tags shall be removed from plant material.

3.08 PROTECTION

- A. Protect landscape work and materials from damage due to landscape operations, operations by other contractors and trades and trespassers.
- B. Maintain protection during installation and maintenance periods. Treat, repair or replace damaged landscape work as directed.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Formwork for cast-in-place concrete, with shoring, bracing and anchorage.
- B. Openings for other work.
- C. Form accessories.
- D. Form stripping.

1.02 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

- A. Section 03300 Cast-In-Place Concrete, supply of concrete accessories for placement by this section.

1.03 RELATED SECTIONS

- A. Section 03200: Concrete Reinforcement.
- B. Section 03300: Cast-in-place Concrete.
- C. Section 02520: Concrete Paving
- D. Section 02111: Tree and Plant Protection

1.04 REFERENCES

- A. ACI 301: Structural Concrete for Buildings.
- B. ACI 318: Building Code Requirements for Reinforced Concrete.
- C. ACI 347: Recommended Practice For Concrete Formwork.
- D. ANSI/ASME A17.1: Safety Code for Elevators, Dumbwaiters, Escalators, and Moving Walks.
- E. PS 1: Construction and Industrial Plywood.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 347, 301, 318.
- B. Maintain one copy of each document on site.

1.06 REGULATORY REQUIREMENTS

- A. Conform to applicable code for design, fabrication, erection and removal of formwork.

1.07 COORDINATION

- A. Coordinate this Section with other Sections of work which require attachment of components to formwork.
- B. If formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement before proceeding, request instructions from Landscape Architect/Engineer.

PART 2 - PRODUCTS

2.01 WOOD FORM MATERIALS

- A. Form Materials: At the discretion of the Contractor. Review with Landscape Architect prior to construction of forms.
- B. Formwork for site wall concrete above grade shall be smooth and continuous free of knots, formwork jointing. Contractor shall submit shop drawings for this formwork to Architect prior to commencing work.

2.02 FORMWORK ACCESSORIES

- A. Form Ties: Contractor to submit preferred form ties to Landscape Architect for review and approval.
- B. Form Release Agent: Colorless mineral oil which will not stain concrete, or absorb moisture

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.02 EARTH FORMS

- A. Earth forms are not permitted.

3.03 ERECTION - FORMWORK

- A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.
- B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to over stressing by construction loads.
- C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principle shores.
- D. Align joints and make watertight. Keep form joints to a minimum.
- E. Obtain approval before framing openings in structural members which are not indicated on Drawings.
- F. Provide radiused edges at external corners of walls.

3.04 APPLICATION - FORM RELEASE AGENT

- A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
- B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.

3.05 INSERTS, EMBEDDED PARTS, AND OPENINGS

- A. Provide formed openings where required for items to be embedded in passing through concrete work.
- B. Locate and set in place items which will be cast directly into concrete.
- C. Coordinate with work of other sections in forming and placing openings, sleeves, bolts, anchors, and components of other Work.

3.06 FORM CLEANING

- A. Clean forms as erection proceeds, to remove foreign matter within forms.
- B. Clean formed cavities of debris prior to placing concrete.
- C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.
- D. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

3.07 FORMWORK TOLERANCES

- A. Construct formwork to maintain tolerances required by ACI 301.

3.08 FIELD QUALITY CONTROL

- A. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.
- B. Do not patch formwork.

3.09 FORM REMOVAL

- A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.
- B. Loosen forms carefully. Do not wedge pry bars, hammers or tools against finish concrete surfaces scheduled for exposure to view.
- C. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Reinforcing steel bars, wire fabric and accessories for cast-in-place concrete.

1.02 RELATED SECTIONS

- A. Section 03100 - Concrete Formwork
- B. Section 03300 - Cast-in-Place Concrete

1.03 REFERENCES

- A. ACI 301 - Structural Concrete for Buildings.
- B. ACI 318 - Building Code Requirements For Reinforced Concrete.
- C. ACI SP-66 - American Concrete Institute - Detailing Manual.
- D. ANSI/ASTM A82 - Cold Drawing Steel Wire for Concrete Reinforcement.
- E. ANSI/ASTM A184 - Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
- F. ANSI/ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.
- G. ANSI/ASTM A496 - Deformed Steel Wire Fabric for Concrete Reinforcement.
- H. ANSI/ASTM A497 - Welded Deformed Steel Wire Fabric for Concrete Reinforcement.
- I. ANSI/AWS D1.4 - Structural Welding Code for Reinforcing Steel.
- J. ASTM A615 - Deformed and Plain Billet Steel Bars for Concrete Reinforcement.
- K. ASTM A616 - Rail Steel Deformed and Plain Bars for Concrete Reinforcement.
- L. ASTM A617 - Axle Steel Deformed and Plain Bars for Concrete Reinforcement.
- M. ASTM A704 - Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement.
- N. ASTM A706 - Low-Alloy Steel Deformed Bars for Concrete Reinforcement.
- O. ASTM A7657 - Zinc-Coated (Galvanized) Bars for Concrete Reinforcement.
- P. ASTM A775 - Epoxy-Coated Reinforcing Steel Bars.
- Q. ASTM D3963 - Epoxy-Coated Reinforcing Steel.
- R. AWS D12.1 - Welding Reinforcement Steel, Metal Inserts and Connections in Reinforced Concrete Construction.
- S. CRSI - Concrete Reinforcing Steel Institute - Manual of Practice.
- T. CRSI 63 - Recommended Practice For Placing Reinforcing Bars.
- U. CRSI 65 - Recommended Practice For Placing Bar Supports, Specifications and Nomenclature.

