

CHEYENNE URBAN FORESTRY

Tree Selection and Planting Guidelines **And** **Tree Retention and Protection Guidelines** **(For Construction Projects on City Lands)**

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TREES AND SHRUBS

PART 1 - TREE SELECTION AND PLANTING

SECTION 1 - General

1.01 SUMMARY

A. Work Included: Provide trees, and planting of same if requested, complete as shown and as specified including a one (1) year guarantee/warranty period if trees are provided and planted by the contractor.

1.02 QUALITY ASSURANCE, CITY CODE, VEGETATION AND PLANTING STANDARDS

A. Certificates

1. Submit certificates of inspection required by law for transportation of each shipment of plants along with the invoice.

2. File copies of certificates after acceptance of material. Inspection by Governmental agencies at place of growth does not preclude rejection of plants at the project site.

B. Applicable Standards: Apply standards for plant materials as described in the following:

1. "[American Standard for Nursery Stock ANSI Z60.1](#)" (off site link) most recent edition, American Association of Nurserymen, Inc.

C. Applicable Standards: Apply standards for tree and shrub fertilization as required in the following:

1. " American National Standard for Tree Care Operations - Tree, Shrub, and Other Woody Plant Maintenance - Standard Practices (Fertilization) ANSI A300 (Part 2) Fertilization", most recent edition.

a. Best Management Practices Tree and Shrub Fertilization, Companion publication to the ANSI A300 Standard for Tree, shrub, and Other Woody Plant Maintenance - Standard Practices (Fertilization)

D. [City of Cheyenne Road, Street & Site Planning Design Standards](#) (off site link) from the Cheyenne Metropolitan Planning Organization.

E. [City of Cheyenne Code: Title 17 Zoning; Title 12 Streets, Sidewalks, and Public Places and Chapter 12.16 Trees and Shrubs.](#) (Off site link)

1.03 PROJECT REQUIREMENTS

A. Planting work shall be done under the direct supervision of a qualified superintendent working on the site with experienced laborers familiar with planting procedures.

B. Contractor shall be responsible for obtaining any permits associated with planting in public rights-of-way and/or storage of materials.

C. Existing Conditions:

1. Vehicular accessibility on site shall be as directed by Director of Forestry or project supervisor. Repair damage to prepared grounds and surfaces caused by vehicular movement during work under this section to original condition at no additional cost to Owner.

1.04 MATERIAL SUBMITTALS

A. Samples: Submit samples, if required, three (3) weeks prior to delivery to site. Attach product name, address of manufacturer and/or supplier to each sample.

1. Mulch: Wood - One (1) pint.

2. Organic Soil Amendments: One (1) Pint of each type.

3. Tree Strap: One (1).

4. Fertilizer (as recommended from soil lab): Manufacturer's product information, as well as receipts of purchase.

1.05 ANALYSES OF SAMPLES AND TESTS

A. Contractor, at their own cost, will have project site soil tests done by a certified or qualified soils testing lab to determine any fertilizer recommendations prior to soil preparation for planting trees and shrubs.

B. Sampling: Owner reserves right to take and analyze samples of materials for conformity to specifications at any time. Furnish samples upon request.

C. Rejected Materials: Contractor shall remove rejected materials immediately from the site at their own expense. Contractor shall pay cost of testing materials not meeting specifications.

1.06 CONSTRUCTION SCHEDULE

A. Contractor shall provide the City Forestry Office of anticipated work schedule in writing or by E-mail to Director and Assistant Director at least 14 days prior to start of landscape work.

1.07 INSPECTION OF PLANT MATERIAL

A. Plants shall be subject to inspection for conformity to specification requirements and approval by the City at their place of growth prior to award of bid.

B. A written request for the inspection of plant material shall be submitted to the City at

least 10 working days prior to planting. This request shall state the place of growth and the quantity of plants to be inspected.

C. Plants shall be inspected upon delivery, and the City reserves the right to reject any plants that do not meet the standards or that have been damaged during shipment. Such approval shall not impair the right of inspection and rejection during progress of the work.

D. A Contractor's representative shall be present at all inspections.

E. The City shall be the sole judge of acceptability of nursery stock at any time during the course of this contract.

1.08 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Labeling: Furnish standard products in manufacturer's standard containers bearing original labels legibly showing quantity, analyses, genus/species/variety/cultivar and name of manufacturer/grower. Labeling need not apply to collected material. However, contractor shall warrant that plant material is true to species specified.

B. Transportation: During transportation, Contractor shall protect plant material from desiccation and all other potential damage.

C. Storage: Store products with protection from weather or other conditions which would damage or impair the effectiveness of the product.

D. Handling: Do not lift or handle container or balled and burlapped plants by tops, stems or trunks at any time. Do not bind or handle plants with wire or rope at any time.

E. Anti-Desiccant: At Contractor's option, spray all evergreen or deciduous plant material in full leaf with anti-desiccant just before transporting. Apply an adequate film over trunks, branches, twigs and foliage.

1.09 WARRANTY AND REPLACEMENTS

A. Warranty: For a period of one (1) year after Final Acceptance of all landscape work and at no additional cost to the City, the Contractor shall replace any plant material that is dead, or that is, in the opinion of the City's Representative, in unhealthy or unsightly condition, or that has lost its natural shape due to dead branches or excessive pruning of dead branches.

