CITY COUNCIL WORK SESSION MEMO

DEPARTMENT	PRESENTED BY	DATE
Parks and Recreation	Diesel Post - Parks and Recreation Director	January 6, 2025

AGENDA ITEM

Presentation of the City of Salida's Parks Development Manual and the City of Salida Park Construction Standards and Specification manual for consideration and feedback.

BACKGROUND

Currently, there is nothing formally adopted in the City of Salida that clarifies a park type, the required amenities with the different types of parks, construction standards for parks, or preferred locations for future parks or amenities. Additionally, there is no direction to potential developers of the authority of the Department of Parks and Recreation, the Department of Community Development, the Planning Commission, or the Council to determine if land dedication of Fee-in-lieu. With these called out, staff and developers will be able to have more productive and efficient conversations at the concept and pre-application levels.

REQUESTED DIRECTION FROM COUNCIL

Staff requests direction from the Council as to whether they approve of the concept of having clear development rules and construction standards and would like any feedback that members may have.

PARK DEVELOPMENT MANUAL

CITY OF SALIDA

PREPARED BY
CITY OF SALIDA
DEPARTMENT OF PARKS AND RECREATION

City of Salida Park development types and standards

Background

Chapter 16 of the Salida Municipal code states that developers will “dedicate and develop land or pay fee-in-lieu". City staff will work with developers in the pre-application phase through the approval process to identify desirable land based on:

- The attached “Preferred Park and Amenities figure”
- Current need
- The 2019 PROST Master Plan
- The Trust for Public Lands ParkServe Park location needs map, and
- Other applicable information

All proposed parks are to be discussed and vetted with city staff prior to the initial platting of any development.

Dedication and development vs. Fee-in-lieu

City staff will determine the most appropriate or desired park for a given location and whether or what percentage of fees will be accepted in lieu of dedicated and developed parkland. The Director of Parks and Recreation will determine if the City will require dedication or the paying of the fee-in-lieu. The P&R Director and the Department of Community Development can negotiate a combination of dedication and development and fee-in-lieu payment. Negotiating reduced requirements of land or fee amount is not permitted under the Land use Code. Any development whose dedicated and developed park is under the size required by the code will pay the remaining proportion of fees-in-lieu.

Design Criteria

Design criteria for parks, trails and open space. Land dedicated for public parks, trails and open space and land set aside for common open space shall meet the following design criteria, as applicable:

a. Connectivity required. To the maximum extent practicable, parks, trails and open space shall be organized to create integrated systems of open areas that connect with the following types of lands located within or adjacent to the development:
    i) Dedicated public parks or trails;
    ii) Dedicated school sites;

iii) Other dedicated or common open spaces;
iv) Regional parks, trails or open lands as specified in Master Plans and the TPL ParkServe map;
v) Neighborhood shopping and activity centers; and
vi) Adjacent employment centers.

b. Regular shaped and contiguous.
i) Parks, trails and open space shall be shaped to provide a critical mass for usable park and open space functions and shall be contiguous unless the land is used as a continuation of an existing trail or other linear park or unless specific topographic features require a different configuration. An example of such topographic features would be the provision of open space along a stream.
ii) Wherever possible, public parks should be regularly shaped, with a minimum dimension of three hundred (300) feet.

c. Accessible to residents.
i) Parks, trails and open space shall be reasonably accessible to all of the residents of the development.
ii) In order to make them visible to the general public, all public (dedicated) parks shall be bounded on at least one (1) side by a public street. In addition, to the maximum extent practicable, private lots should not back onto a public (dedicated) park, but should be separated from the park by public streets.
iii) Access to dedicated or common open space shall be a minimum of twenty-five (25) feet wide.

d. Recreational facilities. Recreational facilities constructed in parks and open space shall comply with all applicable County construction standards and specifications.

e. Landscaping and fences/walls on perimeter.
i) All open space should be left in its natural or existing condition except as determined by the City. Existing trees and vegetation shall be preserved wherever practicable.
ii) Where public parks or open space are bordered predominantly by private rear or side yards, only open fences (e.g., split rail fences) no higher than forty-eight (48) inches may be erected on the common boundaries with the park or open space. Opaque fences and walls (e.g., privacy fences) are prohibited in yards bordering the park or open space.

f. Drainage detention areas dedicated to the City or used as part of a pocket park or common open space.
    i) If a proposal is made to dedicate a detention area to the City, the City shall determine if the detention area serves the public interest. Public interest shall be based on ease of maintenance, potential use of the area for open space or recreation uses by the public, whether the area would complement the Town's park or trail system and/or whether the applicant will provide cash escrow for ongoing maintenance of the facility.
    ii) If the City accepts dedication of a detention area or if the detention area is intended to be part of a pocket park or common open space area, regardless of ownership or maintenance, the following standards shall apply:
        a) Slopes shall comply with City construction standards and specifications, but in no case shall exceed a slope of 4:1.
        b) Adequate access shall be provided to the detention area for pedestrians, the physically disabled and maintenance equipment.
        c) Drainage structures shall be designed and located to facilitate maximum use of the detention area for recreational use.
        d) Landscaping shall be provided.
        e) Amenities, such as benches, play equipment, game courts and playing fields appropriate to the size and location of the detention facility, shall be required and shall be based on proposed/existing adjacent uses unless the detention pond location or design cannot reasonably accommodate the amenities. On one (1) acre or less, fewer amenities are required. The applicant shall be responsible for installing all amenities per the City's construction standards and specifications, in coordination with the Parks and Recreation Department.

Park classifications and associate amenities required

As per the 2019 City of Salida Parks, Recreation, Open Space, and Trails Master Plan, there are four classifications of parks in the City of Salida. Each classification has different service goals and characteristics. City staff determines the types of parks desired in any location, and can up or downscale parks according to current needs.

All parks.

The following amenities are required for all parks regardless of the optional amenities selected from Subparagraph b. below.

a) Landscaping shall be provided for all impervious areas not used for other amenities.
b) Tables and seating shall be provided, such as benches, chairs, picnic tables, and ADA seating. The make and model of these amenities must be approved by City staff.
c) Internal access pathways shall be provided to and between park amenities, parking areas, and the perimeter.
d) Open turf play areas shall be provided unless agreed upon by staff at the initial concept development of the park.
e) Universal and inclusive play elements shall be provided to accommodate all ages and abilities. The make and model of play structures must be approved by City staff.
f) Dog waste stations shall be provided at all pedestrian access points into the park, with a minimum of three (3) per park. The make and model of waste stations must be approved by City staff.
g) Trash receptacles shall be provided at all seating areas with a minimum of three (3) per park. Trash receptacle make and model must be approved by City staff.
h) Will be built per the City of Salida Standard of Construction in Parks.

Pocket parks

Pocket parks shall be:

a) less than 1 acre in size;
b) centrally located within neighborhoods served;
c) bordered on at least one (1) side by public streets (excluding collector and arterial streets) to provide easy public access, visual surveillance, and parking;
d) accessible from the surrounding neighborhoods using sidewalks and/or trails;
e) owned and maintained by the City, an HOA or metropolitan district;
f) platted with a dedicated public access easement; and

g) constructed to City standards and specifications for design and construction of public improvements (per Land Use Code and Parks Construction Standards and Specifications document).

Provide opportunities for passive outdoor recreation at a sub-neighborhood scale. Pocket parks shall be located within 1/4 mile of the residences they are intended to serve and may include:

- lawn areas,
- picnic shelters and tables,
- play equipment,
- artwork or
- other amenities that are appropriate for the demographics and types of activities that the neighborhood may desire.

Neighborhood parks

Neighborhood parks shall be:

a) not less than a minimum size of one (1) acre;
b) centrally located within or adjacent to the neighborhood(s) served;
c) bordered on at least two (2) sides by public streets (excluding arterial streets) providing easy access, visual surveillance and parking;
d) accessible by sidewalks and/or trails;
e) accessible from the surrounding neighborhoods using sidewalks and/or trails;
f) owned and maintained by the City, an HOA or metropolitan district;
g) platted with a dedicated public access easement; and
h) constructed to City standards and specifications for design and construction of public improvements (per Land Use Code and Parks Construction Standards and Specifications document).

Provide places for recreation and social gathering within approximately 1/2 mile from most residences being served. Neighborhood parks may Include:

- multi-use lawn areas,
- picnic areas,
- playground,
- small game courts,
- community gardens,

- open playing fields and facilities as appropriate.

Community parks

Serve multiple neighborhoods and focus on the recreational needs and interests of the entire community. They provide opportunities for organized recreational activities as well as community events and gatherings. Community parks shall be:

(A) a minimum size of 5 acres;

(B) sited in an area level enough to accommodate play fields or recreational facilities as needed;

(C) able to maintain a balance between programmed activity facilities and other community activity areas, such as performance areas, festival spaces, gardens, water features, etc. that have broad appeal to the community;

(D) accessible from a collector or arterial street;

(E) integrated into the City's trail system;

(F) owned by the City; and

(G) constructed to City standards and specifications for design and construction of public improvements (per Land Use Code and Parks Construction Standards and Specifications document).

Regional parks

Serve an entire community and focus on a broad range of recreational needs. They provide opportunities for organized recreational activities as well as community events and gatherings and offer both passive and active recreation and leisure opportunities. Regional parks shall be:

a) a minimum size of 25+ acres (with exceptions based on use characteristics, special features, etc.) Large tracts of land are often necessary to provide natural resource-based recreation opportunities and protect the natural resources for longterm use for outdoor recreation. This criterion will not be exclusively used to determine whether a park is regional. Parks of less than 25 acres may still be determined regional based upon other criteria.

b) able to serve a regional clientele (as opposed to mostly local) including drawing tourists from outside the local area.

c) able to provide outdoor recreation facilities and activities that are primarily natural resource based (camping, picnicking, hiking, swimming, boating, canoeing, fishing, nature study).
d) able to provide for unique or unusual geologic features, historically significant sites, watersheds, or parks containing characteristics which may be of regional or statewide significance.
e) accessible from a major arterial street;
f) integrated into the City's trail system;
g) owned by the City, State or Federal government; and
h) constructed to City standards and specifications for design and construction of public improvements (per Land Use Code and Parks Construction Standards and Specifications document).

Exceptional Dedications, Recreational facilities, and Sports Complexes

Any Exceptional Dedications, Recreational facilities, or Sports Complexes negotiated between the Developer and City staff will be contingent on approval by City Council.

Construction standards

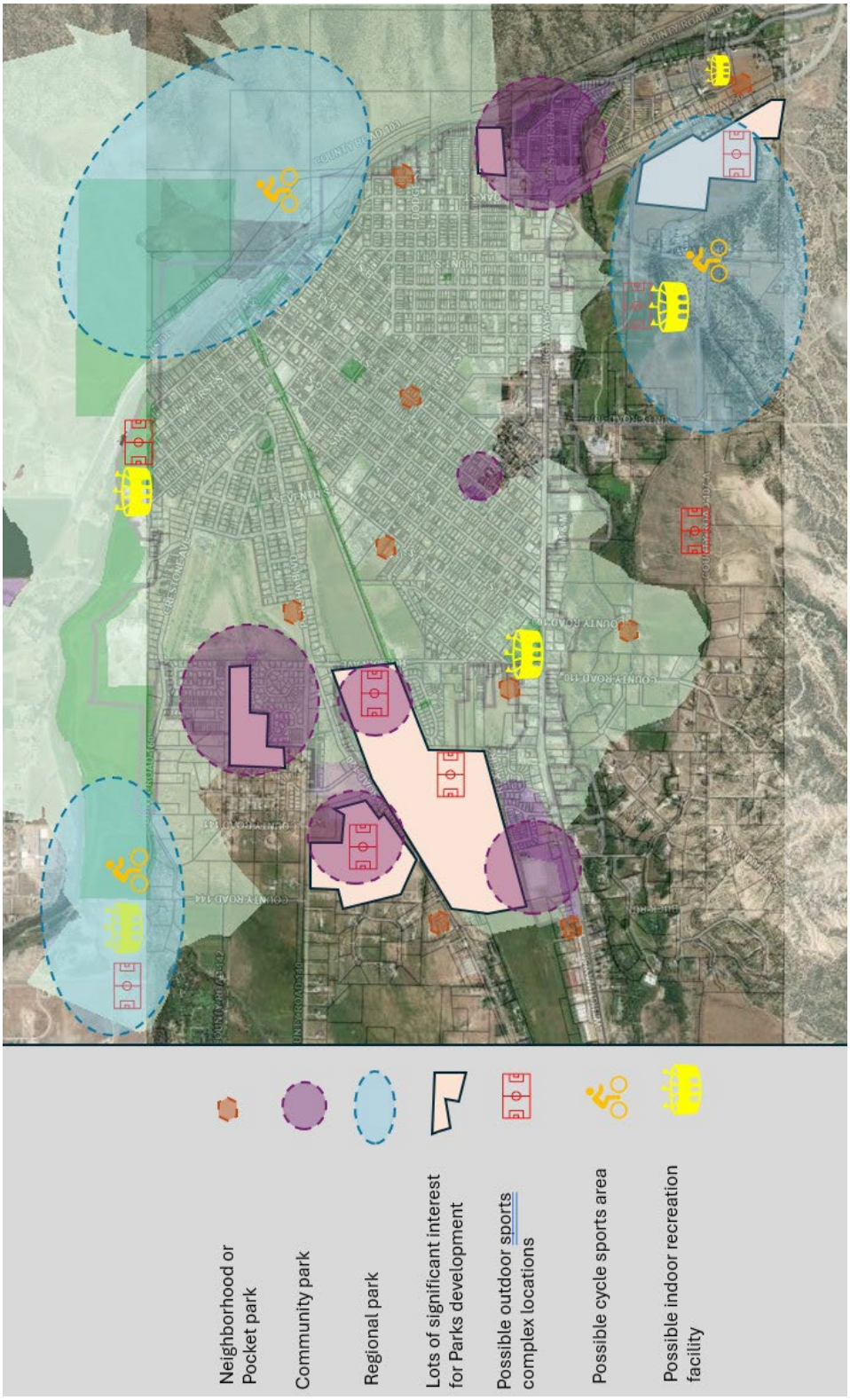
All dedicated and developed parks must adhere to the City of Salida Park Construction Standards and Specifications document and following standards:

a. Construction scheduled to begin to avoid construction activity impact
b. Have irrigation design and engineering approved by a landscape architect (City approval required)
    i. Must follow Salida irrigation manual standards
c. Trail construction must follow the City of Salida standards
d. All water taps are commercial grade and appropriately sized.
e. All installed electrical service is commercial grade.
f. Any amenity (playground, bench, lights) must be approved by staff
g. Provide "as built" documents upon completion of the project
h. Adhere to the attached exhibits.

Acceptance and Maintenance

Parks are accepted as City owned parks upon approval of the Director of Parks and Recreation via formal letter.

Future Park development planning map



STANDARD SPECIFICATIONS FOR CONSTRUCTION IN PARKS

CITY OF SALIDA

PREPARED BY VALERIAN LLC.
FOR
CITY OF SALIDA
DEPARTMENT OF PARKS AND RECREATION

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TECHNICAL SPECIFICATIONS

SECTION 31 11 00
CLEARING AND GRUBBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes requirements for stripping debris and removing and disposing of vegetation and debris.

1.3 DEFINITIONS

A. The term “clearing” refers to removing and disposing trees, brush, stumps, logs, grass, weeds, roots, decayed vegetable matter, poles, stubs, rubbish, refuse dumps, sawdust piles, and loose boulders of one cubic yard (1 yd^3) or less existing outside of the construction limits, debris resting on or protruding through the ground surface, or appearing on the construction limits before final acceptance of the work. Clearing also includes removing and disposing of obstructions, such as fences, bridges, buildings, and other incidental structures within the construction limits and shown on the Site Demolition Plans.

B. The term “grubbing” refers to removal from the area within the construction limits and proper disposal of all objectionable matter defined above under clearing, which is embedded in the underlying soil. Grubbing also includes removing and properly disposing of sidewalks, driveways, catch basins, drop inlets, manholes, curbing, retaining walls, utilities, foundations, paved floors, underground tanks, and portions of plants to be removed that are below grade, and other structures within the construction limits.

C. Subsoil: All soil beneath the topsoil layer of the soil profile and typified by the lack of organic matter and soil organisms.

D. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow, and ; reasonably free of subsoil, clay lumps, gravel, and other objects more than two-inches (2”) in diameter; and free of subsoil and weeds, roots, toxic materials, or other non-soil materials.

E.

1.4 SUBMITTALS

A. Existing Conditions: Documentation of existing conditions, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.
   1. Use sufficiently detailed digital photographs or videos.
   2. Include plans and notations to indicate specific damaged conditions of existing construction, site elements, and landscape.

1.5 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
   1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Project Manager.
   2. Provide alternate routes around closed or obstructed traffic ways if required by Project Manager.

B. Improvements on Adjoining Property: Not allowed without prior approval from Project Manager. Work only within Work Limit Line as defined on drawings.

C. Salvable Items: Carefully remove items indicated to be salvaged and store on City property where indicated.

D. Protection and Repair of Underground lines:
   1. Existing Public Utilities: Locate existing underground utilities within the limits of work per General Contract Conditions, Article 804 Protection of Municipal, Public Service or Public Utility Systems. Request utility locates seventy-two (72) hours in advance of any excavations by calling the Utility Notification Center of Colorado at 811. The contractor is responsible for providing written and graphical documentation from the utility owner. Take whatever precautions are necessary including potholing to verify location and depth to protect these underground lines from damage. Should unmarked or incorrectly marked utilities or other piping be encountered during excavation, notify the Project Manager immediately for direction. If damage does occur, all damage shall be repaired by the utility owner and all costs of such repair shall be paid by the contractor. Only written all clears will be acceptable, verbal all clears will not be accepted.
   2. Existing Private Utilities: Locate existing underground utilities within the limits of work per General Contract Conditions, Article 804 Protection of Municipal, Public Service or Public Utility Systems. The contractor is required to contact all private utility companies including The City of Salida to locate all private utilities. The Contractor is responsible for providing written and graphical documentation from the private utility owner. The request for locates shall be a minimum of seventy-two (72) prior to proceeding with any excavation. If, after such requests, private utilities are encountered and damaged by the contractor these shall be repaired at no cost to the City. If the contractor damages staked or located private utilities they shall be repaired by the utility owner and all costs of such repair shall be

paid by the contractor. Only written all clears will be acceptable, verbal all clears will not be accepted.

E. Do not commence site clearing operations until temporary erosion- and sedimentation-control and tree and or plant protection measures are in place.

1.6 DELIVERY STORAGE AND HANDLING

A. All materials except for stripped topsoil and those materials indicated to remain or to be stockpiled, shall remain the property of the City. All other materials shall be removed at the Contractor's expense.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PROTECTION

A. Protect existing site conditions from damage during construction.
   1. Restore existing conditions damaged by Contractor during the work of this Contract to their original condition, as acceptable by Project Manager.

3.2 CLEARING

A. Remove brush and vegetation from areas designated to be cleared. As directed by Project Manager, trim low hanging, unsound, or unsightly branches on existing trees and shrubs designated to remain. All cuts shall be in accordance with the City of Salida standards.

3.3 GRUBBING

A. Remove all stumps, roots, and debris a minimum of twelve-inches (12”) below finish grade in all areas as required. Use hand methods for grubbing inside the tree protection zone of trees to remain. Backfill and compact stump and root holes to a maximum of eighty-five percent (85%) in landscape areas and ninety-five percent (95%) under hardscape or as directed by the Project Manager.

3.4 TOPSOIL STRIPPING

A. See Division 31 Section “Earth Moving”.

3.5 DISPOSAL

A. Haul and dispose of all removed materials, trash, debris and waste materials legally inside and outside of the City’s property. All recyclable materials shall be hauled to nearest recycling center.

PART 1 - MEASUREMENT AND PAYMENT

1.1 MEASUREMENT

A. Measurement will be made by the contract unit specified for Clearing and Grubbing. Measurement shall include the actual number of units of specified material(s) placed and accepted at the locations shown on the Contract Drawings, or as directed by the Project Manager, and in accordance with the Specifications.

1.2 PAYMENT

A. Payment will be made at the contract unit price, and shall include required materials, transportation, equipment, labor. The price shall include all clearing and grubbing of miscellaneous debris necessary to ensure a clear dirt surface remains on the site. Price shall include the removal and offsite disposal of all materials.

END OF SECTION 31 11 00

SECTION 31 20 00
EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the requirements for excavation, re-grading, stripping and stockpiling of topsoil, filling, backfilling, compaction, hauling, and legal off-site disposal of spoil materials to meet the required lines and grade as specified to complete the work.

1.3 DEFINITIONS

A. Excavation: The removal of material encountered to subgrade or over-excavation and subsequent disposal or placement of materials removed.

B. Unclassified Excavation: The term “unclassified excavation”, as used herein, includes the excavation of all materials required for the work obtained within construction limits of project, including bedrock, surface boulders, wasted sections of concrete, asphalt or other debris including historic landfills that may be encountered. All excavation will be considered unclassified unless otherwise noted.

C. Classified Excavation: The term “classified excavation”, as used herein, defines the soil conditions that are expected to be encountered and makes provisions for measurement and payment of any rock encountered at an agreed upon unit price.

D. Unauthorized Excavation: Inadvertent or purposely removing materials beyond indicated subgrade elevations or dimensions without specific direction of the Project Manager. Unauthorized excavation, as well as remedial work resulting from unauthorized excavation shall be at Contractor’s expense.

E. Unsuitable Materials: For the purposes of classified excavation, unsuitable material shall be defined as material below subgrade elevation that exhibits excessive pumping or that does not meet density requirements due to unsatisfactory material as determined by geotechnical engineer and/or Project Manager.

F. Subgrade: The undisturbed earth or the compacted soil layer immediately below proposed pavement and topping materials.

G. Structure: Walls, foundations, slabs, pavement or other man-made stationary features occurring above or below ground surface.

H. Structural Fill: The term “structural fill”, as used herein, includes soil materials used for general site filling under pavements or structures.

I. Rough Grade: Cutting and filling the earth for preparation of finish grade. Elevation shall be within +/- one-tenth (.10’) of a foot to the elevation indicated for that point.

J. Finished Grade: Any surface which has been cut to or built to the elevation indicated for that point. Elevation shall be +/- five one-hundredths (.05’) of a foot from required elevation.

1.4 SUBMITTALS

A. Samples for Verification: For the following products, in sizes indicated below:
   1. Warning Tape: Twelve-inches (12”) long; of each color.

B. Qualification Data: For qualified testing agency.

C. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:
   1. Location of soil source.
   2. Classification according to ASTM D 2487.
   3. Laboratory compaction curve according to ASTM D 698.

D. Provide a minimum of one (1) gallon sample of imported fill material for approval by the Project Manager.

E. For imported fill materials, general or structural, the Contractor shall provide, at a minimum, a soils report indicating gradation tests, liquid limit, plastiCity index and standard proctor density test and free of environmental contaminants. Depending on the use of the imported backfill materials the Project Manager may request that a soils analysis be performed to determine percent organic content of the soils, salt levels, and environmental contaminants of concern. Division 32 Section “Topsoil” for additional information.

F. A source for imported fill materials shall be submitted for approval by the Project Manager and the City.
   1. Imported Material from a Quarry: A letter shall be submitted to the Project Manager and DDPHE specifying the type of material.
   2. Imported Material from a Source Other than a Quarry: Submit a Phase I Environmental Assessment (ESA) and sampling protocol and/or a Phase II ESA or similar.

G. Pre-excavation Photographs or Video: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth moving operations. Submit before earth moving begins.

1.5 QUALITY CONTROL

A. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.

B. Comply with requirements within all Related Report Documentation.

C. Imported Soil:
   1. Submit source location for soil to be imported to site for approval by the Project Manager.
      a. Any fill material to be moved to and placed on City of Salida owned property must be free of contamination (observed or previously documented) and be acceptable for unrestricted residential use. Imported soil or material that contains stains, odors, or debris regardless of analytical results shall not be imported to City-owned property.

D. Onsite Backfill of Disturbed Soil:
   1. Any disturbed soil for reuse on site with suspected or observed contamination or debris must be segregated and adequately characterized.

E. Offsite Reuse of Disturbed Soil:
   1. If excess soil will be reused offsite, contact The City of Salida to determine project-specific protocols, sampling and analysis.
   2. Disturbed soils that contain stains, odors, or debris shall not be reused offsite.
   3. Soil sampling will be required. Sampling parameters differ based on the planned soil disposition.
   4. A contract is required for any soil reuse on a 3rd party property.

F. Codes and Standards: Comply with all applicable local, state and Federal rules, regulations and ordinances concerning sloping of excavation, trenching and safety of workers, including the latest version of OSHA requirement.

G. Testing Agency: Testing Agency to test the following, and as stated throughout this Section:
   1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
   2. Determine that fill material and maximum lift thickness comply with requirements.
   3. Determine, at the required frequency, that in-place density of compacted fill complies with requirements.

H. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable.

1.6 PROJECT CONDITIONS

A. Protection and Repair of Underground lines:
   1. Existing Public Utilities: Locate existing underground utilities within the limits of work per General Contract Conditions, Article 804 Protection of Municipal, Public

Service or Public Utility Systems. Request utility locates seventy-two (72) hours in advance of any excavations by calling the Utility Notification Center of Colorado at 811. The Contractor is responsible for providing written and graphical documentation from the utility owner. Take whatever precautions are necessary including potholing to verify location and depth to protect these underground lines from damage. Should unmarked or incorrectly marked utilities or other piping be encountered during excavation, notify the Project Manager immediately for direction. If damage does occur, all damage shall be repaired by the utility owner and all costs of such repair shall be paid by the Contractor. Only written all clears will be acceptable, verbal all clears will not be accepted.

2. Existing Private Utilities: Locate existing underground utilities within the limits of work per General Contract Conditions, Article 804 Protection of Municipal, Public Service or Public Utility Systems. The Contractor is required to contact all private utility companies and the City of Salida to locate all utilities. The Contractor is responsible for providing written and graphical documentation from the private utility owner. The request for locates shall be a minimum of seventy-two (72) hours prior to proceeding with any excavation. If, after such requests, private utilities are encountered and damaged by the Contractor these shall be repaired at no cost to the City. If the Contractor damages staked or located private utilities, they shall be repaired by the utility owner and all costs of such repair shall be paid by the Contractor. Only written all clears will be acceptable, verbal all clears will not be accepted.

B. Use of Explosives: Use of explosives is not permitted.

C. Protection of Persons and Property: The Contractor is responsible for installing barricades and posting warning lights with all open excavations occurring as part of the work.

1. Protect structures, utilities, walkways, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

D. Environmental Requirements: Blasting is not permitted. Employ jack hammering and other loud noises and methods sparingly; comply with all applicable noise abatement ordinances or regulations. Onsite burning is not allowed.

E. Existing Benchmarks: Carefully preserve and maintain existing benchmarks, vertical/horizontal control, monuments, property line pipes and pins, and other reference points. If disturbed or destroyed, restore or replace at no additional cost to the City.

F. Do not commence earth moving operations until temporary erosion- and sedimentation-control measures, specified in Division 01 Sections "Temporary Facilities and Controls” and Division 31 Section "Clearing and Grubbing," are in place.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: All fill material, regardless of intended use category, must be clean and free from organic matter, roots, brush or other vegetation, trash, debris or other detrimental substances, and rocks or unbroken lumps larger than three-inches (3”). The Project Manager is to approve material prior to placement.
   1. The Contractor is responsible for furnishing load tickets and providing a daily log of cubic yards of soil materials imported or exported.