1.04 SUBMITTALS

- A. **SHOP DRAWINGS:** Indicate bar sizes, spacings, locations, and quantities of reinforcing steel and wire fabric bending and cutting schedules, and supporting and spacing devices.
- B. **MANUFACTURERS CERTIFICATE:** Certify that products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with (CRSI 63, 655 and Manual of Practice/ACI 301/ACI SP-66/ACI 318/ANSI/ASTM A184).

1.06 COORDINATION

- A. Coordinate with placement of formwork, formed openings and other Work.

PART 2 - PRODUCTS

2.01 REINFORCEMENT

- A. REINFORCING STEEL: ASTM A615, 60 ksi, 276/414/617 MPa yield grade; deformed billet steel bars, unfinished.

2.02 ACCESSORY MATERIALS

- A. TIE WIRE: Minimum 16 guage black annealed type.

2.03 FABRICATION

- A. Fabricate concrete reinforcing in accordance with CRSI Manual of Practice.
- B. Locate reinforcing splices not indicated on drawings, at point of minimum stress. Submit location of splices with Landscape Architect within shop drawings.

PART 3 - EXECUTION

3.01 PLACEMENT

- A. Comply with Concrete Reinforcing Steel Institute's "Recommended Practice for Placing Reinforcing Bars," and as herein specified.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.
- C. Place, support and secure reinforcement against displacement. Do not deviate from required position.
- D. Field bending of rebar is not acceptable.
- E. Accommodate placement of formed openings.
- F. Maintain concrete cover around reinforcing as follows:

Walls (exposed to weather or backfill	2.5 inches
Footings and Concrete Formed Against Earth Top	2.5 inches
Earth Bottom	2.5 inches

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Concrete materials and execution for all site concrete.
- B. Cast-in-place concrete site walls, footings for wayfinding signs, site furnishings and lighting.
- C. Control, expansion and contraction joint fillers associated with concrete work.
- D. Non-shrink grout.
- E. Grout for patching.

1.02 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

- A. Section 02520: Portland Cement Cement Paving, placement of joint filler in pavements.

1.03 RELATED SECTIONS

- A. Section 02520: Concrete Paving.
- B. Section 02850: Wayfinding Signage
- C. Section 02870: Site Furnishings
- D. Section 03100: Concrete Formwork.
- E. Section 03200: Concrete Reinforcement.
- F. Section 03370: Concrete Curing.
- G. Section 07160: Dampproofing.
- H. Section 07900: Joint Sealers.

1.04 SUPPLEMENTAL UNIT PRICING

- A. CONCRETE:
- B. CAST-IN-PLACE CONCRETE

1.05 REFERENCES

- A. CONCRETE:
 - 1. ACI 211.1: Recommended Practice for Selecting Proportions for Normal and Heavyweight Concrete.
 - 2. ACI 301-89: Structural Concrete for Buildings.
 - 3. ACI 302-89: Guide for Concrete Floor and Slab Construction.
 - 4. ACI 303R.:Guide to Cast-in-Place Concrete Practice.
 - 5. ACI 304-91: Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.
 - 6. ACI 305R-91: Hot Weather Concreting.
 - 7. ACI 306R-88: Cold Weather Concreting.
 - 8. ACI 308-92: Standard Practice for Curing Concrete.
 - 9. ACI 318-89/Rev. 92: Building Code Requirements for Reinforced Concrete.

10. ANSI/ASTM D994: Preformed Expansion Joint Filler for Concrete (Bituminous Type.)
11. ANSI/ASTM D1190: Concrete Joint Sealer, Hot-Poured Elastic Type.
12. ANSI/ASTM D1751: Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types.)
13. ANSI/ASTM D1752: Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
14. ASTM B221: Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.
15. ASTM C31: Practice for Making and Curing Concrete Test Specimens in the Field.
16. ASTM C33-90: Concrete Aggregates.
17. ASTM C39: Test Method for Compressive Strength of Cylindrical concrete Specimens.
18. ASTM C94-92: Ready-Mixed Concrete.
19. ASTM C138: Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete.
20. ASTM C143: Test Method for Slump of Hydraulic Cement Concrete.
21. ASTM C150-92: Portland Cement.
22. ASTM C172: Practice for Sampling Freshly Mixed Concrete.
23. ASTM C173: Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
24. ASTM C231: Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
25. ASTM C260-86: Air Entraining Admixtures for Concrete.
26. ASTM C494-92: Chemicals Admixtures for Concrete
27. ASTM C618-92: Fly Ash and Raw or Calcinated Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.
28. ASTM C979-82 (Reapproved 1986): Standard Specifications for Pigments for Integrally Colored Concrete.
29. ASTM C1065: Test Method for Temperature of Freshly Mixed Portland-Cement Concrete.
30. ASTM C1077: Practice for Laboratories Testing concrete and concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.
31. Section 500: Standard Specifications for Concrete.

1.06 DEFINITIONS

- A. DEFECTIVE CONCRETE: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.

1.07 SUBMITTALS

- A. PRODUCT DATA: Provide data on joint fillers, and concrete admixtures.
- B. MIX DESIGN:
 1. Provide proposed concrete mix design as required under 2.06.
- C. MANUFACTURER'S CERTIFICATE: Certify that products meet or exceed specified requirements.