1. Correct Species: Warrant that all plant materials are true to species, variety and cultivar.

2. Vigor: Warrant that all trees planted under this Contract shall be healthy and in flourishing condition of active growth (in the opinion of the City) one year from date of Final Acceptance.

3. Delays: All delays in completion of planting operations which extend the planting into more than one planting season shall extend the Warranty Period likewise.

4. Condition of Plants: Plants shall be free of dead or dying branches and branch tips, mechanical injury, and co-dominant stems. All foliage shall be of normal density, size and color. Plants shall be free of sunscald, disease and insect infestations and shall have healthy buds. All plants shall be symmetrical. All root-balls shall be properly bound with burlap and wire baskets. Extremely dry or crushed root-balls will be rejected. Trees shall be dug and transplanted in the same growing season. Plant materials exhibiting conditions which are determined unacceptable due to poor health or poor installation by the Contractor shall be repaired and/or replaced at no additional cost to the City.

5. Replacements: As soon as weather conditions permit, replace, without cost to City, all dead plants and all plants not in a vigorous, thriving condition, as determined by City's Representative during and at the end of the Warranty Period. Replacement materials shall be subject to the same inspection process and all other requirements of original material. Contractor shall closely match replacements to adjacent specimens of the same species. Apply all requirements of these specifications to all replacements.

6. Watering: Contractor shall be responsible for providing water to the plants during the growing season and during the dormant season as needed, while one-year Warranty Period is in effect or when the city assumes responsibility of the project.

a. Contractor and City will agree upon a watering regime for plants under City maintenance, but still under Contractor one-year warranty and replacement period.

7. Exclusions: Contractor shall not be held responsible for failures due to neglect by City, vandalism, or vehicular damage during Warranty Period. Report such conditions to City's Representative.

SECTION 2 PRODUCTS

2.01 PLANT MATERIALS

A. General: Only plant material with seed stock originating and suited for growth in United States Department of Agriculture (USDA) hardiness zones 2, 3, & 4, will be acceptable for this project.

1. Growing Conditions: Plants shall be nursery-grown in accordance with good horticultural practices under climatic conditions similar to those of project, USDA Zone 4b, for at least two (2) years unless otherwise specifically authorized.

2. Collected Plant Material: All plant material which, due to size or quantity and cannot be nursery grown, may be collected. The Contractor, and if possible, the Director of Forestry or Representative will review this plant material in its native state before collection as is reasonably practical. The Director of Forestry or Representative reserves the right to reject this same material once it reaches the site if, in his/her opinion, it is not of the same quality as when it was initially reviewed.

3. Appearance: All plants shall be exceptionally heavy, symmetrical, tightly knit, and so trained or favored in development and appearance as to be superior in form for their species, with regard to number of branches, compactness, and symmetry. Trees which have multiple leaders (unless specified), or damaged or crooked leaders, will be rejected. Trees with abrasions of the bark, sunscald, disfiguring knots, or improper pruning cuts shall be rejected.

4. Vigor: Plants shall be sound, healthy and vigorous, well branched and densely foliated when in leaf. They shall be free of disease and insect pests. They shall have healthy, well-developed root systems. Plants shall be free from physical damage or adverse conditions which would prevent thriving growth.

5. Plants shall be harvested and transplanted during the same growing season.

B. Condition of Root System: The root-balls of all trees must be completely free of circling or girdling roots.

C. Measurements:

1. Take a caliper (trunk diameter) measurement at a point on the trunk six inches (6") above natural ground line for trees up to four inches (4") in caliper and at a point twelve (12") inches above the natural ground line for trees over four inches (4") in caliper.

2. Substitutions: Substituted plants shall be true to species and variety and shall conform to measurements specified except that plants larger than specified may be used if accepted by City. Use of larger plants shall not increase the contract price nor allow the Contractor to use smaller than specified material on other plants. If larger plants are approved, the most recent version of the [American Standard for Nursery Stock ANSI Z60.1](#) shall dictate the size of the root-ball or container.

2.02 ORGANIC SOIL AMENDMENTS (Composted)

A. Contractor shall, at their own expense, supply a representative organic soil amendment sample and written confirmation of the organic soil amendment composition from the supplier.

B. Organic Soil Amendments shall be used in tree and shrub planting areas. The organic soil amendments will be thoroughly mixed in the top 6 to 8 inches of soil. A soil test shall be done after amending the soil, with results not to deviate from the following ranges:

1. Organic soil amendments shall not raise the pH of the soil (become more alkaline), after well mixed into the soil.

2. Organic soil amendments well mixed into the soil, shall not raise the salt index of the soil above 2mmhos/cm (millimhos per centimeter) or 2dS/m (deciSiemens per Meter).

3. Organic amended soil shall not exceed the C:N (Carbon:Nitrogen) ratio of 30:1 or be less than 10:1 C:N.

4. Organic content of the soil after mixing in the organic soil amendment shall be above 5%.

5. The organic soil amendments shall be finely shredded and free of sticks, stones, lumps, and noxious weeds.

2.03 COMMERCIAL FERTILIZERS

A. If required, each tree and shrub planting site shall have the proper mix of fertilizer elements, which are specified on the soil lab report as lacking, applied according to the manufacturer label. Fertilizers shall be thoroughly incorporated into the entire tilled planting site to a depth of 6 to 8 inches. Fertilizers will not just be incorporated into backfill soil from individual planting holes.