B. Structural Fill: Shall be Class 1 or Class 2 material composed of non-organic mineral aggregates and soil from excavations of existing soils obtained from on-site or imported fill, including granular or aggregate base course from removed pavements. Fill containing organic matter or any other deleterious substances, including overly wet soils, bedrock, or high swell content soils will not be accepted. If sufficient materials meeting the above requirements are not available from on-site sources, provide additional material obtained from off-site sources and approved by the testing and inspections agency, at no additional cost to the City. The soil must be compactable and pass, at minimum, a proof roll prior to being accepted for supporting paving materials.

C. On-Site Topsoil: The top four-inches (4”) minimum of organic material in the excavation zone shall be stripped stockpiled prior to other earthwork operations. All stockpiled topsoil shall be reused on site unless otherwise noted.

2.2 ACCESSORIES

A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, six-inches (6”) wide and four (4) mils thick, continuously inscribed with a description of the utility.

B. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of six-inches (6”) wide and four (4) mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to thirty-inches (30”) deep.

C. Tape: Colored as follows:
   1. Red: Electric.
   2. Yellow: Gas, oil, steam, and dangerous materials.
   3. Orange: Telephone and other communications.
   4. Blue: Water systems.
   5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where the Work of this Section will be performed for compliance with requirements and conditions affecting installation and performance.
   1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within the work area.
   2. Proceed with installation only after unsatisfactory conditions have been corrected and approved by Project Manager.

3.2 GENERAL PROCEDURES

A. Comply with Division 01 Section “Erosion and Sedimentation Control” and all local, state and national erosion control requirements.

B. Erosion Control shall be maintained during all phases of site excavation and site development and maintained throughout the construction period in order to protect adjacent properties, streets, and storm sewers from erosion and sediment runoff during the construction process. Do not commence excavation and grading work until erosion control measures are in place and have been inspected by the Project Manager. Contractor shall be responsible for maintaining erosion control measures throughout construction. Frequent monitoring, cleaning and other work required for proper operation shall be Contractor’s responsibility. Contractor shall modify/replace all erosion control measures to fit field conditions following direction for corrective actions from Project Manager and or Wastewater Management Inspector.

3.3 FIELD QUALITY CONTROL

A. Testing and inspections shall be coordinated and paid for by the Contractor.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by the Project Manager.

D. Field tests will be performed at the following locations and frequencies at a minimum:
   1. Paved Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every two thousand (2,000) sq. ft. or less of paved area or building slab, but in no case fewer than three (3) tests.
   2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 50 feet (50’) or less of wall length, but no fewer than two (2) tests.

3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every one hundred fifty feet (150') or less of trench length, but no fewer than two tests.
4. Landscaped areas: At least one test every twenty thousand (20,000) sq. ft or less of disturbed landscaped area, but in no case fewer than two (2) tests.

E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; re-compact and retest until specified compaction is obtained.

3.4 DEWATERING

A. Wherever possible, prevent surface water and subsurface or groundwater from flowing into excavations and from flooding the project site and surrounding area.

B. Contractor shall be required to dewater excavated areas by pumping, or otherwise control the water so that the project can be constructed in accordance with the plans. Any controlling of the water must be performed in such a manner that recently constructed portions of the project are not damaged. Repairs shall be at the Contractor's expense.

C. Damage to adjacent property that results from the Contractor's alteration of any surface drainage, ground water flows or pumped water shall be repaired by the Contractor at no additional cost to the City.

3.5 GROUND SURFACE PREPARATION

A. Complete clearing and grubbing operations in accordance with Division 31 Section "Clearing and Grubbing". Where new material is to be placed on compacted subgrade, scarify ground surface until surface is free from ruts, hummocks or other uneven features, which would prevent uniform compaction and bond between old and new material.

B. Prior to placing any new sections of asphalt or concrete pavement, the entire subgrade shall be scarified to a depth of six-inches (6"). In areas where existing pavement is to be removed and replaced the existing compacted subgrade may be reused if the subgrade meets specified compaction. In areas of existing subgrade that do not meet the specified compaction, materials shall be removed, replaced and compacted to meet the specified proctor density. Adjust moisture content and compact as hereinafter specified.

3.6 STRIPPING AND STOCKPILING TOPSOIL

A. Strip all topsoil from the excavation zone for new facilities (four-inches (4") in depth for all disturbed areas). Stockpile topsoil in locations indicated on the Drawings or as directed by the Project Manager.

B. Placing topsoil, refer to Division 32 Section “Topsoil”.

3.7 EXCAVATION

A. Stability of excavations: Comply with local codes, ordinances, and requirements of agencies having jurisdiction to include the latest revision to OSHA standards.

B. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
   1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
   2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:
      a. Twenty-four inches (24”) outside of concrete forms other than at footings.
      b. Twelve-inches (12”) outside of concrete forms at footings.
      c. Six-inches (6”) outside of minimum required dimensions of concrete cast against grade.
      d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
      e. Six-inches (6”) beneath bottom of concrete slabs-on-grade.
      f. Six-inches (6”) beneath pipe in trenches, and the greater of twenty-four inches (24”) wider than pipe or forty-two inches (42”) wide.

C. Classified Excavation: Excavate to subgrade elevations. Material to be excavated will be classified as earth and rock. Do not excavate rock until it has been classified and cross sectioned by the Project Manager and approved by the Project Manager. The Contract Sum will be adjusted for rock excavation according to unit prices included in the Contract Documents. Changes in the Contract Time may be authorized for rock excavation.
   1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; together with soil, boulders, and other materials not classified as rock or unauthorized excavation.
      a. Intermittent drilling; ram hammering; or ripping of material not classified as rock excavation is earth excavation.
   2. Rock excavation includes removal and disposal of rock. Remove rock to lines and subgrade elevations indicated to permit installation of permanent construction without exceeding the following dimensions:
      a. Twenty-four inches (24”) outside of concrete forms other than at footings.
      b. Twelve-inches (12”) outside of concrete forms at footings.
      c. Six-inches (6”) outside of minimum required dimensions of concrete cast against grade.
      d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
      e. Six-inches (6”) beneath bottom of concrete slabs-on-grade.

f. Six-inches (6”) beneath pipe in trenches, and the greater of twenty-four inches (24”) wider than pipe or forty-two inches (42”) wide.

3.8 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions shown on Contract Drawings within a tolerance of +/- one-tenth (0.1’) of a foot. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
   1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
   2. Pile Foundations: Stop excavations six to twelve inches (6” – 12”) above bottom of pile cap before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.

3.9 EXCAVATION FOR WALKS AND PAVEMENTS

A. See project Geotechnical Report.

B. Excavate to indicated elevations and dimensions within a tolerance of +/- one-tenth (0.1’) of a foot.

C. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.
   1. Prior to placing the pavement section, the entire subgrade should be scarified to a depth of six-inches (6”), adjusted to a moisture content near optimum and compacted as indicated in the Geotechnical Report.

3.10 INSPECTION

A. Subgrade and Rough Grade Inspection:
   1. Contractor shall notify Project Manager when excavations have reached required subgrade.
   2. If Project Manager determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
   3. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices.
   4. For concrete subgrade preparation, proof-roll subgrade in locations identified by the Project Manager with a pneumatic-tired and loaded ten (10-wheel), tandem-axle dump truck weighing not less than fifteen (15) tons to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
      a. Completely proof-roll subgrade in one direction. Limit vehicle speed to three (3) mph.
      b. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by the Project Manager, and replace with compacted backfill or fill as directed.

5. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by the Project Manager, without additional compensation.

3.11 SPECIAL CONDITIONS

A. Cold Weather Protection: Protect excavation bottoms against freezing when atmospheric temperature is less than thirty five degrees (35°) F.

B. Dust Control: Provide dust control to alleviate dust nuisance to the public, to adjacent properties and other work underway at the project site.

C. Unanticipated Conditions: Notify the Project Manager immediately upon finding subsurface or other conditions which are not shown or which cannot be reasonably assumed from existing surveys. Secure Project Manager's instructions before proceeding with further work in such areas.

D. Unsatisfactory Soils: Remove or otherwise correct unsanitary, sour, or otherwise unsatisfactory soil. Remove contaminated or unsuitable material from under paved areas.

E. Additional Excavation: When excavation has reached required subgrade elevations, the Contractor shall contact the testing agency, which will make an observation of conditions. If unsuitable bearing materials are encountered at required subgrade elevations, carry excavations deeper and replace excavated material as directed by the testing agency.

3.12 FILL AND BACKFILL

A. General: Place soil material in layers to required subgrade elevations, for each area classification listed below, using materials specified in this Section.
1. Under grassed areas, use satisfactory, excavated or borrow material.
2. Under walks and pavements, use satisfactory, excavated or borrow materials, or a combination to meet structural fill requirements.

B. Backfill excavations as promptly as work permits, but not until completion of the following:
1. Inspection, testing, approval, and recording locations of underground utilities have been performed and recorded.
2. Removal of all trash and debris from excavation.

3.13 PLACEMENT AND COMPACTION

A. Abide by requirements of project Geotechnical Report unless otherwise directed by Project Manager.

B. Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills.

Ground surfaces that are steeper than four-to-one (4:1) (horizontal to vertical) shall be stripped of vegetation, scarified to a depth of six-inches (6") and create excavated benches to ensure that fill material will bond with the existing surface.

1. Present remediation options to Project Manager for any soils that do not meet the specified standard proctor density to bring those soils into compliance with the specifications.

C. Place backfill and fill materials in layers not more than eight-inches (8") in loose depth for material compacted by heavy compaction equipment, and not more than four-inches (4") in loose depth for material compacted by hand-operated tampers, each layer to be compacted to meet requirements herein.

D. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

E. Compaction of Fill for Hardscape Areas:
   1. Select fill material shall be placed and mixed in evenly spread layers. After each fill layer has been placed, it shall be uniformly compacted. Fill materials shall be placed such that the thickness of loose material does not exceed eight-inches (8") and the compacted lift thickness does not exceed six-inches (6").
   2. Compaction shall be obtained by the use of sheepsfoot rollers, multiple-wheel pneumatic-tired rollers, or other equipment required to meet specifications. Granular fill shall be compacted using vibratory equipment or other equipment required to meet specifications. Compaction of each layer shall be continuous over the entire area. Compaction equipment shall make sufficient passes to ensure that the required density is obtained. Refer to Paragraph 3.12.I herein for criteria.
   3. Prior to placement of any base or surfacing materials, one hundred percent (100%) of the subgrade shall be proof rolled with a fully loaded tandem-axle truck.

F. Compaction of Landscape Slope Areas:
   1. Fill slopes shall be compacted by means of sheepsfoot rollers or other suitable equipment. Compaction operations shall be continued until slopes are stable, compact to a density as specified in Paragraph 3.12.I. Permanent fill slopes shall not exceed four-to-one (4:1) (horizontal to vertical).
   2. Where natural slopes are steeper than twenty percent (20%) in grade and the placement of fill is required, cut benches shall be provided at the rate of one bench for each five feet (5') in height (minimum of two benches). Benches shall be at least ten feet (10') in width. Fill shall be placed on completed benches as outlined within this specification.

G. Control soil and fill compaction, providing minimum percentage of density specified. Correct improperly compacted areas or lifts as directed if soil density tests indicate inadequate compaction.

H. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or layer of soil material. Apply water in minimum quantity as necessary to prevent free water from appearing on surface during or subsequent to compaction operations.
   1. Moisture Content: The Contractor may be required to add moisture to the excavation materials in the stockpile area if it is not possible to obtain uniform moisture content by adding water on the fill surface. The Contractor may be required to rip or disc the fill soils to provide uniform moisture content through the soils.
   2. The application of water to the embankment materials shall be made with any type of watering equipment which will give the desired results. Water jets from the spreader shall not be directed at the embankment with such force that fill materials are washed out.
   3. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.
   4. Stockpile or spread soil material that has been removed because it is too wet to permit compaction. Assist drying by disking, harrowing, or pulverizing until moisture content is reduced to a satisfactory value.

I. Density Tests: Field density tests shall be made by the Contractor per Division 01 Section “Contractor Quality Control” locations and depths selected by the Project Manager. Where sheepsfoot rollers are used, the soil may be disturbed to a depth of several-inches. Density tests shall be taken in compacted material below the disturbed surface. When density tests indicate that the density or moisture content of any layer of fill or portion thereof is below that required, the particular layer or portion shall be reworked until the required density or moisture content has been achieved. Criteria for acceptance are as follows:
   1. Under pavements and structures: Intervals and quantities of tests required shall be established by the Project Manager. On-site or imported clay materials shall be compacted to at least ninety five percent (95%) of maximum standard Proctor dry density (ASTM D 698) at moisture content within two percent (2%) of optimum. Granular material, whether imported or developed on-site, shall be moisture conditioned to within two percent (2%) of optimum and compacted to at least 95% of maximum modified Proctor dry density (ASTM D 1557).
   2. Under landscape areas (top 12-inches): Eighty five percent (85%) of maximum standard Proctor dry density at moisture content within two percent (2%) of optimum (ASTM D 698).

3.14 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
   1. Stockpile soil materials away from edge of excavations.

3.15 PLACING STOCKPILED TOPSOIL

3.16 Refer to Division 32 Section “Topsoil”.

3.17 FINISH GRADING

A. General: Uniformly grade areas within project limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations or contours are indicated or between such points and existing grades.

B. Subgrade tolerances are as follows:
   1. Lawn, Seeded, and Unpaved Areas: Finish areas to receive topsoil to within not more than +/- five one-hundredths (.05’) of a foot above or below required subgrade elevations.
   2. Athletic Fields: Finish areas to receive topsoil to within not more than +/- two one-hundredths (0.02’) of a foot from required elevation.
   3. Pavements: Shape surface of areas under pavement to line, grade, and cross-section, with finish surface not more than five one-hundredths (.05’) of a foot above or below required subgrade elevation.

C. Under no circumstances shall variations from specified grade elevations create any ponding or retention of water on intermediate pavement levels, or finished surfaces.

3.18 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
   1. Scarify or remove and replace soil material to depth as directed by Project Manager; reshape and re-compact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
   1. Restore appearance, quality, and condition of finished surfacing to match adjacent work.

3.19 MAINTENANCE

A. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.

B. Settling: Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, lawn, or other finish), add

backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.20 DISPOSAL OF EXCESS AND WASTE MATERIALS

A. Removal from City's Property: Remove waste materials, including materials not allowed for fill, backfill or site grading as specified within, trash, contaminated materials, and debris, and legally dispose of it off City's property at Contractor's expense for hauling and recycling. All recyclable materials shall be hauled to nearest recycling center.
   1. Disposal of disturbed soil: laboratory analytical results will be required prior to DADS acceptance of disturbed soil.

B. Remove any excess fill material from the site, unless otherwise directed by the Project Manager.

C. Removal of unsuitable material and its replacement as directed will be paid on basis of Conditions of the Contract relative to changes in work.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Measurement will be made by the contract unit specified for Earth Moving. Measurement shall include the actual number of units of specified material(s) placed and accepted at the locations shown on the Contract Drawings, or as directed by the Project Manager, and in accordance with the Specifications.

4.2 PAYMENT

A. Payment will be made at the **contract unit** price, and shall include required materials, transportation, equipment, labor, excavation, stockpiling, disposing, hauling off, importing fill, re-transporting to fill locations (from locations of excavation or from onsite stockpiles), watering, compaction, sub-grade preparation, measuring of subgrade to bring within tolerances, backfilling, dust control, erosion and sediment control, rough grading, fine grading, as required in accordance with the Contract Drawings and Specifications. Stripping and stockpiling of topsoil shall be paid for separately under Division 32 Section "Topsoil".

END OF SECTION 31 20 00

SECTION 31 23 16
EXCAVATION AND BACKFILLING OF TRENCHES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. All work shall be done in conformance with the Details and Technical Specifications for Storm Drainage and Sanitary Sewer Construction - 4.0 Utility Trenching and Excavation and 5.0 Bedding and Backfilling, available from Denver Wastewater Management Division

1.2 SUMMARY

A. This Section includes requirements for the excavation and backfill for all piping, conduit, or related appurtenances, as shown on the plans and as specified herein.

B. City of Salida Standard Tree Planting Detail – “All electric fixtures and utilities, including but not limited to outlets and lights, shall be located at outside perimeter of tree planting areas within hardscape. In tree lawns, fixtures shall be placed minimum 3 (three) feet radially from base of trunk.”

PART 2 - PRODUCTS (Determined per project)

PART 3 - EXECUTION (Determined per project)

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Measurement will be made by the contract unit specified for Excavation and Backfilling of Trenches. Measurement shall include the actual number of units of specified material(s) placed and accepted at the locations shown on the Contract Drawings, or as directed by the Project Manager, and in accordeplace

B. ance with the Specifications.

4.2 PAYMENT

A. Payment will be made at the contract unit price, and shall include required materials, transportation, equipment, labor, excavation, stockpiling, disposing, hauling off,

importing fill, re-transporting to fill locations (from locations of excavation or from onsite stockpiles), watering, compaction, sub-grade preparation, measuring of sub-grade to bring within tolerances, backfilling, dust control, erosion and sediment control, rough grading and fine grading as required to construct in accordance with the Contract Drawings and Specifications. Stripping and stockpiling of topsoil shall be paid for separately under Division 32 Section “Topsoil”.

END OF SECTION 31 23 16

SECTION 31 32 50
WATERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes requirements for furnishing, hauling, and applying water required for compaction of embankments, backfills, sub-grade, and for landscaping, dust control, and other construction operations.

PART 2 - PRODUCTS

2.1 WATER

A. If water supply is from a hydrant, the City shall supply the Contractor with an approved and calibrated water meter with a backflow preventer. The City will be responsible to pay all water usage costs.

B. Water applied for moisture density control, pre-wetting, and as dust palliative shall be free of debris, organic matter, and other objectionable substances.

C. Water for landscaping shall be free from oils, acids, salts or any substance that may be harmful to plant life. Non-potable water may be accepted on a case-by-case basis as approved by Project Manager.

D. When the water source proposed for use by the Contractor is not known, the Contractor shall provide an analysis of water samples from an approved testing laboratory. The analysis shall be provided to the Projeceplace

E. t Manager prior to use.

PART 3 - EXECUTION

3.1 WATER TRUCK

A. At least one water truck shall be on site or as directed by Project Manager.
   1. Truck shall have capaCity of at least one-thousand (1,000) gallons or be of adequate size related to the scope of work or as directed by the Project Manager.

2. Water is to be metered for measurement, the Contractor shall provide and use an approved metering device.
3. Monthly water usage readings either from the vehicle or from a meter are to be provided to the Project Manager.

3.2 APPLICATION

A. Pressure type distributors or a pipeline equipped with sprinkler system.

B. Moisture and Density Control: Ensure a uniform and controlled application of water without ponding or causing erosion for optimum moisture content.

C. Pre-wetting: Pre-wetting material in excavation areas prior to removal for placement in embankments will be allowed as approved by the Project Manager. Prior to excavation the Contractor shall drill, bore or dig test holes to the full depth of excavation to determine moisture requirements. The contractor will identify and confirm with the Project Manager the areas for pre-wetting, including equipment to be used for the pre-wetting operations.

D. Landscape Watering: The Contractor shall provide water for seeding, mulching, planting, transplanting, sodding, herbicide treatment, maintenance operations including watering during establishment periods or any other landscape related activities when called out on the Contract Drawings or Specifications.

E. If overwatering occurs during any of the above operations, de-water at no additional expense to the City.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Measurement will be made by the percentage required as per the contract unit specified for Watering. Measurement shall include the actual number of units of specified material(s) placed and accepted at the locations shown on the Contract Drawings, or as directed by the Project Manager, and in accordance with the Specifications.

4.2 PAYMENT

A. Payment will be made at the contract unit price, and shall include required materials, transportation, equipment, labor, excavation, stockpiling, disposing, hauling off, dust control, erosion and sediment control, as required in accordance with the Contract Drawings and Specifications.

END OF SECTION 31 32 50

SECTION 32 11 16
AGGREGATE BASE COURSE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the requirements for furnishing and placing crushed aggregate, bonded with fine aggregate, constructed on a prepared underlying course in accordance with these specifications and in conformity with the dimensions, typical cross section, and the lines and grades shown on the Contract Drawings. The locations where aggregate base course will be used is shown on the Contract Drawings.

1.3 SUBMITTALS

A. See Division 01 Section “Submittals” for submittal requirements.

B. Certification: Contractor shall provide a certificate of compliance for any imported Aggregate Base Course materials.

C. Gradation and Standard Proctor Density Test Results: For imported backfill materials, at a minimum, submit results of gradation tests and standard proctor density test.

D. Sample: Provide a 1-pound (1#) sample of material(s) for approval.

PART 2 - PRODUCTS

2.1 AGGREGATE BASE COURSE

A. Aggregate base course shall meet the requirements of Item 703.03 of the Standard Specifications for Road and Bridge Construction of the Colorado Department of Highways, latest revision for Class five (5) or Class (6), or as specified by the Soils Engineer and on Contract Drawings.

2.2 RECYCLED CONCRETE

A. May be substituted for five (5) or Class (6) Aggregate, if acceptable to the Project Manager.

2.3 AGGREGATE

A. The use of this term implies the use of Aggregate Base Course within this Section only.

PART 3 - EXECUTION

3.1 EQUIPMENT

A. All equipment necessary for the proper construction of this work shall be in working condition, and shall be free of fluid leaks. Project Manager reserves the right to have any piece of equipment removed from the site if it is deemed inoperable and/or is leaking fluids.

3.2 PREPARING SUBGRADE

A. The underlying subgrade or base course shall be tested at the Contractors expense and accepted by the Project Manager before placing and spreading operations are started. See Division 01 Section “Contractor Quality Control”.

3.3 METHOD OF SPREADING

A. The aggregate material shall be placed on the prepared underlying course and compacted in layers not to exceed six-inches (6”) in depth before compaction. The depositing and spreading of material shall commence where designated and shall progress continuously without breaks. The material shall be deposited and spread in a uniform layer and without segregation of size to a uniform thickness.

B. The aggregate spread shall be of uniform grading with no pockets of fine or course materials. During the spreading process, sufficient caution shall be exercised to prevent the incorporation of underlying materials in the aggregate.

3.4 COMPACTION OF AGGREGATE BASE COURSE

A. When aggregate base course is used as part of asphalt roadway system (asphalt and base course composite section), the aggregate base course shall be compacted to 95% of Modified Proctor per ASTM D-1557, within 2% of optimum moisture.

B. Aggregate material shall be placed and mixed in evenly spread layers. After each fill layer has been placed, it shall be uniformly compacted. Fill materials shall be placed such that the thickness of loose material does not exceed eight-inches (8”) and the compacted lift thickness does not exceed six-inches (6”).

C. Compaction shall be obtained by the use of vibratory rollers, multiple-wheel pneumatic-tired rollers, or other equipment approved by the Project Manager. Granular fill shall be compacted using vibratory equipment or other equipment approved by the Project Manager. Compaction of each layer shall be continuous over the entire area.

Compaction equipment shall make sufficient passes to ensure that the required density is obtained.

D. Prior to placement of any base or surfacing materials, one-hundred percent (100%) of the subgrade shall be proof rolled with a fully loaded tandem-axle truck.

3.5 CLEANING

A. Perform cleaning during installation of the Work and upon completion of the Work. Remove all excess materials, debris, and equipment from site. Repair any damage resulting from installation of aggregate base course.

3.6 PROTECTION AND MAINTENANCE

A. Spreading of aggregate shall not take place when temperatures are below freezing. When the aggregate base course contains frozen material or the underlying subgrade is frozen, construction shall not occur.

B. Following the completion of the aggregate base course, the Contractor shall perform all maintenance work necessary to keep the aggregate in a satisfactory condition until final acceptance of the project. The surface shall be kept clean and free from foreign material. The aggregate base course shall be properly drained at all times. Any work, maintenance or necessary repairs shall be performed at the expense of the Contractor.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Measurement will be made by the contract unit specified for Aggregate Base Course. Measurement shall include the actual number of units of specified material(s) placed and accepted at the locations shown on the Contract Drawings, or as directed by the Project Manager, and in accordance with the Specifications.

4.2 PAYMENT

A. Payment will be made at the contract unit price, and shall include required materials, transportation, equipment, labor, excavation, de-watering, stockpiling, placement, grading, compaction, hauling off, watering, dust control, erosion and sediment control, as required in accordance with the Contract Drawings and Specifications.

END OF SECTION 32 11 16

SECTION 32 13 13
CONCRETE WALKS, CURBS, AND MISCELLANEOUS FLATWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes requirements for furnishing, placing, shoring, bracing, and anchorage of formwork, concrete reinforcement, accessories, and placing concrete flatwork, including walks, curbs and gutters, ramps, and pans, including installation of control and expansion joints, concrete curing and concrete finishing.

1.3 REFERENCES

A. Project Reports: **Geotechnical Study Cleora Park, Salida, CO, CMT Technical Services**. **Dated: August 27, 2023**

B. Note: All references below shall be from the most current edition.

C. American Concrete Institute (ACI):
1. ACI 117 - Standard Tolerances for Concrete Construction and Materials.
2. ACI 301 - Specifications of Structural Concrete for Buildings.
3. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.
4. ACI 305 and 306 - Hot and Cold Weather Protection for Concrete.
5. ACI 315 - Details and Detailing of Concrete Reinforcement.
6. ACI 318 - Building Code Requirements for Reinforced Concrete.
7. ACI 347 - Recommended Practice for Concrete Formwork.

D. American Society for Testing and Materials (ASTM):
1. ASTM A615 - Deformed and Plain Billet-Steel for Concrete Reinforcement.
2. ASTM C33 - Concrete Aggregates.
3. ASTM C94 - Ready-Mixed Concrete.
4. ASTM C150 - Portland Cement.
5. ASTM C260 - Air Entraining Admixtures for Concrete.
6. ASTM C494 - Water Reducing Admixtures for Concrete.
7. ASTM C618 - Fly Ash Mineral Admixture for Concrete.
8. ASTM C672 - Scaling Resistance of Concrete Surfaces Exposed to Deicing Chemicals.
9. ASTM-C800 - Curing Compound, Concrete, for New and Existing Surfaces.

10. ASTM C1059 - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete
11. ASTM-C1315 - Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete

E. Concrete Reinforcing Steel Institute (CRSI) - Manual of Standard Practice.

F. Colorado Department of Transportation (CDOT) – Standard Specifications for Road and Bridge Construction, latest edition

G. National Ready Mixed Concrete Association (NRMCA)

1.4 QUALITY CONTROL

A. Pre-Construction Conference: Conduct conference at location approved by the Project Manager.
1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with concrete to attend, including the following:
a. Contractor's superintendent.
b. Independent testing agency responsible for concrete design mixtures.
c. Ready-mix concrete manufacturer.
d. Concrete subcontractor.
e. Special concrete finish subcontractor.
2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semi-rigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, concrete repair procedures, and concrete protection.

1.5 SUBMITTALS

A. Qualification Data: Installer to document for City experience on projects of similar scope and scale successfully completed within the past five (5) years.

B. Product Data and Material Certificates: For each type of product and material indicated on the plans and in this specification.

C. Mix Designs:
1. Submit substantiating data for each concrete mix design specified for use to the Project Manager not less than four (4) weeks prior to first concrete placement. Data for each mix shall, as a minimum, include the following per section 2.7.B:
a. Mix identification designation (unique for each mix submitted).
b. Statement of intended use for mix.
c. Mix proportions.
d. Aggregates.

e. Admixtures (must be approved by the Project Manager)
f. Wet and dry unit weight.
g. Entrained air content.
h. Design slump.
i. Strength qualification data.

D. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

E. Field quality-control reports.

F. Minutes of Pre-Construction conference.

1.6 DELIVERY, STORAGE AND HANDLING

A. General: Materials handling and batching shall conform to applicable provisions of ASTM C94.

B. Reinforcing: Unload and store reinforcing bars so they are kept free of mud and damage.

C. Project-Site Mixing: Not allowed without prior approval from the Project Manager. If allowed, submit process description to the Project Manager for approval prior to construction.

D. Hauling Time for Concrete: Deliver and discharge all concrete transmitted in a truck mixer, agitator, or other transportation device not later than one and one-half (1-1/2) hours from batch time, or three hundred (300) revolutions of the drum after the initial mixing water has been added, whichever is earliest.

E. Extra Water:
1. Deliver concrete to site in exact quantities required by design mix.
2. Should extra water be required for workability before depositing concrete, and the water/cement ratio of accepted mix design will not be exceeded, the General Contractor’s superintendent shall have the sole authority to authorize addition of water. Additional water shall not exceed one (1) gallon/cu. yd. Any additional water added to mix after leaving batch plant shall be indicated on truck ticket and signed by person responsible.
3. Where extra water is added to concrete, it shall be mixed thoroughly for thirty (30) revolutions of drum before depositing.
4. Water may be added at the site only once for each batch.
5. A full set of tests shall be performed after addition of water. Excessive slump or other out of range tests will be cause for rejection.

1.7 PROJECT CONDITIONS

A. Environmental Requirements:
   1. Cold Weather Placement:
      a. If the daily temperature drops below forty degrees (40°) F for three (3) days prior to concrete placement or the temperature is expected to drop below forty degrees (40°) F on the day of the concrete placement, then comply with ACI 306R for preparation, protection, and curing of concrete.
      b. The mixed concrete temperature shall be between 50 and 90 ºF at the time of placement. Water, aggregates, or both shall be heated when necessary under such control and in sufficient quantities to avoid fluctuations in the temperature of the concrete of more than 10 ºF from batch to batch.
      c. If approved by the Project Manager, an accelerating admixture may be used. Admixtures shall meet requirements of Part 2. Calcium Chloride and other chloride-type accelerating admixtures are not allowed.
   2. Hot Weather Placement:
      a. When placing concrete in hot weather, follow recommendations of ACI 305R.
      b. Placing of concrete during hot weather shall be limited by the temperature of the concrete at the time of placing. Mixed concrete which has a temperature of 90 ºF or higher, shall not be placed.
      c. When air temperatures on day of placement are expected to exceed ninety degrees (90°) F, mix ingredients shall be cooled before mixing. Flake ice or well-crushed ice of a size that will melt completely during mixing may be substituted for all or part of mix water.
      d. If approved by the Project Manager, a retarding admixture may be used. Admixtures shall meet requirements of Part 2.

1.8 RIGHT OF WAY WORK

A. Contractor shall obtain all necessary permits when working with in the Right of Way.

B. Contractor shall preserve and protect all permanent land survey control markers.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

A. Hand Placed Steel Forms: Hand placed steel forms are only to be used for sections that are straight and have no bend, radii or curvature in the sections to be used.

B. Wood Forms: Forms shall be made of solid one side grade, sound, undamaged lumber with straight edges.
   1. Curved elements (bends, radii, or curvature) shown on plans are to be constructed with smooth-curved plywood forms. Faceted forms composed of straight sections will not be accepted.

C. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
   1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

2.2 CONCRETE MATERIALS

A. Provide materials in accordance with ACI 301, unless amended or superseded by requirements of this section or general notes on structural drawings.
   1. General: Ready-mixed Concrete: ASTM C94. On-site mixed concrete not allowed.
   2. Cement: ASTM C150. Type II
   3. Fly Ash: ASTM C618 Class F.
   4. Aggregate: ASTM C33.
      a. All sand and aggregates to meet C-33 Table 3 for Class 4S “Severe Weathering Region”.
         1) Fine Aggregate: Clean, natural sand.
         2) Coarse Aggregate: Clean gravel or crushed stone.
   5. Water: ASTM C 94/C 94M, clean and not detrimental to concrete.

2.3 ADMIXTURES

A. General: Unless specified, no admixtures may be used without specific approval of the Project Manager.

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.

D. Water Reducing Admixture: ASTM C494, Type A.

E. High Range Water Reducing Admixture (Superplasticizer): ASTM C494, Type F or G.

F. Warm weather admixtures: ASTM C494. Use of admixtures will not relax warm weather placement requirements.

G. Cold Weather Admixtures: ASTM C494. Use of admixtures will not relax cold weather placement requirements.

2.4 CONCRETE MIX

A. All Concrete mixes from the approved list or submitted for approval shall meet the following criteria.
   1. Mix concrete in accordance with ASTM C94 and ACI 301 Chapter 3.
   2. Cement Content: Type II cement, minimum of five hundred twenty-eight (528) pounds per cubic yard.

3. Fly Ash: Class F per CDOT Standard Specifications for Road and Bridge Construction Section 701.02. Fly ash shall not exceed twenty (20%) of total cementitious material by weight unless approved by the Project Manager.
4. Maximum water-cement ratio: 0.44.
5. Slump: Four inches (4") maximum when hand placed.
6. Air Entrainment: five percent (5%) to eight percent (8%).
7. Aggregate Size: three quarter-inch (3/4") maximum.
8. Concrete for Exterior Flatwork, including Pavement, Curb and Gutter, and Drainage Pans shall be Class P, as approved by the Project Manager.

2.5 FIBROUS CONCRETE REINFORCEMENT

A. Shall be one hundred percent (100%) virgin polypropylene, fibrillated fibers containing no reprocessed olefin materials and specifically manufactured to an optimum gradation utilizing twenty-five (25) individual fiber designs for use as concrete secondary reinforcement. Volume per cubic yard shall be one and one-half (1.5) pounds, or in accordance with manufacturer's recommendations. Fiber manufacturer must document evidence of five (5) year satisfactory performance history, compliance with applicable building codes and ASTM C1116 Type III 4.1.3 and ASTM C1116 Performance Level I.
   1. Fibrous concrete reinforcement shall be utilized in all flatwork applications.

2.6 EXPANSION JOINT MATERIAL

A. Interior Use or Exterior Use where sealants are specified: Bituminous saturated fiber conforming to ASTM D1751, one half-inch (1/2") thick. Provide manufacturer's certification of compatibility with specified sealants where required.

B. Pre-molded closed cell polyethylene foam backer rod if required.

C. Joint Sealant: ASTM D 5893 Type NS, Silicone per CDOT's approved joint and crack sealant list. Where concrete color additive is used, sealant color to match adjacent concrete.

2.7 SLIP JOINTS

A. Speed Dowel Model PSD09/#4TX, 9" long sleeve to accommodate 18" smooth steel round bar, 5/8" diameter. Manufactured by Sika/Greenstreak, or approved equal.

2.8 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth made from jute or kenaf, weighing approximately nine (9) oz./sq. yd. dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Spray Curing and Sealing Compound: White, Waterborne, Membrane-Forming ASTM C 1315, Type two (2), Class A, dissipating.

2.9 RELATED MATERIALS

A. Chemical Surface Retarder: Water-soluble, liquid, set retarder with color dye, for horizontal concrete surface application, capable of temporarily delaying final hardening of concrete to a depth of one eighth-inch (1/8”) to one quarter-inch (1/4”) to match the Project Manager’s sample.

2.10 TRUNCATED DOME INSERTS FOR RAMPS

A. All truncated domes within Parks maintained areas shall be unpainted grey cast iron plates conforming ASTM A-48 class 30.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

A. Requirements of Regulatory Agencies: Comply with all applicable provisions of the state and local building and safety codes.

B. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer, unless otherwise approved by Project Manager.

C. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
   1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").

D. Testing: All testing shall be completed by the Contractor at their expense unless otherwise specified by the contract.

E. Testing Agency Qualifications: Engage a qualified testing agency to perform material evaluation tests and to design concrete mixtures. Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
   1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

F. Testing Frequency: Obtain at least one composite sample for each one hundred (100) cubic yards, or fraction thereof of each concrete mixture placed each day.

a. When frequency of testing will provide fewer than five (5) compressive-strength tests for each concrete mixture, testing shall be conducted from at least five (5) randomly selected batches or from each batch if fewer than five (5) are used.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one (1) test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one (1) set of four (4) standard cylinder specimens for each composite sample.
5. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimen at seven days and two specimens at twenty-eight (28) days and keep one for backup in the event a sample should break.
   a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at twenty-eight (28) days.

G. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than two-hundred (200) psi.

H. Test results shall be reported in writing to Project Manager, concrete manufacturer, and Contractor within forty eight (48) hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at twenty eight (28) days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both seven (7) and twenty eight (28) day tests.

I. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Project Manager.

J. Concrete work will be considered defective if it does not pass tests and inspections.

K. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

L. Prepare test and inspection reports.

M. Record of Work: A record shall be kept by the Contractor listing the time and date of placement of all concrete for the structure. Such record shall be kept until the completion of the project and shall be available to the Project Manager for examination at any time.

N. Mockups: Prior to starting any concrete work, provide a sample panel using materials indicated for project work. For each type, color and finish of concrete specified, build panel at the site of full thickness and approximately ten feet (10') by 10 feet (10'), including expansion joints, control joint, scales, fillers, and one radial edge. Provide the workmanship proposed for the work. Correct and replace sample panel until Project Manager's acceptance of the work. Retain panel(s) during construction as a standard for completed paving work.
   1. Build panel approximately one-hundred (100) sq. ft. in the location indicated or, if not indicated, as directed by the Project Manager.
   2. Approved mockups may become part of the completed Work if approved prior to the construction of the mock up and is undisturbed at time of Substantial Completion.
   3. Notify the Project Manager a minimum of seven (7) days in advance of dates and times when mockups will be constructed.
   4. Obtain the Project Manager's written approval of the mockups before starting construction.
   5. If the Project Manager determines that the mockup does not meet the requirements, demolish and remove from the site and cast another until the mockup is approved.
   6. Maintain the mockups during construction in an undisturbed condition as a standard for judging the completed Work.
   7. Demolish and remove mockups when directed by the Project Manager.

O. Tolerances: Comply with tolerances in ACI 117, the Contract Drawings, and as follows:
   1. Elevation and Cross-slope: In conformance with grading plans and ADA.
   2. Thickness: Plus, three eighths-inch (3/8"), minus one quarter-inch (1/4").
   3. Surface: Gap below ten feet (10') long, unleveled straightedge not to exceed one eighth -inch (1/8").
   4. Lateral Alignment and Spacing of Dowels: one-inch (1").
   5. Vertical Alignment of Dowels: one quarter-inch (1/4").
   6. Joint Spacing: three-inches (3").
   7. Contraction Joint Depth: Plus, one quarter-inch (1/4"), no minus.
   8. Joint Width: Plus, one eighth-inch (1/8"), no minus.

3.2 PREPARATION OF SUBGRADE

A. Excavate to required depth in accordance with geotechnical report. Remove soft, yielding material and replace with select fill. Compact to minimum ninety-five percent (95%) Standard Proctor within two percent (2%) of optimum moisture.

B. Refer to Division 31 Section: Earth Moving for requirements for subgrade testing and proof-rolling.

C. Maintain subgrade in a compacted condition until concrete is placed.

3.3 FORMS

A. Metal, plastic, or uniform warp free lumber forms, coated with form release agent. Slope forms to give slabs positive drainage and stake securely. Obtain approval of the Project Manager for alignment and grade of forms a minimum of forty-eight (48) hours prior to placing concrete. Any concrete work installed without obtaining approval from the Project Manager shall be subject to removal and replacement at the discretion of the Project Manager, at no cost to the City.

B. Radii shall be continuous and flowing to avoid angular intersections in the horizontal alignment, radial forming shall use bender board or approved equal as directed by the Project Manager.

3.4 REMOVING AND REUSING FORMS

A. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

3.5 STEEL REINFORCEMENT

A. Install steel reinforcement only in locations shown on Contract Drawings.

B. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

C. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

D. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

3.6 CONCRETE PLACEMENT

A. Prior to placing any new sections of concrete pavement, the entire subgrade shall be scarified to a depth of 6-inches. In areas where existing pavement is to be removed and replaced the existing compacted subgrade may be reused if the subgrade meets specified compaction. In areas of existing subgrade that do not meet the specified compaction, materials shall be removed, replaced and compacted to meet the specified proctor density. Adjust moisture content and compact as hereinafter specified.

B. Contractor’s Review: The Contractor shall inspect forms and reinforcing prior to concrete placement to assure accurate placement embedded items and overall acceptability.

C. Project Manager's Review: Contractor shall provide minimum of forty-eight (48) hours' notice to the Project Manager to allow review of forms and reinforcement before concrete is placed and to observe placing of concrete.

D. Do not place concrete on frozen surfaces.

E. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

F. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

G. Do not add water to concrete during delivery.

H. Deposit and spread concrete in a continuous operation between transverse joints. Do not use vibratory equipment to move concrete into place.

I. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
   1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies**,** reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

J. Screed paving surface with a straightedge and strike off.

K. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

L. Curbs and Gutters: Use design mixture for automatic machine placement. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing.

M. Slip-Form Paving: Use design mixture for automatic machine placement. Produce paving to required thickness, lines, grades, finish, and jointing.
   1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of slip-form paving machine during operations.

N. Cold-Weather Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:
   1. When air temperature has fallen to or is expected to fall below forty degrees (40°) F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than fifty degrees (50°) F and not more than eighty degrees (80°) F at point of placement.

2. If subgrade is frozen, as determined by Geotechnical Engineer and/or Project Manager, thaw subgrade to depth of eight (8”) prior to placing concrete.
3. Do not use frozen materials or materials containing ice or snow.
4. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.

O. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:
1. Cool ingredients before mixing to maintain concrete temperature below ninety degrees (90°) F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.7 CONCRETE FINISHING

A. Allow time for bleed water to appear, then scrape or push off all bleed water. Do not work water into surface.

B. Final level, light bull float, but do not trowel surface.

C. After darbying or bullfloating, stop finishing until bleeding has ceased and until concrete can support foot pressure with only about one eighth-inch (1/8”) indentation. During or after the first floating, check planeness of surface with a ten foot (10’) straightedge applied at not less than two different angles, and then cut down all high spots and fill all low spots to achieve a true plane within one eighth-inch (1/8”) in ten feet (10’).

D. Finishes:
1. Medium Broom Finish: Provide a medium broom finish for all exterior concrete unless otherwise noted. Immediately after float finishing and tool work, roughen surface with fiber-bristle broom to match the approved mockup panel. Confirm direction or pattern of broom finish with the Project Manager prior to commencing slab placement.

E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a three eighths-inch (3/8”) radius. Final concrete finish to completed following jointing. Surface/edging tool marks are not acceptable.

F. Do not use evaporative retarders as finishing aid.

3.8 CONCRETE CURING AND SURFACE TREATMENTS

A. General:
   1. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Maintain concrete with minimal moisture loss at a relatively constant temperature for the period necessary for hydration of the cement and hardening of concrete.
   2. Curing shall commence as soon as free water has disappeared from the concrete surface after placing and finishing. The curing period shall be seven days for all concrete unless test cylinders, made and kept adjacent to the structure and cured by the same methods, are tested with the average compressive strength equal to seventy percent (70%) of the specified twenty-eight (28) day strength.
   3. Curing shall be in accordance with ACI 301 procedures. Avoid rapid drying at the end of the curing period. During hot and cold weather, cure concrete in accordance with ACI 305R and ACI 306R.

B. Curing Methods: Perform curing of concrete by curing and sealing compound, by moisture curing, by moisture-retaining cover curing, or by combinations thereof, as herein specified. Coordinate with and choose a curing method that is compatible with the requirements for subsequent material usage on the concrete surface.
   1. Provide curing and sealing compound to exterior slabs, walks, curbs, etcetera as follows:
      a. Apply specified curing and sealing compound to concrete slabs as soon as final finishing operations are complete. Apply uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions. Recoat areas subjected to rainfall within three hours after initial application.
      b. Maintain continuity of coating and repair damage during period.
   2. Provide moisture curing by one of the following methods:
      a. Keep concrete surface continuously wet by covering with water.
      b. Continuous water-fog spray.
      c. 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-inch lap over adjacent absorptive covers.
   3. Provide moisture retaining cover curing as follows: Cover concrete surfaces with a moisture-retaining cover for curing concrete, placed in widest practical width with sides and ends lapped at least 3-inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

C. Curing Formed Surfaces: Where wooden forms are used, cure formed concrete surfaces by moist curing with forms in place for full curing period or until forms are removed. When forms are removed, continue curing by methods specified above for specified curing time.

3.9 JOINT

A. Construct joints true to line with faces perpendicular to surface.

B. Expansion Joints: Expansion joint material shall be provided at the following locations and shall be in place prior to the placing of concrete:
   1. As shown on the Contract Drawings; or
   2. At each end of curb return.
   3. Between sidewalk and driveway slabs or service walks.
   4. Between new concrete and existing concrete.
   5. Between new concrete and fixed vertical objects.
   6. At maximum one hundred twenty foot (120') spacing.
   7. Provide half-inch (1/2”) thick by depth of the slab material, allow half-inch (1/2”) thickness for joint sealer.
   8. As directed by Project Manager.
   9. Thoroughly clean all surfaces prior to installation of sealant material.

C. Slip Joints:
   1. To be used at all Expansion Joints except at buildings, curbs, ramps and stairs.
   2. Dowels to be placed no closer than twelve-inches (12”) from edge of concrete and twenty-four-inches (24”) on-center.
   3. Attach bases to the face of concrete forms using a double-headed nail or self-tapping screw.
   4. Center of base shall be centered on form.
   5. Prior to placing concrete, Speed Dowel sleeve shall be slipped over base.
   6. Concrete shall not be placed directly over the Speed Dowel System. Place concrete minimum eighteen-inches (18”) from Speed Dowel system and work concrete around the Speed Dowel System.
   7. Concrete forms shall be removed with bases still attached. Bases may be reused.
   8. Install slip dowels to the full depth of the embedded Speed Dowel sleeve and proceed with next concrete pour.
   9. Greasing of dowels is not required. Embedded Speed Dowel Sleeve accommodates expansion and shrinkage movements that may occur.
   10. Bent or badly sheared slip dowels shall not be used. Saw cut dowels recommended, deburr ends.
   11. Place edge forms plumb. Out of plumb forms may result in misaligned dowels.

D. Contraction (Control) Joints in Walks: Contraction joints shall be formed with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut one eighth-inch (1/8”) wide joints into concrete that has hardened sufficiently that cutting action will not tear, abrade, or otherwise damage surface, but before development of random contraction cracks. Saw cut joints shall be spaced at a distance equal to the width of the walk, but not over ten feet (10’) unless approved by the Project Manager. Depth of joints shall be one-fourth (1/4) the slab thickness.
   1. Tooled joints will not be allowed on concrete trails, unless directed by the Project Manager.

E. Curb and Gutter Contraction (Control) Joints: Space curb and gutter joints not more than
twelve foot six-inches (12’-6”) on center, and align them with sidewalk joints. Contraction joints shall be tooled. Form plane of weakness by inserting and later removing a metal divider, finish with an edger or groover, or by saw cutting a previously tooled joint.

3.10 FORM REMOVAL

A. Remove forms after concrete surface is hard enough so as not to be damaged in any way. Reasonable care is to be used in removing forms. Repair minor defects with high strength grout as per the Project Manager’s direction. Plastering will not be permitted on exposed faces.

3.11 CLEANING

A. Perform cleaning during installation of the Work and upon completion of the Work. Remove all excess materials, debris, and equipment from the site. Repair any damage resulting from installation of the concrete.

B. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

3.12 PROTECTION AND REPAIR

A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Project Manager.

B. Drill test cores, where directed by the Project Manager, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.

C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material.

3.13 ACCEPTANCE

A. Concrete work will be accepted when it meets the specified strength and all other requirements of this specification.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Measurement will be made by the contract unit specified for Concrete Walks, Curbs and Miscellaneous Flatwork. Measurement shall include the actual number of units of specified material(s) placed and accepted at the locations shown on the Contract Drawings, or as directed by the Project Manager, and in accordance with the Specifications.

4.2 PAYMENT

A. Payment will be made at the contract unit price, and shall include required materials, transportation, equipment, labor, excavation, stockpiling, disposing, hauling off, watering, dust control, joint cutting, coordination with restroom building manufacturer, erosion and sediment control, compaction, sub-grade preparation, formwork, placing of concrete, reinforcing, joints, curing, sealing, finishing, testing, and all other items required to complete the work as required in accordance with the Contract Drawings and Specifications.

END OF SECTION 32 13 13

SECTION 32 15 40
CRUSHED STONE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes requirements for demolition, earthwork, grading, furnishing, and placement of crushed stone and gravel paving.
   1. Furnish and place crushed stone paving, bonded with fine aggregate, constructed on a prepared underlying base course in accordance with these specifications and in conformity with the dimensions, typical cross section, and the lines and grades shown on the Contract Drawings. The locations where crushed stone paving will be used are shown on the Contract Drawings.

1.3 REFERENCES

A. ASTM C117 – Test Method for Materials Finer than No. 200 (75-um) Sieve in Mineral Aggregates by Washing.

B. ASTM C136 – Method for Sieve Analysis of Fine and Coarse Aggregates.

C. ASTM D4318 – Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

1.4 SUBMITTALS

A. Material Analysis: Contractor shall provide copies of the following test data required by ASTM:
   1. ASTM C136 - Sieve Analysis.
   2. ASTM C127 - Specific Gravity and Absorption.
   3. ASTM C131 - L.A. Abrasion.

B. Samples: Provide a one (1) quart sample of all crusher fines and gravel paving material for approval.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws if applicable.

B. Bulk Materials:
   1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas, plant materials or within critical root zones.
   2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
   3. Accompany each delivery of bulk materials with appropriate certificates.

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 Project Manager. Contractor shall be responsible for hauling off-site and disposing of according to general conditions and codes of the governing jurisdiction.

1.6 PROJECT CONDITIONS

A. Environmental requirements: Work shall occur only when weather and soil conditions permit in accordance with locally accepted practice.

B. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with proposed crushed stone paving areas by field measurements before proceeding with work.

C. Interruption of Existing Services or Utilities: Do not interrupt services or utilities to facilities occupied by Owner or others.

D. Existing Conditions:
   1. Utilities: Determine location of existing and proposed underground utilities. Perform work in a manner to avoid damage. Hand excavate, as required.
   2. Excavation: Maintain grade stakes set by others until removal is mutually agreed upon by parties concerned.

E. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained.

1.7 MAINTENANCE SERVICE

A. General: Maintain Work in accordance with Division 01.
   1. Maintenance Period: Begin maintenance immediately after Work is completed. Maintain areas until the end of the Warranty period.

1.8 WARRANTY

A. See Division 01 Section “Warranty”.

PART 2 - PRODUCTS

2.1 CRUSHED STONE PAVING

A. Type: Crushed granite stone or gravel. Shall be unused material free of shale, lay, friable materials, organics and debris.
   1. Size Range: 3/8 inch maximum

Sieve Size	Percent Passing
2 inch	100
3/8 inch	100
No. 4	85
No. 8	63
No. 16	50
No. 30	39
No. 50	29
No. 100	18

   2. Color: Uniform grey, tan-beige or as approved by the Project Manager.

B. Factory blended stabilized crushed stone paving. Provide in all locations shown on the drawings.
   1. Mix crushed stone paving material with Natracil with a pug mill that includes a weigh-belt feeder.
      a. Mix fourteen (14) pounds of binder per two thousand (2,000) pounds of aggregate.

2.3 GRAVEL PAVING

A. Hard, durable stone, erosion resistant, washed free of loam, sand, clay, and other foreign substances, of following type, size range, and color. All gravel paving shall be installed at a depth of 4’’. Gravel paving shall have a minimum SRI of 29 for 50% of all gravel paving.

   1. River Cobble (2’’- 4’’)- 4’’ Depth: Butala (719.539.2521). Submit samples for landscape architect approval. Or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where the Work of this Section will be performed for compliance with requirements and conditions affecting installation and performance.
   1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within the work area.
   2. Verify that final grades are completed in accordance with the drawings.

B. Proceed with installation only after unsatisfactory conditions have been corrected and approved by Project Manager.

3.2 FIELD QUALITY CONTROL

A. Mock-up: Provide field constructed sample installation of crushed stone paving and prepared subgrade.
   1. Mock-up to be ten foot (10') x ten foot (10') and located where directed by Project Manager. Mock-up shall include proposed edge and banding, and surface stabilization if specified.
   2. Project Manager shall review mock up within forty-eight (48) hours of notification by the contractor.
   3. Make necessary adjustments as directed by Project Manager.
   4. Obtain approval from Project Manager before proceeding with the Work.
   5. Retain and protect mock-up during construction as a standard for judging completed crushed stone paving work. Do not remove or destroy mock-up until work is completed.
   6. Accepted and properly maintained sample installations may remain in completed work if approved in writing by Project Manager.
   7. All work shall match accepted field mock-up.

3.3 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, turf areas, existing landscape areas, and trees from damage.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of

C. Install edging of type and in locations shown on drawings. Obtain acceptance of layout by Project Manager before excavating or installing. Make minor adjustments as required.

3.4 PLACEMENT OF CRUSHED STONE PAVING

A. Cut earthwork to width of trail/area to receive crusher fines paving to approximate depth section as specified on the Contract Drawings. Remove, haul and dispose of excess material off site, or use on-site with approval of Project Manager.

B. Complete excavation required in sub-grade before fine grading and final compaction of sub-grade is performed. Extend sub-grade compaction one foot (1') beyond proposed edge of crushed stone paving or as indicated on drawings.
   1. Where earth moving is required the sub-grade shall be compacted to ninety five percent (95%) standard proctor within two percent (2%) of the optimum moisture.
   2. Keep areas being graded or compacted shaped and drained during construction. Ruts greater than or equal to 1 inch deep in sub-grade shall be graded out and reshaped as required, and re-compacted before crushed stone paving placement.
   3. If the trail is part of a cross slope it should drain in the direction of the slope no greater than two percent (2%). Ensure that no low spots exist so that ponding does not occur.

C. Prior to placement of Crushed Stone Paving material, the sub-grade shall be proof rolled. Where soft spots are detected, scarify subgrade beneath Crushed Stone Paving trail to a minimum of six-inch (6") depth. Moisture treat and compact to a minimum ninety five percent (95%) proctor density as determined by ASTM D698 or AASHTO T-99. Take moisture density tests every two hundred fifty (250) lineal feet of trail or proof roll. Treat and compact sub-grade, leaving it 5-inches below final grade for placement of Crushed Stone Paving. Compact material and retest by proof rolling to achieve approval of Project Manager.

D. Install crushed stone paving only after excavation and construction work which might injure it have been completed, and after edging has been completely installed on the compacted sub-grade. Install crushed stone paving, over compacted base course in areas indicated on plan.

E. Spread crushed stone evenly to fifty percent (50%) of specified depth. Avoid segregation of aggregate and contamination with lower courses or sub-grade.

F. Compact to ninety-five percent (95%) of maximum density as determined by ASTM D1557.
   1. Maintain surface course moisture content within plus/minus three percent (± 3%) of optimum. Add water to quarry fines paving as required to achieve optimum moisture content and a uniform, compacted surface conforming to the finish grades indicated.
   2. Compact areas inaccessible to rolling by mechanical tamping.

G. Protect crushed stone paving from soil or other contaminates during and following installation.

H. Spread and compact additional crushed stone paving to achieve the required minimum compacted thickness per compaction requirements in this section

3.5 PLACEMENT OF STABILIZED CRUSHED STONE PAVING: ADD ALTERNATE

A. Only place stabilized crushers fines where there are no plantings.

B. Complete items 3.3.A through H above using specified crusher fines material with pre-incorporated specified binder at specified application rates.