- D. SAMPLES: Submit 6 inch minimum sample of joint filler material.

1.08 PROJECT RECORD DOCUMENTS

- A. Accurately record actual locations of embedded utilities and components which are concealed from view.

1.09 QUALITY ASSURANCE

- A. Perform Concrete Work in accordance with ACI 301.
- B. Perform Mortar Work in accordance with ACI 530 and ACI 530.1.
- C. Acquire cement and aggregate from same source for all cast-in-place Work.
- D. Conform to ACI 305R when concreting during hot weather.
 - 1. The optimum temperature of concrete at time of placement shall not exceed 89 degrees.
 - 2. When the air temperatures are expected to exceed 90 degrees F. obtain approval from the Landscape Architect on the procedures to be used in protecting, depositing, finishing and curing of concrete. Retarding admixture meeting the requirements of ACI 305R as manufactured by Master Builders Company, Cleveland, Ohio or, accepted substitute, may be used upon approval of the Landscape Architect.
 - 3. Protect concrete to prevent rapid drying. Start finishing and curing as soon as possible. The use of continuous fog sprays may be required by the Landscape Architect for 24 hours after depositing or the work restricted to evening or nights, especially in times of low humidity.
- E. Conform to ACI 306R when concreting during concreting during cold weather.
 - 1. When placing concrete after the first frost or when the mean daily temperatures are below 40 degrees F, follow recommendations of ACI 306R.
 - 2. When the mean temperatures are below 40 degrees F, concrete shall have a minimum temperature of 60 degrees F. at the time of placing.
 - 3. Maintain concrete temperature at a minimum of 55 degrees F. for not less than 72 hours after depositing concrete.
 - 4. Do not place concrete without approval of the Landscape Architect on days when the temperature at 9:00 a.m. is below 30 degrees F. until, in the opinion of the Landscape Architect, necessary precautions have been taken and necessary equipment supplied to prevent the concrete from freezing.
- F. Obtain copies of all reference material, the content of which is unfamiliar to the Contractor:
 - 1. ACI: American Concrete Institute, P.O. Box 19150, Redford Station, Detroit, MI 48219, 313-532-2600.
 - 2. ASTM: American Society for Testing materials, 1916 Race Street, Philadelphia, PA 19103, 215-299-5400.
 - 3. ANSI: American national Standards Institute, 11 West 42nd Street, 13th Floor, New York, NY 10036, 212-642-4900.

4. IMIAC: International Masonry Institute, 823 15th Street, NW, Washington, DC 20036, 202-429-9280.

1.10 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle concrete in accordance with ACI 301.
- B. CHEMICAL COMPOUNDS: Deliver and store under weather protection in manufacturer's packaging with labels intact.
- C. HAULING TIME: Discharge concrete transmitted in a truck mixer, agitator or other transportation device within 1-1/2 hours or 300 revolutions after the mixing water has been added.
- D. EXTRA WATER: Deliver concrete to the job in exact quantities required by the design mix. Should extra water be required before depositing the concrete, the General Contractor's superintendent shall have sole authority to authorize the addition of water without exceeding water/cement rate and without effecting colored concrete's manufacturer's recommendations. Any additional water added to the mix after leaving the batch plant shall be indicated on the truck ticket and signed by the person responsible. Where extra water is added to the concrete it shall be mixed thoroughly for 30 revolutions of the drum of 3-1/2 minutes at mixing speed, whichever is greater. Water may be added only once.

1.11 FIELD SAMPLES

- A. Construct and erect a field sample for cast-in-place concrete surfaces for seat walls and pavements receiving special treatment, finish and/or color.
- B. SAMPLE: Sufficient size to indicate special treatment, finish and coloring required.
- C. If requested by Landscape Architect, cast concrete against same panel. Obtain acceptance of resultant surface finish prior to erecting formwork.
- D. Locate where directed.
- E. Accepted sample is considered basis of quality for the finished work. Keep sample exposed to view for duration of concrete work.
- F. Accepted sample may remain as part of the Work.

1.12 COORDINATION

- A. Coordinate the placement of joint devices with erection of concrete formwork and placement of form accessories.
- B. Schedule pre-installation meeting with all involved parties.

PART 2 - PRODUCTS

2.01 CONCRETE MATERIALS

- A. CEMENT: ASTM C150, Type II - Moderate, Portland.
- B. FINE AND COARSE AGGREGATES: ASTM C33, normal weight, containing no deleterious substances which cause surface spalling.
- C. WATER: Clean, potable and not detrimental to concrete.

2.02 ADMIXTURES

- A. **GENERAL:** Unless specified no admixtures may be used without specific approval of the Landscape Architect.
- B. **PROHIBITED PRODUCTS:** Calcium chloride or admixtures containing more than 0.05% chloride ions or thiocyanates are not permitted.
- C. **AIR-ENTRAINING ADMIXTURE:** ASTM C260 subject to compliance with requirements, provide one of the following:
 - 1. Air Mix - Euclid Chemical Co.
 - 2. Airtite - Gifford - Hill Co.
 - 3. Darex ARA - W. R. Grace
 - 4. MB-VR or MicroAir - Master Builders, Inc.
 - 5. SikaAer - Sika Corporation
- D. **WATER REDUCING:** ASTM C494, Type A; subject to compliance with requirements provide one of the following:
 - 1. Eucon WR-75 - Euclid Chemical Co.
 - 2. PSI-N - Gifford-Hill Co.
 - 3. Pozzolith 344N - Master Builders
 - 4. Plastocrete 161 - Sika Corp.
- E. **FLY ASH:** ASTM 618, Class C or F
- F. **CERTIFICATION:** Written certification of conformance to above requirements will be required from all admixture manufacturers prior to mix design review by the Landscape Architect.
- G. **CONCRETE COLORING:** To be determined by Landscape Architect. Submit concrete color sample prior to pouring concrete on site.

