

**CITY OF LONGMONT
SECTION 600 - PARKS AND FORESTRY
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LANDSCAPE AND IRRIGATION

600.00 REGULATED AREAS AND DEVELOPMENT PROCESS

600.01 GENERAL

1. All arterial right-of-way, primary greenway or other areas owned and/or maintained by the City Parks and Forestry Services, including detention pond areas, shall comply with these specifications, the approved plans and the terms and provisions of the public improvements agreement.
 - a. Development adjacent to Ken Pratt Boulevard (Highway 119) east of Main Street (Highway 287) shall follow the Ken Pratt Boulevard Landscaping Guidelines for the design of the arterial right-of-way improvements. Plant quantity requirements will be per the Longmont Development Code current at the time of development.
 - b. Areas owned and not maintained by the City shall conform to these Standards and Specifications, however, certain exceptions may be made on a case by case basis through approval by the Parks and Open Space Division.
 - c. Common open space and other areas not owned or maintained by the City, but maintained by a property owner, property owner's association, homeowner's association or other maintenance organization, shall conform to applicable general criteria and the minimum design criteria (Paragraphs xxx.01 and xxx.02 of each technical section) of these Standards and Specifications.
 - d. Trees designated for saving or protection in a preliminary or final development plan or a tree preservation plan approved by the City, regardless of their location in publicly dedicated land or private property, shall be protected per the applicable criteria of Sections 602.00 and 606.00.
2. Arterial rights-of-way, primary greenways, park sites, and other areas owned or maintained by City Parks and Forestry, and private common open space and other privately maintained development areas shall also conform to the City Municipal Code and the Longmont Area Comprehensive Plan.
3. Consideration is to be given to provide for uniformity and proper alignment of concrete paths and associated landscaping within the regulated areas. Intersections, concrete path alignment and landscaping shall provide for safety and maintenance considerations.
4. Any deviation in layout of the irrigation system, concrete path, or landscaping from the approved construction plans shall be reviewed and approved by the City staff prior to installation. If modifications are extensive, plan re-submittal and approval will be required. For minor modifications, per City determination, correction on as-built drawings may be sufficient. Determination on modification type shall be determined by City staff.
5. Landscape plans shall be included as part of the overall construction plans for the phase of construction associated per the public improvement agreement.

6. Additional plan design criteria and plan information as relevant shall be included per each sub-section of 600 in these Standards and Specifications.
7. The City will consider variances to City Standards in an effort to reduce water consumption in arterial rights-of-way. The Public Works and Water Utilities Department recommends reducing turf area by increasing the size of shrub beds or using sub-surface irrigation in turf areas. Subsurface irrigation is only advised in areas without extensive buried utilities. Financial assistance with increased costs may be available. Contact Public Works and Water Utilities (303-651-8348) for details on the availability of funds.
 - a. Untreated (raw) water sources for irrigation systems will be used when available per the Water Conservation Master plan. Contact Water Resources for availability.

600.02 PLAN REQUIREMENTS

1. Concept Plans. A concept plan shall be submitted for all annexations into the City. Plans shall include the following information as a minimum:
 - a. Plan delineation showing parks, primary greenways and arterial rights-of-way as adopted per the most recent update of the Longmont Area Comprehensive Plan. City Landscape Regulations shall define requirements of each designated area. Plan shall be consistent with requirements outlined in Landscape Regulations.
 1. Plan to be at a scale no smaller than 1"=200'.
 2. Existing trees with general species and size defined.
 3. Delineation of wetlands or other sensitive habitats with areas defined by a qualified ecological report. Wetlands shall be noted as to whether they are considered jurisdictional waters of the United States by US Corps of Engineers regulations.
 4. Existing topography showing two (2) foot contour intervals.
 5. All existing water bodies including ditches, streams, ponds, or other significant occurrences.
 6. Notation as to areas that will be dedicated to the City and their proposed widths, lengths and areas.
 - b. Typical cross-sections for relevant primary greenways and arterial streets expressing intended conceptual improvements.
 1. Cross-sections to be at a scale no smaller than 1"=20'.
 2. Width of area as proposed, shown with right-of-way line, curbing or ditch centerline and 100-year floodplain boundary line. Location of concrete path with distance from right-of-way line to be defined.

3. Typical landscape design concepts, including plant clustering, buffers and other features described.
 - c. Notes to be placed on the plan that read as follows as relevant to the development:
 1. Primary greenways shall be dedicated to the City at the time of final platting and shall be constructed by the Developer according to City Landscape Regulations requirements in effect at the time of construction. Once Final Acceptance is obtained, the City shall assume maintenance obligations for the primary greenway.
 2. Arterial rights-of-way shall be dedicated to the City at the time of final platting and shall be constructed by the Developer according to City Landscape Regulations requirements in effect at the time of construction. Maintenance shall be the responsibility of the homeowners association or City (as applicable) after Final Acceptance of public improvements is obtained per of the Municipal Code.
2. Preliminary Development Plans - A preliminary plan shall be submitted as required by the City Development Code. Plans shall include all of the information from the Concept Plan and the following general information as a minimum (also see requirements under each sub-section of this chapter):
 - a. Scale of drawings at 1"=50' or larger. North arrows, scale, street names and other standard plan notations to be shown.
 - b. Existing plant materials identified on the plans showing their location as surveyed, tree size measured at four and one half (4 ½) feet above adjacent grade, species and condition or health. Also it should be indicated if the trees/shrubs are to remain or be removed as part of the site development.
 1. A site visit with the City Forester is encouraged at this time to determine tree removal or saving status.
 - c. Preliminary grading concept showing berming or land forms. Contours should be shown at two-foot intervals.
 - d. Preliminary landscape plan showing plant groupings, general plant type (deciduous, ornamental or coniferous trees); shrub beds; flower beds; water features; concrete paths or walkways, fences, live ground covers or mulch areas, and other unique features.
 - e. List of suggested plant species for each type of plant material shown on the plan.
 - f. Delineation of regulated areas per Landscape Regulations including primary greenways, park sites, arterial rights-of-way, buffer areas, common open space and scenic entry corridors. Each area to be identified in terms of total length (excluding road crossings), width (minimum, maximum and typical), and square footage of each type area (primary greenway, arterial ROW, etc.).

- g. Details or cross sections of each regulated area with a typical landscape treatment described. Scale of detail or section to be 1"=20' scale or larger.

For primary greenways, a plan cross-sectional sheet with ditch cross-sections along the centerline of the ditch at fifty (50) foot intervals are to be included. Existing grade and proposed edge of right-of-way are to be clearly indicated. Scale to be 1"=20' horizontal and 1"=10' vertical.

Or instead of these cross-sections, provide:

Photographic survey of ditch sections along centerline of ditch at fifty (50) foot intervals where photographs are keyed to a plan that notes where photograph is taken from. The photograph is to clearly show a physical demarcation of the proposed edge of the right-of-way (e.g. a pole held by an assistant). Entire length of primary greenway to be photo-surveyed.

- h. Plan notes that include the following (also see specific notes per each sub-section of this chapter):
 - 1. A design intent statement that clarifies in general terms the proposed landscape treatment.
 - 2. A maintenance obligation statement that clarifies for each individual area, the responsible entity for on-going maintenance. Include clarification for arterial rights-of-way, primary greenways, on-site improvements (common open space), detention ponds and/or scenic entry corridors.
 - 3. A development obligation statement that clarifies the responsibility of the Developer to install landscaping and irrigation according to the most current Landscape Regulations and Standards and Specifications in effect at the time of construction.
 - 4. A statement, as relevant, that clarifies the obligation of the Developer to prune any existing trees within the project limits, if they are to remain, according to City Forestry Standards and under the direction of the City Forester. A current list of licensed contractors is available by calling 303-651-8446.
 - 5. A statement describing landscape and irrigation tap sizes and locations and if they will be eligible for a tap fee waiver.
- 3. Final Development Plans and/or Final Site Plans - A final plan shall be submitted as required by the City Development Code. Plans shall include all of the information required for Preliminary plans and the following information as a minimum (also see requirements under each sub-section of this chapter):
 - a. Scale of drawings at 1"=20' or larger. North arrows, scale, street names and other standard plan notations to be shown.
 - 1. Only areas owned or maintained by the City need have plans at this scale. Common open space or other non-regulated areas can vary from

this scale requirement provided sufficient detail and clarity can be illustrated at the different scale.