2.04 STAKING MATERIAL

A. Use wire, twine, or strap material (such as ArborTie®), appropriate for the tree size. (Wire through a garden hose is unacceptable.)

B. Tree brace straps, designed for specifically staking trees, shall be used around the tree trunk in conjunction with wire or twine. Straps shall be 8" to 12" long by 2" (or greater) wide, high grade webbing material that will not fray or tear easily and will not cut into or abrade the tree trunk. The straps, typically used with wire or twine, will have a grommet at each end.

C. Staking poles shall be standard "T-post", six feet tall steel dark green or approved color, or six foot tall wood posts specifically intended for tree staking.

2.05 WATER

- A. Clean and fresh.
- B. Transport as required.

2.06 MULCHING MATERIAL

A. Trees and shrubs in turf areas or other planting beds shall be mulched with a chipped bark and/or wood mulch not larger than four inches (4") in length or other materials as specified by the project plan.

2.07 ANTI-DESICCANT

A. Anti-desiccants for retarding excessive loss of plant moisture and inhibiting wilt shall be sprayable, water insoluble, commercially manufactured, and specifically formulated to produce an evaporation/transpiration loss barrier.

2.08 TREE WRAP

A. Tree trunk wrapping material, used to help protect the tree trunk from sunscald, shall be specifically manufactured for tree trunk protection and shall be pre-approved by the city. Tree wrap shall be installed on trees, under warranty, in October and removed in May.

SECTION 3 EXECUTION

3.01 LAYOUT AND EXCAVATION OF PLANTING AREAS (Refer to 3.08 and 3.09 for Planting Illustration)

A. Layout and Staking: Lay out plants at locations shown on drawings. Use stakes at least one-foot tall to indicate tree location.

B. Review: Locations of plants shall be checked in the field and shall be adjusted to exact position before planting begins.

C. The Contractor shall notify Underground Utility Locator(s), serving Cheyenne, prior to digging. Contact City's Representative after utility locates are complete and before planting begins, for a final placement review.

D. Planting Site: Till the soil, in an area four times the width of the root-ball, to a depth of six to eight inches, if the area to be tilled will not conflict with structures, plants, major tree roots, or infrastructure. In this stage, incorporate organic soil amendments and/or fertilizer according to Section 2.02 A., and 2.03 A. Mix the amendments into the soil during the soil tilling process. Organic soil is added at a rate of one inch in depth covering the area tilled. Fertilizer is added, if needed, according to product label for tree use. Soil amendments shall not be added to just the planting pit backfill soil.

E. Excavate B&B tree planting pits to a width at least twice the diameter of the ball, but to a depth of one to two inches less than the height of the top most permanent root, as noted below in section 3.02.

F. Equipment for Digging Plant Pits: Use of a tree spade to solely dig plant pits is prohibited. A tree spade can be used to dig planting holes when the transplant plants are also dug with a tree spade. Using a backhoe to dig planting holes is acceptable, with scarification of the tree pit after excavation - see Section 3.02 C. 2.

G. Signs, access barriers, and other safety devices shall be used at all times to ensure public and worker safety, especially after the work site is closed for the night.

3.02 PLANTING OPERATIONS (Refer to 3.08 and 3.09 for Planting Illustration)

A. General:

1. Protect plants at all times from sun or drying winds.
2. Keep plants that cannot be planted immediately upon delivery in the shade, well-protected, and well-watered.

B. Handling and De-potting of Plant Materials:

1. Avoid all damage to containers and rootballs. If rootball is cracked or broken during handling, plant shall be rejected.

C. Installation:

1. Locate the uppermost permanent root emerging from the tree trunk, by loosening the burlap around the trunk on B&B trees, and carefully removing soil along the trunk.

2. Plant Pit: Measure the depth of the root-ball between the uppermost permanent root and the bottom of the root-ball. The depth of the planting hole shall cause the uppermost root to be one to two inches above the surrounding soil grade. The soil at the bottom of the planting pit shall be undisturbed and provide a solid foundation for the plant. Scarify sides of planting pit, thoroughly breaking up all surfaces and eliminating all "glazed" areas.

3. Remove bottom of the wire basket prior to setting into the pit.

4. Positioning: Plants shall be set in the center of the pit, and kept plumb. The uppermost root shall be kept between surrounding soil grade and two inches above the surrounding soil grade. If there is more than two inches of soil on the top of the rootball above the uppermost root, remove excess soil from the top of the rootball leaving two inches of soil covering the root system.