2.03 ACCESSORIES

- A. **BONDING AGENT:** Two-part epoxy resin adhesive, Sonobond as manufactured by Sonneborn Building Products, ChemRex, Inc. or approved equal.
- B. **NON-SHRINK GROUT:** Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 4,500 in 28 days:
 - 1. Quikrete Non-Shrink Grout - The Quikrete Companies
 - 2. NBEC Non-Shrink Grout - U.S. Grout Corporation
 - 3. SonogROUT G.P. - Sonneborn Building Products, ChemRex, Inc.

2.04 JOINT FILLER MATERIAL

- A. **JOINT FILLER:** Type C - ASTM D1751; Asphalt impregnated fiberboard or felt, 1/2 inches thick; tongue and groove profile.
- B. **SEALANT AND PRIMER:** As specified in Section 07900.

2.05 CONCRETE MIX

- A. Mix and deliver concrete in accordance with ASTM C84, Alternative No. 3, requiring the concrete supplier to supply concrete to specific performance criteria at the minimum mix cement content.
- B. Select proportions for normal weight concrete in accordance with ACI 301 Method 1 (3.9.3.3).and, Method 2 (3.9.1.1).
- C. Provide concrete to the following criteria:

Mix #	Intended Use	Strength (1)	Cement (2)	Max W/C (3)	Nom Mx.Crs. Agg.(4)	Slump	Air (5)	Admix (6)	Admix (7)	Admix (8)
1	Wall seat, footings, pavement.	4,000	6 sack	0.45	1"	4"	5-7	WRA	Air	
2	Wall seat cap	4,000	6 sack	0.45	1"	4"	5-7	WRA	Air	Color

NOTES:

- 1. Strength: Proportion mixes to attain compressive strengths (p.s.i) indicated in 28 days unless higher strengths are specified herein.
 - 2. Minimum cementitious materials is the minimum weight of Portland Cement plus flyash. Flyash shall be a maximum of 25%. Flyash shall not be used when temperature is below 328F. Provide not less than 6 sack of cementitious materials per cubic yard for slip-formed concrete elements.
 - 3. W/C is the ratio of weight of water to weight of cementitious materials (Portland Cement). The weight of water shall include all free water in the aggregates at the time of batching.
 - 4. For the maximum coarse aggregate size indicated, use the following aggregate size numbers per ASTM C33: for 1" maximum coarse aggregate, use #57 aggregate. Use 10% less coarse aggregate at sandblast finish.
 - 5. Percentage of air entraining.
 - 6. WRA: Water Reducing Admixture;
 - 7. AIR - Air Entraining.
 - 8. Color - Davis Color Additive
- D. Use accelerating admixtures in cold weather only when approved by Landscape Architect. Use of admixtures will not relax cold weather placement requirements.

2.06 GROUTING MIXING

- A. Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C476 fine and coarse grout.
- B. Add admixtures in accordance with manufacturer's instruction; mix uniformly.
- C. Do not use anti-freeze compounds to lower the freezing point of grout.

2.07 SOURCE QUALITY CONTROL

- A. Submit proposed concrete mix design of each class of concrete to Landscape Architect for review prior to commencement of work. Each mix design shall be from only one supplier and shall conform to ACI 211.1. See paragraph 2.05 in this Section for design procedures. Submittals shall include following:
 - 1. Mix identification designation.
 - 2. Statement of intended use for mix.
 - 3. Mix proportions, including admixtures.
 - 4. Manufacturer's data and/or certifications verifying conformance of mix materials, including admixtures with specified requirements.
 - 5. Wet unit weight.
 - 6. Entrained air content.
 - 7. Design slump.
 - 8. Required average strength qualification data per ACI 301, 3.9.1 and 3.9.2. Submit separate qualification data for each production facility which will supply concrete to the project.
 - 9. Average qualification data (trial mix data or field test data per ACI 301 3.9.3.). When field test data is used to qualify average strength, submit separate qualification data for each production facility which will supply concrete to the project.
 - 10. Field test data submitted under 7. and 8. above shall include the Concrete Testing Agency's report from which data was compiled.
 - 11. Adjust, modify and retest proposed mixes if required to obtain Landscape Architect's approval.
- B. Tests on cement and aggregates may be performed to ensure conformance with specified requirements.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify requirements for concrete cover over reinforcement as per Section 03200.
- B. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete as per Section 03200.
- C. Verify formwork line, levels, and acceptance by Landscape Architect under requirements of Section 03100.

3.02 PREPARATION

- A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instruction.
- B. In locations where new concrete is dowelled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

3.03 JOINTING

- A. GENERAL: For pavement joints, place pavement joints in accordance with Section 02520.
- B. PLACEMENT IN WALLS:
 - 1. Place wall expansion joints to align with stepped footing. Obtain acceptance from Landscape Architect of joint locations prior to Work commencing.