- b. Final grading concept showing berming or land forms. Existing and proposed contours are to be shown at a one (1) foot contour interval. Illustrate floodplain boundary definition showing 100-year floodplain boundary and a line representing 10% of 100-year floodplain for relevant areas.
- c. Final landscape plan showing individual plant layout at 2/3 mature size, specific plant species for each plant as identified by a key that relates to a full landscape schedule showing key, quantity per species, botanical name, common name, size and condition purchased (e.g., balled & burlapped/B&B, and mature height and spread etc.). Separate landscape schedule to be provided for each regulated area: common open space areas, arterial right-of-way, primary greenway, etc. Also show and include general dimensions for all water features with specific notation as to type; concrete paths or walkways, fences, and other unique features.
- d. All existing and proposed utilities and their associated easements, graphically shown in their correct alignment and labeled as existing or proposed; underground or overhead, and with dimensions describing the width of the easements.
 - 1. See Section 500 for Public Works and Water Utilities requirements and Section 700 for Power & Communications regulations.
- e. A chart showing the following for each separate regulated area:
 - 1. Total length, width (minimum, maximum and typical), square footage, and acreage of each area (Primary Greenway, arterial right of way, common open space, etc).
 - 2. Total number of required trees and shrubs for each area, per current Landscape Regulations.
 - 3. Proposed number of trees and shrubs for each area.
 - 4. Square footage of shrub beds for each area.
 - 5. Square footage of each different turf type for each area.
 - 6. Length of concrete path for each area.
 - 7. Square footage of any buildings located in each area (as applicable).
- f. Plan notes, in addition to those required for Preliminary Plans, that include the following (also see specific note under each sub-section of this chapter):
 - 1. A statement that indicates if potable City water is to be used as a source for irrigation systems and, if so, the tap and backflow prevention device size and location. Also note whether the tap is eligible for fee waiver (for

those taps irrigating City owned areas only – primary greenways and arterial rights-of-way).

2. Location of landscape material shall be altered to provide adequate clearance from the final location of the electric distribution facilities to the satisfaction of Longmont Power & Communications.
4. Public Improvement Plans - Shall be submitted as required by the City Development Code in the same plan set as other public improvements, however, landscaping and irrigation designs for common open space areas are to be shown on separate sheets and with separate calculations from city owned and/or maintained areas. Generally, construction plans shall be required for all public improvement plan submittals. Plans shall include all information required for Final Plans and include the following information as a minimum:
 - a. Scale of drawings at 1"=20' or larger. North arrows, scale, street names and other standard plan notations to be shown. As these plans will be used for construction as-built drawings, clear drafting notations and professional quality mapping will be required. All plans including multi-sheet sets shall include original key clarifying where each sheet lies in overall development.
 - b. Final irrigation plan for both public and private improvements showing all equipment, layout, pipe sizing, sleeves, equipment legend and notes to clearly indicate components and construction. Tap location, meter pit assembly, controller, electrical service, valves and other locations as relevant shall be clearly indicated.
 1. Irrigation plans shall be required at a scale of 1"=20' or larger. Variances to this requirement may be made for long linear areas that will be irrigated with large rotor zones. Specific approval by staff is required before plans are submitted
 2. A chart listing the number of zones and the number of heads per each zone shall be included on all irrigation plans. Chart to be included for publicly owned and/or maintained areas and a separate chart for common open space areas.
 3. Areas with temporary irrigation systems should be noted on the plans, as necessary. Sufficient information should be provided on the plans in order for the City to determine that temporary irrigation is appropriate, including proposed methods and frequency of watering.
 4. The following plan notes are required on the irrigation plans for all common open space:
 - i. All mainline and lateral piping shall be Class 200 PVC.
 - ii. The number of stations on the controllers shall include two extra stations for possible future use. Controller box shall be weather tight and vandal resistant with locking exterior disconnect.

- iii. Check valves are required in all heads.
 - iv. Polyethylene Drip Pipe shall be weather and UV resistant, NSF approved and SDR pressure rated. Blue stripe or White stripe drip pipe is preferred. Soaker hose is not permitted.
 - v. All irrigation taps and electric services are to have an address and building permit before installation.
 - vi. All piping shall be buried a minimum of eighteen (18) inches.
 - vii. All piping shall be sleeved where located under paved surfaces. Electric wiring shall be sleeved separately from piping. Pipe sleeve sizes shall be two (2) sizes larger than the diameter of the pipe being sleeved and wire sleeves shall be a minimum of two (2) inches in diameter. All sleeves shall be marked with a "V" chiseled into the concrete curb or other paved surface it crosses under.
 - viii. Three (3) spare electrical wires shall be extended to each end of the mainline. The wires shall be looped in each valve box (eighteen (18) inch minimum loop) for possible future use.
 - ix. Head-to-head coverage is to be provided to all seeded and sodded areas.
 - x. Drip irrigation shall be provided for all trees and shrubs located in shrub beds and in all native seeded areas (even those areas approved for temporary irrigation for native seed). Trees located in irrigated turf areas shall not receive drip. Drain valves shall be included at the end of each drip lateral pipe.
- c. Plan notes, in addition to those required for Preliminary & Final Plans that include the following (see specific sub-sections of this chapter for additional note requirements):
- 1. It is the responsibility of the Developer and their Contractors to build the project according to approved plans and City details and in accordance with current City Standards and Specifications. Field changes to these plans are to be approved by the City staff prior to any work. Field conditions that conflict with or jeopardize the longevity of the proposed improvements shall be brought to the attention of the City staff for resolution. Failure to bring such matters to the City's attention or to obtain approval of remedial measures will in no way relieve the Contractor of their obligation to resolve the matter to the satisfaction of the City staff.
 - 2. It shall be the Contractor's responsibility to schedule a Pre-Construction meeting with the City Project Managers and inspectors prior to any work

commencement for publicly owned and / or maintained landscaped areas. Clarification will be given at this meeting on inspector contacts. Failure to schedule this meeting or perform necessary field inspections during the course of construction shall in no way relieve the Contractor of any obligations, performance standards or construction specifications as outlined in the Longmont Standards and Construction Specifications. Any work that proceeds without the approved City inspections shall be corrected at no cost to the City.

3. It shall be the responsibility of the Developer/Contractor to build the project in a time frame necessary to obtain Construction Acceptance and Final Acceptance during the growing season.
4. It is the responsibility of the Contractor to have a copy of the most current City Standards and Specifications on site at all times. All improvements within the publicly owned and/ or maintained areas and commonly-owned areas shall be installed per these standards and details. The standards shall be available to the Contractor at all site meetings/inspections. Any work that proceeds within the greenway or right-of-way that does not adhere to current Standards and Specifications and/or without the approved City inspections shall be corrected at no cost to the City.
5. Landscape and irrigation improvements shall not be installed prior to all utility construction.
6. A statement that clarifies mulch type, depth and type of permeable weed barrier underlayment.
7. A statement that clarifies fence type, height, and materials. If applicable, include a note that clearly states that the fence and/ or signage is to be maintained by the homeowner's association, property owner or individual homeowner, as relevant to the project.
8. For common open space areas, the following designer certification:

I certify this irrigation plan to be designed per current City of Longmont Design Standards and Specifications including the approved materials list, and that it was made under my supervision in accordance with Uniform Plumbing Code and Electric Code.

Design Company Name / Phone number
Designer Signature /Title

Date

Notary

9. An itemized cost estimate and an estimated completion date per phase for City public improvements and common open space areas for landscaping, irrigation and associated concrete path. The estimate shall be itemized by area with the specific sizes for each area or quantity for each type of work provided.

600.03 ACCEPTANCE PROCESS

1. Construction Acceptance of Public Improvements - Request a Construction Acceptance inspection by calling either: a) Parks and Forestry Services at 303-774-4532 for City owned and maintained areas; or b) Planning at 303-651-8330 for privately maintained area. Also request Construction Acceptance from Public Works and Water Utilities by calling 303-651-8304. All construction must be 100% complete prior to this inspection. Schedule walk through during the growing season. Submission of equipment and public improvement as-built drawings per Section 603.07 is required as part of this acceptance process.
 - a. Generally, between the months of November and April, City inspectors will not be available to inspect the landscape portions of Development projects. If all other City Divisions and Departments are able to approve Construction Acceptance for other areas during the dormant season, a Partial Construction Acceptance may be granted for weather dependent improvements. If the Developer and Contractor can finalize all work and obtain a Landscape and Irrigation Construction Acceptance prior to June 1 of the next growing season, then the City will allow for less than one year warranty period for landscape and irrigation improvements and sign for Final Acceptance at the same time as the other City Divisions and Departments. This shortened warranty period may not be available in seeded areas where establishment is unsatisfactory. In the event that the Developer and Contractor is not able to obtain a full Construction Acceptance from the City for outstanding items prior to June 1, then a delay of the Final Acceptance for all public improvements may be required.
 - b. Upon obtaining Construction Acceptance, warranty and maintenance period by Developer continues. (This section does not apply to City capital improvement projects unless specifically stated in their bid documents.)
 1. Maintain area in optimal condition for duration of period between Construction Acceptance and Final Acceptance (one-year minimum).
 2. Make periodic adjustments to irrigation system to achieve most desirable application of water. Reduce watering as appropriate. Provide all necessary maintenance including mowing and fertilizing turf areas, wrapping/unwrapping trees (at beginning and end of dormant season), securing stakes and guys, restoring mulch areas, removing trash and debris, sweeping and removing snow or ice from walks, pruning broken limbs and replacing dead plant materials, weed control, erosion control, and repairing other damage as needed.
 3. Maintenance shall insure optimal health and vigor of plant materials as needed to maintain specifications. Developer is responsible for all winterization or activation of irrigation system and other adjustments until

Final Acceptance. Icing of walks due to irrigation water and/or seasonal conditions shall be immediately addressed by Developer. Maximum allowable snow removal response time is twenty four (24) hours.