5. Back-filling:

a. Backfill around the rootball, using the soil removed from the planting pit, to stabilize the tree in the planting pit. After tree is placed in the hole and stabilized with some backfill soil, remove the remainder of the wire basket and remove the remaining burlap from around the top one-half to two-thirds of the rootball. All wire, string, the top portion of burlap around the rootball, and any other shipping material shall be removed from around the rootball.

b. Brace each plant plumb and rigidly in position until planting soil has been placed around the bottom of the rootball. After two-thirds of the hole has been filled with backfill soil, use water at low pressure to settle the soil around the rootball. Do not tamp or pack the soil around the root-ball.

c. The uppermost permanent root emerging from the trunk on the tree or shrub shall be between surrounding soil grade to two inches above the surrounding natural soil grade of the planting pit. **The top permanent root shall not be below the surrounding soil grade.**

d. No additional soil shall be placed on the top of the rootball, other than the two inches of soil left covering the roots from the nursery soil.

e. Contractor shall remove excessive excavated planting backfill material from the site as directed by the City's Representative.

6. Staking and/or Guying: Stake or guy as outlined in Section 3.03.

D. Tree Wells: A 2 to 3 inch high earth berm shall be formed on the outside perimeter of the planting pit, unless otherwise specified. (For mulching see Section 3.04).

E. Tree Wrap: Wrap, as detailed, all deciduous sensitive barked trees in the month of

October and remove after full leaf expansion in the spring. Do use any device that will puncture or abrade the bark of the tree to secure tree wrap.

F. Watering: Water each plant immediately after planting. Use a deep watering device or surface application, allowing water to soak into the rootball and backfill soil. Contractor shall provide watering services for proper frequency and amount, for the health and full development of all contractor-installed plant materials, until Final Acceptance and as required during the guarantee period, including winter months.

1. The amount will be no less than ten gallons of water for each one inch caliper tree trunk measure.

2. Frequency will depend upon the retention of plant available water in the soil.

G. Labels: Do not remove nursery-type plant labels or any City of Cheyenne tags from the trees until after Final Landscape Acceptance.

3.03 STAKING AND GUYING (Refer to 3.08 and 3.09 for Planting Illustration)

A. General:

1. Balled and Burlapped (B&B) Trees shall be able to stand upright without support. Trees shall be staked, if so indicated, on the planting detail plan.

2. All plant materials shall remain plumb and straight for all given conditions from installation through the guarantee period.

B. Staking:

1. Trees shall be staked and guyed as detailed below.

2. Locate (two) stakes in a line with the trunk of the tree, parallel or in-line with prevailing wind. Drive stakes at least eighteen (18) inches down into undisturbed soil.

3. Support straps (web straps designed for tree staking) shall be placed around the trunk in a single loop. Run wire or other line through grommets on support strap. Staking support line shall be installed parallel to the ground. Trees shall be guyed to allow the tree trunk to sway two inches (2").

4. A city approved durable wire or twine covering shall be installed between the tree strap and the post to reduce human contact injury and to improve visibility of the wire or line.

5. If metal t-posts are used, a city approved durable cap shall be installed on top of the t-post to reduce human contact injury and to improve visibility of the post.

3.04 MULCHING (Refer to 3.08 and 3.09 for Planting Illustration)

A. Install a 3 to 4 inch deep layer of specified mulch within a planting area as defined by the project specifications. Mulch will not touch tree trunks.

3.05 CLEANUP

A. Keep all areas of work clean, neat and orderly.

B. Clean up and remove all materials and debris from the entire work area prior to Initial and Final Acceptance.

3.06 MAINTENANCE

A. If the irrigation system is not available for proper watering at the time of installation, the Contractor shall provide water to plants to maintain soil moisture in the Available Soil Moisture Percent range of 40% to 75%. Failure of the irrigation system shall not relieve Contractor of the responsibility to provide the required water.

3.07 WINTER WATERING

A. Contractor shall provide winter watering of all trees and other materials as needed during the warranty period. Contractor shall maintain a log of all watering and maintenance operations.

3.08 Illustration of Planting Containerized Trees and Shrubs

3.09 Illustration of Planting Balled & Burlapped (B&B) Trees

END OF TREE SELECTION AND PLANTING SPECIFICATIONS

PART 2 - TREE RETENTION AND PROTECTION

This section provides standards and guidelines for the retention and protection of trees and high-value shrubs for any proposed public works or construction project.

4.00 TREE RETENTION AND PROTECTION PLAN

A. Develop with the aid of City Forestry or a Project Consulting Arborist a written Tree Protection plan for all trees to be retained on the project site.

4.10 REFERENCE STANDARDS AND GUIDELINES

A. Contractor shall comply with applicable requirements and recommendations of the most current versions of the following standards and guidelines. Where these conflict with other specified requirements, the more restrictive requirements shall govern.

1. ANSI Z133.1-2006 (or more recent version) American National Standard for Arboricultural Operations

2. ANSI A300 (Part 1) - 2001 Pruning, (Part 2) - 2004 Fertilization, (Part 3) - 2006 Support Systems, or more recent versions, Standard Practices for Trees, Shrubs and Other Woody Plant Maintenance, and Best Management Practices companion publications.

3. GUIDE FOR PLANT APPRAISAL - 9TH EDITION (or more recent version)
Authored by the Council of Tree and Landscape Appraisers; published by the International Society of Arboriculture.