3.04 PLACING CONCRETE

- A. Place concrete in accordance with ACI 304, or ACI 301.
- B. Notify Landscape Architect minimum 48 hours prior to commencement of operations, to allow for examination of forms and reinforcement prior to placing concrete. Do not begin placement of concrete without acceptance from Landscape Architect.
- C. Ensure reinforcement, inserts are not disturbed during concrete placement.
- D. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- E. Place concrete continuously between predetermined expansion, control, and construction joints.
- F. Do not interrupt successive placement.

3.05 CONCRETE FINISHING

- A. Finish site wall footing with form finish.
- B. Finish seat wall face and cap with light sandblast finish.
- C. Finish pavements to requirements of Section 02520.

3.06 CURING AND PROTECTION

- A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
- C. Cure concrete surfaces in accordance with Section 03370.

3.07 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed in accordance with ACI 301-89, Chapter 16, 17, and 18 and under provisions of Section 01400.
- B. Provide free access to Work and cooperate with appointed firm.
- C. Four concrete test cylinders will be taken for concrete for site wall footing. Test results shall be submitted to the Owner and Landscape Architect for review as per General Conditions. Owner shall pay for testing except tests which indicate concrete failure in accordance with General Conditions:
 - 1. Break one cylinder at seven days and record test results.

2. Break two cylinders at 28 days and record results as an average test result.
 3. Hold one cylinder and discard if average of 28 day test results meets specifications; break at 45 days and record test results if average 28 day test results fail to meet specifications.
- D. One slump test, one air-entrainment test, and one wet unit weight of concrete test will be taken for each set of test cylinders taken.
 - E. Test and evaluate mortar in accordance with ASTM C780.
 - F. Test and evaluate grout in accordance with ASTM C1019.

3.08 REPAIR OF SURFACE DEFECTS

- A. Allow Landscape Architect to inspect concrete surfaces immediately upon removal of forms.
- B. Modify or replace concrete not conforming to required lines, details, and elevations at Landscape Architects direction.
- C. Repair or replace concrete not properly placed resulting in excessive honeycombing and other defects. Do not patch, repair or replace exposed concrete except upon express direction of Landscape Architect.
- D. Repair defects in concrete walls as follows:
 1. Deep Defects Exposing Reinforcing: Chip to sound concrete and clean thoroughly to remove all loose concrete and dust. Apply thin coat of bonding agent. Form and pour full with patching grout prior to development of tack-free condition of bonding agent. Strip forms after grout has hardened and provide specified finish. Moist cure and apply clear curing and sealing compound immediately after finishing.
 2. Other equivalent repair procedures may be used subject to review of Landscape Architect.

3.09 NON-SHRINK GROUT

- A. Install non-shrink grout in locations as detailed according to manufacturer's recommendations.

3.10 DEFECTIVE CONCRETE

- A. Repair or replacement of defective concrete will be determined by the Landscape Architect.
- B. Do not patch, fill, touch-up, repair or replace exposed concrete except upon express direction of Landscape Architect for each individual area.

3.11 SCHEDULE - CONCRETE TYPE AND FINISHES

- A. SITE WALL FOOTINGS: Mix Design #1, form finish.
- B. SIGN WALL PANEL: Mix Design #2, light sandblast finish.
- C. SEAT WALL CAP: Mix design #2, light sandblast finish.
- D. PAVEMENTS: Mix design #1, finish shall comply with Section 02520.

END OF SECTION

SECTION 03370**CONCRETE CURING****PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Initial and final curing of horizontal and vertical concrete surfaces.

1.02 RELATED SECTIONS

- A. Section 02520: Concrete Paving.
- B. Section 03300: Cast-In-Place Concrete.

1.03 REFERENCES

- A. ACI 301: Structural Concrete for Buildings.
- B. ACI 302: Recommended Practice for Concrete Floor and Slab Construction.
- C. ACI 308: Standard Practice for Curing Concrete.
- D. ASTM C171: Sheet Materials for Curing Concrete.
- E. ASTM C309: Liquid Membrane-Forming Compounds for Curing Concrete.
- F. ASTM D2103: Polyethylene Film and Sheeting.

1.04 SUBMITTALS

- A. **PRODUCT DATA:** Provide data on curing compounds/mats/paper/film compatibilities and limitations.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 301 and ACI 302.

1.06 DELIVERY, STORAGE, AND HANDLING.

- A. Deliver curing materials in manufacturer's packaging including application instructions.

PART 2 - PRODUCTS**2.01 MATERIALS**

- A. **CURING AND SEALING COMPOUND:** Clear styrene acrylate type, 30% solids content minimum, and have test data from an independent laboratory indicating a maximum moisture loss of 0.030 grams per sq. cm. when applied at a coverage rate of 300 sq. ft. per gallon. Manufacturer's certification required. Subject to compliance with requirements, provide one of the following:

"Super-Rez Seal" or "Super Pliocure" - Euclid Chemical Co.
"Master Kure 30" - Master Builders