2. Final Acceptance for Public and Private Improvements - Request inspection at least 30 days before the end of one-year maintenance period from City inspectors and during the growing season, per Section 600.03 of these standards. It is the developer's responsibility to schedule inspections when plants are not in dormancy. Failure to do so may result in the delay of Final Acceptance until the following growing season. In addition, request Final Acceptance from Public Works and Water Utilities by calling 303-651-8304 and for landscape and irrigation improvements not to be maintained by the City, by calling Planning staff at 303-651-8330. A 15-day project work-through will take place where Parks and Forestry personnel, Homeowners Association, or the Developer will be on-site to operate and inspect the irrigation system and landscaped areas. Schedule an irrigation operator's training session with City personnel at the beginning of this project work-through period.
 - a. The City's Land Development Code (Title 15), and development plans define responsibility of on-going maintenance. If the area is to be maintained by the City, Parks and Forestry Services shall begin maintenance upon Final Acceptance, except for City capital improvement projects where the bid documents will clarify when City maintenance is to begin. If it is to be maintained by the property owner, Developer, Contractor or homeowner's association, the appropriate entity shall continue maintenance upon Final Acceptance.
 - i. The City shall assist the property or homeowner's association (when such entities exist) by turning over a hard copy of irrigation as-built drawings after inspection and will retain a digital copy.
 - b. Appropriate securities shall be released at Final Acceptance per the Municipal Code.
 - c. At the City's discretion, an extended warranty may be accepted for portions of a project that do not fully meet City Standards and Specifications at the time of inspection, in order to facilitate Final Acceptance. Securities for extended warranty periods will be required.
 - d. Common Open Space Final Acceptance. Landscape and irrigation improvements must be completed in order to grant Final Acceptance for a project, unless otherwise approved. At this time, the developer must provide digital (.pdf) and hard copy of landscape and irrigation as-built drawings with the following certification statements (inspection to follow receipt of as-built drawings):

Designer Certification:

I certify this irrigation system has been inspected and constructed per current City of Longmont Design Standards and Specifications including approved materials list.

Design Company Name/Phone number

Designer Signature/Title

Date

Notary

Contractor Certification:

I certify this irrigation system was installed per current City of Longmont Design Standards and Specifications including approved materials list, and that it was done under my supervision in accordance with Uniform Plumbing Code and Electric Code.

Construction Company Name/Phone Number

Contractor Signature/Title

Date

Notary

3. Outlots to be Dedicated to the City - Provide City Parks and Forestry with tax payment certification for areas dedicated to the City prior to Final Acceptance.

601.00 CONCRETE PATHS, BRIDGES AND UNDERPASSES

601.01 GENERAL CRITERIA

1. Concrete paths in arterial rights-of-way, primary greenways, parks and other areas owned or maintained by City Parks and Forestry Services, shall comply with all standards in 216.00 and 601.00 of the City Standards and Specifications manual. Where those standards or specifications may conflict, section 601.00 shall be followed.
2. Bridges or street underpasses may be required where crossings of a primary greenway waterway and arterial street are necessary to allow logical concrete path alignment. Bridges are to comply with this section of these Standards and Specifications. Street underpasses shall follow section 301.03 and section 601 of these Standards and Specifications.
3. Concrete flatwork in private development areas shall conform to current industry standards.

4. All Sections as applicable shall also apply to all City capital design and construction projects that reference these Standards. References to the “Developer” in these Standards shall be considered references to the Consultant or Contractor. In the event of any conflict between these Standards and the project specifications, the more stringent of the two shall apply.

601.02 MINIMUM DESIGN CRITERIA

1. A minimum eight (8) foot wide, minimum six (6) inch thick concrete path is to be provided along all arterial rights-of-way, primary greenways, and other areas as determined in cooperation with City staff. There is to be a two (2) foot minimum clear zone adjacent to all concrete paths from any vertical object except where water or sanitary sewer maintenance access is needed. Variances from this minimum clear zone requirement may be given in those cases. A tool jointed concrete rumble strip may be used between the path and the vertical object where minimal ‘nuisance’ strips may result.
2. A minimum eight (8) foot wide, minimum six (6) inch thick concrete path is to be provided along all secondary greenways. There is to be a two (2) foot minimum clear zone adjacent to all concrete paths from any vertical object except where water or sanitary sewer maintenance access is needed. Variances from this minimum clear zone requirement may be given in those cases. . A tool jointed concrete rumble strip may be used between the path and the vertical object where minimal ‘nuisance’ strips may result.
3. A ten (10) foot wide inside clear dimension is to be provided for all bridges in City-owned areas and for all arterial street underpasses.
4. Americans with Disabilities Act (ADA) and AASHTO standards are to be followed in the design of all concrete paths. A grade of not more than 1:20 shall be provided for all concrete paths and sidewalks connecting to public paths.
 - a. ADA guidelines allow for the following design grades for outdoor recreation trails. These requirements could apply to Primary Greenway concrete trails in some situations. Please note that it is the responsibility of the Developer to verify current ADA requirements and coordinate with the City of Longmont to clarify where ‘outdoor recreation trail’ standards may be applied.
 - i. 1:12 slope for no longer than two hundred (200) feet with no landings required.
 - ii. 1:10 slope for no longer than thirty (30) feet with a five (5) foot landing at each end that does not exceed a 1:20 slope.
 - iii. 1:8 for no longer than ten (10) feet with a five (5) foot landing at each end that does not exceed a 1:20 slope.
5. Concrete paths adjacent to slopes steeper than 4:1 shall have a six (6) foot minimum shoulder at +/- 2% slope on the downhill side of the path before the steeper slopes begin.

6. Horizontal curves with fifty (50) foot minimum radius (fifty (50) foot minimum tangent sections between curves) is the desired guideline for all concrete paths. One hundred (100) foot radius is encouraged. An overly curvilinear concrete path is not encouraged.
 - a. Curvilinear concrete paths may not be closer than six (6) feet from the back of curb.
7. Vertical curves shall take into consideration the topography, drainage and ADA requirements and shall provide for safety of pedestrians and recreationalists. An overly "roller-coaster" treatment of concrete path alignment shall not be allowed.
8. The concrete path shall be offset from the property line in such a manner as to provide the following:
 - I. A detached concrete path, except at street intersections where the path is to be curb attached for a minimum of fifty (50) lineal feet from the intersection.

Width of tree lawns between concrete paths and curbs or other hard surfaces to be a minimum of eight (8) feet where canopy deciduous trees are used for ease of maintenance operations and long-term tree health. Canopy trees will not be allowed where tree lawns are less than eight (8) foot in width. Where available right-of-way width is insufficient for the required offset, variances may be allowed if landscape provisions are met, but will be restricted to ornamental or small tree canopy trees. In areas narrower than five (5) feet, depending on tree type, a root barrier may be required to prevent concrete path and/or curb heaving. See Approved Materials List – Tree Recommendations for suggested plantings.

- II. Optimally sized landscape areas on both sides of the concrete path within the right-of-way to allow for efficient irrigation and to eliminate nuisance strips – optimal shrub areas four (4) feet minimum and eight (8) feet preferred; optimal turf areas twelve (12) feet.
 - III. Concrete path placement at the edge of the right-of-way where additional common open space is provided behind the right-of-way line. This layout will provide maximum separation between curblines and concrete path and also provide a visual definition of the boundary between private and public areas.
9. Additional concrete flatwork is required where a detached concrete path becomes curb attached and where the detachment is two (2) feet or less in separation. This area may be placed in decorative concrete flatwork (colored/ textured).
10. Where shrub beds are adjacent to curbs in arterial rights-of-way, an eighteen (18) inch wide, four (4) inch thick bomanite (or approved equal) strip along the curb edge, per Section 606.02. Pre-approved stamp is the brick pattern. Color to be submitted to and approved by the City.
11. Where greenway concrete paths intersect with local, collector or arterial streets (where an underpass is not required), a stop sign shall be located at the intersection of the two traffic routes (facing the greenway route) and an intersection warning sign shall be placed one hundred (100) feet from the intersection along the greenway.