4.20 DEFINITIONS

A. CRITICAL ROOT ZONE: Generally, all of the ground area within the tree's dripline.

B. DIAMETER (CALIPER): The size (in inches) of a tree's trunk is measured at: [1]-six (6) inches above grade for trunk diameters up to and including four (4) inches; [2]-twelve (12) inches above grade for trunk diameters from four (4) inches up to and including eight (8) inches; and [3]-four and a half (42) feet above grade for trunk diameters greater than eight (8) inches; in

accordance with guidelines established in the "Guide for Plant Appraisal" (see Section 5.00). All measurements should be rounded to the nearest inch.

C. DRIPLINE: The outermost edge of the tree's canopy or branch spread. The area within a tree's dripline is all the ground under the total branch spread.

D. HIGH-VALUE SHRUB: Any specimen shrub with an appraised value of \$100.00 or more.

E. PROJECT CONSULTING ARBORIST: An independent consultant with a degree in a field related to arboriculture, and at least five years field experience in tree preservation or on-site monitoring of public works or construction projects involving tree retention and protection. The consultant should be a member in good standing with the International Society of Arboriculture and a professional consulting arborist as recognized by the American Society of Consulting Arborists.

F. TREE PROTECTION AREA: Generally, a tree protection area should consist of the ground encompassing from 1.5 (minimum) to 2.0 times the distance between the trunk and dripline, or one linear foot away from the trunk base for every inch diameter of the trunk, whichever is greater. Areas of ground covered by pavement, buildings, or other permanent structures where the presence of roots is minimal or negligible, are excluded. The area under or within the tree's dripline is also referred to as the "Critical Root Zone".

With groups of trees or where an array effect is present, there may be discontinuous (non-overlapping) perimeters of tree protection areas which result in difficult to maintain or ineffective tree protection fencing. In these cases, even though tree protection areas do not overlap, they should be treated as though they do, if the distance between the perimeters of such areas is less than thirty (30) feet. In effect, this will artificially enlarge the area of tree protection, but will result in a clearly defined, manageable area.

4.30 GENERAL REQUIREMENTS

A. There shall be daily supervision of field crews by the City Forestry Staff or Project Consulting Arborist during the critical phases of the project: for example, demolition of existing concrete; root pruning; construction of retaining walls or sand walls; and construction of new curb or sidewalk in tree protection areas.

B. To prevent or minimize soil compaction, designated routes for equipment and foot traffic by work crews shall be determined prior to commencing construction activities, and shall be indicated in the tree protection plan. These routes shall be marked at the site, prior to commencement of construction, with tree protection fencing and signage as specified in the Site Plan and Sections 6.05 & 6.06 (tree protection fencing).

C. Motorized equipment and trailers, including but not limited to tractors, Bobcats, bulldozers, trackhoes, trucks, cars, and carts shall not be allowed access within tree protection

areas. Should access be necessary within designated tree protection areas, the existing grade shall be covered with six to eight inches of wood chip mulch to help distribute the weight of equipment and to minimize soil compaction and rutting. Plywood and/or mulch are not acceptable bridging materials for driving over exposed tree roots. Exposed tree roots shall not be driven over. The Director of Forestry or Project Consulting Arborist shall be notified and shall approve of the access and driving surface prior to its use.

D. Materials and supplies shall not be stockpiled or stored within the tree protection area. Should temporary storage be necessary within designated tree protection areas, the existing grade shall be covered with double, overlapping sheets of one inch thick plywood, or six to eight inches of wood chip mulch to help distribute the weight of materials or supplies and to minimize soil compaction.

E. Under no circumstances shall any objects or materials be leaned against or supported by a tree's trunk, branches, or exposed roots. The attachment or installation to trees of any sign, cable, wire, nail, swing, or any other material that is not needed to help support the natural structure of the tree is prohibited. Standard arboricultural techniques such as bracing or cabling that are performed by professional arborists are acceptable upon approval by the Director of Forestry or Project Consulting Arborist.

F. A monetary fine may be imposed by the project coordinator if the fenced tree protection area is breached.

5.00 DEMOLITION AND RECONSTRUCTION ACTIVITIES AND TREE PROTECTION

5.10 DEMOLITION OF EXISTING CONCRETE

Caution should be used during removal of existing street, curb, gutter, sidewalk, drain inlets, and other concrete demolition, to minimize injury to tree root systems. The following procedures should be used when removing existing concrete.

A. Breaking of the existing concrete for removal should be done in a manner that will minimize ground disturbance.

B. Curbs and sidewalks within designated tree protection areas and critical root zones shall be removed by hand. When removing existing sidewalks and curbs, care should be taken to avoid injury to roots located under, over, or adjacent to paved and concrete surfaces.

C. Roots and root-trunk flares growing over curbs should not be injured during breaking of curbs and removal of debris. Wood and bark tissues shall not be injured by striking tissues with equipment.

D. During the removal of concrete, all root systems and soil areas exposed shall not be disturbed.

E. Motorized equipment and trailers, including tractors, Bobcats, bulldozers, trackhoes, trucks, cars, and carts are to be limited to access on the existing paved street only. Access is discouraged behind the curb within tree protection areas.

F. Should access be necessary within designated tree protection areas, the existing grade shall be covered with double, overlapping sheets of one inch thick plywood, or six (6) to eight (8) inches of wood mulch to help distribute the weight of equipment and to minimize soil compaction and rutting. Plywood and/or mulch are not acceptable bridging materials for driving over exposed tree roots. Exposed tree roots shall not be driven over. The Director of Forestry or Project Consulting Arborist shall be notified and shall approve of the access and driving surface prior to its use.