C. Do not allow traffic on stabilized crushed stone paving for two days.

3.6 MAINTENANCE AND REPAIRS:

A. Crusher Fines Paving:
   1. Areas that do not compact, become eroded or are degraded in visual quality and/or performance as determined by the Project Manager are to be removed and/or repaired. Obtain approval of repair methods from Project Manager prior to affecting repairs.

B. Stabilized Crusher Fines Paving:
   1. To repair, excavate damaged area leaving a minimum one-inch (1") depth of existing stabilized crushed stone paving. Apply stabilized crusher fines to existing surface as described above. Compact per 3.3.F above.
   2. Do not allow traffic on repaired stabilized crushed stone paving for two days or until paving has fully cured.

3.7 CLEANUP AND PROTECTION

A. All areas shall be clean at the end of each workday.

B. The contractor shall maintain protection during installation, curing, and maintenance periods.
   1. Erect temporary fencing or barricades and warning signs as required protecting newly installed Crushed Stone Paving areas from traffic, other trades, and trespassers. Maintain fencing and barricades throughout initial maintenance period and remove with approval of Project Manager.

C. Project completion: All debris, soil, trash, and excavated and/or stripped material resulting from Crushed Stone Paving operations and unsuitable for or in excess of requirements for completing work of this Section shall be disposed of off-site.

D. Maintain protection during installation and maintenance periods. See Division 1. Treat, repair or replace damaged work as required.

3.8 QUALITY ASSURANCE

A. Refer to Division 1 Section "Quality Assurance".

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Measurement will be made by the contract unit specified for Crushed Stone Paving. Measurement shall include the actual number of units of specified material(s) placed and accepted at the locations shown on the Contract Drawings, or as directed by the Project Manager, and in accordance with the Specifications.

4.2 PAYMENT

A. Payment will be made at the contract unit price, and shall include required materials, transportation, equipment, labor, excavation, dry streambed placement, delivery, grading, stockpiling, disposing, hauling off, landscape fabric, watering, dust control, stabilizer, fine grading, placing cobble, placing Mexican cobble in the sensory area, placement of river cobble in crusher fines in the sensory area, approval of placement, submittals, landscape renovation, coordination with landscape supplier as required in accordance with the Contract Drawings and Specifications.

END OF SECTION 32 15 40

SECTION 32 20 00
SITE FURNISHINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Furnish all labor, materials, supplies, equipment, tools, and transportation, and perform all operations in connection with and reasonably incidental to complete installation of site work and site furnishings. Install per manufacturer's specifications.

1.3 SUBMITTALS

A. Manufacturer's Product Data for each type of product indicated in accordance with Division 01 Section "Submittals". The Contractor shall submit color samples, technical data, and installation methods prior to ordering or installation for approval by the Project Manager.
1. Shade Structure
2. Picnic Table
3. Bench – Install Only
4. Fence – Install Only

B. Shop Drawings in accordance with Division 01 Section "Shop and Working Drawings, Product Data, and Samples".

1.4 HANDLING AND STORAGE

A. Protect all materials from damage, deterioration, or loss of any kind while in storage and during Construction.

B. Ensure that the site furnishings have not been damaged during shipping. Damaged materials will not be accepted. If materials have been damaged beyond repair, they must be replaced with new materials of the same type and kind at no additional cost to the City. Damaged materials that have been repaired will be accepted only if the damaged part or parts can be replaced with a completely new manufacturer-supplied part or parts of the same type and kind.

PART 2 – PRODUCTS

2.1 SHADE STRUCTURE

A. Poligon Chelsea Style Shelter with Multi-Rib Roof (Or other approved by City Staff)
   1. Model: 20’ x 24’
   2. Representative: Churchich Recreation
   3. Phone: 303-530-4414 ext 15
   4. Website: churchichrecreation.net
   5. Install per manufacturer’s recommendations, or approved equal.

2.2 PICNIC TABLE

A. Picnic Table: Shall installed per the Manufacturer’s recommendations. (Or other approved by City Staff)
   1. Product: DuMor Model #448-44, S-2 Surface Mount, or approved equal.
   2. Color: Approved by City Staff

2.3 BENCH

Bench: Owner provided, Custom Furnishing, Contractor to install per Manufacturer’s recommendations.

2.4 FENCE

Fence: Owner provided, Custom Furnishing

PART 3 – EXECUTION

3.1 INSTALLATION OF SITE FURNISHINGS

A. Locate all furniture on site for review by the City Project Manager prior to installation.

B. All site furnishings shall be set plumb and level and shall be installed per the manufacturer’s recommendations.

C. Coordinate with City Project Manager the Owner provided Site Furnishings for delivery, storage, and placement.

D. Prior to completion of project, clean all site furnishings to remove any dust, dirt, or debris. Provide a clean factory finish at time of Substantial Completion.

3.2 INSPECTION

Inspection of the work to determine the completion of contract, exclusive of the possible repair and replacement of equipment under the normal one (1) year guarantee of the

project, will be made by the Owner upon written notice requesting such inspection submitted by the Contractor at least ten (10) days prior to the anticipated date.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Measurement will be made by the contract unit specified for Site Furnishings. Measurement shall include the actual number of units of specified material(s) placed and accepted at the locations shown on the Contract Drawings, or as directed by the Project Manager, and in accordance with the Specifications.

4.2 PAYMENT

A. Payment will be made at the contract unit price, and shall include the required materials, surface preparation, transportation, equipment, labor, loading, storage, final location coordination, installation, synthetic turf manufacturer coordination, permitting coordination with Shade structure manufacturer, building department coordination, coordination with Owner provided furnishings and placement, and temporary protection as required in accordance with the Contract Drawings and Specifications.

END OF SECTION 32 20 00

SECTION 32 80 00
IRRIGATION SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the requirements for the installation of an underground irrigation system including the following:
   1. Trenching, stockpiling excavation materials, refilling and compacting trenches.
   2. Complete irrigation system including but not limited to piping, valves, fittings, heads, wiring, sensors, backflow preventer(s), Automatic Irrigation Controller(s) and final adjustments to insure complete coverage.
   3. Water connections.
   4. Replacement of unsatisfactory materials.
   5. Cleanup, inspections, and approval.
   6. Testing.

1.3 REFERENCES

A. 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.
   3. National Sanitation Foundation (NSF) – Piping and backflow prevention.
   4. American Water Works Association (AWWA) – Piping and backflow prevention.

1.4 QUALITY CONTROL

A. Special Requirements.
   1. Tolerances: Specified depths of mains and laterals and pitch of pipes shall be installed per the Contract Drawings and specifications.
   2. Compaction: 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 Sections.
   4. Damage to other Improvements: Contractor shall replace or repair damage to grading, soil preparation, seeding, sodding, planting and/or new site features done under other Sections during Work associated with installation of irrigation system at no additional cost to the City.
   5. Damage or Disturbance to the Existing Irrigation Components: Damage to existing components as a result of work being performed by the Contractor will

require the Contractor to replace the damaged components to the City's current standards, at no additional cost to the City.

6. Water Delivery Interruption: When working on an existing irrigation system, the Irrigation Contractor shall contact the Project Manager and inform them seventy-two (72) hours in advance of any water interruption that is required. The maximum irrigation system interruption is to be no more than seventy-two (72) hours during the growing season, without prior approval from the Project Manager. The contractor shall make all necessary provisions including material, equipment, labor, delivery and scheduling as required to complete all points of connection, upgrades, and improvements within seventy-two (72) hours.
7. Permits: Work involving high voltage electrical wiring, grounding and related Work shall be executed by licensed and bonded electrician. Secure a permit at least forty-eight (48) hours prior to start of installation

B. Pre-Construction Conferences and Site Meetings:

1. Contractor shall schedule and conduct a pre-construction conference to review in detail quality control and construction requirements for equipment and materials used to perform the Work. Conference shall be scheduled not less than ten (10) days prior to commencement of Work. All parties required to be in attendance shall be notified no later than seven (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 the Project Manager, Parks Superintendent, Operations Supervisor, the Contractor's Superintendent, and Installer.
2. Prior to commencement of Work, Contractor shall schedule an on-site conference with Project Manager and any other parties designated by Project Manager to discuss tree protection requirements, staging locations, traffic control, and equipment access. Provide a minimum of seven (7) days notice prior to date of conference.
    a. Identify on Contact Drawings all existing locations of components.
    b. Verify the operation of each component.
    c. Provide documentation of existing components and conditions to the Project Manager prior to starting Work.
3. Contractor shall schedule on-site conferences the frequency of which is to be determined by the Project Manager and any other parties designated by the Project Manager to review project progress.
4. Contractor shall record Meeting Minutes of each conference and distribute to all parties in attendance within three (3) days of conference.

1.5 SUBMITTALS

A. Prepare and make submittals in accordance with conditions of the Contract prior to installation of any irrigation equipment:

B. Material List: Submit a PDF file of complete list of materials, and cut sheets 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.

C. Shop Contract Drawings: If applicable, submit shop Contract Drawings for pumps, backflows and assemblies. Include plumbing and foundation/support systems if the installation differs from the manufacturer's recommended installation.

D. Operation and Maintenance Manual: Supply Operation and Maintenance information for installed booster pumps and pump stations. See Division 01 Section "Operation and Maintenance Data" for manual requirements.

E. Warranty: Submit a written warranty, in accordance with City of Salida requirements.

1.6 CONTRACT RECORD DRAWINGS

A. Prior to the installation of the irrigation system, the Contractor will provide on-site copies of the original irrigation design Contract Drawings for "Contract Record Drawings". Contractor to revise Contract Record Drawings in red ink as the Work progresses to show any changes to the plan and include field dimensions. Contract Record Drawings shall be brought up-to-date prior to any Pay Application Submittals that contain irrigation installation. Should the Contractor choose to utilize GPS for the purposes of documenting Work in progress, a hard copy print will need to be provided prior to Pay Application Submittal. A print of Contract Record Drawings shall be available at Project Site for review by the Project Manager at any time during the project.

B. Contract Record Drawings shall encompass entire scope of work including any altered existing equipment and altered zones, and notate the Automatic Irrigation Controller zone number, type of irrigation, GPM, operating PSI for any altered or added zone.

C. Preparation of Contract Record Drawings: Dimension from two (2) permanent points of reference (building corners, sidewalk, road intersections, or permanent structures) the location of the following items:
   1. Point of connection
   2. Meters and Vaults
   3. Curb stops
   4. Drain valves
   5. Pumps
   6. Backflows
   7. Bypass lines
   8. Service lines
   9. Routing of irrigation mainline. Provide dimensions for each two hundred linear feet (200 L.F.) maximum along each routing and for each change of direction
   10. Routing of non-pressure lateral lines, layout and size, if altered from original design
   11. Sprinkler control valves
   12. Quick coupling valves
   13. Flow meter
   14. Master valve
   15. Rain sensors/rain gauges/weather stations

16. Wire splice boxes
17. Control wire routing, if not with pressure mainline
18. Gate valves
19. Air relief valves
20. Sleeves
21. Flush valves
22. Power service drop
23. Two-wire grounding rods
24. Other related equipment as directed

D. Make dimensions accurately at the same scale used in the original Contract Drawings, or larger. Notes and dimension lettering must be legible. Dimension lines shall be drawn on the plan(s) neatly along the outside edge and shall be red for clarity. Scale shall be included on the drawings.

E. The irrigation legend and zone call outs must be changed to accurately reflect the irrigation equipment installed, if such equipment is not the same as originally specified on the contract documents. This includes flow rates, effective spray diameter/radius and operating pressure of all sprinkler heads.

F. The Project Manager will not certify any pay request submitted by the Contractor if the Contract Record Drawings are not current, and processing of pay request will not occur until Contract Record Drawings are updated.

G. Prior to the Substantial Completion walk, the Contractor shall provide a digital copy of the irrigation design with record installation information that reflects all changes made over the course of the construction project. Contract Record Drawings shall include details of any revisions as per actual installation. Deliver and submit to the Project Manager for review of the following items:
1. Digital Contract Record Drawings in both PDF and AutoCAD format (include any related X-ref files, plot files and pen settings.) Make any additional changes to the file as directed by the Project Manager prior to final submittal and approval.

H. Request for Substantial Completion will not be processed until all Contract Record Drawing prints and digital files have been received and approved by the Project Manager.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Packing and Shipping: Deliver all components to job site 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.

B. Handling, Storage and Delivery of PVC Pipe:
1. Exercise care in handling, loading and storage of PVC pipe.

2. Provide forty-eight (48) hours advance notice of delivery to the Project Manager for observation of unloading and handling of PVC materials during delivery.
3. 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 shall be replaced with new piping.

C. Storage and Protection: Deliver, unload, store, and handle materials, packaging, and products in dry, weatherproof condition in manner to prevent damage, breakage, deterioration, intrusion, ignition, and vandalism.

D. Only materials and equipment meeting project specifications and to be used as part of Project shall be stored on site. Project Manager to may verify at any time during construction period.

1.8 JOBSITE CONDITIONS

A. Existing Conditions:
1. Soil Conditions: The Contractor is responsible for investigating the type of soil and conditions in which lines are to be installed. No extra payment will be allowed due to difficulty in trenching, unless approved by the Project Manager.
2. Contractor is responsible for understanding the scope of related operations as specified and indicated in the Contract Drawings and Specifications before beginning Work under this Section.
3. Report unsatisfactory conditions in writing to the Project Manager within twenty-four (24) hours of discovery. Commencement of installation means acceptance of existing conditions by the Contractor.

B. Protection of Property:
1. Protect buildings, walks, walls, and other property from damage. Erect and maintain barricades, warning signs and lights, and provide guards as necessary or required to protect all persons on the site. Damage caused to asphalt, concrete, monuments, structures or other building material surfaces shall be repaired or replaced at no cost to the City. Restore disturbed areas to original condition.
2. The Contractor is responsible for potholing of all existing utilities, irrigation lines or any other underground improvements that may be damaged due to the installation of Irrigation Systems.

C. Protection of Existing Trees:
1. Refer to Division 01 Section “Tree Retention and Protection”.

D. Protection and Repair of Underground Lines:
1. Request utility locates seventy-two (72) hours in advance of any excavations by calling the Utility Notification Center of Colorado at 811. Take whatever precautions are necessary, including pot holing to verify location and depth to protect these underground lines from damage. If damage does occur, all damage shall be repaired by the Utility Owner. All costs of such repairs shall be paid by Contractor.

2. The Contractor is required to contact all private utility companies including the City of Salida to locate all private utilities. The request for locates shall be a minimum of seventy two (72) hours prior to proceeding with any excavation. If, after such requests private utilities are encountered and damaged by the Contractor these shall be repaired at no cost to the City. If the Contractor damages staked or located private utilities, they shall be repaired by the Utility Owner at the Contractor's expense.

E. Replacement of Paving and Curbs: Any damage due to work that occurs adjacent to or crosses existing roadways, paths, trails, curbing, sidewalks, etc. shall be restored to original condition at the contractors expense, and the satisfaction of the Project Manager.

1.9 WARRANTY/GUARANTEE

A. Provide a one (1) year written warranty for material and installation from date of Substantial Completion.

B. Expenses due to vandalism before Substantial Completion shall be the Contractor's responsibility.

C. Any settling of backfilled trenches that occurs during warranty period shall be repaired at no expense to the City, including complete restoration of damaged property.

D. The Contractor is responsible to monitor and coordinate Automatic Irrigation Controller scheduling and maintenance with the Project Manager for any seeding, sodding, or planting areas under the Contractor's warranty.

E. Project Manager reserves the right for Parks Operations Staff to make temporary repairs during the warranty period as necessary to keep systems in operating condition without voiding the Contractor's warranty, nor relieving the Contractor of their responsibilities.

F. The Contractor shall make repairs and replacements within three days of notification. If the Contractor fails to make repairs within three days, the City will make such repairs at the Contractor's expense.

1.10 TURN OVER ITEMS

A. Where applicable, furnish the following maintenance items to City prior to Substantial Completion:
1. Two (2) sprinkler heads for each size and type specified.
2. Two (2) nozzles for each type of head and spray pattern.
3. Two (2) head adjustment tools for each type of head installed.
4. Two (2) valve keys for operating each type of manual valve. (Manual drain valves, isolation valves).
5. Two (2) valve keys and hose swivels for each type of quick coupling valve.
6. Hand-held remote radio for each Controller that is installed.

1.11 MAINTENANCE DURING PROJECT CONSTRUCTION

A. Within Limits of Construction: Contractor shall fence, water, and keep weed free any turf, trees and any plantings within the limits of construction. Contractor is responsible for maintenance which includes picking up trash, weed control and mowing of turf and native areas within the limits of construction. Contractor is responsible for watering existing landscape within limits of construction. Turf and plants affected by mainline work or irrigation water service shutdown during irrigation season shall receive watering per Parks' schedule, with no interruption of watering greater than seventy-two (72) hours. The Contractor is responsible for maintenance until Final Acceptance is granted.

B. Outside Limits of Construction: Coordinate Automatic Irrigation Controller scheduling and maintenance operations with Project Manager for portions of City property unaffected by construction.

C. Additional Maintenance During Warranty Period:
   1. Make repairs and replacements needed due to defective workmanship and materials.
   2. Winterization: Include cost in bid for winterizing complete system at conclusion of irrigation season (during which system received final acceptance) within three (3)-days of notification by the City. System shall be voided of water using compressed air. Coordinate with the Parks Operations Supervisor and the Project Manager to be present during the winterization procedures. The Contractor shall notify all persons that are to be present a minimum of forty eight (48) hours prior to the winterization of the system.
   3. Spring Start Up: To take place the following season within three (3) days of notification by the City. Open, operate, adjust system and make any necessary repairs. Coordinate with the Parks Operations Supervisor and the Project Manager to be present during the spring start up procedures. The Contractor shall notify all persons that are to be present at the spring start up a minimum of forty-eight (48) hours prior to starting of the system.

PART 2 - PRODUCTS

2.1 GENERAL

A. Equipment must have performance characteristics to operate per the design conditions indicated. If any discrepancy or conflict exists between the quantities of equipment listed in the schedule and quantities shown on the Contract Drawings, the greater quantity shall govern.

B. All material shall be of the highest grade possible and where applicable, shall be marked accordingly and shall be new.

2.2 PIPE AND PIPE FITTINGS

A. Main and Lateral Lines:

1. Main Lines (pressurized, downstream of backflow prevention units):
    a. Class 200 PVC BE, size one inch (1") through two inch (2").
    b. Class 200 PVC RT/Gasketed, size two and one-half inches (2-1/2") and larger.
    c. Velocities in PVC mainline shall not exceed five feet (5') per second.
    d. All PVC pipe shall conform to the requirements of Type 1-ASTM-D-2241.
2. Polyvinyl Chloride (PVC)_ Lateral Lines
    a. Class 200 PVC BE, size one inch (1") to three inch (3").
    b. Velocities in PVC mainline shall not exceed five feet (5') per second.
    c. All PVC pipe shall conform to the requirements of Type 1-ASTM-D-2241.
3. Polyethylene Lateral Lines:
    a. One hundred (100) PSI High Density NSF Polyethylene Piping – one inch (1") minimum diameter.
    b. Velocity of water flow in polyethylene pipe shall not exceed seven and one half (7-1/2) feet per second.

B. Sleeving:
1. Horizontal sleeves under paved surfaces: DR 11 HDPE.
2. Vertical sleeves for access to drains and valves: Schedule 40 PVC.
3. Horizontal sleeving for boring applications: DR 11 HDPE.

C. Brass Pipe and Fittings:
1. Brass Pipe: Eighty-five percent (85%) red brass, ANSI Schedule 40 threaded pipe.
2. Fittings: Medium brass, threaded one hundred twenty five (125) pound class.

D. Pipe and Fittings:
1. Identification Markings: Identify all pipe with following indelible markings:
    a. Manufacturer's name.
    b. Nominal pipe size.
    c. Schedule of class.
    d. Pressure rating.
    e. NSF (National Sanitation Foundation) seal of approval.
    f. Date of extrusion.
2. Class 200 PVC Pipe (pressurized mainline one and one-half inches (1-1/2") and smaller):
    a. Pipe will be assembled with Schedule 80 PVC fittings and solvent welded using ASTM-F-656 purple primer followed with heavy bodied ASTM-D-2564 cement.
3. Class 200 PVC Pipe (pressurized mainline two inches (2") and larger):
    a. Manufactured from virgin Polyvinyl Chloride compound in accordance with ASTM D2241 and ASTM D1784; cell classification 1254-B, Type 1, Grade 1.
    b. All fittings, service tees and pipe restraints shall be epoxy-coated ductile iron fittings.
4. Class 200 PVC Pipe (all lateral lines)
    a. Pipe will be assembled with Schedule 40 PVC fittings and solvent welded using ASTM-F-656 purple primer followed with heavy bodied ASTM-D-2564 cement.

5. High Density Polyethylene (HDPE)
    a. Must meet ANSI/AWWA C906, ASTM F714/D3035. Materials used for the manufacture of polyethylene pipe and fittings shall be made from PE 4710 high density polyethylene resin compound meeting cell classification 445574C/E per ASTM D3350. Certification ANSI/NSF 61/14. All fittings shall be installed using butt-fused fittings or thermo-fused fittings/couplings and must be approved by the Project Manager.
6. Polyethylene Lateral lines (non-pressure lateral lines)
    a. Manufactured from virgin polyethylene in accordance with ASTM D2239, designated as PE 3408. Maximum size two inches (2”); minimum size one inch (1”).
    b. Fittings: Manufactured in accordance with ASTM D2609; PVC Type 1 cell classification 12454-B.
    c. Clamps: All stainless-steel worm gear screw clamps. Use two (2) clamps per connection on all insert fittings.

2.3 DETECTABLE MARKING TAPE

A. Detectable marking tape shall be three inches (3”) wide with lettering at one and a half inches (1.5”) tall. Tape shall be either blue with “Caution Irrigation Line Buried Below” or purple with “Caution Recycled/Reclaimed Water Line Buried Below”.
1. Tape shall consist of a 4.5 mil (0.005") thickness; five-ply composition; ultra-high molecular weight; one hundred percent (100%) virgin polyethylene; acid, alkaline and corrosion resistant. Tape is five (5) mil overall thickness, with a .35 mil solid aluminum foil core. A .8 mil clear film, reverse printed with a repeating warning message is laminated to aluminum foil with a 3.75 mil clear film backing.
2. The tape tensile strength shall be in accordance with ASTM D882-80A and shall not be less than seven thousand eight hundred (7,800) PSI.
3. Elongation properties shall be in accordance with ASTM D882-80A and are less than one hundred fifty percent (150%) at the break point.

2.4 VALVES

A. Gate Valve or Isolation Valve:
1. Valve for one and one-half inch (1-1/2”) and smaller mainline (solvent weld): Shall be Class 125, 304 Stainless Steel with screw-in bonnet, non-rising stem, left hand opening with a stainless steel cross top handle gate valve with clear waterway equal to full diameter of pipe. Able to withstand continuous working pressure of two hundred (200) PSI. Wheel type handle is unacceptable.
2. Valve for two inch (2”) and larger mainline: Shall be epoxy coated interior and exterior ductile iron body which meets ASTM A-536, Grade 65-45-12, push-on, left-hand opening, square nut operated, resilient wedge, mechanical joint AWWA C153 gate valve with clear waterway equal to full diameter of pipe. Able to withstand continuous working pressure of two- hundred fifty (250) PSI. Wheel type handle is unacceptable.

B. Automatic Control Valve:

1. Automatic Valve for Potable Water System: Rainbird PEB/PESB Globe Configuration Valve having manual flow adjustment and both internal and external manual bleed.
2. Valve Riser: Epoxy coated ductile iron riser with integral stainless-steel angle valve or approved equal.
3. Valve ID Tag: Install one flexible marker tag on each valve. Mark each tag with indelible ink indicating zone number. Tags shall be: Potable water systems (yellow), Non-potable systems (purple)

C. Manual Drain Valve:
1. Drain Valve: Mueller Oriseal #H-10283N with brass swing joint assembly, or approved equal.

D. Quick Coupling Valves:
1. Rainbird 44-LRC brass two-piece body with stabilizer, designed for working pressure of one hundred fifty (150) PSI; one inch (1") FIP. Size as shown on drawing.
2. Quick Coupling Valves immediately after the backflow shall be used for winterization and shall be constructed of all brass swing joint and fittings. All other Quick Coupling Valve swing joints shall be constructed as shown on the details.

E. Valve Boxes:
1. All valve boxes shall have a stainless steel hex bolt locking lid system.
2. Isolation Valves, Quick Coupling Valves, Drain Valves, Wire Splices and Ground Rods: Shall be branded with equipment type as outlined in Part 3 - Execution.
   a. Rain Bird VB10RNDH, round body.

3. Electric Control Valve Box: Shall be branded with the zone numbers as outlined in Part 3 - Execution.
   a. Three-quarter inch (3/4") through one-inch (1") valves: Rain Bird VBSTDH, standard body.
   b. One and one-half inch (1-1/2") through two-inch (2") valves: Rain Bird VBJMBH, jumbo body.

4. Valve box cover color:
   a. Green for potable systems.
   b. Purple for non-potable systems.

5. Gravel Leveling Bed and Drainage Sump in Valve Boxes: three quarter inch (3/4") crushed gravel covered in geo-textile fabric, as indicated on the Contract Drawings.

2.5 IRRIGATION HEADS

A. Heads: Provide fabricated riser units of the type and size as indicated on the Contract Drawings. Heads of a specific type or function in the system shall be of the same manufacturer and shall be marked with the manufacturer's name and identification in such a position that they can be identified without being removed from the system.

1. Pop-Up Sprinkler Heads in turf areas: Rain Bird RD-06-S-F series.
    a. P30 for spray nozzles
    b. P45 for rotary nozzles
2. Pop-Up Sprinkler Heads in native grass areas and flower bed areas: Rain Bird RD-12-S- -F series.
    a. P30 for spray nozzles
    b. P45 for rotary nozzles
3. Pop-Up Sprinkler Heads for trees in native areas; Rain Bird RD-12-P45-S-F series with specified rotary nozzles as indicated on contract drawings.
4. Pop-Up Sprinkler Nozzles shall be Rain Bird MPR Series nozzle. Strip series, rotary, and VAN nozzles may be used for specific approved applications at the direction of the Project Manager.
5. Gear Driven Heads: Rainbird 5006 with stainless steel risers, internal check valve, SAM and PRS as specified per Contract Drawings. Plastic risers are permitted on twelve-inch (12”) rotor heads used in native areas. Minimum riser height shall be six inches (6”) in turf areas.

B. Connections to Lateral Pipe:
1. Pop-up Heads: Shall be one-half inch (1/2”) swing pipe, 0.49 inside dimeter with an operating pressure of eighty (80) PSI.
2. Gear Driven Heads: Shall be Rain Bird TSJ Series swing joints.

2.6 LOW VOLUME IRRIGATION

a. Valve: Rain Bird XCZ-100-PRB-COM Series Control Zone Kit with PESB Valve and Pressure Regulating (40 psi), Basket Filter, size per Contract Drawings.
b. Valve shall be installed in Rain Bird VBSPRPH, super jumbo body valve box with locking cover.

B. Supply Header: Class 200 PVC. All supply header piping to be installed at a twelve inch (12”) depth, or as directed by the Project Manager.

C. Sub-surface Irrigation: Landscape Dripline, emitter spacing and flow as per Contract Drawings. All sub surface laterals to be buried at a minimum four inch (4”) depth in soil, or as directed by the Project Manager.
1. Flush valve installed in a Rain Bird VB10RNDH, round body valve box with locking cover.
2. Operation Indicator Head - Rain Bird RD12 spray head with closed 6 series (orange) VAN nozzle shall be installed adjacent to flush valve at each end of the zone.