12. Concrete path to be located out of the low flow channel and associated areas that contain 10% of the 100-year flow rate in large drainage basins, and low flow channel and associated areas that contain 5% of the 100-year flow rate in small drainage basins, as determined by the City Public Works and Water Utilities Storm Drainage Division.
 - a. Exceptions to this provision to be specifically requested with reason for non-compliance given.
13. Bridge width ten (10) foot inside clear dimension between railings minimum), railing height to be 42"-54" above deck height, length and orientation if applicable. Riprap or other engineered abutment protection is required. Railings to be designed to meet AASHTO requirements. Bridge to carry minimum uniform live load of sixty (60) pounds per square foot or one 10,000 pound vehicle load with 80% of load on rear wheels, unless City maintenance vehicles exceeding this weight require access to this area. If jet trucks and other large vehicles require this bridge access, the specific weight of those larger vehicles will be the minimum live load requirements. Assume wind load of 0/25 psf on full height of bridge, as if enclosed. . Shop drawings to be submitted for approval thirty (30) days prior to manufacture schedule.
 - a. Bridges to include railing to eliminate drop off areas at abutment or along approach pathways where needed. Railing to match bridge rails and accommodate turning movement of maintenance/emergency vehicles turning onto bridge.
 - b. Bridges in City owned areas shall be located above 10% of the 100-year floodplain elevation unless larger flows are required by City Storm Drainage Engineers.
 - c. Each bridge shall have a safety sign attached to both ends of bridge. See Section 601.04.6 for sign requirements. Signs shall not protrude into bridge or concrete path clearance zone.
 - d. A steel safety plate is to be mounted on the bridge deck as needed to fill gaps over one half ($\frac{1}{2}$) inch at abutment. Plate is to be mounted to bridge only, and will slide over abutment with expansion movement of bridge. Plate is to run entire width of decking and extend onto abutment sufficiently to cover the gap completely. Plate edges to be beveled to lessen trip hazard or bump.
14. Arterial street underpass of primary greenway concrete paths to be sized to accommodate eight (8) foot wide concrete path plus two (2) foot wide concrete warning strip on the water-side of the path, while maintaining an eight and one half (8.5) foot minimum head clearance (unless maintenance vehicles require greater vertical clearance) from finish grade of concrete path. Additional head clearance (up to ten (10) foot) is preferred where possible. Concrete thickened edge or other structural component to be engineered for the concrete path within the low flow channel and associated areas that contain 10% of the 100-year flow rate in large drainage basins, and low flow channel and associated areas that contain 5% of the 100-year flow rate in small drainage basins. Riprap path protection to prevent undercutting path during flood conditions is required. Elevation of concrete path should allow normal flow conditions without flooding. Separator walls and/or sump pumps are not allowed without specific exception granted. Alternate concrete path route during flooding to be provided at

underpasses using a concrete ramp to arterial concrete path (complying with section 601).

- a. Flood gates to be provided at both sides of underpass out of normal high water elevation and at intersection of ramp to arterial concrete path.
- b. Lighting of underpasses is required. Lighting to be vandal resistant, lexan lens fixtures. Wiring to be enclosed in conduit per UBC and installed per National Electric Code. Number of fixtures to provide consistent pedestrian lighting level. A building permit is required for this work. See Section 700 for Power & Communications electrical requirements.
- c. Striping shall be required in all underpasses. Stripes shall be four (4) inches wide and yellow and shall be painted in a dashed pattern in the center of the trail. The striping shall extend through the underpass and for a minimum of fifty (50) feet outside of each end of the underpass, or as needed for safety.
- d. Signage: Graphics for signs are to be provided by the City if available.
 - i. Low clearance sign mounted directly above concrete path as it enters underpass indicating specific clearance in feet and inches to lowest clearance point.
 - ii. Street sign mounted above underpass concrete path as it enters underpass indicating street name above the concrete path.
 - iii. Primary Greenway ID sign – at street intersections or as deemed appropriate by City staff, mounted on 6x6 wooden post.
 - iv. Dog pick up sign/ station – at street intersections and/or other locations deemed appropriate by City staff. Mounted on 4x4 wood post with PVC bag dispenser mounted beneath sign.
 - v. Trail Courtesy signs – at locations deemed appropriate by City staff. Mounted on wooden 4x4 post.
- e. Site Furnishings: Site furnishings including trash containers on concrete pads and benches on concrete pads may be required for inclusion along Primary Greenways. Furnishings are required on a ½ mile interval and may include other specific locations per City staff.
- f. Underpasses with limited sight distance may be required to include a warning light and sign to indicate presence of maintenance vehicles. Light system includes card reader on post at sufficient distance from underpass to effectively warn path users of vehicle presence – typically at intersection of ramp. Light to be mounted on Underpass face.

601.03 MINIMUM PLAN INFORMATION

1. Location of concrete path within right-of-way, showing connections to other walkways and floodplain boundary lines delineated per Section 600.02.3 of these standards.

2. Concrete path curve radii to be indicated on plans.
3. On all plans, provide a Design Intent Statement that describes the location, width (eight (8) foot minimum), thickness (six (6) inch minimum) of the concrete path. In addition, a note should indicate compliance with the most current City Standards and Specifications at the time of construction.
4. On Public Improvement Plans, a note that relevant floodgates, lighting and signage to be provided per Section 601 of the City Standards and Specifications.
5. On Public Improvement Plans, a note that relevant bridges and street underpasses are to be constructed per Section 601.04 and other relevant sections, as applicable, of the City Standards and Specifications.

601.04 MATERIALS

1. For a specific list of materials accepted by the City please see Parks and Open Space Divisions Approved Materials List.
2. Concrete mix design: see Section 216 of these Standards.
 - a. Control joints: zip strips or saw cut (soft cut) to one quarter ($\frac{1}{4}$) the total slab thickness.
 - b. Curing compound: for all exposed concrete surfaces - white pigmented sealant.
3. Bridge steel to be CorTen self-weathering steel (preferred) or zinc enamel painted structure (color gloss black or as approved by City Parks & Forestry Services). Concrete reinforced bridges are acceptable. Concrete decking is preferred, however, ironwood decking also acceptable (three (3) inch minimum thickness planks). See approved materials list for pre-approved decking. Approach railing to match bridge steel and paint (if applicable). Safety plate at abutment to be one quarter ($\frac{1}{4}$) inch minimum textured, galvanized steel plate.
4. Barrier railings shall be constructed of minimum two (2) inch round tubing with three-eighths ($\frac{3}{8}$) inch walls. All welds shall be ground sooth and railings shall be painted gloss black (or other color per Parks and Forestry approval) with zinc enamel paint. All railing design is to be per Detail 200-19 of these standards and to meet current AASHTO standards.
5. Flood gates welded from four (4) inch (minimum) galvanized pipe support posts and two and one-half (2-1/2) inch pipe for gate with ample cross members for structural integrity. Posts for locking into open and closed positions are required using heavy-duty chain and steel encased padlock. Gate, reflector tape with sign per Section 601.04.6.a
6. Signage: All signs shall be silk-screened with 3M ink on .080" thick aluminum backing plates. No Electronically Cuttable Film (E.C. Film) shall be permitted unless approved by the City. All signs shall have a border the same color as the sign text. Signs to include Spanish translation if possible (to be provided by Parks and Forestry). Sign faces to be secured using tamper resistant fasteners.

- a. Flood gate signs: "Path Closed. Use alternate route. Camino cerrado. Use la ruta alternativa.", to be secured to gate. Color: Yellow with black letters.
- b. Low clearance sign (English only) to be secured to the face of the underpass (with field measured height from lowest point within opening): Color: Yellow with black letters.
- c. Street identification sign (English only) at underpass – Street name (only) to be secured to the face of the underpass: Color: Royal blue with white letters.
- d. Bridge loading sign (English only) (with manufacturer's maximum bridge loading information) to be secured to the bridge by the manufacturer: Color: Bronze plate or approved equal.
- e. Stop sign (English only) at concrete path intersections with roads (standard street sign or smaller version allowed) to be mounted on wood post: Sign Color: Red with white letters.
- f. Path intersection sign to be mounted on wood post: "Warning: Intersection ahead. Aviso: Intersección a continuación." sign: Color: Yellow with black letters.
- g. Bridge caution sign: "Caution: Slippery when wet. Precaución: Resbaloso cuando esta mojado." Or, International graphic symbol to be secured to bridge end posts without extending into path or on separate free-standing wood post. Color: Yellow with black letters.
- h. Primary Greenway ID sign: Name of primary greenway (English only) to be mounted on wood post, Sign Color: White with green letters. Sign to run vertically up post.
- i. Dog waste sign: Copy and color to be provided by Parks and Forestry. Sign face to be mounted on wood post.
- j. Dog waste dispenser: Twenty four (24) inches long four (4) inch PVC (Class 200) pipe with two (2) end caps, painted black. Two (2) each four (4) inch diameter holes cut into one side of pipe top and bottom. Dispenser to be mounted on wood post.
- k. Trail Courtesy sign – Color – Green. Copy to be provided by Parks and Forestry. Two (2) sign faces are to be provided (English and Spanish). Mount to wood post with one sign face on each side.
- l. Sign Posts – four by four (4 x 4) inch or six by six (6x6) inch (size as appropriate for sign face) pressure treated wood posts stained gray (Stain Color – Sherwin Williams Grey Birch). Top edges beveled and posts free of significant checking.
- m. Card Reader post – metal two and one half (2½) inch diameter post – galvanized or painted black enamel.

7. Lighting:
 - a. Vandal resistant, lexan lens fixtures with metal guard. See approved materials list for pre-approved fixtures.
8. Root Barrier: See approved materials list for pre-approved barriers.