5.20 CONSTRUCTION OF SIDEWALKS, CURBS, CONCRETE PAVING AND DRAINAGE INLETS

The following procedures shall be used when constructing sidewalks, curbs, concrete paving, and drainage inlets.

A. Keep all materials and equipment within the street bounded by existing curbs.

B. Protect exposed roots from contamination by stabilization materials and concrete.

C. Locate concrete washout areas away from roots and tree protection areas.

D. When excavating for the construction of inlets, excavated soil shall be deposited in trucks and hauled off or deposited temporarily on one inch thick plywood outside the critical root zone. Excavated and fill soil shall not be deposited, even temporarily, on unprotected natural grade within a tree's dripline.

E. After proper root pruning (see section 6.04), as needed, cover exposed roots within thirty (30) minutes to minimize desiccation. Roots may be covered with soil, mulch, or moistened burlap, and shall be kept moist during the period until the final grade or soil fill is completed.

F. Where possible, sidewalks should be raised, narrowed, curved, or relocated to prevent cutting and removing major roots (i.e., roots greater than three inches in diameter).

G. Limit soil fill to a maximum of two (2) inches fill over the natural grade within critical root zones. Fill should consist of sandy loam topsoil. Clay soils shall not be used as fill. When using fill soil, the existing surface to receive fill should be scarified prior to filling. Any filling operation should not occur during water saturated soil conditions.

H. Provide for easy concrete removal and replacement where an obvious raised root may cause sidewalk cracking in the future. This can be accomplished by installing an expansion joint on either side of the root or by etching the concrete on either side of the root to allow that particular section to be broken out and replaced. Compaction rating for the replacement walkway should not exceed 80% Proctor density. Tree roots will continue to slowly add girth every year; therefore, the base material needs to be malleable (e.g., suitable sub grade aggregates, crushed granite, compacted sand, or gravel) to prevent a fulcrum or pressure point which can crack or heave the walkway.

I. Root Restricting Barriers: Where appropriate, and under the direction of the Director of Forestry or Project Consulting Arborist, root restricting barriers can be installed with a minimal amount of disturbance. A gravel layer three to four inches in depth below the sidewalk and curb discourages root growth directly below these concrete surfaces. There are several other landscape related materials used as barriers to root growth, especially away from sidewalks, curbs and streets. Three such materials are:

1. An artificial thread woven fabric with holes approximately 1/26th-inch square separated by strands approximately 1/26th-inch thick, with strands fused together.

2. Copper screen has been shown to be effective in controlling seedling root growth, 14-mesh or smaller copper wire screen (1/16 inch square openings or smaller).

3. BioBarrier. A landscape fabric with Trifluralin (herbicide) impregnated pellets attached to the fabric. The pellets are impregnated with the herbicide Trifluralin which is released slowly over several years. The herbicide will form a "vapor" barrier where roots will not grow, anywhere from a half inch to 2 inches from the herbicide laced barrier. The herbicide is not systemic and should not kill anymore of the root or damage the health of the tree.

- a. After a two (2) foot deep, narrow trench is dug adjacent to the curb, sidewalk, or other structure involved, and after any affected roots are properly pruned (see section 6.04), the root barrier of choice should be placed against the side of the wall closest to the roots that were severed (side of the wall farthest from the structure being protected).

Note: Root barrier installations should not be used if large, existing roots (four (4) inches or larger in diameter) will be severed. The nylon fabric and copper screen will constrict (and hopefully strangle) the roots to the size of the openings in the material. Roots will be greatly stunted and/or diverted except for knobs that form against the barriers. The barrier should be installed from above the surface of the soil to a depth of at least eighteen (18) to twenty-four (24) inches (in a vertical plane). Mechanical barriers must be undamaged above and below the soil to be effective.

J. Cut the soil around trees instead of using backhoe or blade type equipment. Backhoes and blades can tear roots causing more damage to the tree. Tree roots shall be cut cleanly where damaged.

1. Excavate soil by hand at the construction cut limit to a depth of thirty (30) inches or to the depth of the required root cut, whichever is less.
2. Prune roots as specified in section 6.04.
3. Protect exposed roots as specified in section 6.02,E.

K. Concrete or chemicals spilled within tree protection areas should be completely removed. Contaminated soil shall be completely removed at the time of the spill and removed by hand without disturbance to root systems. Appropriate soil should be added as necessary to restore the grade.

5.30 IRRIGATION OR UTILITY INSTALLATION

A. PROTECTION OF TREES AND HIGH-VALUE SHRUBS:

Contractor shall protect all trees and high-value shrubs from injury due to irrigation related work. All injuries to trees and high-value shrubs shall be mitigated to the satisfaction of the City, and if appropriate, in accordance with guidelines established in the "Guide for Plant Appraisal. All costs of such mitigating shall be charged to and paid by the Contractor.

All irrigation lines shall be indicated on construction plans and pre-approved by the Director of Forestry or Project Consulting Arborist. No irrigation lines shall be located within 10 feet of any existing tree trunk. (See Section B-5 below).