- B. DISSIPATING RESIN COMPOUND: ASTM C309, Type 1. The film must chemically break down in a two to four week period. Subject to compliance with requirements, provide one of the following:
 - "Kurez DR" - Euclid Chemical Co.
 - "Masterseal" - Master Builders
- C. ABSORPTIVE COVER: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M182, Class 2.
- D. MOISTURE RETAINING COVER: One of the following, complying with ASTM C171:
 - Waterproof paper
 - Polyethylene film
 - Polyethylene-coated burlap.
- E. CLEAR PENETRATING SEALER: Material suitable for application on horizontal surfaces containing not less than 20 percent siloxane or 40 percent silane in mineral spirits or alcohol-based carrier. Provide certification of 90 percent chloride screen effectiveness when tested in accordance with the procedure of NCHRP Report No. 244, "Southern Climate Exposure" at manufacturer's recommended rate of application. Subject to compliance with requirements, provide one of the following:
 - "Concresive AEX 3142" - Adhesive Engineering Co.
 - "Chem-Treat BSM40" - Dynamit Nobel of America, Inc.
 - "Consolideck SX" - ProSoCo, Inc.
- F. UNDERLAYMENT COMPOUND: Free-flowing, self-leveling, pumpable cementitious base compound. Subject to compliance with requirements, provide one of the following:
 - "Flo-Top" - Euclid Chemical Co.
 - "Pourcrete" - Master Builders
- G. WATER: Potable, not detrimental to concrete.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are ready to be cured.

3.02 EXECUTION - HORIZONTAL SURFACES

- A. The Contractor shall choose a curing method that is compatible with the requirements for subsequent material usage on the concrete surface.
- B. Cure horizontal surfaces in accordance with ACI 308.
- C. Provide moisture curing by one of the following:
 1. Keep concrete surface continuously wet by covering with water.
 2. Continuous water-fog spray.

3. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping it continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4" lap over adjacent absorptive covers. Maintain in place for 7 days.
- D. Provide moisture-cover curing as follows: Spread over floor slab areas, lap edges and sides, seal with pressure sensitive tape [and cover with plywood]; maintain in place for 7 days.
- E. Provide curing and sealing compound to slab on grade and curb ramps. Apply curing compound in accordance with manufacturer's instructions in two coats with second coat applied at right angles to first.

3.03 EXECUTION - VERITICAL SURFACES

- A. Cure surfaces in accordance with ACI 308.
- B. SPRAYING: Spray water over surfaces and maintain wet for 7 days.
- C. MEMBRANE CURING COMPOUND: Apply compound in accordance with manufacturer's instructions in two coats with second coat applied at right angles to first.

3.04 PROTECTION OF FINISHED WORK

- A. Do not permit traffic over unprotected horizontal surface.

3.05 SCHEDULES

- A. RETAINING WALL FOOTINGS AND SIGN WALL PANEL: Membrane curing compound, acrylic type, clear color.
- B. CONCRETE PAVEMENT: Membrane curing compound, acrylic type, clear color.

END OF SECTION

PART 1 - GENERAL**1.01 SECTION INCLUDES**

- A. Preparing substrate surfaces.
- B. Sealant and joint backing.

1.02 RELATED SECTIONS

- A. Section 02520: Concrete Paving
- B. Section 03300: Cast-in-Place Concrete

1.03 REFERENCES.

- A. ASTM C790 - Use of Latex Sealing Compounds.
- B. ASTM C804 - Use of Solvent-Release Type Sealants.
- C. ASTM C834 - Latex Sealing compounds.
- D. ASTM C919 - Use of Sealants in Acoustical Applications.
- E. ASTM C920 - Elastomeric Joint Sealants.
- F. ASTM D1056 - Flexible Cellular Materials - Sponge or Expanded Rubber.
- G. ASTM D1565 - Flexible Cellular Materials - Vinyl Chloride Polymers and Copolymers (open-Cell Foam).
- H. SWRI (Sealant, Waterproofing and Restoration Institute) - Sealant and Caulking Guide Specification.

1.04 SUBMITTALS

- A. **PRODUCT DATA:** Provide data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, color availability .
- B. **MANUFACTURER'S INSTALLATION INSTRUCTIONS:** Indicate special procedures, surface preparation, perimeter conditions requiring special attention

1.05 QUALIFICATIONS

- A. **MANUFACTURER:** Company specializing in manufacturing the Products specified in this section with minimum 5 years documented experience.
- B. **APPLICATOR:** Company specializing in performing the work of this section with minimum 5 years documented experience/approved by manufacturer.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.07 COORDINATION

- A. Coordinate the work with all sections referencing this section.

1.08 WARRANTY

- A. Provide manufacturer's standard warranty under provisions of General Conditions Section 20.
- B. WARRANTY: Include coverage for installed sealants and accessories which fail to achieve air tight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 - PRODUCTS

2.01 SEALANTS

- A. POLYSULFIDE SEALANT (TYPE A): ASTM C920, Grade P, Class 25, Use M; multi-component, chemical curing, non-staining, non-staining, non-bleeding, self leveling type; color to match concrete as selected by Architect; THC-900 - manufactured by Tremco Construction Products or approved equal.
 - 1. Service Temperature Range -40 to 180 degrees F.
- B. POLYURETHANE SEALANT (TYPE B): ASTM C920, Type M, Grade NS, Class 25, multi-component, chemical curing, non-sag, non-staining, non-bleeding; color to match concrete as selected by Architect Dymeric 511 - manufactured by Tremco Construction Products or approved equal.
 - 1. Sagging: None up to 190 degrees F.