601.05 EXECUTION

1. Locate all utilities prior to grading and trenching and protect from damage, per Section 107.04 of these Standards. Call 303-651-8446 for Parks Division irrigation locates.
2. Submit concrete mix design to Public Works and Water Utilities for approval.
3. Alignment to be per approved plans. Field modifications in alignment must be approved by City staff prior to formwork.
4. Coordinate with irrigation installation so necessary sleeves are placed beneath concrete path as needed. Sleeves to be set at standard trench depth per Section 603.04.
5. Obtain testing of compaction and moisture and re-compact as needed in order to obtain minimum compaction requirements. Compaction testing needed in accordance with Section 211.
6. Timing of concrete placement to allow for proper finish and product. No placement allowed if rain or snow is pending prior to reasonable cure. Excessively hot or cold weather may be reason for placement rescheduling by the City of Longmont. Weather damage due to precipitation may be cause for rejection of paving.
7. Slab thickness to be six (6) inch minimum.
8. No tooled joints are allowed on concrete path construction. Place expansion joints at maximum spacing of four hundred (400) lineal feet or three thousand, two hundred (3,200) square feet, whichever is less. Install expansion material at sufficient depth to allow for sealant and remain flush with finish surface elevation. Expansion joints where flatwork intersects vertical concrete. Dowel per Section 200 between all cold joints and between concrete path and bridge abutment.
9. Install control joints on eight (8) foot centers using zip-strip during placement operation so lines are straight and perpendicular to the edge of the concrete path or saw-cut after placement operation with straight and perpendicular cuts. Control joints also to be placed at intersections, radius points and elsewhere as needed to prevent cracking. Saw-cut joints to be timed properly with the setting of the concrete. Cutting shall be started as soon as the concrete has hardened sufficiently to prevent aggregates from being dislodged by the saw, and shall be completed before shrinkage stresses has developed sufficiently to induce cracking.
10. Testing to be done by an independent testing lab per Section 214 of the City Standards and Specifications.

11. Concrete finish to be consistent light broom finish. Heavy broom finish will not be permitted. Irregularities, poor finish and other deficiencies of workmanship or vandalism will require concrete work to be removed and replaced. Weather damage to finish will also be cause for removal and replacement. Contractor has option to provide sample panel of finish prior to work for City approval.
12. No concrete wash is to be dumped onto landscape areas. Any concrete water or spillage is to be contained and removed from the site prior to any landscaping.
13. Protect concrete with curing compound and other means to prevent premature drying, frost and rain. Provide watchmen as needed to protect from vandalism until reasonable cure is obtained.
14. Remove forms twenty four (24) hours after pour unless otherwise approved. Avoid damage to edges of pavement.
15. Backfill edges of concrete path prior to opening to public use, per Section 602 of these Standards.
16. Install signs at locations field verified by City inspectors. Install posts with 30" minimum bury – backfill excavation with washed rock. Offset post from path edge so that edge of sign face is a minimum of twenty four (24) inches from the path edge. Install sign faces in correct orientation to path for sign message readability. Install sign face using vandal resistant fasteners.
17. Lighting – recess light fixtures between bridge beams or at corner of underpass structures if possible. Mount photocell in concealed location if possible, yet open to natural light conditions.
18. Warning Light – mount light on exterior face of each side of underpass. Mount card reader to metal post at sufficient distance from underpass to engage light prior to vehicle entering area (typically at intersection of the ramp and alternative route).

601.06 COMPLETION SERVICES

1. Provide to City record drawings including horizontal verification of concrete path and all other structures.

601.07 GUARANTEE/WARRANTY

1. Prior to final acceptance, all bridges, street underpasses, concrete paths and other miscellaneous improvements under this section are to be warranted against defects. Cracking, settling, displacement and damage to those improvements are to be repaired or replaced by the Developer at no cost to the City. Repairs and replacements are to be covered by warranty.

602.00 GRADING AND FINE GRADING

602.01 GENERAL CRITERIA

1. For City-owned areas - soil fertility and texture tests conducted by the Colorado State University Soils Lab or other certified lab must be completed and submitted to the City for review; recommendations in the lab reports shall be followed in all cases. Generally this will include soil amendment and fertilizer recommendations; in some cases, all new topsoil will be required.
2. This entire section shall also apply to all City capital design and construction projects that reference these Standards. References to the "Developer" in these Standards shall be considered references to the Consultant or Contractor. In the event of any conflict between these Standards and the project specifications, the more stringent of the two shall apply.

602.02 MINIMUM DESIGN CRITERIA

1. Grades in all areas per Section 600.01.1.b. are to be designed to allow for proper drainage and ease of maintenance operations. Grass swales shall drain at a minimum slope of 2%. Hard surface paths and piping shall drain at a minimum slope of 1%. Berms and other slopes shall not exceed 4:1 for areas scheduled for irrigated and mowed turf. Berms and other slopes shall not exceed 3:1 for native grass areas (unmowed or mowed only during establishment), and for shrub beds. Retaining walls, riprap or other structures will be used to bring grades into conformance with these standards.
2. Ditch embankments shall be graded to 4:1 maximum slope from a distance approximately one (1) foot above channel bottom, or as determined in the field by City inspectors. Retaining walls, riprap or other structures will be used to bring grades into conformance with these standards. A level area should be maintained at the top of slope with a width adequate for landscaping and ditch maintenance access including concrete paths, as determined by Parks & Forestry and the appropriate ditch company.
3. Grading is to be designed to contain right-of-way area nuisance water within the right-of-way. Swales or other means must be used to prevent water from draining from right-of-way areas into private lots.
4. Grading shall take into account all desirable existing vegetation that is and scheduled to remain. No grading will be allowed within the drip line of existing trees scheduled to remain. Cut or fill not exceeding six (6) inch may occur within the drip line, but shall be done by hand methods. Grading will be designed to save as many mature, good quality and desirable species trees as possible, but shall include removal of all invasive or undesirable trees, shrubs, vegetation and noxious weeds (see plant list in appendix). Construction fencing and other standard protection methods shall be utilized to protect existing trees.
5. Grading adjacent to concrete paths shall include a six (6) foot minimum shoulder at +/- 2% slope on the downhill side of the path where slopes are steeper than 4:1.

6. Wetlands and other sensitive areas shall be protected from erosion and damage. Silt fencing shall be utilized to control damage to sensitive areas including waterways, and wetlands.
7. Grading operations shall utilize all existing topsoil on the site.
8. All grading shall adequately allow for a six (6) foot wide mowing deck, especially at tops and sides of berms, along sides and bottoms of swales, etc. Where areas are graded steeper than 4:1 adjacent to the concrete path, a six (6) foot wide shoulder with a 10:1 maximum slope shall be required.
9. Grading shall provide a one (1) foot minimum width flat buffer area with a +/-2% slope at the toe of slopes with shrub beds steeper than 4:1 and where adjacent to a concrete path, sidewalk or curb. Grades in private common areas, including detention ponds, shall not exceed the maximums noted in this section. Walls or other structures may be used where necessary to bring grades into conformance with these standards.
10. Detention ponds shall have corners of ponds at a slope of no greater than 6:1. The pond bottom shall drain at a minimum 2% slope over grass areas and 1% over concrete trickle channels. A concrete slab near the outlet shall be installed and sized appropriately to accommodate siltation. Storm drainage inlets shall be placed in close proximity to the pond outlet to eliminate or minimize the need for a trickle channel. A trickle channel with minimum three (3) foot width, if installed, shall be constructed with a minimum slope of 1% to ensure proper drainage and shall be located to one side of the pond and limited to the extent possible to allow for multi-use functions of the pond area. Adequate maintenance equipment access shall be provided by means of a concrete path or other allowed all-weather traffic-rated surface to access storm drainage inlets/outlets etc.
 - a. Ponds designed to retain water at all times and detain only additional storm flows shall be designed per above criteria where applicable.
11. For detention ponds to be owned and maintained by the City Parks and Forestry Services, the following shall also be provided: a perimeter landscaped area, ten (10) feet in width, around the top of the pond to allow for landscaping and other amenities; benches, picnic tables, play equipment, sports courts and/or fields, and other amenities, as determined by City Parks and Forestry Services, that are in scale with the size of the detention facility. All equipment shall be placed on concrete pads, per the direction of City staff. See Approved Materials List for equipment.
12. Where an arterial ROW is being improved prior to the construction of the ultimate curb and gutter, the Developer will be responsible for anticipating the future road construction. Ultimate ROW improvements shall be designed and built to the future curbline (horizontal and vertical elevation), as determined by the Public Works and Water Utilities Department. The space between the existing road edge and the ultimate curbline shall contain any necessary interim drainage improvements and shall be seeded. Road delineators will be required where no curb and gutter is provided, on a fifty (50) lineal foot spacing. Refer to Section 604 for additional information.