B. EXISTING TREES

1. The Director of Forestry or Project Consulting Arborist shall be notified prior to any trenching or excavation that is known or suspected to involve cutting of any roots more than two inches in diameter.
2. All trenching or other work under the dripline of any tree shall be done by hand or by other methods which will prevent breakage or other injury to branches and roots.
3. Where it is necessary to excavate within the critical root zone of existing trees, contractor shall use all possible care to avoid injury to trees and tree roots. Excavation, in areas where two inch diameter and larger roots occur, shall be done by hand with approved hand tools. Where possible, tree roots two inches or larger in diameter shall be tunneled or bored under and shall be covered with moistened burlap to prevent excessive drying.
4. Wherever a trenching machine exposes roots smaller than two inches in diameter, such roots extending through the trench wall shall be hand pruned (see section 6.04). All trenches within critical root zones shall be closed within twelve hours. If this is not possible, the trench walls shall be covered with burlap and kept moistened. Prior to backfilling, Contractor shall

contact the Director of Forestry or Project Consulting Arborist to inspect the condition and treatment of roots larger than two inches in diameter injured by trenching.

5. Horizontal directional boring (auger tunneling), rather than open trenching, should be used for irrigation line or other utility installation within one half foot linear distance from the trunk base for every inch of trunk diameter (e.g., 30 inch diameter tree trunk equals a distance of 15 feet).

5.40 ROOT PRUNING

A. Tree roots shall not be pruned or cut unless their removal is unavoidable or absolutely necessary. The Director of Forestry or Project Consulting Arborist shall be notified prior to any operation known or suspected to involve cutting roots more than two inches in diameter. The Director of Forestry or Project Consulting Arborist shall be notified immediately in the event that roots in excess of that described above are cut, torn, ripped, or otherwise injured.

B. Removal of roots greater than one inch diameter or parts of roots that are injured or diseased should be performed as follows:

1. Preserve the root bark ridge (similar in structure and function to a branch bark ridge). Directional root pruning is the recommended technique and should be used during hand excavation around tree roots. Roots are similar to branches in their response to pruning practices. With directional root pruning, objectionable and severely injured roots are properly cut to a lateral root, if possible, that is growing downward or in a favorable direction.

2. All roots needing to be pruned or removed shall be cut cleanly with sharp hand tools, with oversight by the Director of Forestry or Project Consulting Arborist. No wound dressings shall be used.

3. Recommended root pruning tools:

- a. By-pass type lopper.
- b. By-pass type pruner.
- c. Large and small hand saws.
- d. Sharp knife for roots less than 1 inch in diameter.
- e. Trowel or small shovel.

C. Root Pruning Near Sidewalks

1. Root pruning should be done carefully, by hand, to achieve the objective of reducing future sidewalk problems as well as preserving the trees. Removing anchoring roots or causing injuries in anchoring roots and root flares can cause future decay and windthrow hazards. Indiscriminate cutting of vigorous roots results in their resprouting so that several more new roots may grow from the cut end, back under the sidewalk, thereby reducing the time between

sidewalk repairs. Roots can be managed in the ground without significant harm to trees, if care is taken to avoid injuries that lead to root and trunk decay.

2. Directional root pruning is recommended because it considers the tree's response to root pruning and decay. With directional root pruning, roots are cut to a large lateral, if possible, that is growing downward or in a more favorable direction. The pruned root ends will be less likely to resprout, since a large lateral can assume the new terminal role of the root.

Proper removal of selected roots or parts of roots can direct roots away from sidewalks in the future. Procedures for root pruning directly next to sidewalks are as follows:

a. Hand dig a trench six to eight inches in depth at the edge of the planting strip and sidewalk.

b. Remove all roots less than two inches in diameter in this trench back to a desirable lateral root, preserving the root bark ridge. If careful excavation does not reveal a desirable lateral root within twelve inches of the exposed root in question, then the exposed root shall be cut so that a minimal amount of root is removed.

c. Small root bundles, the source of future sidewalk problems, should also be removed at this time.

3. All roots larger than two inches in diameter should be examined by the Director of Forestry or Project Consulting Arborist in terms of their role in anchoring the tree.

a. All roots that contribute significantly to anchorage should be preserved. Prune all other roots less than two inches in diameter to sound, downward growing lateral roots that are at least one half the size of the root being removed.

b. All roots larger than four inches in diameter are to be preserved unless their removal is absolutely necessary. Preservation of large roots may require:

- i. Reducing the sidewalk width near the root flare
- ii. Ramping or bridging the sidewalk over the roots to allow for root growth
- iii. Redirecting the sidewalk away from the root flare of the tree.

4. Tree guying subsequent to root pruning: Smaller trees may be able to be reasonably guyed or otherwise supported.

a. Upon review of on-site root pruning and constructing grading limits, the Director of Forestry or Project Consulting Arborist shall determine if smaller existing trees subject to root pruning can be reasonably guyed or otherwise stabilized. Contractor shall retain a qualified tree service company to complete tree guying and stabilization in accordance with American National Standard (ANSI) A300 (Part 3) as referenced in Section 5.00. Tree service company shall be licensed by the City of Cheyenne, through the Director of

Forestry's Office.