2.7 AUTOMATIC CONTROL SYSTEM

A. Controllers:
a. Two Wire Systems:
1) Rainbird ESP-LXD – two-wire controller with ET Manager cartridge including flow manager with metal pedestal unless otherwise specified on plans.
b. Conventional Wire Systems:

1) Rainbird ESP-LXMEF – smart flow irrigation controller with metal pedestal unless otherwise specified on plans.

B. Electrical Control Wiring:
   1. Two Wire Systems:
      a. Two-Wire Decoder Cable – Two (2), #12 or #14 AWG UL. parallel wires each with single, solid copper conductors with polyethylene insulation. Wires shall be contained within separate polyethylene jacket. Cable shall be Regency Maxi Cable with red jacket.
         1) 14 AWG for up to 2500 feet.
         2) 12 AWG for over 2500 feet.
      b. Two-wire single station decoders - FD-Turf Series - to be installed in each valve box, one per valve. Decoders shall have a serial number engraved on each decoder for future identification.
      c. Two-wire decoder cable shall have surge arrestors installed every five hundred (500) ft. along two-wire path or every eight decoders whichever is the shortest distance. Surge arrestors are to be place in valve box containing automatic control valve or in separate Rain Bird VB10RNDH, round body valve box with locking cover. Surge arrestor grounding shall be installed per manufacturer's recommendations.
      d. Copper wire shall be six (6) gauge bare solid copper wire connected to the ground rod using a Cadweld GR1161GPLUS "Plus One Shot" welding kit.
      e. Two-Wire Splice Box: Rain Bird VB10RNDH, round body valve box with locking cover.
   2. Conventional Wire Systems:
      a. Electrical Control Wire for 24VAC Solenoid: Sprinkler Wire - #12 to #14 AWG UL approved direct burial solid conductor copper wiring with polyethylene insulation 0.045-inch thickness.
      b. Electrical Common Wire: Sprinkler Wire - #12 AWG UL approved direct burial solid conductor copper wiring with polyethylene insulation 0.045-inch thickness.
      c. Wire Colors: Match existing color system throughout.

C. Miscellaneous control wiring materials:

   1. Materials for both standard and two wire systems.
      a. Data Wires: Paige 7171D-A direct burial shielded and armored signal cable with polyethylene jacket (NO SUBSTITUTIONS).
         1) Data Wire connections and splices shall be made with Ranger Servi-Seal.
      b. Control Wire and Two-Wire Decoder Cable connections and splices shall be made with 3M DBR/Y-6M direct bury splice, or approved equal, UL listed dry splice methods.
      c. Spare Wire and wire ends shall be capped with 3M DBR/Y.
      d. Mainline Tracer Wire: One (1) continuous AWG UL #10 tracer wire as detailed above all mainline
      e. Splice Box: Rain Bird VB10RNDH, round body valve box with locking cover.

PART 3 - EXECUTION

3.1 PREPARATION

A. Utility Locates: Contact Utility Notification Center of Colorado at or 8-1-1 or 1-800-922-1987 prior to any excavation, for the marking of underground member utilities. The indication of utilities on the Contract Drawings does not relieve the Contractor of the responsibility for utility location. The Contractor is responsible for potholing all utility locations to verify the depth and locations. Potholing related to irrigation installation shall be considered incidental to irrigation installation and will not be paid for separately. Route trenches to avoid existing utilities. Verify with the Project Manager any required relocation prior to installation.

B. 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.

C. Pressure Verification: Contractor shall field verify the tap size, static pressure and verify gallons per minute flow at the project site, prior to commencing Work or ordering irrigation materials, and submit findings in writing to the Project Manager. If Contractor fails to verify tap size, static water pressure and flow prior to commencing Work or ordering irrigation materials, Contractor shall assume responsibility for all costs required to make system operational and the costs required to replace any damaged landscape material. Damage shall include all required material costs, design costs, labor costs and plant replacement costs.

D. 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.
   1. Grading operations, with the exception of finish grading, shall be completed and approved by Project Manager before staking or installation of any irrigation system begins.

E. Layout: Layout and stake system before beginning installation. Staking shall occur as follows:
   1. Mark, with paint, routing of pressure supply line and flag heads for all new zones. Contact the Project Manager forty-eight (48) hours in advance and request review of staking. The Project Manager 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. Valve boxes and mainline shall not be located in ball fields, multi-use sport fields, recovery zones, or below playground equipment.
   3. If project has significant topography, free form planting beds, or other amenities which could require alteration of irrigation equipment layout as deemed necessary by the Project Manager, do not install irrigation equipment in these areas until the Project Manager has reviewed equipment staking.

4. The Project Manager will request the Office of the City Forester's approval of proposed trenching prior to start of trenching. The Contractor shall be following Division 01 Section "Tree Retention and Protection".
5. Review backflow prevention device location and operation with the Project Manager prior to mainline installation.

3.2 EXCAVATION AND BACKFILL

A. Excavation:
1. Pothole existing utilities for location and depth in advance of trenching or boring operations. When pot-holing in cross streets: include all permits, traffic control, backfill, compaction and surface restoration as required by the City of Salida Standards and Specifications. Backfill potholes to ninety-five percent (95%) compaction unless it falls within a tree protection zone.
2. Trenching:
   a. Trench excavation shall follow, as much as possible, the layout shown on the Contract Drawings. 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. Comply with OSHA standards for all trenching and excavation.
   b. Trenching within tree protection zone (TPZ) must be approved prior to the Work and shall be accomplished by hand or other approved method by the City. Refer to Division 01 "Tree Retention and Protection" for additional precautions.
3. Directional Boring:
   a. Directional boring as indicated on the Contract Drawings.

4. Clearances and Depths:
   a. Main pressure line: Make trenches of enough width to properly assemble and position pipe in trench. Clearances:
      1) Mainline and Lateral Piping clearance: Minimum clearance shall be two inches (2") horizontally on both sides of the pipe.
      2) Line Clearance: Provide minimum six inches (6") of clearance between each line, and minimum twelve inches (12") of clearance between lines of other trades.
      3) Installation of multiple runs of piping in a common trench is prohibited.

   b. Pipe and Wire Depth to finish grade:
      1) Pressure Supply Piping: Twenty-six inches (26") to twenty-eight (28") from the top of pipe.
      2) PVC Sleeving: At specified pipe or wire depth.
      3) Non-pressure Piping (gear driven heads): Eighteen inches (18") from top of pipe, maximum variation two inches (2").
         a) Native seed zones using twelve-inch (12") rotors: Twenty-four inches (24") from top of pipe, maximum variation two inches (2")
      4) Non-pressure Piping (pop-up heads): Eighteen inches (18") from top of pipe.

5) Control Wiring and Two-Wire Decoder Cable: Side of pressure main when installed in the same trench; twenty-four (24") inches deep when installed separately from the mainline trench.

5. Vibratory Plow: Not permitted with written approval from the Project Manager.

3.3 INSTALLATION OF IRRIGATION EQUIPMENT

A. Locate all equipment as near as possible to locations designated. Deviations shall be reviewed and approved by the Project Manager prior to installation.

B. Sleeving:

1. Install sleeving under any hard surface prior to surface being installed to accommodate piping and wiring. If irrigation is not being modified, the Contractor shall work with the Project Manager and Park Operations to identify locations and size for sleeves for future use.
2. Minimum depth to top of pipe shall be determined by depth of mainline and lateral lines.
   Sleeving depth shall match pipe and wire depth for all pressure and non-pressure piping installed under all hardscape surfaces, asphaltic concrete, or concrete paving.
3. Sleeving under existing walks or concrete pavement shall be done by directional boring or hydraulic driving. Where cutting of asphalt and/or concrete is necessary, it shall be done per the Contract Drawings and Details and/or per the City of Salida Standards. When cutting concrete, the entire section or "stone" must be removed from joint to joint. The Project Manager shall approve the final locations prior to removal.
   a. HDPE pipe may be used for sleeving when directional boring takes place under existing hard surfaces, walks, roadways, trees, etc.
   b. A sleeve is not required if the irrigation line is installed via directional boring with HDPE pipe as indicated by the Contract Documents.
4. Compact backfill material in three uniform using mechanical tamping devices under pavement.
5. Do not allow sleeves to become filled with soil or other undesirable material. Tape ends of sleeves until commencement of pipe installation.
6. Mark sleeves on hard surfaces with a three inch (3") by three inch (3") "X" as per plans in a manner to ensure easy location in the future.
7. Sleeve size requirements (generally 2x the diameter of the distribution pipe) for wire and pipe, control wire shall be placed in sleeving separate from pipe sleeving:

a.	1" to 1-1/4" Pipe:	2" PVC
b.	1-1/2" to 2" Pipe:	4" PVC
c.	2-1/2" to 3" Pipe:	6" PVC
d.	4" Pipe:	8" PVC
e.	6" Pipe	10" PVC
f.	8" Pipe	12" PVC
g.	1 to 25 Control Wires:	2" PVC
h.	26 to 50 Control Wires:	3" PVC
i.	Two-Wire Decoder Cable:	2" PVC

C. Installation of Piping:
   1. PVC Mainlines:
      a. Ensure that pipe is placed at a consistent depth and on a level base free of rocks and stones. 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.
      b. Install mainlines a minimum of thirty-six inches (36") off any hard surface and thirty-six inches (36") away from swales.
      c. Solvent Weld PVC Pipe (required on all pipe two inch (2") or smaller): Lay pipe and make all plastic to plastic joints in accordance with manufacturer's recommendations. Do not install pipe when air temperature is below forty degrees (40°) F.
      d. Gasketed End Pipe (required on all pipe two and one-half inches (2-1/2") or larger): Lay pipe and make pipe-to-fitting or pipe-to-pipe joint, following the manufacturer's recommendations. Install joint restraint fittings and pipe restraints on all fittings and adjacent pipe runs per manufacturer's recommendations and per the Contract Drawings.
   2. PVC Lateral Lines:
      a. Ensure that pipe is placed at a consistent depth and on a level base free of rocks and stones. When pipe laying is not in progress, or the end of each workday, close pipe ends with tight plug or cap. Perform Work in accordance with good practices prevailing in piping trades.
      b. Install lateral lines a minimum of twelve inches (12") off any hard surface and thirty-six inches (36") away from swales.
      c. Solvent Weld PVC Pipe (required on all lateral lines): Lay pipe and make all plastic to plastic joints in accordance with manufacturer's recommendations. Do not install pipe when air temperature is below forty degrees (40°) F.
   3. HDPE Lines:
      a. All connections between HDPE pipe sections are to be made with fusion welded fittings per the manufacturer's recommendations.
      b. All connections between HDPE and PVC are to be installed per manufacturer's recommendations.
      c. All connection fittings between HDPE and PVC or any other pipe material being used are to be made a minimum of thirty-six inches (36") away from any hard surface.

D. Installation of Detectable Marking Tape:
   1. Install detectable marking tape on mainline and lateral lines at a depth of six inches (6") to eight inches (8") below finished grade.

E. Joint restraints on all gasketed PVC mainline pipe two and one-half inch (2-1/2") and larger: Install joint restraints per the plans and or manufacturer's recommendations.
   1. Joint restraints shall be installed as shown on the plans or per the manufacturer's recommendations. Prior to backfilling any joint restraints the Project Manager shall be present to verify that the restraints were installed in the proper locations and that all bolts have been tightened to the manufacturer's recommendations.

Any restraints that are buried prior to inspection shall be excavated to allow for review and inspection at no additional cost to the City.

F. PVC Pipe Deflection
1. Solvent welded pipe will meet manufacturer's recommendations.
2. Gasketed pipe will not exceed one-inch (1") or two (2) degrees offset per twenty feet (20') in length.

G. Flexible Plastic (Polyethylene) Pipe: Lay pipe and assemble fittings according to manufacturer's recommendations and per the Contract Drawings and Details.

H. Control Wiring:
1. Two-wire control wiring:
   a. Bury two-wire decoder cable between Automatic Irrigation Controller and electric valves in pressure supply line trenches, strung as close as possible to mainline with such cable to be consistently located to one side of pipe, or in separate trenches.
   b. Make wire/cable splices at electric control valve connections as follows:
      1) Two-wire cable to two-wire cable - watertight connectors.
      2) Two-wire cable to electric valve solenoid wires - watertight connectors.
      3) Install all two-wire decoder cable splices not occurring at control valve in a separate Rain Bird VB10RNDH, round body valve box with locking cover.
2. Standard Low Voltage Control Wire:
   a. Install one control wire for each control valve on standard low voltage wire systems.
   b. On standard low voltage wire systems install a total of five spare fourteen (#14) AWG UFUL control wires and one spare common wire from Automatic Irrigation Controller pedestal to the end of each leg of mainline. Label spare wires at Automatic Irrigation Controller and wire splice box.
   c. Make all splices and electric control valve connections using 3M DBR/Y connectors
3. Bury control wiring between Automatic Irrigation Controller and electric valves in pressure supply line trenches, strung as close as possible to mainlines with such wires to be consistently located to one side of pipe, or in separate trenches.
   a. For standard low voltage wire systems bundle all twenty-four (24) volt wires at ten-foot (10') intervals.
4. Provide an expansion loop at every mainline change of direction, every electric control valve location (in valve box), and every five hundred feet (500').
   a. Form expansion loop in each control valve box by wrapping twenty-four inches (24") of wire around a one-inch (1") pipe and withdrawing pipe.
5. Install all control wire splices not occurring at the control valve in a separate wire splice valve box, Rain Bird VB10RNDH, round body valve box with locking cover.
6. Wire Testing:
   a. Existing wiring indicated to remain on documents is to be ohm-tested for continuity prior to construction. The Contractor shall produce the report and copy the Project Manager of the results of such testing.

b. New wiring: All new wiring to be tested for proper resistance prior to connection to valves and controller(s) for continuity. The Contractor shall produce the report and copy the Project Manager of the results of such testing.

I. Installation of Valves:
1. Electric Control Valves: Install electric control valves as detailed on the Contract Drawings.
   a. Electric Control Valves for two-wire system: Install electric control valves as detailed on the Drawings. Install one valve decoder module per valve box.
2. All low volume irrigation shall be zoned independently from turf, and product applications may not be mixed within zone.
3. Quick Coupling Valves: Install quick coupling valves as detailed on the Contract Drawings.
4. Drain Valves: Install manual drain valves at all low points in pressure supply line, whether indicated on the Contract Drawings or necessitated by actual conditions, to ensure proper drainage of the mainline.
5. Isolation/Gate Valves: Install as detailed in locations shown on the Contract Drawings.
6. Valve Boxes: Install one valve box for each type of valve as detailed. Install compacted gravel leveling bed after compaction of subgrade and prior to setting of valve box.
   a. Install filter fabric over gravel prior to setting valves boxes. Ensure that filter fabric extends a minimum of six inches (6”) from the bottom and no more than six inches (6”) from the top of box. Secure the filter fabric to the side of box with duct tape.
   b. Install valve boxes flush with finish grade and square to adjacent surface features and one another
   c. When valve boxes are grouped together, allow at least twenty-four inches (24”) between valve box sides.
   d. Install valve boxes a minimum of eighteen inches (18”) away from any hard surface.
   e. Cutting of valve boxes to give clearance for piping or valves is not permitted, except for the Master Valve and Flow Meter boxes.

J. Valve Box Identification Branding:
   a. Brand Lids as follows in two inch (2”) high minimum letters:
      1) Isolation/Gate Valve “GV”
      2) Quick Coupler Valve “QC”
      3) Manual Drain Valve “DV”
      4) Air Relief Valve “AR”
      5) Master Valve “MV”
      6) Flow Meter “FM”
      7) Wire Splice Box “WS”
      8) Grounding Rod “GR”
      9) Filter “FIL”

3.4 BACKFLOW PREVENTION (Existing)

A. Backflow Prevention Device: Contractor must meet all applicable laws, rules and codes, including but not limited to Uniform Building codes and applicable amendments Plumbing Codes and State Water Regulations. Assemblies must be installed per the manufacturer's specifications.
   1. Install in strict accordance with current requirements of City of Salida. Connections to the City of Salida System are to have an approved assembly for the type of protection they provide, either isolation or containment.
   2. Successful Testing of backflow assembly by a certified Backflow Prevention Assembly Tester is Contractor's responsibility and any cost shall be considered incidental. Test reports shall be forwarded to the City of Salida in accordance with the State of Colorado regulations. Copies of the report, the tester's certification and the certification of the testing equipment used are to be forwarded to the Project Manager.
   3. Request for final payment will not be certified or processed until certification reports have been filed with City of Salida and received by the Project Manager.

3.5 INSTALLATION OF SPRINKLER HEADS

A. Install sprinkler heads where designated after the Project Manager has approved staking. Set to finish grade as detailed.
   1. Spacing of heads shall not exceed the maximum indicated on the Contract Drawings unless re-staked or as directed by the Project Manager. In no case shall the spacing exceed maximum recommended by manufacturer, with the exception of native areas as shown in the Contract Documents.
   2. Install gear driven heads on swing-joint risers as detailed. Swing joints to non-pressure lines shall be set at no more than forty-five degrees (45°) or less than ten degrees (10°).
   3. Install pop-up heads on swing pipe as detailed.
   4. 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. The Project Manager may request nozzle changes or adjustments without additional cost to the City.

3.6 BACKFILLING

A. Do not begin backfilling operations until all piping and system components have been inspected by authorized Parks Operations Staff or by the Project Manager. Backfilling shall not be done in freezing weather unless authorized by the Project Manager.
   1. Leave trenches slightly mounded to allow for settlement after backfilling is completed.
   2. Trenches shall be finish graded and sodded or seeded prior to walk-through of system by the Project Manager.
   3. Materials: Excavated material is generally considered satisfactory for backfill purposes. Backfill material shall be free of trash, organic matter, frozen materials, and stones larger than one inch (1") in maximum dimension. 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.

4. Do not leave trenches open for a period of more than forty-eight (48) hours. Open excavations shall be protected in accordance with OSHA regulations.
5. Compact backfill utilizing the following methods in landscape areas:
    a. Mainline Pipe: Backfill and mechanically compact in three (3) uniform lifts, utilizing optimum moisture content for the soil type.
    b. Secondary Pipe: Backfill in two (2) uniform lifts and hydraulically or mechanically compact each.
    c. Puddling or ponding and/or jetting is prohibited within twenty feet (20') of building or foundation walls.

3.7 ADJUSTING

A. Upon completion of installation, "fine-tune" entire system by regulating valves, adjusting arcs and radius, and setting pressure reducing valves at proper 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 within plus or minus ten percent (10%).

B. If it is determined by the Project Manager or Parks Operations Staff that irrigation adjustments will provide improved coverage and water distribution, the Contractor shall make such adjustments prior to Final Acceptance. Adjustments may include but not limited to changes in nozzle sizes, degrees of arc, and adjusting flow control. Adjustments shall be completed at no additional costs to the City.

C. All sprinkler heads shall be set perpendicular to finish grade or within allowable limits shown on Contract Drawings.

D. Areas that 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 City.

3.8 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 five (5) minutes through furthermost valves. Cap risers after flushing.

B. Testing Pressurized Mainline: Prior to installing any plant materials (sod, seed, trees, shrubs, perennials) arrange and conduct pressure test(s) in the presence of the Project Manager. Arrange for testing a minimum of forty eight (48) hours in advance. The contractor is responsible to supply the hydrostatic test pump and all other equipment required to complete the test.
    1. Set in place, cap and pressure test all piping under paving, in presence of the Project Manager prior to backfilling and paving operations.

2. After installation and backfilling of all control valves, fill pressure supply line with water, and pressurize to forty (40) PSI over the static pressure or to one hundred twenty (120) PSI, whichever is greater, for a test period of two (2) hours. Testing pressure not to exceed one hundred forty-five (145) PSI.
3. All isolation valves, angle valves, ball valves and zone valve flow controls are to remain open during testing.
4. Leakage, Pressure Loss:
    a. Solvent welded PVC Pipe: Test is acceptable if zero pounds of pressure is evident during the test period.
    b. Gasketed Pipe: Test is acceptable if two (2) pounds of pressure or less is evident during the test period.
5. Leaks: Detect and repair leaks. Replace defective PVC pipe with new full length pipe section. No pipe splices will be accepted within pipe sleeve. No PVC pressure couplings or slip-fix repair couplings will be allowed.
6. Retest system until test pressure can be maintained for duration of test.

3.9 COMPLETION INSPECTION

A. Arrange for the Project Manager to be present. Provide a minimum of forty-eight (48) hours of notice in advance of walk-through.

B. Entire system shall be completely installed and operational and trenches shall be finish graded and sod and/or seed in place prior to scheduling of walk-through.

C. Electrically operate each zone in its entirety for the Project Manager the time of walk-through.

D. A project inspection walk through shall include but is not limited to the following:
1. Contractor shall adjust, straighten and nozzle all heads prior to walk through. Review operation, coverage, head/nozzle adjustment, and system adjustment per specifications.
2. Contractor shall have all valves boxes unlocked prior to walk through. Open valve boxes to confirm materials, filter fabric, gravel bedding, wire splices, compaction, elevation, workspace access within boxes, clearance from lid and bedding, locking mechanisms, and zone branding. Interior of boxes should be free of foreign material, only filter fabric shall be visible in the bottom of boxes. All valves must be tagged with zone identification, Christy's valve marker tags or equal and valve box lids must be branded with zone valve identification. Verify connections in all valve and wire splice boxes.
3. Contractor shall provide documentation that resistance tests for all spare common and hot wires and tracer wire has been performed and the results for ohms reading on each wire tested.
4. Confirm irrigation heads are at specified elevation and distance(s) from paved surfaces and curbs, plumb and soil compacted.
5. Inspect concrete size and elevation of pads for backflow assembly, booster pump, and controller enclosure pads. Confirm quality of concrete, finishes, access to the Irrigation Controller and spare conduit/sleeving as required for wiring.

6. Review trench and related excavation repair including backfill, compaction, fine grade, seed, and sod installation.
7. Review appropriate use of purple valve covers and other product as required for reuse water applications.
8. Generate a punch list of items to be corrected, prior to Substantial Completion.
9. Furnish all materials and perform all work required to correct all inadequacies of coverage due to deviations from Contract Documents.

3.10 CLEANING

A. Maintain continuous cleaning operation throughout duration of Work. Dispose of, all trash, waste materials, debris and excess soil generated by installation of irrigation system, off-site, at no additional cost to the City. Contractor shall clear all debris, including, soil, from all paths, walks, roads, and other hard surface areas.

3.11 PROTECTION

A. The Contractor shall repair any damage that occurs from construction operations at no additional cost to the City.

B. Restrict vehicular and pedestrian traffic from areas where irrigation has been installed. Erect temporary fencing or barricades and install warning signs as required or directed by the Project Manager at no additional cost to the City.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Measurement will be based on the percentage complete for the contract unit price amount for Irrigation Systems.

4.2 PAYMENT

A. Payment will be made at the lump sum contract price, and shall include required materials, transportation, equipment, labor, adjustments, transportation, equipment, labor, earthwork, installation of irrigation heads with nozzles, valves, piping, swing joints and related hardware, backflow preventor related hardware, trenching, irrigation controller installation, backfill and compaction, trenching, disposing and removal of existing irrigation equipment, temporary watering, dust control, erosion and sediment control, fine grading, as required in accordance with the Contract Drawings and Specifications.

END OF SECTION 32 80 00

SECTION 32 91 13
SOIL PREPARATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes requirements for the preparation of soil for sodding or planting operations. Soil preparation consists of ripping, fertilizing, soil conditioning, and fine grading the topsoil. Soil preparation as specified herein must precede all sodding and planting.

1.3 DEFINITIONS

A. Fertilizer: A substance that is added to soil to help the growth of plants.

B. Soil Amendment: Any substance which is intended to improve the physical, chemical, or other characteristics of the soil.

C. Soil Conditioner: Combination of slow-release fertilizer, humate, and Mycorrhiza.

1.4 SUBMITTALS

A. See Division 01 Section “Submittals” for submittal requirements.

B. Testing Agency Qualifications: The Project Manager to approve prior to construction.

C. Soils Test Data: See Quality Control.
1. Material Test Reports
    a. Soil analysis for native soils at the project site.

D. Product Data (for each type of product):
1. Include recommendations for application and use.
2. Include test data substantiating that products comply with requirements.
3. Material Certificates: For each type of soil conditioner, soil amendment, and fertilizer before delivery to the site, according to the following:
    a. Manufacturer's qualified testing agency's certified analysis of standard products.
    b. State, Federal and other inspection certificates shall accompany invoice for materials showing source or origin.eplace
    c.

E. Samples: For each bulk-supplied material, one (1) quart volume of each in sealed containers labeled with content, source, and date obtained. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of composition, color, and texture.

1.5 QUALITY CONTROL

A. Testing Agency: Retain an independent, state-operated, or university operated laboratory experienced in soil science, soil testing, and plant nutrition; with the experience and capability to conduct the testing indicated and that specializes in the types of tests to be performed.
   1. Laboratories: Subject to compliance with requirements, provide testing of materials in the Section by a qualified testing laboratory approved by the Project Manager.
   2. Multiple Laboratories: Work may be divided among qualified testing laboratories specializing in physical testing, chemical testing, and fertility testing.

B. Preconstruction Testing
   1. Engage the approved testing agency to perform preconstruction soil analyses on existing on-site soil, imported topsoil, and pre-amended imported soil.
   2. Notify Project Manager seventy-two (72) hours in advance of the dates and times when laboratory samples will be taken.

C. Soil Sampling Requirements
   1. Sample Collection and Labeling: Have samples taken and labeled by the Contractor in the presence of the Project Manager and under the direction of the testing agency.
   2. Number and Location of Samples: Minimum of five (5) samples for projects up to one (1) acre in size and two (2) additional samples for each additional acre of project size. Samples shall be collected randomly throughout the areas to receive similar soil preparation, including seed/sod, native seeding, planting beds, and gardens. Provide a site plan of the sampling locations to the Project Manager for approval, prior to sampling.
   3. Procedures and Depth of Samples: Collect composite samples to a depth of six inches (6”) and combine in a clean plastic container.
   4. Mixing of Samples: Mix samples together thoroughly, removing plant debris and breaking up clods.
   5. Labeling: Label each sample with the date, location keyed to a site plan or other location system, visible soil condition, and sampling depth.

D. Testing Requirements
   1. Soil Texture: Soil-particle, size-distribution analysis by the following methods according to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods":
      a. Sieving Method: Report sand-gradation percentages for very coarse, coarse, medium, fine, and very fine sand; and fragment-gradation (gravel) percentages for fine, medium, and coarse fragments; according to USDA sand and fragment sizes.

b. Hydrometer Method: Report percentages of sand, silt, and clay.

2. Fertility Testing: Soil-fertility analysis shall, include the following:
   a. Percentage of organic matter.
   b. CEC, calcium percent of CEC, and magnesium percent of CEC.
   c. Soil reaction (acidity/alkalinity pH value).
   d. Buffered acidity or alkalinity.
   e. Lime estimate.
   f. Soil texture estimate.
   g. Nitrogen ppm.
   h. Phosphorous ppm.
   i. Potassium ppm.
   j. Manganese ppm.
   k. Zinc ppm.
   l. Iron ppm.
   m. Boron ppm.
   n. Copper ppm.
   o. Sodium ppm
   p. Sodium absorption ratio (SAR).
   q. Soluble-salts ppm.
   r. Presence and quantities of problem materials including salts and metals cited in the Standard protocol. If such problem materials are present, provide additional recommendations for corrective action.
   s. Other deleterious materials, including their characteristics and content of each.