2.02 ACCESSORIES

- A. PRIMER: Non-staining type, recommended by sealant manufacturer to suit application.
- B. JOINT CLEANER: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- C. JOINT BACKING: ASTM D1056/D565; round, open cell polyethylene foam rod; oversized 50 percent larger than joint width; manufacturer compatible with specified joint sealant.
- D. BOND BREAKER: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces/ and/ joint openings are ready to receive work.
- B. Verify that joint backing and release tapes are compatible with sealant.

3.02 PREPARATION

- A. Remove loose materials and foreign matter which might impair adhesion of sealant.

- B. Clean (and prime) joints in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions.
- D. Protect elements surrounding the work of this section from damage or disfiguration.

3.03 INSTALLATION

- A. Install sealant in accordance with manufacture's instructions.
- D. Install bond breaker where joint backing is not used.
- E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- G. Tool joints concave.

3.04 CLEANING

- A. Clean adjacent soiled surfaces.

3.05 PROTECTION OF FINISHED WOK

- A. Protect sealants until cured.

3.06 SCHEDULE

	<u>Location</u>	<u>Type</u>	<u>Color</u>
A.	Paving Joints	A	To match concrete
B.	Wall joints	B	To match concrete

END OF SECTION

PART 1 - GENERAL**1.01 SCOPE**

- A. Furnish and install exterior light standard caissons.
- B. Furnish and install conduit and wiring associated with the lighting system.
- C. Furnish and install receptacles at poles.
- D. Coordinate electric service to poles and luminaries.

1.02 WORK NOT INCLUDED:

- A. Electrical controls, hook-up to the electrical meter and the electrical meter shall not be a part of this contract. This work shall be provide by the City. Coordinate all work with the City Electrical Division.

1.03 RELATED WORK:

- A. Section 0220 - Earthwork.
- B. Section 02515 - Portland Cement Concrete Paving.

1.04 REFERENCE STANDARDS:

- A. Electrical Code Compliance:

Comply with applicable local code requirements of the authority having jurisdiction and NEC Articles 220, 225, 250, 410, and 501 as applicable to installation, and construction of exterior luminaries and light standards.

- B. NEMA Compliance:

Comply with applicable requirements of NEMA Standards Pub/No. LE2 and TT1 pertaining to exterior luminaries, electrical pole and standard units, materials, and installation.

- C. IES Compliance:

Comply with IES RP-19, 20, and PB-15 pertaining to exterior.

- D. UL Compliance:

Comply with UL standards, including UL 486A and B, pertaining to exterior luminaries and electrical poles and standards. Provide lighting equipment, components and fittings which are UL-listed and labeled.

E. NFPA Compliance:

Comply with requirements of NFPA 78, "Lighting Protection Code," pertaining to installation of exterior luminaries.

F. Code Compliance:

Comply with applicable requirements of City of Colorado Springs Electrical Division guide specifications for installation of steel standard structures.

G. Luminaries shall be located so as not provide any conflicts with barrier free spaces: Public Las 90-480 and American National Standards Institute A117.1-1961, and A.D.S.

H. All work shall be inspected and approved by the appropriate authorities.

I. All equipment shall be UL listed, as required.

1.05 MATERIALS AND WORKMANSHIP:

A. All materials and apparatus required for the work, except as specified otherwise, shall be new, of first class quality, and shall be furnished, delivered, erected, connected and finished in every detail, and shall be so selected and arranged as to fit properly in to the spaces. Where no specific kind or quality of material is given, an article acceptable to the Engineer shall be furnished.

B. All component parts of each item of equipment or device shall bear the Manufacturer's Nameplate, giving at least the name of the manufacturer, description, size, type, serial number, and electrical characteristics in order to facilitate maintenance or replacement. This nameplate shall not be visible during normal operation of the equipment.

C: Blemished, damaged or unsatisfactory luminaries shall be replaced in a satisfactory manner with no cost to the Owner.

1.06 SUBMITTALS:

A. Shop Drawings:

1. Submit reproducibles (sepias) of scaled shop drawings for each type of luminaries and receptacle specified.
 - a. Drawings shall indicate: name of projects; luminaries type; complete details and/or date of luminaries including manufacture's name, catalogue numbers for lampholders and ballasts; lightshields; switches; metal gauge; type of wiring; specified lamp wattages; color and texture of finishes and mounting details.
 - b. Catalogue cuts will be acceptable if the cut represents the luminaries type exactly as specified, without any modifications in construction or electrical characteristics although, modified attachment and mounting details shall be illustrated.
 - c. Show certification that all pertinent drawings have been checked and that standards and luminaries submitted have mounting hardware compatible with installation, and that poles and caissons, revised with custom speaker hanger arms, grommet holes etc., are within specification for location and purpose specified.
2. Submit shop drawings for line locations and conduit.
3. Submit shop drawings for exterior electrical receptacle mounting.

B. Samples:

1. Submit samples of finishes and color. Submit samples of any luminaries which are substitutes for specified samples. Unless otherwise indicated, samples shall be as follows:
 - a. For standard catalogue types - complete, production line samples, with all installation hardware, proper lamp(s), and equipped with a cord and plug.
 - b. Sample of any specially designed or developed luminaries, mounting hardware or poles shall be submitted for the purpose of ascertaining its photometric performance, quality of visible parts and details, maintenance features (including relamping process), method of installation, and safety features.