5.50 TREE PROTECTION FENCING

A. Tree protection fencing should be installed behind the existing curb as close to the street as construction will allow in areas where the street surface will be removed and replaced. Tree protection areas shall be designated on construction documents, and fencing locations should be staked for approval by the Construction Manager and Director of Forestry or Project Consulting Arborist.

B. Tree protection fences should be constructed of one of the following:

1. Galvanized chain-link - six feet in height. Posts should be installed on ten foot centers (maximum), at a depth of three feet minimum. Installation of post shall not result in injury to surface roots or root flares of trees.

2. Colored (orange), molded plastic construction fencing, four feet in height. T-Posts, six feet tall, should be installed on a maximum of ten foot centers to support the fencing.

C. Fencing shall be installed to completely enclose the tree protection areas.

D. Tree protection fencing shall be installed prior to any construction activity and shall remain until its removal is authorized by the Director of Forestry or Project Consulting Arborist.

5.60 TREE PROTECTION SIGNS

A. A sign shall be mounted on tree protection fencing at fifty foot intervals warning constructing personnel and the public to keep out of the tree protection areas.

6.00 PROJECT SITE MONITORING

A. As determined by the Director of Forestry for projects of sufficient size to warrant such, a Project Consulting Arborist should be retained to enforce and monitor the Tree Retention and Protection objectives. The project site should be monitored a minimum of two times weekly, more frequently at the start of the project until all procedures and specifications are understood and properly executed by all parties.

7.00 INJURIES TO EXISTING PLANTS - DAMAGE PENALTIES - Trees can have an extremely high value!

A. TREE AND HIGH-VALUE SHRUB APPRAISAL:

1. All trees and high-value shrubs will be evaluated and appraised by the Director of Forestry or Project Consulting Arborist using the Guide for Plant Appraisal as referenced in Section 4.10, and a list of all tree values for the project will be on file in the Construction Manager's office. Any tree or other plant requiring retention or protection that is not on the list shall be appraised by the Director of Forestry or Project Consulting Arborist as necessary to comply with this damage penalty.

2. Documentation for appraisals will consist of: [1] - measurement of plant size; [2] - identification by common and botanical names; [3] - current condition (overall health, injuries, visible hazard status, etc.) and [4] - location factors as described in the "Guide for Plant Appraisal". Photographs may be taken of certain trees and shrubs to document debilitating condition factors.

3. The minimum threshold level for plants to be damage appraised shall be a minimum of \$100.00 cumulative damage.

B. Trees and other plants designated as requiring retention or protection shall be identified and located on construction plans. Loss of, or partial injury to, any of these plants due to Contractor neglect or improper construction activities will result in liquidated damages for the assessed value of the tree as determined by the Director of Forestry or Project Consulting Arborist.

C. Trees determined as requiring "general protection" or "special protection" in the construction areas and in other key locations should be clearly identified by the Director of Forestry or Project Consulting Arborist. Loss or partial injury to any of these trees due to Contractor neglect or improper construction activities will result in liquidated damages for the assessed value of the trees as determined by the Director of Forestry or Project Consulting Arborist. Injury to a portion of these trees will be assessed by the Director of Forestry or Project Consulting Arborist and a corresponding portion of the liquidated damages will be assessed to the Contractor.

D. A fine will be levied against the Contractor for each incident of construction damage, including construction traffic, within designated tree protection areas. Any fine shall be independent of any applicable liquidated damages for the assessed value of the tree or tree part.

E. Trees or roots visibly and unnecessarily injured will cause the City to withhold from the Contractor an assessed amount conforming to the requirements stipulated above, for a period

of one full year. After that period the impact of the injury to any tree will be assessed by the Director of Forestry or the Project Consulting Arborist.

F. If any trees or shrubs designated to be retained or protected are injured and replacement is justified, an equivalent number of diameter inches of trees or shrubs of same or similar species shall be furnished and planted by the Contractor in accordance with "Guide for Plant Appraisal" (See 4.10 A. 3.)

8.00 SUBMITTALS

A. Proposed methods and schedule for effectuating tree and other plant protection shall be submitted for approval. Contractor shall submit a construction schedule which includes a time frame for work near existing plants. Approval the construction schedule shall be obtained from the Director of Forestry prior to commencement of construction near tree protection areas.

B. Proposed methods, materials, and schedule for root pruning, branch pruning, and other tree maintenance shall be submitted for approval to the Director of Forestry or Project Consulting Arborist who will then mark the location of root pruning lines in the field prior to the operation. If possible, root pruning should occur between autumn leaf drop and spring foliage. Root pruning during the growing season shall require approval of the Director of Forestry or Project Consulting Arborist.

9.00 TREE AND OTHER PLANT MAINTENANCE DURING AND AFTER COMPLETION OF CONSTRUCTION

A. Proper maintenance should include, but without limitation to: structural and remedial pruning; watering; mulching; reducing soil compaction; fertilization; insect and disease control; soil and tissue analysis; aeration; and wound treatment.

B. The timing, duration and frequency of necessary maintenance practices should be determined by the Director of Forestry or Project Consulting Arborist, based on factors associated with the site and affected plants.

END OF TREE RETENTION AND PROTECTION SPECIFICATIONS