E. Recommendations: Based on the test results, provide recommendations for soil treatments, amendments, and conditioners to be incorporated to produce a soil suitable for healthy viable plant growth for the species indicated in the Contract Documents. Include, at a minimum, recommendations for nitrogen, phosphorous, and potassium fertilization, and for micronutrients.
   1. Fertilizers and Soil Amendment Rates: State recommendations in weight per one thousand (1,000) sq. ft. for six inch (6”) depth of soil.
   2. Soil Reaction: State the recommended liming rates for raising pH or sulfur for lowering pH according to the buffered acidity or buffered alkalinity in weight per one thousand (1,000) sq. ft. for six inch (6”) depth of soil.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and compliance with State and Federal laws if applicable.

B. Bulk Materials:
   1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
   2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.

3. Do not move or handle materials when they are wet or frozen.
4. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.

C. Notify Project Manager of delivery schedule in advance so material can be inspected upon arrival at the project site. Immediately remove unacceptable material from the project site.

1.7 PROJECT/SITE CONDITIONS

A. General: Do not perform work when climate and existing site conditions will not provide satisfactory results.

B. Vehicular site access shall be limited to the area(s) indicated on the Contract Drawings or as defined by the Project Manager.

C. Damage to turf, natural areas, pavements, irrigation systems, underground utilities, and other improvements shall be repaired by the contractor at no additional cost to the City.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Topsoil: Shall be as specified under Division 32 Section “Topsoil”.

B. Soil Amendments:
1. Class I compost material shall consist of aged organic matter, free of weed or other noxious plant seeds, lumps, stones, or other foreign contaminants harmful to plant life, and having the following characteristics based on a nutrient test performed no longer than 3 months prior to its incorporation into the project:
   a. Organic matter: twenty-five (25%) percent maximum.
   b. Salt content: Five (5.0) mmhos/cm maximum.
   c. pH: 7.5, maximum.
   d. Carbon to nitrogen ratio shall be less than 20:1.
2. Mountain peat, aspen humus, gypsum and sand will not be accepted.

PART 3 - EXECUTION

3.1 SITE EXAMINATION

A. Examine the site for compliance with requirements and other conditions affecting performance.
1. General: Verify that existing site conditions are as specified and indicated on the Contract Drawings before beginning work under this Section.
2. Grades: Inspect to verify rough grading is within +/- one tenth of one foot (0.1’) of grades indicated and specified.

3. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within the work area.
4. Unsatisfactory Conditions: The General Contractor shall notify the Project Manager in writing of any known unsatisfactory site conditions. If the soil is found to be unfit to support planting as described above, it is to be removed and replaced with clean soil from a source approved by the Project Manager.

B. Locate all utilities (sewer, water, irrigation, gas, electric, phone, and other conduits and subsurface equipment) prior to commencing work. The Contractor shall be responsible for the protection of all new and existing infrastructure and repair any damages caused by work under this Section at no additional cost to the City.

C. Protect grade stakes set by others until removal is directed by the Project Manager.

3.2 PREPARATION

A. In general, turf and planting areas shall receive Soil Amendments unless otherwise noted or specified by the Project Manager. For the purpose of bidding, the Contractor shall assume all areas to receive soil amendments will be at four (4) cubic yards per one thousand (1,000) square feet. Once soils tests have been received and determination is made on the proper amount to be added the site-specific soils the rate to be applied may be adjusted per the price based on the Schedule of Values for Soil Amendment.

B. Weed Seed Eradication: Perform pesticide treatment over the entire area to be planted during the growing season. Allow enough time to successfully complete the entire pesticide treatment process (germinate / terminate) before proceeding with planting.
1. Water surface one half (1/2") inch per week for two (2) weeks prior to application if natural precipitation does not supply this amount to encourage weed seed germination.
2. Notify Project Manager forty-eight (48) hours in advance of each pesticide treatment.
3. Apply pesticide in accordance with manufacturer’s recommendations.
4. Two (2) weeks after the first pesticide application, review surface for evidence of plant growth.
5. If there is no evidence of plant growth, obtain the Project Manager’s approval of surface conditions to proceed with Soil Preparation.
6. If more than 10% of the area to be planted contains new plant growth, the pesticide and watering application shall be repeated until new plant growth is satisfactorily eradicated.
7. Remove plant debris from treated area.

C. Areas of Compacted Topsoil: Areas within the work limits, or as defined on Contract Drawings or by the Project Manager, that have vegetation that is sparse, stunted, anemic, weedy or was used as construction staging, a parking area, and/or subjected

to heavy use will require ripping to prepare the soil for planting. Scarify compacted soil to an eight-inch (8") minimum depth to loosen topsoil.

D. Areas of Disturbed Topsoil: Areas disturbed but not severely compacted, as determined by the Project Manager, shall be deep tine aerated or shattered to prepare the soil for revegetation.

E. Areas of Undisturbed Natural Topsoil: Undisturbed sites that are or were supporting healthy plant growth need only surface seedbed preparation prior to sowing seed.

3.3 INSTALLATION OF SOIL AND SOIL AMENDMENTS

A. Proceed with installation only after unsatisfactory conditions have been corrected and approved by the Project Manager.

B. Beginning of installation means Acceptance of existing conditions by the Contractor.

C. Install topsoil as required in Division 31 section "Earth Moving" and Division 32 Section "Topsoil".

D. Timing: Perform soil preparation just prior to planting operations and in accordance with final planting schedule.
   1. Coordinate with irrigation system installation to avoid damage.

E. Soil Preparation in Turf Grass and Planting Bed Areas:
   1. Apply Soil Amendments at the following rates:
      a. Soil Amendments: Bid quantity to be four (4) cubic yards per one thousand (1,000) square feet, or per soil test recommendations.
      b. Fertilizer: Refer to Related Sections. Mycorrhizal inoculants: Apply per manufacturer's instructions and quantities appropriate to the planting type.
   2. After applying Soil Amendments, thoroughly till area to depth of six inches (8") minimum by plowing, rototilling, harrowing, or disking until soil is well pulverized and thoroughly mixed. Soil Conditioners and Fertilizer shall be applied topically once final grade has been established and just prior to sodding.
   3. Take soil samples, in similar locations to pre-construction testing, and test amended soil to ensure the final product meets the laboratory recommendations prior to planting.

F. Fine Grading in all Landscape Areas:
   1. Complete fine grading for all areas prior to seeding or planting. Allow for natural settlement.
   2. For ground surface areas surrounding buildings to be landscaped, maintain required positive drainage away from buildings.
   3. Establish finish grades as follows:
      a. Lawn, Seeded, and Unpaved Areas: Finish areas to within not more than +/- five one-hundredths (.05') of a foot above or below required elevations.
      b. Athletic Fields: Finish areas to within not more than +/- two one-hundredths (0.02') of a foot from required elevation.

4. Finish grade shall be below edge of pavement prior to sodding, seeding or planting.
    a. Sodded Areas: Allow one and one-half inches (1-1/2”) for sod.
    b. Planting Beds: Allow four inches (4”) for mulch.
5. Compaction of Surface Grade Prior to Landscape Installation: Firm, but not hard, eighty five percent (85%) standard Proctor density within two percent (2%) optimum moisture.
6. Turfgrass Lawn Areas: Prior to acceptance of grades, hand rake to smooth, even surface, free of debris, clods, rocks and organic matter greater than one inch (1”).
7. Restore planting areas to specified condition if eroded or otherwise disturbed after fine grading and prior to planting.

3.4 INSPECTION

A. Provide notice to the Project Manager requesting inspection at least seventy-two (72) hours prior to anticipated date of the work.

B. Deficiencies: The Project Manager will specify deficiencies to the Contractor who shall make satisfactory adjustments and shall again notify the Project Manager for an additional inspection.

3.5 CLEANING

A. Protect areas adjacent to soil preparation and planting areas from contamination. Keep adjacent paving and construction clean and work area in an orderly condition.

B. Remove debris and excess materials from site. Clean out drainage inlet structures. Clean all paved and finished surfaces that are soiled as a result of work under this Section.

3.6 PROTECTION AND REPAIR

A. Provide and install barriers as required and as directed by the Project Manager to protect completed areas against damage from pedestrian and vehicular traffic until Acceptance by the City.

B. Protect areas of in-place soil from additional compaction, disturbance, and contamination. Prohibit the following practices within these areas except as required to perform planting operations:
1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Vehicle traffic.
4. Foot traffic.
5. Erection of sheds or structures.
6. Impoundment of water.
7. Excavation or other digging unless otherwise indicated.

C. If prepared soil or subgrade is disturbed or contaminated prior to planting, the Contractor shall restore or replace the planting soil as directed by the Project Manager at no cost to the City.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Measurement will be made by the contract unit specified for Soil Preparation. Measurement shall include the actual number of units of specified material(s) placed and accepted at the locations shown on the Contract Drawings, or as directed by the Project Manager, and in accordance with the Specifications.

4.2 PAYMENT

A. Payment will be made at the **contract unit** price, and shall include required materials, transportation, equipment, labor, earthwork, stockpiling, disposing, hauling off, watering, dust control, erosion and sediment control, raking, fine grading, decompaction, soil amendments, soil testing, weed eradication as required in accordance with the Contract Drawings and Specifications.

END OF SECTION 32 91 13

SECTION 32 92 20
NATIVE SEEDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes requirements for the installation of native seed, mulch, erosion control material (if applicable), and establishment of the seeded areas, to be achieved as outlined in these Specifications until Final Acceptance.

1.3 REFERENCES

A. Comply with U.S. Department of Agriculture Rules and Regulations under the Federal Seed Act and be equal to or better in quality than the standards for Certified Seed.

1.4 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, herbicide, defoliant, or desiccant.

C. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

D. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments, soil conditioners and fertilizers to produce a soil mixture best for plant growth.

E. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or top surface of a fill or backfill before planting soil is placed.

F. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

G. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil, but in disturbed areas such as urban environments, the surface soil can be subsoil.

H. Weeds: Including but not limited to Puncturvine, Field Bindweed, Dandelion, Jimsonweed, Diffuse, Spotted and Russian Knapweed, Quackgrass, Horsetail, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canada Thistle, Nutgrass, Blackberry, Tansy Ragwort, Bermuda Grass, Johnsongrass, Poison Ivy, Nut Sedge, Nimble Weed, Bent Grass, Barnyard Grass, Perennial Sorrel, Cheatgrass, Kochia, Prickly Lettuce, Feral Rye, and Brome Grass or any weed listed on Colorado Noxious Weed List and Watch List.

1.5 SUBMITTALS

A. See Division 01 Section “Submittals” for submittal requirements.

B. Materials: The Contractor shall submit to the Project Manager for approval a complete list of all materials to be used during this portion of the work prior to delivery of any materials to the site. Include complete data on source, amount and quality. This submittal shall in no way be construed as permitting substitution for specific items described on the plans or in these specifications unless approved in writing by the Project Manager.
   1. Certification of Seed: From seed vendor for each seed monostand or mixture stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
   2. Native Grass Species (supplied as pure live seed): Submit lab germination test results for all grass species. Submit an affidavit that describes estimated purity for all forb species that are not typically tested.
   3. Pesticides: Include product label and manufacturer's application instructions specific to this Project.
   4. Soil Conditioners (if applicable): Include product label and manufacturer’s application instructions specific to the project.
   5. Mulch: Include product label and manufacturer’s application instructions specific to the project. The contractor shall provide ship tickets to verify application rates.
   6. Tackifier: Include product label and manufacturer’s application instructions specific to the project.
   7. Product Certificates: For soil amendments, soil conditioners and fertilizers, from the manufacturer.

C. Qualification Data: For qualified landscape Installer.

D. Pesticide application records, per State requirements.

E. Material Test Reports
   1. Soil analysis for native soils at the project site: See Division 32 Section “Soil Preparation”
   2. Analysis for each soil amendment.
   3. Analysis for each soil conditioner.

F. Analysis and standards: Wherever applicable, for non-packaged materials, provide the analysis by a recognized laboratory made in accordance with methods established by the Association of Official Agriculture Chemists.

G. Seeding schedule: Submit the proposed seeding schedule, indicating dates for site preparation, seeding, mulching, erosion control, 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.

H. Maintenance Instructions: Maintenance is per Division 32 Section “Landscape Maintenance” if a maintenance contract exists, or per the establishment subsection. Include recommended procedures for maintenance of irrigated and non-irrigated (if applicable) native seed areas during a calendar year. Submit before expiration of required initial maintenance or establishment periods.

I. Contract Closeout Submittals:
   1. Operating and Maintenance Data: At completion of work, submit one (1) digital copy to the Project Manager in accordance with Division 01 Section “Contract Closeout”. Include directions for irrigation, aeration, mowing, fertilizing, and spraying as required for continued and proper maintenance through full growing season and dormant period.
   2. Warranty for Native Seed Areas: At Substantial Completion submit a written warranty to the Project Manager based upon specified requirements.

1.6 QUALITY CONTROL

A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful native grass establishment.
   1. Experience: Five (5) years' experience in native seed installation in addition to requirements in Division 01 Section “Quality Control”.
   2. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
   3. Personnel Certifications: Installers shall have certification the following categories from the NALP:
      a. Landscape Industry Certified Technician - Exterior, with installation maintenance irrigation specialty area(s).
   4. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.
   5. Pesticide Applicator: Applicators shall be a Colorado State licensed, Commercial Applicator.

B. Soil Analysis: See Division 32 Section “Soil Preparation” and Division 32 Section “Topsoil”.

C. Pre-installation Conference: Conduct conference at the Project site to coordinate the seeding process with the Project Manager and other trades. This meeting shall include coordination of equipment movement within planting areas to avoid soil compaction, an overview of proposed methods of installation, review of the performance criteria and

maintenance procedures, and an overview of underground utility location maps and plans. This meeting shall be coordinated by the Contractor and comply with requirements in Division 01.

D. Standards: All materials and methods used during this portion of the work shall meet or exceed applicable federal, state, county, and local laws and regulations. All seed shall be free from insects and disease. Species shall be true to their scientific name as specified.

E. Any native seed species substitutions shall be submitted to and approved by the Project Manager prior to installation.

F. All species shall be supplied as pure, live seed.

G. Equipment: The Contractor shall furnish all equipment free of noxious weeds, weed seed, plant material, and contaminated soil.

H. The Project Manager reserves the right to reject the seed at any time prior to Acceptance and that fails to meet specification requirements. Promptly remove rejected seed from site.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Bulk Materials:
1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk materials with appropriate certificates.

B. Seed and Other Packaged Materials: Shall be furnished in bags or containers clearly labeled to show the name and address of the supplier, the seed name, the lot number, net weight, origin, the percent of weed seed content, the guaranteed percentage of purity and germination, pounds of pure live seed (PLS) of each seed species, and the total pounds of PLS in the container. Seed that has become wet, moldy or damaged in transit or in storage will not be acceptable.

C. Soil Conditioner and Fertilizer: Deliver products to the site in original unopened container bearing manufacturer’s guaranteed chemical analysis, name, trade name, trademark and conformance to state law, and bearing name and warranty of producer.

D. Material will be inspected upon arrival at project site. Project Manager will reject any opened or unacceptable materials as described above. Store all materials in a manner to prevent wetting and deterioration.

E. Immediately remove unacceptable material from job site.

1.8 PROJECT/SITE CONDITIONS

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

B. Vehicular accessibility on site shall be approved by the Project Manager

C. Seeding Season: Seeding shall generally occur during the specified windows below. Seeding dates may be modified when temperature and moisture conditions are favorable.

Seed Type	**Irrigated Areas Only**	**Non-Irrigated Areas**
Native Grasses	April 15-Sept.1	November 15-April 15

1. Dormant Seeding: Upon approval of the Project Manager, dormant seeding for Irrigated and Non-irrigated areas may be accomplished between November 15 and April 15. No seeding shall be done when the ground is frozen, muddy, covered with snow, or otherwise in a condition unsuitable for seeding. Dormant seeding will not relieve the Contractor from the Warranty or the Acceptance requirements specified elsewhere in this specification.

D. Coordination:
1. Coordinate with construction of utilities on site. Do not begin placing native seed until underground work is completed in the area.
2. Coordinate seeding with approved schedule. Limit construction access to areas where topsoil has been placed if placement is completed more than three (3) days prior to commencement of landscaping in the area. Limit fine grading to areas that can be prepared for planting within twenty-four (24) hours after fine grading.
3. No vehicular or equipment access shall be allowed within areas that have been seeded.
4. Coordinate with installation of underground irrigation system.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Soil Preparation: See Division 32 Section “Soil Preparation”.

B. General:
1. The selected seed mix must be approved by the Project Manager prior to its incorporation into the project.
2. All seed brands shall be free from Colorado prohibited noxious weed seeds, including but not limited to Canada Thistle, Field Bindweed, Johnsongrass, and Leafy Spurge. The Contractor shall furnish to the Project Manager a signed statement certifying that the seed is from a lot that has been tested by a

recognized laboratory for seed testing within six months prior to the date of delivery.

3. Computation for quantity of seed required on the project is based on Pure Live Seed (PLS).
4. The formula used for determining the quantity of PLS shall be: *Pounds of Seed x (Purity x Germination) = Pounds of PLS*.
5. If seed available on the market does not meet the minimum purity and germination specified, the Contractor must compensate for a lesser percentage of purity or germination by furnishing sufficient additional seed to equal the specified product. Product comparison shall be made on the basis of PLS in pounds, stated on each seed bag.

C. Seed Mixes:
   1. Native Seed Mix (with forbs): See Plans

D. Mulch:
   1. Hydromulch: should be fully biodegradable matrix composed of 100% recycled and thermally refined wood fibers, crimped interlocking biodegradable fibers, and naturally derived biopolymers.
   2. The hydro mulching specifications are as follows: Percent Moisture Content: 10.0% +/- 3.0%.
      a. Percent Organic Matter: 99.3% +/- 0.2%.
      b. Percent Ash Content: 0.7% +/- 0.2%.
      c. pH: 4.9 +/- 0.5.
      d. Water Holding Capacity: 1200-1600 grams.
      e. Hydromulch is only acceptable for irrigated applications
      f. Functional Longevity ≤ 12 months
      g. Cure Time < 2 hours
      h. Thermally Processed Wood Fibers – 77%
      i. Wetting Agents (Cross Linked Tackifiers) – 10%
      j. Crimped, Biodegradable Interlocking Fibers – 2.5%

E. Tackifier: Tackifier shall consist of free flowing, non-corrosive powder produced from the natural plant gum of Plantago insularis (desert Indianwheat). The powder shall consist of the following properties:
   1. Protein Content: 1.6 +/- 0.2%
   2. Ash Content: 2.7 +/- 0.2%.
   3. Fiber: 4.0 +/- 0.2%.
   4. pH 1% Solution: 6.5-8.0.

F. Fertilizer and Soil Conditioner: See Division 32 Section “Soil Preparation”.

G. Water: Contractor to utilize the existing irrigation system and or quick coupler(s) when available. If irrigation or quick coupler(s) are not available then the contractor is responsible for watering. Water shall be free of substances that may be harmful to seed growth. Hoses and other watering equipment necessary to water the seed to be furnished by Contractor.

2.2 PESTICIDES

A. General: Pesticide, registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use 'Restricted Use' pesticides unless authorized in writing by Project Manager and authorities having jurisdiction.

B. Ensure that applications adhere to the product label for restrictions and landscape sites.

C. Selective for either of the following types:
   1. Broadleaf:
      a. 2,4-D Amine,
      b. Clopyralid,
      c. Aminopyralid,
      d. Triclopyr,
      e. Or approved equal.
   2. Grasses:
      a. Imazapic,
      b. Indaziflam,
      c. Or approved equal.

D. Non-Selective: Broadleaf or Grasses
   1. Glyphosate,
   2. Or approved equal.

2.3 EROSION CONTROL MATERIALS

A. Erosion-Control Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended steel wire staples, 6 inches (6") long.

B. Erosion-Control Fiber Mesh: Biodegradable burlap or spun-coir mesh, a minimum of 0.92 lb/sq. yd., with fifty (50%) to sixty-five (65%) percent open area. Include manufacturer's recommended steel wire staples, 6 inches (6") long.

C. Erosion-Control Mats: Cellular, non-biodegradable slope-stabilization mats designed to isolate and contain small areas of soil over steeply sloped surface, of 3 inch (3") nominal mat thickness. Include manufacturer's recommended anchorage system for slope conditions.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Invisible Structures, Inc.; Slopetame 2.
      b. Presto Products Company, a business of Alcoa; Geoweb.
      c. Tenax Corporation - USA; Tenweb.

2.4 SUBSTITUTIONS

A. All substitutions shall be submitted to and approved by the Project Manager prior to installation.

PART 3 - EXECUTION

3.1 SITE EXAMINATION

A. Examine areas to be seeded for compliance with requirements and other conditions affecting performance.
   1. Grades shall be in conformance with Division 31 Section “Earth Moving”. Finish grades shall have consistent slopes as indicated on the Contract Drawings.
   2. Soil preparation of seeded areas shall be in conformance with Division 32 Section “Soil Preparation”.
   3. Verify that no foreign or deleterious material or liquid such as but not limited to, paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a seeding area. If contamination is present in soil, remove the soil and contamination as directed by the Project Manager and replace with new soil.

B. Locate, protect, and maintain the irrigation system during seeding operations. Verify that the irrigation system is operable and a coverage test has been completed and approved prior to seeding by the Project Manager. Irrigation system components damaged during seeding operations shall be replaced or repaired to current Denver Parks irrigation standards at the Contractor’s expense.

C. Locate and protect existing underground utilities. Perform work in a manner to avoid damage. Hand excavate as required.

D. Protect grade stakes set by others until removal is directed by the Project Manager.

E. When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, noxious materials or obstructions, notify Project Manager before planting.

3.2 PREPARATION

A. Notify the Project Manager at least seven (7) working days prior to start of seeding operations.

B. Utilize equipment having low unit pressure ground contact within seeding areas.

C. Limit subgrade preparation to areas that can be seeded within twenty-four (24) hours. Seeding beyond twenty-four (24) hours of preparation shall only be done with the approval of the Project Manager.

D. Uniformly moisten excessively dry soil that is not workable.

E. The Contractor shall prepare the soil of all areas to be seeded in accordance with the requirements of Division 32 Section “Soil Preparation”.
   1. Do not mix or place soils and soil amendments in frozen, dry, or excessively wet conditions.
   2. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.

F. Weed Control: See Division 32 Section “Soil Preparation” for required weed control procedures. If weeds are present on-site, treat with pesticide prior to preparing soil for installing seed. Do not proceed with planting until the Project Manager have approved the specified and completed weed control measures.

G. Fine Grading: See Division 32 Section “Soil Preparation”.
   1. Verify all areas are graded to drain at a minimum of two percent (2%) or as indicated on the Contract Drawings. Maintain positive drainage, prevent ponding, and direct runoff into catch basins, drainage structures, etc., and provide a well - contoured surface prior to proceeding.
   2. Verify that the subsurface drainage system and drain inlets, if present, are operative.
   3. A firm weed-free seed bed is required. The seed bed shall be totally free from rock or clay clods or any other materials over one inch (1”) in diameter. Remove sticks, roots, rubbish, and other extraneous matter and legally dispose of the off-site.
   4. Obtain the Project Manager’s approval of finished grade prior to proceeding with seeding operations.

H. Transition Grading: When areas of new seed abut existing areas, grade shall transition to prevent any abrupt grade breaks.

I. When grading is completed, the soil shall be firmed by float dragging, followed by steel raking, to provide for the proper seeded surface.

3.3 INSTALLATION OF NATIVE SEED

A. Proceed with installation only after unsatisfactory conditions have been corrected and approved by the Project Manager.

B. Beginning of installation means acceptance of existing conditions by the Contractor.

C. Install native seed only after all other landscape and irrigation items have been installed and accepted by the Project Manager.

D. Seed shall be uniformly applied at the specified rate, (half in one direction and the other half perpendicular to the first application). The direction of the final application shall always be perpendicular to the slope or running in the direction of the contour.

Seed shall be installed at a depth between one-quarter inch (1/4”) and one-half inch (1/2”).

E. Areas that are too small or steep for mechanical seeding may be hand seeded. Seed shall be uniformly applied at the specified rate utilizing a broadcast spreader and then hand raked in to a depth of no more than one-half inch (1/2”), then roll seed bed to ensure proper contact to the soil.

F. Do not drill or sow seed during windy, rainy weather or when ground is frozen or otherwise unable to be tilled.

G. Watering: Refer to Division 31 Section “Watering”.

H. Review seasonal restrictions prior to seeding.

3.4 PREPARATION FOR EROSION CONTROL MATERIALS

A. Review erosion control measures with the Project Manager prior to installation. The Contractor shall take measures and furnish equipment and labor necessary to control and prevent soil erosion, blowing soil and accumulation of wind-deposited materials on the site throughout the duration of work.

B. For erosion control mats, install planting soil in two (2) lifts, with second lift equal to thickness of erosion control mats. Install erosion control mat per manufacturer’s recommendations.

C. Fill cells of erosion control mat with planting soil and compact before planting.

D. Install erosion control blanket on slopes exceeding 4:1, and in swales or other areas of concentrated runoff. As shown on the Contract Drawings or as directed by the Project Manager. Install in accordance with manufacturer’s recommendations.

E. For erosion-control blanket or mesh, install from top of slope, working downward, and as recommended by the manufacturer. Fasten the blanket per manufacturer’s recommendations.

3.5 MULCHING

A. Hydromulch Application: Utilize an approved hydromulcher to apply cellulose fiber at a rate of two-thousand (2,000) pounds per acre. The Contractor shall provide verification of application rates in the form of ship tickets.

B. Mulching shall not be installed when surface water is present resulting from rain, melting snow, irrigation, or other causes.

C. Areas not properly mulched, or any damage that may occur during construction is the responsibility of the Contractor and shall be repaired and re-mulched in an acceptable manner at the Contractor’s expense . Mulching removed by wind, rain, or other causes prior to acceptance shall be re-established by the Contractor at their own expense.

D. The seeded area shall be mulched within four (4) hours of seeding. Areas not mulched within twenty-four (24) hours after seeding must be re-prepped and re-seeded with the specified seed mix at the Contractor's expense.

3.6 CLEANING

A. Perform cleaning during installation of the work and upon completion of the work. Remove all excess materials, debris and equipment from site.

B. Remove non-degradable erosion-control measures after the establishment period or at the direction of the Project Manager..

C. Protect adjacent and adjoining areas from hydromulching overspray. The Contractor shall remove all hydromulch from surface areas not specified for seeding, including but not limited to plant materials, fences, paved areas, signs, mulch beds, irrigation components and all other objects as directed by the Project Manager.

3.7 PROTECTION AND REPAIR

A. The Contractor shall protect existing utilities, irrigation, paving, and other facilities from damage caused by seeding operations. The Contractor shall repair any damage at their expense. Any areas outside the Contract Limits that are disturbed as a result of construction operations shall be restored to Parks standards at no additional cost to the City.

B. The Contractor shall repair damage to prepared topsoil and existing surfaces, caused by vehicular access and movement during work under this section, to original condition at no additional cost to the City.

C. The Contractor shall protect and restrict access from seeded areas until the areas are established and Accepted. Temporary fencing, barricades, and warning signs shall be installed as required, or by direction of the Project Manager at no additional cost to the City. Maintain fencing and barricades throughout the site until the Project Manager approves removal.

3.8 ESTABLISHMENT

A. If maintenance is required per the Contract, refer to Division 32 Section "Landscape Management and Maintenance".

B. If maintenance is not required per the Contract, then the native seed establishment is per the Acceptance sub-section.

C. Maintenance of the native seed areas are the responsibility of the Contractor until Final Acceptance.

3.9 ACCEPTANCE

A. Substantial Completion shall be granted when seed has been applied and stabilized or per the discretion of the Project Manager.