C. Permits and Meters:

1. Contractor shall fill out and submit the required Load Data Form to the City Electrical Division.

2. The City will provide the meter free of charge. The contractor shall coordinate the electrical hook-up through the Electrical Division. Contact Pam Hamamoto or Don Moon @ (719) 636-5574.

1.07 PRODUCT DELIVERY AND STORAGE:

- A. Store all luminaries, lamps and hardware flat in a clean, dry area off the ground under watertight cover at room temperature.

1.08 WARRANTIES:

- A. Submit to the Owner a copy of manufacture's written guarantee agreeing to repair or replace any and all defects in workmanship and/or materials for a period of two (2) years, or as otherwise specified, from the date of final acceptance of the installation, without cost to the Owner.

PART 2-PRODUCTS

2.01 PEDESTRIAN LIGHTS:

A. Luminaries:

1. Manufacturer:

Unique Solutions; as available from WESCO DENVER UTILITY;
6883 East 47th Avenue Drive, Denver, Colorado 80217, 303-322-1564

2. Catalogue Number:

GV1A-150HPS-12-L-A-#N W/GVIAPR12XX

3. Color:

Custom paint capital to match Sherwin-Williams color BM 31-24 (medium gloss). Submit samples.

B. Poles:

1. Manufacturer

Ameron as available from WESCO Denver Utility, 6883 East 47th Avenue Drive, Denver, Colorado 80217, 303-322-1564

2. Catalogue Number:

Victorian Style II Series, Catalogue Number, VBF-4,1 with 2-inch by 4-inch grommated outlet box with 1-inch knockouts at top of pole, $\frac{3}{4}$ -inch knock out for speaker jack and (2) grommets for banner mounts.

3. Color:

Custom paint to match Sherwin Williams color BM 31-24 (medium gloss). Submit samples.

4. Base:

Pole base shall have factory installed 1-1/4- inch bolt holes in the base steel flange. Bolt diameter to match Colorado Springs Utilities, Electric Department, Street Lighting Construction Standards, Detail 220-1, Concrete Foundation. Open area in pole base shall accommodate (4) 2-inch conduits and ground rods.

2.03 RECEPTACLES:

Receptacles shall be specification grade, for all-weather, exterior with self closing over, in color and of the appropriate code and NEMA configuration to match the supply circuit and load involved. Proper grounding shall be provided through receptacle for equipment. Mount securely in outlet box at top of pole.

2.04 WIRE AND CONDUIT

A. Wire:

#4 copper and # 10 copper TW.

B. Conduit:

2-inch Schedule 40 PVC.

2.07 FUSE:

10 amp.

2.08 MASTER BREAKER:

20 amp minimum

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. Install all luminaries at locations and heights as indicated, in accordance with luminaries manufacturers written instructions, applicable requirements of NEC, NECA's "Standard of Installation", NEMA standards, and with recognized industry practices *to ensure that* luminaries fulfill all requirements. Electrical service to be connected to adjacent traffic signal, including all bores, sleeves, cut/patch and related electrical components. All workmanship shall be first class and finished work shall present a neat uncluttered appearance. The Contractor shall coordinate his work with other construction phases so as to provide a minimum of interference to the combined operations.
- B. Notify Owner's Representative about field conditions at variance with contract documents before commencing installation.
- C. It shall be the Contractor's responsibility to replace and restore all surface materials in kind, equal to, or exceeding those disturbed by trenching, excavation or backfilling operations. This includes seeding, sodding, replacement of subbase, pavement, trees, shrubs, etc. All excess materials shall be disposed of as directed by the Owner's Representative.
- D. Ascertain and make sure that all lamps installed are exactly as specified for each luminaries type.
- E. Replace all lamps used during construction, all burned out lamps, or inoperative lamps andlor inoperative ballasts and transformers in all luminaries just prior to acceptance of project by Owner.
- H. From feed to end of circuits, install #4 copper wire in conduit:
1 -white-neutral
1 -black-phase
1 -red-phase
1-green-grounding wire
Include 1 grounding pin at meter and at each light pole.
- I. From pole to luminaries, install #10 copper TW wire.
- J. Install a 10 amp fuse at each pole.
- K. Install master breaker - 20 amp. minimum.

3.02 TESTS:

- A. Prior to final acceptance, the Contractor shall demonstrate by test to the Owner's Representative's satisfaction that all the electrical and lighting equipment

installations are in proper condition per drawings and specifications. The Contractor shall furnish all equipment and appliances to make the test.

- B. The Owner shall be notified at least two days prior to energizing the lighting system and the system shall not be put into operation before the Owner or his authorized representative is present. All lighting circuits and equipment shall be given an initial operational test, consisting of having the entire system energized for 72 consecutive hours without any failures of any type occurring anywhere in the system. All circuits shall test clear of faults, grounds and open circuits to the satisfaction of the Owner's Representative.
- C. After satisfactory completion of all tests required in these Special Provisions and by the Owner's Representative, the illumination system shall be placed in operation. Final acceptance will not be made until the system has operated satisfactory for a period of not less than 14 days.
- D. The Contractor shall be fully responsible for the system during this period of operation and he shall make any adjustment or repairs which may be required, and remedy any defects or damages which may occur, at his own expense.
- E. Operation of the system shall not in any way be construed as an acceptance of the system or any part of it or as a waiver of any of the provision of the contract..
- F. The Contractor shall not be required to pay for electrical energy consumed by the system during the period of trial operation.

END OF SECTION