602.03 MINIMUM PLAN INFORMATION

1. Preliminary Development Plans: Existing topography at two (2) foot contour interval for entire site including rights of way and primary greenway. Proposed topography in general graphic delineation depicting location of berms or other landforms. Additionally, a detail or section that shows the existing and proposed topography for all right-of-way areas, primary greenway areas and detention ponds within the project area. Detail to show location of concrete path, landscape areas as well as proposed grades with maximum slopes indicated.
2. Final Development Plans and Public Improvement Plans: Existing topography at one (1) foot contour interval for entire site including rights of way and primary greenway. Proposed topography that ties to existing contours so that cut and fill areas are clearly indicated. Slope arrows that indicate minimum and maximum slopes allowable. Ultimate curblin alignment and existing edge of asphalt along arterial ROWs slated for future expansion. All future alignment information is to be determined by the Public Works and Water Utilities Department using the most current information available.
3. Public Improvement Plan notes that read as follows:
 - a. All irrigated turf areas shall not exceed 4:1 slopes. Native grass and shrub bed areas shall not exceed 3:1 slopes.
 - b. All existing trees scheduled to remain shall be protected by an orange construction fence four (4) feet high secured with steel t-posts at the drip line of each tree. Sufficient posts shall be used to maintain fence in erect condition at all times. No grading shall commence without construction fencing in place. Hand grading only will be allowed within the limits of construction fencing. No more than six (6) inch of cut or fill will be allowed within the drip line of any tree shown to remain on these construction plans.
 - c. All topsoil shall be striped from the site for use on this project. No topsoil shall be removed from the site. After clearing and grubbing operations are complete, and prior to other earthwork activities, strip topsoil to maximum depth possible to recover topsoil. No subsoil shall be removed as part of this topsoil striping operation. Stockpile topsoil in an area where grading activities can commence without interference, and protect from wind or other erosion with fabric or by other approved means. Subgrade work to leave an allowance for replacement of topsoil.
 1. In City-owned areas, replace topsoil to the depth available or six (6) inch minimum. Where sufficient topsoil is not available on-site, additional imported topsoil shall be utilized to allow for six (6) inch minimum depth of topsoil in all landscape areas. Imported topsoil shall comply with Section 602.04 of the City Standards and Specifications.
 - e. Soil amendments per Section 602.04 of the City Standards and Specifications shall be used in all landscaped areas. Soil amendment shall be applied no more than thirty (30) days before seeding. A minimum of three (3) cubic yards soil amendment per 1000 square feet of landscape area shall be incorporated into

the top six (6) inches of topsoil by tilling. Increase amendment quantities as needed per Soils Test recommendations.

602.04 MATERIALS

1. For specific list of materials accepted by the City please see Parks and Open Space Division Approved Materials List.
2. Topsoil: A friable loam, typical of cultivated local topsoils, containing at least 2% humus. It must be taken from a well drained, arable site and shall be reasonably free of subsoil, stones, clods, sticks, roots and other objectionable extraneous matter or debris. No stones or other materials over two (2) inches in size shall be allowed. It shall contain no toxic materials. Topsoil shall have an acidity in the range of ph 5.5 to ph 8.5.
 - a. Submit sample and written confirmation from supplier of material composition including the percent of organic matter, salts, and nutrient composition. Sample is to be representative.
3. Soil Amendment: A high quality composted material containing a minimum of 30% organic matter by dry weight. The mixture shall be free from clay subsoil, stones, lumps, plants or roots, sticks, weed stolons, seeds, high sodium content and other materials harmful to plant life. The compost shall be coarsely ground with an even composition and have an acidity in the range of PH 5.5 to PH 7.0. All material shall be sufficiently composted such that no material used is recognizable. The following nutrient analysis should be provided on a dry basis: Nitrogen: 1% min; Phosphorus: .4%; Potassium: 1.2%; Salts: 6.5% (as received basis).
 - a. Submit sample and written confirmation from supplier of material composition including: percent organic matter, sodium, nutrient composition and trademark. Sample is to be representative.
4. Fertilizer: Triple superphosphate with a chemical analysis of (0-46-0).

602.05 EXECUTION

1. Locate all utilities prior to grading or trenching and protect from damage, per Section 107.04 of these Standards. Call 303-651-8446 for Parks Division irrigation locates.
2. Install construction fencing and/or Storm Water Construction Activity BMP's as needed prior to any grading activities.
3. Apply general herbicide or broadleaf herbicide (2,4-D amine 4% A.I.) as applicable to areas where noxious weed beds have been established or where seed mix is to be planted. Herbicide must be applied by certified contractors at the rate recommended by the manufacturer after proper notification has been done in accordance with chemical applicator's standards. Precautions must be taken to avoid drifting of spray onto other properties and shall not be done in breezy conditions. Plant material not designated for herbicide application that is damaged shall be replaced by the Contractor. Timing of application shall allow complete weed kill prior to grading operations and again prior to final grade if re-growth has occurred.

4. For arterial ROW development adjacent to a road slated for future expansion, survey and stake future horizontal and vertical alignment of the ultimate curb. These stakes are to be maintained throughout the ROW construction process, including irrigation layout, seeding and sodding. Disturbed stakes are to be re-surveyed, as necessary, to maintain the required information during construction. Grades outside the ultimate roadway are to be set to anticipate future road improvements. Grades between the existing road edge and the ultimate curbline are to be graded to provide drainage and a safe shoulder for vehicles.
5. Take precautions to accommodate proper drainage and flow during and after grading and soil preparation.
6. Clear and grub the site by removing unsuitable vegetation, woody and rock material present in the surface grade.
7. Strip topsoil to a maximum depth, as determined by field inspection to recover as much quality topsoil material available and where site is scheduled for cutting or filling. If existing grades are to be maintained, topsoil can remain undisturbed. Stockpile stripped topsoil in location separated from grading activities and cover to protect from wind and other erosion.
8. Proceed with earthwork operation per approved plans. When complete with rough grading, obtain approval from City inspectors by . Rough grade inspection is to allow for six inch (6") minimum depth of topsoil and specified soil amendments as part of the fine grading work.
9. Rip to twelve (12) inch depth with agriculture subsoiler in all areas to receive plantings.
10. Re-spread or import topsoil to achieve six (6) inch minimum depth in all landscaped areas and grade to smooth and even lines. Establish swales and drainage as required per plans.
11. Evenly distribute soil amendment at rate of three (3) cubic yards per 1000 square feet of area, or as recommended by Soil Test, over the entire area to be prepared. Till amendments and topsoil into top twelve (12) inches of soil. Compact to a firm, but not hard (80% of Standard Proctor Density at 2% optimum moisture). Soil amendment shall be applied no more than thirty (30) days before planting operations.
12. Remove all objects greater than one-half ($\frac{1}{2}$) inch in diameter in all irrigated turf areas. For native grass seeded areas, two (2) inch diameter objects or greater are to be removed.
13. Trim finish grade elevations adjacent to paved areas to one (1) inch below pavement finish grade.
14. Evenly distribute triple superphosphate fertilizer at the rate of fifteen (15) pounds per thousand square feet; modify type and rate if soils test recommends otherwise.
15. Remove all debris piles and other stockpiles from site. Clean walkways and streets on daily basis to minimize mud tracking and siltation into drainage structures.

603.00 IRRIGATION

603.01 GENERAL CRITERIA

1. This entire Section shall also apply to all City capital design and construction projects that reference these Standards. References to the "Developer" in these Standards shall be considered references to the Consultant or Contractor. In the event of any conflict between these Standards and the project specifications, the more stringent of the two shall apply.
2. This entire section shall also apply to common open space areas.
3. Comply with the International Plumbing Code, City Electrical Code (latest editions) and general industry standards for all areas.
4. All arterial right-of-way, primary greenway and other private required landscaped areas shall have an automatic, clock-activated irrigation system of sufficient coverage to irrigate all plant material.
5. Design and planning criteria shall be in conformance with the 1996 Water Conservation Master Plan, as amended. Xeriscaping is required within all City owned areas and in privately owned common areas.
 - a. Xeriscaping within this section shall be defined as reducing water use in landscaped areas through: proper planning and design (zoning plant materials and recognition of micro-climates); good soil improvement (topsoil and soil amendment); limiting turf areas and using water thrifty turf types (see approved materials list); efficient irrigation (zoning irrigation to separate turf areas from shrubs, minimize overspray onto hard surfaces, use of water saving equipment (see approved materials list), and recognition of micro-climates); use of mulches (and avoidance of impermeable weed barriers); use of water thrifty plant materials (natives are encouraged); and through appropriate maintenance practices. For more information contact Xeriscape Colorado.
6. Installation of an irrigation system within Common open space and City owned areas shall include a separate tap (private areas separate from public areas), backflow preventer, meter, meter pit and power source for the irrigation controller which will not be subject to disconnection should the fronting property be vacated. Where raw water irrigation is available, it shall be used for irrigation with potable back-up also provided.
 - a. All potable irrigation systems shall be equipped with backflow prevention devices meeting the specifications of the Public Works and Water Utilities Department.
 - b. Where the City will maintain the system, devices will be installed below ground and a cage whose design will be approved by Parks & Forestry will protect all above ground mounts. The irrigation controller will be of the pedestal-mounted variety or be wall mounted with lockable, weatherproof cabinet.
 - c. In common open space areas, devices will be installed in protected location and/or in weather tight and vandal resistant controller enclosures with locking exterior disconnect..