B. Final Acceptance will be granted when native seed areas are in a healthy, vigorous growing condition, and meet the listed Native Seed Establishment Criteria, until the establishment criteria has been met.

C. Native Seed Establishment Criteria.
   1. Irrigated native seed areas shall be established when the following criteria are met:
      a. After seeding, by the end of the first full growing season, total vegetation cover shall exceed ninety percent (90%) by aerial cover, with eighty percent (80%) of species present being native, and no more than ten percent (10%) being weed species.
      b. By the end of the first full growing season, seedlings from twenty percent (20%) of planted forb species shall be present, only if forbs are specified in the contract.
      c. At any time during the Contract period no more than ten percent (10%) by aerial cover of the seeded area shall be dominated by aggressive exotic species (weeds) such as, but not limited to, red clover (*Trifolium* spp.), white or yellow sweet clover (*Melilotus* spp.), Canada thistle (*Cirsium arvense*), tall fescue (*Festuca elatior*), field bindweed *(Convolvulus arvensis*), cheatgrass (*Bromus tectorum),* kochia (*Bassia scoparia*), etc.
      d. Until Final Acceptance, seeded areas that fail shall be replaced until they meet establishment criteria as required. Replacement materials shall be identical to those originally specified.
      e. Remedial Action: If seeded areas greater than ten (10) square feet fail to meet the terms of the guarantee shown above, the Contractor will develop and submit to the Project Manager a remedial action plan that takes into consideration the site goals and specific deficiencies causing the remedial action. The Contractor will implement the remedial action plan and submit a report that describes the remedial action taken. If remedial seeding or planting is required, Contractor will not be required to perform additional remedial seeding or planting in the same area for a minimum of two (2) growing seasons. After two (2) growing seasons following the remedial planting, the performance criteria must be met for the second growing season or additional remedial action must be taken. This guarantee remains in effect until all zones meet the third growing season criteria.
      f. Seeded areas will not be accepted in parts. Each time any portion or section of the entire seeded area requires replacement or remedial action, the establishment period shall extend until all seeded areas meet the minimum establishment requirements stated above.
      g. All expense incurred including repairs from vandalism for the replacement and or establishment of the seeded areas are the responsibility of the Contractor.
      h. If seeded in the fall, review for establishment shall be no later than June 15 of the following year.

i. All Native Seeded areas shall be reviewed for a minimum period of one (1) year from the date of Substantial Completion to meet the Establishment Criteria. Any areas not meeting the criteria per the Project Manager will need to be remined prior to acceptance.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Measurement will be based on the percentage complete for the lump sum contract amount for Native Seeding.

4.2 PAYMENT

A. Payment will be made at the lump sum contract price, and shall include required materials, transportation, equipment, labor, earthwork, stockpiling, disposing, hauling off, watering, dust control, erosion and sediment control, fine grading, soil preparation, furnishing and installation of seeds and mulches installation and maintenance of temporary protection by fencing or other means, watering and all maintenance required until Final Acceptance of the work as required in accordance with the Contract Drawings and Specifications.

END OF SECTION 32 92 20

SECTION 32 92 23
SODDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes requirements for furnishing and installation of bluegrass sod, and establishment of sodded areas to be achieved as outlined in these Specifications until Final Acceptance.

1.3 DEFINITIONS

A. Finished Grade: Elevation of finished surface of planting soil.

B. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, pesticides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, herbicide, defoliant, or desiccant.

C. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

D. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

E. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or top surface of a fill or backfill before planting soil is placed.

F. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

G. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil, but in disturbed areas such as urban environments, the surface soil can be subsoil.

H. Weeds: Including but not limited to Puncturvine, Field Bindweed, Dandelion, Jimsonweed, Diffuse, Spotted and Russian Knapweed, Quackgrass, Horsetail, , Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canada Thistle,

Nutgrass, Blackberry, Tansy Ragwort, Bermuda Grass, Johnsongrass, Poison Ivy, Nut Sedge, Nimble Weed, Bent Grass, , Perennial Sorrel, Cheatgrass, Kochia, Prickly Lettuce, Feral Rye, and Broom Grass or any weed listed on Colorado Noxious Weed List and Watch List.

1.4 SUBMITTALS

A. See Division 01 Section “Submittals” for submittal requirements.

B. Materials: The Contractor shall submit to the Project Manager for approval a complete list of all materials to be used during this portion of the work prior to delivery of any materials to the site. Include complete data on source, amount and quality. This submittal shall in no way be construed as permitting substitution for specific items described on the plans or in these specifications unless approved in writing by the Project Manager.
   1. Sod Certificates:
      a. State, Federal and other inspection certificates for sod shall be provided to the Project Manager a minimum of ten (10) working days prior to anticipated date of sod delivery.
      b. Submit a list of varieties contained in the sod and include the source and origin for approval by the Project Manager.
   2. Pesticides (if applicable): Include product label and manufacturer's application instructions specific to this Project.
   3. Fertilizers (if applicable): Include product label and manufacturer’s application instructions specific to the Project.
   4. Product Certificates: For soil amendments and fertilizers, from manufacturer.

C. Qualification Data: Qualified Landscape Contractor.

D. Pesticide application records, per State requirements, if applicable.

E. Material Test Reports:
   1. Soil analysis for native soils at the project site: See Division 32 Section “Soil Preparation”.

F. Analysis and standards: Wherever applicable, for non-packaged materials, provide digital copies of the analysis by a recognized laboratory made in accordance with methods established by the Association of Official Agriculture Chemists.

G. Planting schedule: Submit in writing the proposed planting schedule, indicating dates for topsoil placing, site preparation, pesticide treatments, soil preparation, sodding, seeding, 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.

H. Contract Closeout Submittals:
   1. Operating and Maintenance Data: At completion of work, submit one (1) digital copy the Project Manager in accordance with Division 01 Section “Contract Closeout’. Include directions for irrigation, aeration, mowing, fertilizing and spraying as required for continued and proper maintenance through full growing season and dormant period.
   2. Warranty for Turfgrass Sod Areas: At Substantial Completion, submit a written warranty to the Project Manager based upon specified requirements.

1.5 QUALITY CONTROL

A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful turf establishment.
   1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
   2. Experience: Five (5) years' experience in turf installation in addition to requirements in Division 01 Section "Quality Control."
   3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on the Project site when work is in progress.
   4. Sod Producer: Company specializing in sod production and harvesting with minimum five (5) years’ experience, and certified by the State of Colorado Department of Agriculture.
   5. Personnel Certifications: Installers shall have certification the following categories from the Professional Landcare Network:
      a. Certified Landscape Technician - Exterior, with installation maintenance irrigation specialty area(s), designated CLT-Exterior.
   6. Maintenance Proximity: Not more than two (2) hours' normal travel time from Installer's place of business to Project site.
   7. Pesticide Applicator: Applicators shall be a Colorado State Licensed, Commercial Applicator.

B. Soil-Testing Laboratory Qualifications: An independent laboratory or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.

C. Soil Analysis: See Division 32 Section “Soil Preparation” and Division 32 Section “Topsoil”.

D. Pre-installation Conference: Conduct conference at the Project site to coordinate the seeding process with the Project Manager, the City, and other trades. This meeting shall include coordination of equipment movement within planting areas to avoid soil compaction, an overview of proposed methods of installation, review of the performance criteria and maintenance procedures, and an overview of underground utility location maps and plans. This meeting shall be coordinated by the Contractor and comply with requirements in Division 01.

E. Standards: All materials and methods used during this portion of the work shall meet or exceed applicable federal, state, county, and local laws and regulations. All sod shall be free from insects and disease. Species shall be true to their scientific name as specified.

F. Equipment: The Contractor shall furnish all equipment free of noxious weeds, weed seed, plant material, and contaminated soil.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Sod: Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver on pallets properly loaded on vehicles with root system protected from exposure to sun, wind, and heat in accordance with standard practice. Sod that has been damaged by poor handling or improper storage is subject to rejection by the Project Manager.
   1. Protect from dehydration, contamination, freezing and heating at all times. Keep stored sod moist and under shade or covered with moistened burlap.
   2. Do not drop sod rolls from carts, trucks or pallets.
   3. Do not deliver more sod than can be installed within twenty four (24) hours.

B. Bulk Materials:
   1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
   2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.

C. Fertilizer: Deliver inorganic or chemical fertilizer to site in original unopened container bearing manufacturer’s guaranteed chemical analysis, name, trade name, trademark, warranty and conformance to state law.

D. Material will be inspected upon arrival at project site. Project Manager will reject any opened or unacceptable materials as described above.

E. Immediately remove unacceptable material from job site.

1.7 PROJECT/SITE CONDITIONS

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

B. Vehicular accessibility on site shall be approved by the Project Manager.

C. Install sod between April 15 and October 1 or when irrigation is available for twenty one (21) days per.

D. Schedule work for periods of favorable weather. Do not install sod on saturated or frozen soil. The Project Manager reserves the right to deny sod installation on days that are deemed to be unfavorable for installation.

E. Coordination:
   1. Coordinate with construction of utilities on site. Do not begin placing topsoil and sod until underground work is completed in the area.
   2. Coordinate sodding with the approved schedule. Limit construction access to areas where topsoil has been placed if placement is completed more than 3 days prior to commencement of landscaping in the area. Limit fine grading to areas that can be prepared for planting within twenty four (24) hours after fine grading.
   3. Coordinate with Contractors' work requiring access to site over sodded areas.
   4. Coordinate with installation of underground irrigation system.

1.8 WARRANTY

A. Warranty for Sodded Areas: Warrant sod areas to be in a healthy, vigorous growing condition, and for consistency and completion of coverage for a period of one (1) year from date of Substantial Completion as a full stand of grass. Re-sod any areas where sod has failed due to disease or other inadequate installation, as defined in this Section.
   1. During the original warranty period, immediately replace the sod with an approved sod blend/mix in the areas that have failed to achieve a full stand of grass or which are unhealthy.
   2. Re-sodding will not be allowed in any season considered unfavorable for sod installation as indicated in these Specifications. .

PART 2 - PRODUCTS

2.1 MATERIALS

A. Soil Preparation: See Division 32 Section "Soil Preparation.

B. Topsoil: See Division 32 Section "Topsoil".

C. Sod Standards:
   1. Nature's Prairie Turf
      Turf Manufacturer LLC
      Phone: 970-493-3911
      www.turfmastersod.com
   2. Sod to be produced in accordance with requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" in TPI's "Guideline Specifications to Turfgrass Sodding."
   3. Harvesting: Sod shall be fertilized two to three (2–3) weeks prior to harvesting. Mow sod to a height of one and one-half inches (1-1/2") before the sod is lifted. Sod shall be harvested in rolls, and shall not be cut more than 24 hours prior to planting.

4. Size: Machine cut to a minimum pad thickness of three quarters inch (3/4), excluding top growth and thatch. Provide sod of uniform pad sizes eighteen inches (18”) maximum width by twenty four (24”) minimum length, with maximum five percent (5%) deviation in either length or width. Broken pads or pads with uneven ends will not be acceptable. Sod pads incapable of supporting their own weight when suspended vertically from upper ten percent (10%) of pad will be rejected. Sod which has dried out, sod with adhering soil which breaks, tears, or crumbles away will not be accepted. Sod cut for more than twenty-four (24) hours will not be accepted.
5. Plastic netting: Sod to be free of plastic netting used during establishment by sod grower.
6. Inspection will be made periodically during sodding, at completion and at end of Warranty period by the Project Manager. Inspection is primarily for quality; however, other requirements are not waived even though visual inspection results in Acceptance.

D. Fertilizer: Inorganic mixture with following chemical composition: (20-5-10) with fifty percent (50%) sulfur coated urea (no iron), or as recommended by testing lab based on soil sample results.

2.2 PESTICIDES

A. General: Pesticide, registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use ‘Restricted Use’ pesticides unless authorized in writing by the Project Manager and authorities having jurisdiction.

B. Selective for either of the following types:
1. Broadleaf:
   a. 2,4-D Amine,
   b. Clopyralid,
   c. Aminopyralid,
   d. Triclopyr,
   e. Or approved equal.
2. Grasses:
   a. Imazapic,
   b. Indaziflam,
   c. Or approved equal.

C. Non-Selective: Broadleaf or Grasses
1. Glyphosate,
2. Or approved equal.

2.3 SUBSTITUTIONS

A. All substitutions shall be submitted to and approved by the Project Manager prior to installation.

PART 3 - EXECUTION

3.1 SITE EXAMINATION

A. Examine areas to be planted for compliance with requirements and other conditions affecting performance.

1. Grades shall be in conformance with Division 31 Section “Earth Moving”. Finish grades shall have consistent slopes as indicated on the Contract Drawings.

2. Verify soil preparation of all areas to be sodded are in accordance with the requirements of Division 32 Section “Soil Preparation”.
3. Verify that no foreign or deleterious material or liquid such as, but not limited to, paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.

B. Locate, protect, and maintain the irrigation system during sodding operations. Verify that the irrigation system is operable, and a coverage test has been completed and approved prior to sodding by the Project Manager. Irrigation system components damaged during seeding operations shall be replaced or repaired to current City of Salida Parks irrigation standards at the Contractor’s expense.

C. Protect grade stakes set by others until removal is directed by the Project Manager.

3.2 PREPARATION

A. Work notification: Notify the Project Manager at least seven (7) working days prior to start of sodding operations.

B. Limit turf subgrade preparation to areas that can be sodded within twenty four (24) hours.

C. Uniformly moisten excessively dry soil that is not workable.

D. The Contractor shall prepare the soil of all areas to be sodded in accordance with the requirements of Division 32 Section “Soil Preparation”.
1. Do not mix or place soils and soil amendments in frozen, dry, or, excessively wet conditions.
2. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.

E. Weed Control: See Division 32 Section “Soil Preparation” for required weed control procedures. Do not proceed with planting until the Project Manager has approved the specified and completed weed control measures.

F. Fine Grading: See Division 32 Section “Soil Preparation”.
   1. Verify all areas are graded to drain at a minimum of two percent (2%) or as indicated on the Contract Drawings. Maintain positive drainage, prevent ponding and direct run-off into catch basins, drainage structures, etc., and provide well-contoured surface prior to proceeding.
   2. Verify that the subsurface drainage system and drain inlets, if present, are operative.
   3. A firm weed-free seed bed is required. The seed bed shall be totally free from rock or clay clods or any materials over one inch (1”) in diameter. Remove sticks, roots, rubbish, and other extraneous matter and legally dispose of them off-site.
   4. Obtain the Project Manager’s approval of finished grade prior to proceeding with seeding operations.

G. Transition Grading: When areas of new sod abut existing areas, sod shall transition to prevent any abrupt grade breaks.

H. When grading is completed the soil shall be firmed by float dragging, followed by steel raking, to provide for the proper sodded subgrade. The sod bed shall be totally free from rock or clay clods over one-half inch (1/2”) inch in diameter.
   1. Newly Graded Subgrades: Loosen subgrade to a minimum depth of six inches (6”)
   2. Unchanged Subgrades: If turf is to be planted in areas unaltered or undisturbed by excavating, grading, or surface-soil stripping operations, prepare surface soil as follows:
      a. Remove existing grass, vegetation, and turf. Do not mix into surface soil.
      b. Loosen surface soil to a depth of at least 8 inches. Apply soil amendments and fertilizers according to planting soil mix proportions and mix thoroughly into top six inches (6”) of soil. Till soil to a homogeneous mixture of fine texture.
      c. Remove stones larger than one-half (½”) inch in any dimension and sticks, roots, trash, and other extraneous matter.
      d. Legally dispose of waste material, including grass, vegetation, and turf, off-site.

I. Adjustment: Adjust irrigation heads to proper watering height according to depth of sod material but lower than compacted blade height to enable lawn mowers to cut grass freely without damage to the sprinkler system.

J. Repair: Re-establish grade and specified conditions to damaged sod areas prior to placing sod.

K. Fertilizer: Fertilizer shall be applied topically once final grade has been established and just prior to sodding. Diamonium phosphate, bid quantity to be two (2) pounds of

nitrogen per one thousand (1,000) square feet. Apply per manufacturers recommendations for the type of planting area, or per soil test recommendations.

3.3 SOD INSTALLATION

A. Proceed with installation only after unsatisfactory conditions have been corrected and approved by the Project Manager.

B. Beginning of installation means acceptance of existing conditions by the Contractor.

C. Sodding:
1. Install sod during approved installation period (May 15 – September 1), unless otherwise approved by the Project Manager.
2. Any exposed areas not sodded within the approved installation period will require erosion control protection until sod can be installed.
3. Sod within twenty-four (24) hours after preparation of bed.
4. If plastic netting is present within sod, remove all netting during sod installation and discard from site.
5. Subgrade on which sod is laid shall be slightly moist during installation.
6. Lay sod at full roll width. Remove existing sod prior to installation of new sod in order to permit installation in 18” multiples, typical.
7. Lay sod with longest dimension parallel to contours and in continuous rows.
8. Tightly butt ends and sides of sod together. Stagger and compact vertical joints between sod strips.
9. Sod shall not be overlapped or stretched during placement. Exposed joints due to shrinkage will require replacement of sod in affected areas.

D. Topsoil: Where new sod abuts an existing turf area topsoil shall be placed along seams and or joints to provide a smooth transition.

E. Rolling: After sod and soil have dried, roll sodded areas after installation to ensure proper contact with the subgrade, remove minor depressions and irregularities, and ensure tight joints between adjacent pieces. Sod shall be moist prior to rolling. Once rolling is complete additional watering shall occur. Roller shall not exceed one hundred (100) pounds.

F. Water: Water shall be free of substances that may be harmful to sod growth. Hoses and other watering equipment necessary to water the sod to be furnished by Contractor.
1. Water thoroughly with a fine spray as laying progresses and immediately after planting. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of one and one half inches (1-1/2 ”) below sod.

G. Review seasonal restrictions prior to sodding.

3.4 CLEANING

A. Perform cleaning during installation of the work and upon completion of the work Remove all excess materials, debris, and equipment from site.

3.5 PROTECTION AND REPAIR

A. The Contractor shall protect existing utilities, irrigation, paving, and other facilities from damage caused by sodding operations. The Contractor shall repair any damage at their expense. Any areas outside the Contract Limits that are disturbed as a result of construction operations shall be restored to Parks standards at no additional cost to the City.

B. The Contractor shall repair damage to prepared topsoil and existing surfaces, caused by vehicular access and movement during work under this section, to original condition at no additional cost to the City.

C. The Contractor shall protect and restrict access from seeded areas until the areas are established and Accepted. Temporary fencing, barricades, and warning signs shall be installed as required, or by direction of the Project Manager at no additional cost to the City. Maintain fencing and barricades throughout the site until the Project Manager approves removal.

D. Erosion Control: Review erosion control measures with the Project Manager prior to installation. The Contractor shall take measures and furnish equipment and labor necessary to control and prevent soil erosion, blowing soil and accumulation of wind-deposited materials on the site throughout the duration of work.

3.6 ESTABLISHMENT

A. If maintenance is required per the Contract, refer to Division 32 Section “Landscape Maintenance”.

B. If maintenance is not required per the Contract, then the sod establishment is per the Acceptance sub-section.

C. Establishment of the sodded areas are the responsibility of the Contractor until Final Acceptance per the following requirements:
   1. General: The establishment period shall begin immediately after each area is sodded and continue for Sixty (60) days or as determined by the Project Manager. During this time, the Contractor is responsible for watering, mowing, spraying, weeding, fertilizing and all related work as necessary to ensure that sodded areas are in a vigorous growing condition. Provide all supervision, labor, material and equipment to develop and maintain sodded areas from time of installation.

2. Mowing and Trimming: When turfgrasses reach three and one-half inches (3-1/2”) in height, begin weekly mowing program to maintain turf at two and one-half inches (2-1/2”) to three inches (3”) in height. Do not remove more than 1/3 the height of the grass blade in single mowing. Do not mow when grass is wet. All clippings from adjacent paved areas shall be removed and clippings from mowed turf areas shall be removed to the satisfaction of Project Manager.
3. Fertilizing: Within thirty (30) days of sodding and every sixty (60) days thereafter until Acceptance, apply specified fertilizer to maintain optimal turf vigor or per the direction of the Project Manager.
4. Weed Control: Control annual weeds by mowing. Do not use pesticides unless approved by the Project Manager and City of Salida Parks Operations Supervisor.
5. Insect and Disease Control: As needed, apply insecticide and fungicide approved by the Project Manager and the Parks Operations Supervisor.

3.7 ACCEPTANCE

A. Substantial Completion of sod areas shall be granted when the sod has been applied and stabilized or per the discretion of the Project Manager.

B. Final Acceptance will be defined as a healthy uniform turf over the entire sodded area that does not contain any stressed or bare spots greater than one (1) square foot.
1. Sixty (60) days after sodding, prior to Final Acceptance, the sodded areas shall be reviewed by the Project Manager and the Contractor. Any areas as determined by the Project Manager where the sod has failed to establish shall be re-sodded.
2. The Project Manager shall be satisfied with establishment. The sodded areas shall have a full stand of grass, in a vigorous growing condition, thoroughly rooted to the soil with absence of visible joints.

C. Use approved materials to re-establish turf that does not comply with the requirements of these specifications and continue maintenance until turf meets the requirements and reaches Final Acceptance.

D. After Final Acceptance, the sodded areas will become the responsibility of the City.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Measurement will be made by the contract unit specified for Sodding. Measurement shall include the actual number of units of specified material(s) placed and accepted at the locations shown on the Contract Drawings, or as directed by the Project Manager, and in accordance with the Specifications.

4.2 PAYMENT

A. Payment will be made at the contract unit price, and shall include required materials, transportation, equipment, labor, earthwork, loading, transporting, stockpiling, disposing, hauling off, watering, dust control, rolling, finish grade, installation of sod, weeding, fertilizing, fine grading, temporary protection by fencing or other means, watering and all maintenance required until Final Acceptance of the work as required in accordance with the Contract Drawings and Specifications.

END OF SECTION 32 92 23

SECTION 32 93 00
TREES, PLANTS, AND GROUNDCOVERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes requirements for furnishing, installing, and maintaining live woody plant material. Contractor to install tree plantings only. Shrubs, ornamental grasses and perennials are shown for information only.

1.3 DEFINITIONS

A. ANSI: American National Standards Institute. Z60.1 is the national standard for nursery stock.

B. Backfill: The soil used from original excavation site or the act of placing soil in an excavation.

C. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown wrapped with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.

D. Bare-Root Stock: Plants with a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed, and with not less than the minimum root spread according to ANSI Z60.1 for type and size of plant required.

E. Caliper: Caliper of a trunk as measured by a diameter tape at a height six-inches (6”) above the root flare for trees up to, and including, four-inch (4”) size at this height; and as measured at a height of twelve-inches (12”) above the root flare for trees larger than four-inch (4”) size.

F. Cane: A cane shall be considered a primary stem which starts from the ground or at a point close to the ground at a point not higher than one-fourth (1/4) the height of the plant, and which reaches the minimum height stated in the plant size specification.

G. Central leader: Also referred to as leader or the dominant leader. A continuation of the main trunk located in the center of the crown, beginning at the lowest main scaffold branch and extending to the top of the tree. Central leaders should be straight without defects.

H. Circling root(s): One or more roots whose diameter is greater than ten percent (10%) of the trunk caliper circling more than one-third of the trunk. Circling roots are unacceptable.

I. Clear Trunk: The portion of the trunk below the main crown which may include shortened temporary branches.

J. Co-dominant: Two or more vigorous, upright branches or stems of relatively equal diameter that originate from a common point, usually where the leader was lost or removed. Co-dominant stems are unacceptable.

K. Container-Grown: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.

L. Crown: The portion of a tree beginning at the lowest main scaffold branch extending to the top of the tree. On younger trees, the crown may be comprised of temporary branches.

M. Cultivar: A named plant selection from which identical or nearly identical plant characteristics can be produced, usually by vegetative propagation or cloning.

N. Diameter Breast Height (DBH): Diameter of a trunk as measured by a diameter tape at a height 54-inches (54") above the ground line for trees with caliper of six-inches (6") or greater as measured at a height of twelve-inches (12") above the root flare. Per ANSI Z60 American Standard for Nursery Stock.

O. Drip Zone: The outermost edge of the tree's canopy or branch spread. The area within a tree's drip line is all the ground under the total branch spread.

P. Finish Grade: Elevation of finished surface of planting soil.

Q. Genus: Biological classification name for a group of related plants that share similar characteristics or features.

R. Included Bark: Bark embedded in the union between a branch and the trunk or between two or more stems that prevents the formation of a normal branch bark ridge. Included bark is unacceptable.

S. Kinked Root: A main root that is sharply bent. Kinked roots are unacceptable.

T. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant. Some sources classify herbicides separately from pesticides.

U. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

V. Root Ball: Root mass of a tree or shrub after digging or removal of the container. Depth is measured from the base of the root flare to the bottom of the root ball. Width is measured horizontally across the root ball with an approximately circular form or the least dimension for non-round root balls, centered around the trunk within a 10% Root tolerance according to ANSI Z60.1

W. Root Collar: Also referred to as the root flare. The transition zone where the trunk and root zone meet.

X. Root Flare: Also called “trunk flare”. The area at the base of the tree's stem or trunk where the stem or trunk broadens to form first order roots; the area of transition between the root system and the stem or trunk.

Y. Scaffold Branches: Large main branches originating from the trunk that form the main structure of the crown.

Z. Species: Biological classification name for a subgroup of plants within a genus.

AA. Stem-girdling Root: A circling, bent, or straight root that touches or rests on the trunk or root flare that can become a permanent root. Stem-girdling roots are unacceptable.

BB. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

CC. Temporary Branch: A small branch that is temporarily retained along the lower trunk of young trees to promote general health and trunk taper.

DD. Tree Protection Zone: The zone equal to eighteen inches (18”) radially from the tree for every one-inch (1”) of trunk diameter at breast height.

EE. Trunk: The main stem of a tree, beginning at the root collar and ending at the lowest main scaffold branch.

FF. Taper: The thickening of a trunk to the root flare or branch toward its parent base.

GG. Variety: A naturally occurring named plant selection subtype of a species.

1.4 SUBMITTALS

A. See Division 01 Section “Submittals” for submittal requirements.

B. Product Data: For each type of product.

1. Plant Materials: Include quantities, sizes, quality, and sources for plant materials.

C. Product Samples: At a minimum provide the following samples for approval by the Project Manager, additional product samples may be required at the direction of the Project Manager.
   1. Mulch: one (1) gallon bag minimum of each type of mulch.
   2. Tree Stakes: one (1) of each type.
   3. Tree Straps: one (1) each.
   4. Guy Material: one (1) linear foot.
   5. Guy Signal: one (1) linear foot.
   6. Tree Wrap: one (1) linear foot.

D. Pesticides: Product label, Safety Data Sheet (SDS) labels and manufacturer's application instructions specific to Project.

E. Proper Identification: All plants shall be true to name as ordered or shown on planting plans and shall be labeled individually or in groups by species and cultivar (as appropriate).

F. Contractor shall provide a complete list of all plant material for approval by the Project Manager a minimum of ten (10) days prior to delivery. Any substitutions of plant material, including but not limited to size, type, species and variety shall be listed and submitted to the Project Manager for approval.

G. Tree Planting Permit: The contractor shall obtain a planting permit request form available at the City of Salida Parks Department and the Project Manager.

H. Contractor shall provide the following certificates:
   1. State Inspection Certificate from the origin nursery.
   2. Certificate from origin state.
   3. Quarantine Certificate from origin state.
   4. Any Certificates required by the USDA Animal and Plant Health Inspection Service (APHIS) and ANSI-Z-60 and accompanying Rules and Regulations.