6. Any deviation in taps from the approved construction plans to be approved by the City Public Works and Water Utilities Department prior to installation. Any water service line above two (2) inch shall be coordinated with City Public Works and Water Utilities Engineer. All taps of two (2) inches or less shall be installed by the Public Works and Water Utilities Department upon payment of applicable fees to the City. All taps in excess of two (2) inch shall be installed by a Contractor approved by the Public Works and Water Utilities Department to install irrigation systems and shall be inspected by the division upon payment of the applicable fees.

Tap fee waivers to be applied for in writing through City Public Works and Water Utilities Department with size of tap, address of tap and type of area to be irrigated from this tap described. Eligible taps include those irrigated areas owned by the City including arterial right-of-way or primary greenway improvements. No water from these taps is to irrigate areas outside of the rights of way on areas eligible for fee waiver. The City Public Works and Water Utilities Department reserves the right to rescind this waiver if water usage is being abused.

7. All irrigation taps and electric services are required to have an address and building permit before installation. The billing information will be required at the time of building permit issuance. Addresses are determined by the Planning Division (contact 303-651-8330 for information) and building permits are obtained from the Building Inspection Division.
8. Final location of irrigation controller to be coordinated and approved by the City Parks and Forestry Services for City owned areas or by City inspectors for other areas. Electric source to be coordinated and approved by Longmont Power & Communications (LPC) for all areas. For controllers on a system with a waived tap and per the approval of LPC, the electrical connection will not be metered, provided there are no additional loads on the service. Electric services with any additional loads will be metered. The Developer will be responsible for all applicable LPC connection costs and fees. Maintenance of the service from the LPC source will be the responsibility of the entity in charge of overall maintenance of the area.

603.02 MINIMUM DESIGN CRITERIA

1. For City-owned areas, a system is to be designed to provide head to head coverage with matched precipitation rates. Heads shall not overspray walkways, pavements or other hard surface areas. Temporary establishment irrigation of native grass areas MAY be an allowable variance if accepted by Parks and Forestry. Principles of Xeriscape shall be utilized in the design of irrigation system. Design considerations include: shrub and perennial beds are to be zoned separately from turf areas, sloped areas to have separate zoning for heads at the higher elevations from those at the lower elevation and areas with different exposures to be zoned separately. This design criteria is encouraged for all areas.
2. For Common Open Space areas: a system is to be designed to provide head to head coverage with matched precipitation rates. Heads shall not overspray walkways, pavements or other hard surface areas where possible. Temporary establishment irrigation of native grass areas MAY be an allowable variance if accepted by Planning. Principles of Xeriscape shall be utilized in the design of irrigation system. Design considerations that must be included are: shrub and perennial beds are to be zoned

separately from turf areas, sloped areas to have separate zoning for heads at the higher elevations from those at the lower elevation and areas with different exposures to be zoned separately.

3. For all areas, if the use of untreated, raw water for irrigation is found to be appropriate by the Public Works and Water Utilities Department and Parks & Forestry, such use may be required. The Developer shall install an approved pump in an approved secure above-ground pump enclosure. Pump system to include filtration equipment with self-flushing screens. Typical "dirty-water" equipment shall be required for these systems, including purple valve boxes scrubber valves, pipes and heads. At all times of use, a conspicuous notice shall be posted warning that untreated ditch is being used for irrigation. Sign message to be provided by City.
4. For City-owned areas, if a tap fee waiver is requested for arterial right-of-way or primary greenway areas, the water from the City tap (with waived fee) shall not irrigate areas outside of City-owned areas.
5. For all areas, check valves-in-head required.
6. For all areas, only materials, sizes and other requirements listed in this section and on Parks and Open Space Division Approved Materials List shall be specified for use, per type of area noted. IF THE AREA IS OWNED BY THE CITY BUT MAINTAINED BY DEVELOPER/SUBSEQUENT OWNERS, some exceptions may be granted. No exceptions will be given to any equipment/materials to be buried within these areas. Parks and Forestry Services to approve exceptions to these requirements.
7. Obtain available design pressure and flow from Public Works and Water Utilities Department Engineering staff by calling 303-651-8376. For City-owned areas, design system shall not exceed available pressure at time of Longmont Planning Area final build-out of area. Where available pressure exceeds 85 psi, design the system to 85 psi and include provision for pressure regulator installation to reduce actual pressure to 85 psi if necessary.
8. Remote control valves shall be located to minimize lateral piping and sleeving under walkways and hard surface areas. For all areas, isolation valves shall be placed at both sides of each road crossing, at the upstream end of each leg in the mainline and at other areas as needed to minimize disruption to overall system in the event of system failure.
9. For all areas, no cross-connections between City water and untreated raw water shall be permitted.
10. For all areas, lateral piping shall be sized based on flow demands (gpm's): velocities shall not exceed five and one half (5.5) feet per second in any Class 200 piping. Copper pipe velocities shall not exceed seven (7) feet per second.
11. For all areas, backflow prevention devices are required for all irrigation systems and shall meet Public Works and Water Utilities specifications.

603.03 MINIMUM PLAN INFORMATION

1. The final plan shall include all information required in Section 600.02.4 as well as the following notes:
 - a. All Areas: A plan note that shows separate tap sizing calculations for each area served by each separate tap. The calculation shall be based on total ultimate use from the tap including all phases or off-site areas served from the tap even if future build-out is several years out.
 1. The tap sizing calculation shall use the following formula: Total square feet of irrigated area from that tap (including future build-out if applicable) divided by eight (8). Result times 7.48 = gallons per cubic feet per week. Take gallons per cubic feet per week and divide by five (5) days per week, divide that answer by seven (7) hours per day, and divide that answer by sixty (60) to = gallons per minute. Tap size should then be the same as the smallest copper pipe (Type K) that will not exceed seven (7) feet per second. The number of days per week and hours per day are somewhat flexible, but those given above should be the typical. (If the areas include temporary irrigation of dryland turf, call Parks and Forestry for adjustments to this formula).
 - b. A note shall read, 'A ___ Inch tap will serve the _____ (Name of area), and a tap fee waiver will (or) will not be requested.'
2. All Areas: The construction plans should separate City owned areas from Common Open Space areas and include final irrigation plan information including piping, heads, valves, tap, controller and other miscellaneous equipment layout. Provide gpm, valve size, and valve number for each remote control zone valve. Provide pipe sizes for each section of mainline and lateral. Provide a separate irrigation schedule for City owned vs. Common open space areas that shows a key for each piece of equipment shown on the plan and describes the manufacturer, model number or other designation.
3. Construction plans shall include the following notes:
 - a. All Areas: Minimum design pressure.
 - b. All Areas: These plans are diagrammatic and may require field adjustments.
 - c. All Areas: It shall be the Contractor's responsibility to install the irrigation system in accordance with these plans and the most current City Standards and Specifications. Field changes to these plans are to be approved by the City inspector prior to work.
 - d. All Areas: All heads shall include a check valve. All valves shall have three extra wires looped per detail, and extended to the farthest wire drop or valve of each mainline branch. City Owned Areas: All rotor heads shall include a stainless steel riser.

- e. City Owned Areas: Pipe including mainline shall be located within a two (2) foot offset from walks or curbs and to maximize tree planting zones. Field adjustment to this standard must be approved by the City inspector prior to work.
- f. All Areas: It is the responsibility of the Contractor to have a copy of the most current City Standards and Specifications on site at all times. All improvements shall be installed per these Standards and Specifications. The Standards and Specifications shall be available to the Contractor at all site meetings/inspections. Any work that proceeds within these regulated areas that does not adhere to current Standards and Specifications and/or without the approved inspection of the City shall be corrected at no cost to the City.
- g. All Areas: All sleeves will be marked with a "V" chiseled in concrete path, curb or other paved surface at all crossing points directly over the sleeve location.

603.04 MATERIALS

- 1. All Areas: For a specific list of materials accepted by the City, please see Parks and Open Space Divisions Approved Materials List.
- 2. All Areas: Taps: Contractor is responsible for supplying saddle for the PVC or A.C. pipe.
- 3. All Areas: Backflow Prevention Device & Water Meter: Backflow devices and water meters to be purchased to meet Public Works and Water Utilities specifications.
 - a. All Areas: Above ground reduced pressure backflow preventers are required for all potable systems and for all untreated raw water with in-line injection system designs.
- 4. City Owned Areas: Master valve: sized to match size of mainline.
- 5. All Areas: Copper: Type K rigid conforming to ASTM Standard B88.
- 6. All Areas: Mainline: Class 200 PVC, NSF approved.
 - a. City Owned Areas: For pipe sizes larger than four (4) inches use gasketed pipe.
 - b. City Owned Areas: No mainline to be sized at one and one quarter (1 ¼) inch.
 - c. All Areas: Use ductile iron fittings for mainline sizes larger than four (4) inches.
 - d. All Areas: No cold weather glue permitted.
- 7. Laterals:
 - a. All Areas: Class 200 PVC, NSF approved.
 - b. City Owned Areas: No laterals smaller than one (1) inch or sized at one and one quarter (1¼) inch.