I. Analysis of existing soil shall be per Division 32 Sections “Topsoil” and “Soil Preparation”.

J. Contract Close Out Submittals:
   1. Operating and Maintenance Data: At completion of work, submit One (1) digital copy and two (2) hard copies to the Project Manager in accordance with Division 01 Section “Contract Closeout”. Include recommended procedures for continued and proper maintenance during a full calendar year.
   2. Warranty for Trees, Plants, and Groundcovers: At completion of work, furnish written warranty to the Project Manager based upon specified requirements.

1.5 QUALITY CONTROL

A. All plant material shall comply with federal and state laws and regulations requiring inspection for plant diseases, pests, and weeds. Inspection certificates required by law shall accompany each shipment of plants. Clearance from the local county agricultural commissioner, if required, shall be obtained before planting trees originating outside the county in which they are to be planted. Even though trees may conform to county, state, and federal laws, the City may impose additional requirements that pertain to local issues.

B. The Contractor shall arrange for the inspection of plant material upon delivery to the site for compliance with the Specifications and Contract Drawings. The Project Manager has the right to reject plant material that does not meet Specifications until Final Acceptance. Inspection of materials is primarily for quality, size, form, variety, damage, and proper rooting but other requirements are not waived even though initial visual inspection results in approval. Rejected material shall be removed from the site within twenty-four (24) hours.

C. The City and/or project manager have the right to cull a pre-determined quantity of plant material representative of the genus to invasively inspect for root defects. Upon discovery of defects that will impact future health and growth, other plant material may be inspected as well to determine quality of overall plant material and possible rejection.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Materials: Deliver materials in original containers with tags showing genus, species and size. Protect materials from damage during delivery and while stored at site. The Project Manager reserves the right to inspect containers before or after installation to verify compliance with Specifications.

B. Bulk Materials:
   1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants or in tree protection zones.
   2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
   3. Accompany each delivery of bulk materials with appropriate certificates.

C. Trees: Nursery stock shall be harvested and planted during the same growing season. Do not prune, except as approved by the Parks Department and the Project Manager. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and transportation damage. Do not bend, tie, or deliver trees in such a manner as to destroy natural shape. Root balls should be moist and provide protective covering during delivery. Plant materials delivered without protective covering may be rejected. Protect root balls from damage during digging, transferring, loading, unloading and planting. All trees shall be labeled with a securely attached

waterproof tag bearing a legible plant name. Remove all tags and flagging as directed by the Project Manager.

D. Deliver bare-root stock plants within twenty-four (24) hours of digging. Immediately after digging up bare-root stock, pack root system in wet straw, hay, or other suitable material to keep root system moist until planting. Transport in covered, temperature-controlled vehicles, and keep plants cool and protected from sun and wind at all times.

E. Store bulbs, corms, and tubers in a dry place at sixty degrees to sixty-five degrees (60° to 65°) F until planting.

F. Handle planting stock by the root ball only, providing support to top.

G. Deliver trees after preparations for planting have been completed and install immediately. If planting is delayed more than six (6) hours after delivery, set planting materials in shade, protect from weather and mechanical damage, and keep roots moist.
   1. Set balled stock on ground and cover ball with wood chips, or other acceptable material.
   2. Do not remove container-grown stock from containers before planting.
   3. Water root systems of trees stored on site with a fine-mist spray. Water as often as necessary to maintain root systems in a moist condition.
   4. Root balls should be stored in shade and be covered with moist mulch if stored on site for longer than twelve (12) hours.

1.7 PROJECT/SITE CONDITIONS

A. Vehicular accessibility on site shall be as directed as shown on approved plans or by the Project Manager. Repair damage to prepared topsoil and existing surfaces, caused by vehicular access and movement during work under this section, to original condition at no additional cost to the City.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

1.8 COORDINATION AND SCHEDULING

A. Coordinate installation of planting materials during normal planting seasons for each type of plant material required, avoiding temperature extremes. Planting materials should be generally planted between May15 and September 15, or at the direction of the Parks Department or Project Manager. If irrigation is not available at the time of planting then the Contractor is responsible for watering of all plant material at no additional cost to the City, refer to Division 31 Section “Watering”.

B. Plant trees after final grades have been accepted and prior to sodding, unless otherwise authorized by the Project Manager.

1.9 WARRANTY

A. Warranty: The warranty specified in this Article shall not deprive the City of other rights the City may have under other provisions of the Contract Documents and shall be in addition to, and run concurrently with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Trees, Plants, and Groundcovers shall be warranted for a period of one (1) year after date of Substantial Completion, against defects including death, structural failures, dieback as determined by the Parks Department and the Project Manager. Warranty shall not cover defects resulting from lack of adequate maintenance, neglect or abuse, hail, or incidents that are beyond Contractor's control.

C. The Warranty shall not be enforced should any plant die due to vandalism after Substantial Completion.

D. Remedial Actions:
   1. Replace any plant materials that have been excessively pruned, more than twenty percent (20%) percent die back in the central leader, or in an unhealthy or declining condition immediately upon notice from the Project Manager during warranty period.
   2. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.

E. All plants shall be true to name and meet all conditions of these specifications. Any plant that is not true to name as indicated by form, leaf, flower, or fruiting characteristics shall be replaced at the Contractor's expense.

PART 2 - PRODUCTS

2.1 PLANT MATERIALS

A. General: Furnish and install nursery-grown trees and shrubs conforming to the requirements of ANSI-Z-60 and ANSI A300, Part 6, with healthy root systems developed by transplanting or root pruning. Provide well shaped, symmetrical, fully branched, healthy, and vigorous stock free of disease, insects, eggs, larvae, girdling, and defects such as sun scald, injuries, abrasions, and disfigurement. Trees of a larger size than that specified in the plant list may be used with a proportionate increase in size of roots and balls, if acceptable to the Parks Department and Project Manager. The use of larger plants shall be pre-approved by the Parks Department and covered by the Contractor at no additional cost to the City.

B. Label all plants of each size, caliper genus, species cultivar or variety with a securely attached waterproof tag bearing legible designation of botanical and common name.

C. All plants shall be the genus, species, variety or cultivar designated on the Contract Drawings. No substitutions will be accepted without the prior written approval of the

Parks Department and the Project Manager. Contractor must provide proof of non-availability.

2.2 TREES

A. These specifications shall apply to deciduous, broadleaf evergreen and coniferous species. Note that leaf characteristics will not be evident on deciduous trees during the dormant season.

B. Crown: The form and density of the crown shall be typical for a young specimen of the species/cultivar. Changes in form caused by wind, pruning practices, pests, or other factors shall not substantially alter the form for the species/cultivar. These crown specifications do not apply to plants that have been specifically trained in the nursery to be: topiary, espalier, multi-stem, or clump; or unique selections such as contorted or weeping cultivars.
   1. Trees shall have a single, relatively straight trunk, and central leader, unless noted on plans to be “Multi-trunk” or “Clump”. They shall be free of co-dominant stems and vigorous, upright branches that compete with the central leader. If the original leader has been headed, a new leader at least one-half of the diameter of the original leader shall be present.
   2. Main branches shall be evenly distributed along the central leader, not clustered together. They shall form a balanced crown appropriate for the age of the species/cultivar.
   3. Branch diameter shall be no larger than one-half the diameter of the central leader measured one-inch (1”) above where the branch is attached.
   4. The attachment of the largest scaffold branches shall be free of included bark.
   5. Temporary branches, unless otherwise specified, should be present along the lower trunk below the lowest scaffold branch, particularly for trees less than one-inch (1”) in caliper. These branches should be no greater than three-eighths-inch (3/8”) diameter. Clear trunk shall be no more than thirty percent (30%) of the total height of the tree, unless otherwise noted.

C. Trunk: The tree trunk shall be relatively straight, vertical, and free of wounds, except properly made pruning cuts, which shall be closed over or less than three-quarters-inch (3/4”) diameter open, sunburned areas, conks (fungal fruiting bodies), wood cracks, bleeding areas, signs of boring insects, galls, cankers, stem-girdling ties, or lesions (mechanical injury).
   1. Trunk caliper and taper shall be sufficient so that the tree will remain vertical without a stake. Trunk caliper at six-inches (6”) above the soil media (substrate) surface shall be within the diameter range shown for each container size below and as specified in current edition of ANSI Z60.1.
   2. The cut made when re-growing the top should be just above the major structural roots. The “shank” that results from this procedure should be at a consistent height above the structural roots and no longer than five-inches (5”), to ensure that the trees are consistently planted at the correct depth. The base of the trunk should not have a large pruning cut from re-growing the top.

D. Roots: The root system shall be substantially free of injury from biotic (e. g., insects and pathogens) and abiotic (e. g., pesticide toxiCityand salt injury) agents.
   1. The uppermost roots or root collar shall be within the upper two-inches (2”) of the soil media (substrate). Depth of the root-ball shall be measured from the top of the ball, which in all cases shall begin at the root flare. Soil above the root flare shall not be included in the root-ball depth measurement, and shall be removed.
   2. The tree shall be well rooted in the soil media (substrate). Root distribution shall be uniform throughout the soil or media and radial from the trunk. Structure and growth shall be appropriate for the genus, species and cultivar or variety. When the burlap or container is removed, the root-ball shall remain intact. Trees should have several lateral roots or many fibrous roots spaced evenly around the trunk to provide support so the trees are stable when planted. Trees should have as many small roots as possible. Fibrous roots can be achieved by root-pruning, using air-pruning containers, or under-cutting or root pruning and transplanting at any stage of production.
   3. The root collar and the inside portion of the root-ball shall be free of defects, including circling, kinked, and stem-girdling roots. Soil removal or root washing near the root collar may be necessary to inspect for the aforementioned root defects.
   4. Roots on the periphery and bottom of the root-ball shall be less than one-eighth-inch (1/8”) diameter.
   5. As a general rule for young nursery-grown trees, there should be two or more structural roots within one- to three-inches (1” – 3”) of the soil surface. “First order lateral roots” is another term that has been used for these roots. If the roots are deeper than three-inches (3”) , the stock shall be rejected.
   6. Root-balls that are undersized as specified in current edition of ANSI Z60.1. shall be rejected. Field grown trees for balled and burlap delivery shall have the roots pruned at least six-inches (6”) inside the final root-ball size performed within adequate time for the tree to develop fibrous roots at the outer edge of the root-ball prior to harvest and delivery.

E. Leaves: The size, color, and appearance of leaves shall be typical for the time of year and stage of growth of the species or cultivar. Trees shall not show signs of prolonged stress or extended drought as indicated by under or oversized leaves, wilted, shriveled or dead leaves.

F. Branches: Shoot growth (length and diameter) throughout the crown shall be appropriate for the age and size of the species/cultivar. Trees shall not have dead, diseased, broken, crossing, distorted, or otherwise injured branches.

G. All deciduous trees of one species used in formal rows or groupings shall exhibit cultural uniformity, i.e. “matched” in height, crown width and shape, height to first branch, and trunk taper. For this reason, it is desired that these trees be produced by a single grower.

H. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated, and only if approved by the Parks Department and the Project Manager.

2.3 SHRUBS – FOR INFORMATION ONLY

A. Container Grown Shrubs: All specifications for container grown plants shall include both plant size and container size. Plant size intervals and reference to height or spread shall be in accordance with the guidelines for the appropriate plant type set forth in ANSI Z60.1; Section 2.2 - Types of Deciduous Shrubs.

B. Container size shall be by container classification (i.e., not by container volume) as set forth in the ANSI Z60.1 Container Class Table.

C. In all cases, container grown nursery stock shall meet the following general requirement:
   1. All container grown nursery stock shall be healthy, vigorous, well rooted, and established in the container in which it is growing. Container grown nursery stock shall have a well-established root system reaching the sides of the container to maintain a firm ball when the container is removed, but shall not have girdled or kinked roots and/or root growth encircling the inside of the container.

D. The container shall be sufficiently rigid to hold the ball shape and to protect the root mass during shipping.

E. Minimum shrub sizes shall conform to the following standards:
   1. Tender shrubs (Type 0) that do not produce top growth that is winter hardy:

Height or Spread	**Minimum number of canes**	**Minimum spread of roots**
fifteen-inches (15”)	three (3) canes	Nine-inches (9”)

   2. Small shrubs (Type 1) that grow to a mature height of not more than three feet (3’):

Height or Spread	**Minimum number of canes**	**Minimum spread of roots**
fifteen-inches (15”)	four (4) canes	Nine-inches (9”)

   3. Intermediate shrubs (Type 2) that grow to a mature height between three feet (3’) and seven feet (7’):

Height or Spread	**Minimum number of canes**	**Minimum spread of roots**
Two feet (2’)	four (4) canes	twelve-inches (12”)

   4. Large shrubs (Type 3) that grow to a mature height exceeding seven feet (7’):

Height or Spread	**Minimum number of canes**	**Minimum spread of roots**

four feet (4')	six canes (6)	twenty-inches (20")

2.4 PERENNIALS, GRASSES, GROUNDCOVERS, AND VINES-FOR INFORMATION ONLY

A. All container grown plants shall be healthy, vigorous, well rooted, and established in the container in which they are growing and be in conformance with ANSI Z60.1. A container grown plant shall have a well-established root system reaching the sides of the container to maintain a firm ball when the container is removed but shall not have girdled or kinked roots and/or root growth encircling the inside of the container. Top growth is to be in conformance with established nursery standards.

2.5 TREE-STABILIZATION MATERIALS

A. Trunk-Stabilization Materials:
1. Deciduous and Evergreen Tree Stakes: Rough-sawn, sound, new softwood with specified wood preservative treatment by pressure process, free of knots, holes, cross grain, and other defects, two-inch (2") diameter by six feet (6'), pointed at one end.
2. Guys and Tie Wires: ASTM A 641/A 641M, Class 1, #14 galvanized-steel wire, two-strand, twisted. Guying must be approved by the Parks Department.
3. Tree-Tie Webbing: UV-resistant nylon webbing with brass grommets, size as indicated.
4. Safety Signals for Guy and Staking Wire: One-half inch (1/2") diameter PVC pipe, length as indicated.

B. Tree-Wrap:
1. Two layers of crinkled paper cemented together with bituminous material, four-inches (4") wide minimum, with stretch factor of thirty-three percent (33%).
2. Tree wrap tape: Tape as approved by the Parks Department and the Project Manager.

2.6 PLANTING BACKFILL MATERIAL

A. Unless otherwise directed by the Project Manager, the plant pit backfill material shall consist of the following, thoroughly mixed:
1. Soil Amendment as specified in Division 32 Section "Soil Preparation"; one-third (1/3) proportion of total mix.

B. If imported topsoil is required, it shall meet the requirements specified in Division 32 Section "Topsoil", Article 2.2.

2.7 MULCH

A. Organic Mulch: Organic mulch, free from weeds, chemicals, and/or deleterious materials and suitable as a top dressing of trees and shrubs, consisting of chipped wood material not larger than four-inches (4") in length.

2.8 FILTER FABRIC

A. Nonwoven Geotextile Filter Fabric: Polypropylene or polyester fabric, 3 oz./sq. yd. (101g/sq. m) minimum, composed of fibers formed into a stable network so that fibers retain their relative position. Fabric shall be inert to biological degradation and resist naturally-encountered chemicals, alkalis, and acids.

2.9 MISCELLANEOUS MATERIALS

A. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees, as approved by the Parks Department and the Project Manager. Deliver in original, sealed, and fully labeled containers. Mix and apply according to manufacturer's instructions.

B. Pre-Emergent Pesticide: As approved by the Parks Department and the Project Manager.

C. Pesticides: EPA registered and approved, and as approved by the Parks Department and the Project Manager.

D. Subdrainage: See Division 33 Section "Subdrainage Systems".

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify actual grade elevations and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.

B. Examine areas to receive landscaping for compliance with requirements and for conditions affecting performance of work of this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.
   1. When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify the Project Manager before planting.
   2. Verify that adequate overhead clearance exists to planting locations.
   3. Suspend planting operations during periods of excessive heat, cold, and/or moisture until acceptable planting conditions exist.
   4. Uniformly moisten excessively dry soil that is not workable.

C. Verify that no foreign or deleterious material or liquid such as, but not limited to, paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within the work area. If contamination is present in the soil within a planting area, notify the Project Manager immediately.
   1. If contamination is discovered during Construction the Project Manager will determine the best course of action to remediate the contamination, which may

include requesting the Contractor perform the removal of contamination and replacement of clean material.

2. If contamination is determined to be the result of construction operations, Contractor is to remove contaminated material and replace with clean material at the direction of the Project Manager.

D. Verify final grades are completed in accordance with the drawings. Proceed with installation only after unsatisfactory conditions have been corrected and approved by the Project Manager.

E. Cooperate with any other contractors and trades, who may be working in and adjacent to the landscape work areas. Examine the Contract Drawings which show the development of the entire site and become familiar with the scope of all work required.

3.2 FINISH GRADING

A. See Division 31, Sections “Earth Moving and 32 Sections “Soil Preparation” and “Topsoil”.

3.3 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, turf areas and existing plants from damage caused by planting operations. Repair damage to surrounding areas and site elements noted above resulting from planting operations at no additional cost to the City.

B. Utilities: Contractor shall be responsible locating utilities and, repair of utilities damaged during the work. Determine location of overhead and underground utilities and perform work in a manner that will avoid damage. Hand excavate, as required. Maintain markings until their removal is mutually agreed upon by the Contractor and the Project Manager.

C. Layout, stake and label all individual tree locations for approval by the Project Manager prior to installing trees.

D. Outline planting beds and mark plant locations within the bed(s) for approval by the Project Manager prior to installing any plant material or mow bands. Make adjustments as directed by the Project Manager at no additional cost to the City.

1. If formal arrangements or consecutive order of plants is indicated on Contract Drawings, select stock for uniform height and spread, and number the labels to assure symmetry in planting.

E. Prepare planting area for soil placement and mix planting soil according to Division 32 Section “Soil Preparation”.

3.4 FIELD QUALITY CONTROL

A. Provide quantity, size, genus, species, and variety of trees indicated, complying with current applicable requirements of ANSI Z60.1 “American Standard for Nursery Stock”, and all applicable state and local rules and regulations.

B. Inspection: The Contractor shall arrange for the inspection of plant material upon delivery to the site for compliance with the Specifications and Contract Drawings. The Parks Department and Project Manager have the right to reject plant material that does not meet Specifications until Final Acceptance.

C. Measurements: Measure trees according to the requirements of the ANSI Z-160, with branches and trunks in their normal position. Do not prune to obtain required sizes. Measure main body of tree for height and spread; do not measure branches or roots tip-to-tip.

3.5 WEED CONTROL

A. Do not proceed with landscape work until weed growth has been controlled and eliminated, per Division 32 Section “Soil Preparation”.

B. See Division 32 Section “Soil Preparation” for detailed weed control measures.

C. Use pesticides only with the written approval of the Project Manager, and in strict accordance with manufacturer’s instructions.

3.6 EXCAVATION FOR TREES AND SHRUBS

A. Planting Areas: Excavate by hand, auger or with a mini excavator. Scarify or roughen sides of tree pit by hand to eliminate any glazing. Tree spades may not be used to dig tree pits.
   1. Balled and Burlapped Trees: Excavate a minimum two times (2X) as wide as ball diameter at base of pit. Excavate a minimum of three to four time (3X – 4X) as wide as ball diameter at top of pit. The base of the root collar shall be two to three-inches (2” to 3”) higher than the grade at which the tree originally grew and finished grade. Slope sides of the pit as shown on the detail.
   2. Container-Grown Trees and Shrubs: Excavate approximately two times (2X) times as wide as container diameter at base of pit. Excavate a minimum of three to four time (3X – 4X) as wide as container diameter at top of pit. Plants shall be set one-inch (1”) higher than finished grade.
   3. Open top of root ball burlap and carefully remove soil to expose trunk flare to first order roots. Set hole depth based on bottom of root ball and base of root flare. Do not excavate deeper than depth of the root ball.
   4. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly compact the soil directly under the root ball to prevent settling.

B. Obstructions:

1. Utilities: Notify the Project Manager immediately of utilities that conflict or may potentially conflict with proposed plant locations. In such cases, alternative plant locations will be determined by the Project Manager.
2. Notify the Project Manager prior to planting if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavation.

C. Drainage: Notify the Project Manager if subsoil conditions show evidence of water seepage or retention in tree or shrub pits.
1. Fill the pit with water and allow it to completely drain before planting occurs.
2. If water does not drain out of pit within twenty-four (24) hours, notify the Project Manager.

3.7 PLANTING TREES AND SHRUBS

1. Balled and Burlapped Stock:Top of root ball should be exposed prior to hole depth determination. Set balled and burlapped stock plumb and in center of pit with base of root flare two to three-inches (2” to 3”) above adjacent finish grades as indicated.
2. Remove, without damaging the root ball, all of the wire basket and twine. Cut away burlap from minimum top two-thirds (2/3) of the root ball, but do not remove from under ball. Remove pallets, if any, before setting. Do not use planting stock if ball is cracked, loose, or broken before or during planting operation.
3. Remove remaining excess soil from top of root ball level base of root flare or top of first order root.
4. Place backfill around ball in layers. When pit is approximately one-half backfilled, water thoroughly and allow to absorb into soil to eliminate voids and air pockets prior to placing remainder of backfill. Repeat watering until no more is absorbed. Water again after placing final layer of backfill.

B. Container Grown Stock:
1. Carefully remove containers so as not to damage root balls.
2. Shave exterior 1” of soil and roots from root ball to remove circling roots and to promote radial fibrous roots. Use sharp spade or handsaw designed specifically for tree work to make clean, non-tearing cuts on roots.
3. Set plants plumb and in center of pit with top of ball raised one-inch (1”) above adjacent finish grades or as indicated.
4. Place backfill around ball in layers.. When pit is approximately one-half backfilled, water thoroughly and allow to absorb into soil to eliminate voids and air pockets prior to placing remainder of backfill. Repeat watering until no more is absorbed. Water again after placing final layer of backfill.

C. Bare-Root Stock: Set and support each plant in center of planting pit or trench with root flare two-inches (2”) above adjacent finish grade.
1. Backfill: As specified in Part 2 of this Section.
2. Remove girdled or kinked roots and/or root growth that is encircling without tangling or turning toward surface, spread roots laterally. Plumb before backfilling, and maintain plumb while working.
3. Carefully work backfill in layers around roots by hand eliminating air pockets. Bring roots into close contact with the soil.

4. When planting pit is approximately one-half filled, water thoroughly and allow to absorb into soil before placing remainder of backfill. Repeat watering until no more water is absorbed.
5. Continue backfilling process. Water again after placing final layer of soil.

3.8 TREE WRAP

A. Inspect tree trunks for injury, improper pruning, and insect infestation and take corrective measures required before wrapping. Inform Parks Department of conditions prior to wrapping. Wrap trees starting at the base of the trunk and spiral cover trunk to height of first branches. Overlap wrap, exposing half the width, and securely attach without causing girdling. Use black electrical tape to secure. Do not use staples.
   1. All deciduous trees shall be wrapped by November 1st and removed by May 15 or per the direction of the Parks Department and the Project Manager.
   2. Contractor shall be responsible for wrapping, re-wrapping if needed, and unwrapping trees during the warranty period.

3.9 PRUNING OF PLANTS

A. Prune only damaged or dead branches as directed by the Parks Department and the Project Manager.

3.10 TREE STABILIZATION

A. Install site-fabricated trunk stabilization as follows, unless otherwise indicated on Contract Drawings.
   1. Drive wood stakes into undisturbed grade outside tree pit. Avoid penetrating root balls or root masses.
   2. Securely attach specified wire to stakes.
   3. Support trees with specified wire and tree tie webbing from the tree trunk to each stake. Allow one to two inches (1” to 2”) of slack to avoid rigid restraint of the tree.
   4. For staked trees: Attach twenty-four inch (24”) long by one-half inch (1/2”) diameter PVC pipe flagging to each wire.
   5. For guyed trees: Must have prior approval from Parks Department.

3.11 MULCHING

A. Trees: Create a forty-eight-inch (48”) diameter by three inch (3”) high formed soil berm around tree and fill with three-inch (3”) deep specified wood mulch. Mulch shall be kept four to six-inches (4”-6”) away from tree trunk.

B. Shrubs:
   1. Mulch backfilled surfaces of pits, planting beds areas, and other areas indicated or as directed by the Project Manager.
   2. Mulch in shrub bed areas: Apply three-inch (3”) thick layer of mulch and finish level with adjacent finish grades. Do not place mulch against stems of plants.

3.12 ANTIDESICCANT

A. Apply antidesiccant using power spray to provide an adequate film over trunks, branches, stems, twigs, and foliage.

B. When deciduous plants are moved in full-leaf, the Project Manager may direct the use of an antidesiccant at nursery before moving and again two (2) weeks after planting. Antidessicant to be supplied and applied by Contractor at no additional cost to the City.

3.13 CLEANING

A. Perform cleaning during installation of the work and upon completion of the Work, to the satisfaction of the Project Manager. Remove all excess materials, debris, and equipment from site. Repair any damage resulting from planting operations.

B. Remove surplus soil, excess subsoil, unsuitable soil, and waste material including trash and debris generated during installation at no additional cost to the City.

3.14 PROTECTION

A. Protect existing utilities, paving and other facilities from damage caused by planting operations. The Contractor shall repair any damage at no additional cost to the City.

B. Restrict vehicular and pedestrian traffic from planted areas. Erect temporary protection zones with signs and/or barriers as required or directed by the Project Manager at no additional cost to the City.

C. Erosion Control: Take measures and furnish equipment and labor necessary to control and prevent soil erosion, blowing soil and accumulation of wind-deposited materials on the site throughout the duration of work.

3.15 MAINTENACE

A. The Contractor shall be responsible for maintaining all trees, shrubs, and groundcover until substantial completion is issued.

B. Maintain trees by pruning, cultivating, season appropriate watering, mulching, weeding, wrapping, unwrapping, restoring planting saucers, and resetting to proper grades or vertical position, as required to establish healthy, viable plantings. Monitor and control as required to keep trees free of insects and disease. Restore or replace damaged tree wrappings, stakes, guying.

C. During the irrigation season (generally May through September), water may be available from on-site quick couplers. When the system is not charged, it shall be the Contractor’s responsibility to supply adequate amounts of water from a water truck or other approved source. Hoses and other watering equipment shall be supplied by Contractor.
   1. Watering Amount:

a. Minimum watering requirements shall be twenty-five (25) gallons of water per diameter inch of every tree when temperatures are at or above forty degrees (40°) F.
b. Watering frequency shall be based on the average soil moisture level throughout the planting area.
    1) An average of six (6) “Average” on a soil moisture meter shall be maintained during establishment.
    2) Readings shall be taken every two (2) weeks at a minimum during the Construction period and at a minimum of four (4) locations throughout the planting area.

2. Readings shall be taken at a depth of eight inches (8”).At time of Substantial Completion, verify that tree-watering devices are in good working order and leave them in place. Replace improperly functioning devices.

D. If Landscape Maintenance is included in the contract then the Contractor shall continue maintenance of all trees, shrubs, and groundcovers after Substantial Completion as specified in Division 32 Section “Landscape Maintenance”.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Trees: Measurement will be made by the contract unit specified for Trees only. Measurement shall include the actual number of units of specified material(s) placed and accepted at the locations shown on the Contract Drawings, or as directed by the Project Manager, and in accordance with the Specifications.

PAYMENT

A. Trees: Payment will be made at the unit price bid and shall include furnishing of trees, excavation, storage of plantings, backfill, construction of dishes, staking of trees, guying, fertilizing, wrapping, wood mulching for trees, deer protection fence, placing wood mulch, watering until Final Acceptance, and other items necessary to complete the work as shown on the Drawings and in accordance with the Specifications.

END OF SECTION 32 93 00