- c. All Areas: Polyethylene Drip Pipe: weather and UV resistant material, NSF approved, SDR pressure rated pipe, only as approved for drip applications.
8. Pipe Fittings: All Areas: Pipe fittings shall be molded fittings manufactured of the same material as the pipe.
- a. All Areas: Funny Pipe (pop-up heads only): to be compatible with the elbows needed for the sprinkler heads and appropriately sized crimp-type clamps to be used.
 - b. All Areas: PVC: Schedule 40, Type 1, PVC solvent weld with ASTM Standards D2466 and D1784. No cold weather glue permitted.
 - c. All Areas: Copper pipe: Wrought copper or cast bronze fittings, soldered or threaded per installation details.
 - d. All Areas: Use ductile iron fittings for mainline sizes larger than four (4) inches.
9. Sleeving: All Areas: Ductile Iron Pipe or Class 200 PVC under all paved surfaces. Each mainline, lateral or wire crossing of any paved area to be installed in a separate sleeve.
- a. All Areas: Sizes to be a minimum of two sizes larger than the pipe being sleeved. Minimum four (4) inch diameter, or larger where appropriate, for irrigation lines.
 - b. All Areas: Wires to be in separate sleeve from pipe, two (2) inch minimum size pipe for control wire sleeves.
 - c. All Areas: Shall have marker tape on upper side and both ends for future locates.
10. Valves:
- a. Remote Control Zone Valves (including Master Valves): All Areas: Electrically operated, appropriate for the water supply (scrubber type for raw water applications), with manual bleed device and flow control stem. Shall have a slow-opening and slow-closing action for protection against surge pressure.
 - 1. Pressure regulating function to be used as needed per Section 603.2.5.
 - b. Drip Remote Control Valves: All Areas: Same as remote control zone valves sized to match system requirements, including upstream filter, pressure regulator and y-strainer.
 - c. Isolation Gate Valves: All Areas: Able to withstand a continuous operating pressure of 150 psi. Clear waterway equal to full diameter of pipe. Shall be opened by turning square nut to the left (wheel opening is unacceptable).
 - d. Manual Drain Valve: All Areas: three quarter ($\frac{3}{4}$) inch ball valve with tee handle.

- e. Quick Coupling Valves: All Areas: one (1) inch brass units with rubber cover and one (1) inch brass key.
11. Valve Boxes: All Areas: House valves in valve box with matching locking cover: One valve per box. Install in Jumbo box sizes, as specified. Also, install a waterproof tag with permanent marker with each valve number. One tag shall be attached to each valve.
12. Control System:
- a. Controller (for systems not to be maintained by the City including Common Open space areas): Number of stations shall include two extra stations for possible future use. Controller box shall be weather tight and vandal resistant with locking exterior disconnect.
 - 1. Control System Enclosure: Weatherproof security enclosure with floor stand kit and lock kit.
 - b. Satellite Control Field Unit (for systems to be maintained by the City):
 - 1. One per water tap. Number of stations shall include three (3) extra stations for possible future use. Toro Sentinel system may be purchased through City Parks and Forestry Services. System shall come pre-assembled with security enclosure.
 - aa. The Yagi antenna, antenna cable, twenty (20) foot mast and hand held radio and charger are not available through the City and are not considered part of the Toro Sentinel package, if ordered through the City.
 - 2. Hand held remote control with charger (one per field unit).
 - aa. Hand held unit, programmed to City control frequency, to be turned over to the City Parks and Forestry Services in new condition.
 - c. Surge Protection: All Areas: eight (8) foot copper grounding rod, #4 solid copper wire, grounding buss receptacle, ground terminal strip and surge protector per details.
13. Electric Control Wiring: All Areas: #14 solid copper direct burial UF or PE cable, UL approved, for systems up to 2,000 feet in length. For larger systems, wire is to be #12 solid copper direct burial UF or PE cable, UL approved, or larger, per system design and manufacturer's recommendations.
- a. All Areas: Five (5) wires with consistent color scheme throughout:
 - Red = live
 - White = ground
 - Black = extra (to farthest end of mainline including each branch).
 - Blue = extra (to farthest end of mainline including each branch)

Green = extra (to farthest end of mainline including each branch)

- b. All Areas: Label each wire with waterproof tape and permanent marker at the controller and the furthest end of each wire.
 - c. All Areas: Wire connectors and waterproofing sealant specific for direct burial to be used to join control wires to remote control valves.
14. Sprinkler heads: All Areas: All heads shall be of the same manufacturer as specified on the plans, and marked with the manufacturer's name and model in such a way that materials can be identified without removal from the system. City Owned Areas: City will specify brand and models to match other equipment in use in public system in the vicinity.
- a. All Areas: Include check valve in head.
 - b. Gear driven rotor heads: City Owned Areas: with stainless riser.
15. Drip system: All Areas: Spiral barb emitters. Install tracer wire over all drip pipes, buried a minimum of six (6) inches under the soil. City Owned Areas: No spaghetti tubing allowed.
16. Thrust blocks: All Areas: 3000 psi concrete with #4 rebar wrapped with asphalt tar based mastic coating.
17. Raw Water Systems: All Areas: For all raw water irrigation systems, typical “dirty-water” equipment shall be required, including purple valve boxes, pipes heads, scrubber valves and bubblers instead of drip emitters. Raw water systems typically include supply turn-out structure (where applicable), storage pond for three (3) days storage. Storage pond to be lined – submit lining material product literature for City review and approval, and rip rap will be installed twelve (12) inch minimum below the lowest water level at draw down of irrigation. All raw water systems to include provision for potable back up in the event of raw water delivery system failure.
- a. Potable backup will be from a fire hydrant in close proximity to the storage pond.
18. Pump Systems: City Owned Areas: Irrigation pump systems for raw water use to be coordinated with Parks and Forestry. Submit information on pump equipment for City review and approval – using Approved Materials list for equipment as appropriate. All Areas: Basic system requirements include: Pump system capable of water delivery at required volume and pressure for ultimate landscape build out (Variable Speed Pump to be used if drip irrigation is included in the design or if there is a varying depth of water storage); skid-mounted pump system (typical); pump control system with interface to irrigation controller(s); pump enclosure heating system to maintain 49 degrees minimum temperature at 0 degrees F; lighting and power (GFI) on separate breaker from pump; masonry (typical) enclosure with vandal resistant coatings and steel screen over vent openings; pump access hatch centered over pump; man door access using steel door with lock guard over door hardware; pump enclosure sized to provide adequate walking room around pump skid and controller systems.

- 19 Signs: All Areas: Raw Water in Use sign for all raw water systems. City Owned Areas: Green with white letters – copy to be provided by Parks and Forestry.

603.05 EXECUTION

1. All Areas: Locate all utilities prior to trenching and protect from damage, per Section 107.04 of these Standards. Call 303-651-8446 for Parks and Open Space Division irrigation locates.
2. All Areas: Inspect tap or other existing irrigation system, as applicable, prior to work.
3. All Areas: Water Service Connections (Taps): Contact Public Works and Water Utilities Department forty eight (48) hours prior to schedule work at 303-651-8468 for water taps and inspections. Tap Fee Waiver request forms need to be submitted to the Public Works and Water Utilities Department and approved prior to tapping. Call Water Meter Shop at 303-651-8469 to purchase water meter. Backflow prevention devices shall meet Public Works and Water Utilities Department requirements. Minimum two weeks prior notice to be given Water Meter Shop for installations which will require meters or backflow devices larger than two inch. Larger devices and meters are not always kept in stock and may have ordering stocking delay.
 - a. All Areas: Contractor is responsible for excavation, connection to corporation stop at the water main, providing the saddle for the PVC or A.C. pipe, making the connection to the existing water service, backfill and compaction, and pavement or shoulder surface treatment or replacement as needed. See Section 500 of City Standards and Specifications for Public Works and Water Utilities materials and procedures. All items in Section 500 pertain, including requirement that no soldered joints or fittings are allowed on water service lines where buried. Soldered joints or fittings are permissible above grade or inside a vault. No solder, sealants, fluxes, pipe dope, and other materials shall contain any lead. Call Public Works and Water Utilities Engineer at 303-651-8376 for questions. The Public Works and Water Utilities Department will make the actual tap on the line if the tap is two (2) inch in size or less. Larger taps must be made by the Contractor; all taps and installations are subject to approval and inspection by the Public Works and Water Utilities Department. Water meter jumpers will be furnished from the Water Meter Shop free of charge.
 - b. All Areas: Install meter, master valve (City-owned areas), and drain valve inside specified areas and vaults. Inspection of service line (where appropriate), vault, water meter and backflow is to be coordinated with Public Works and Water Utilities Department.

City Owned Areas: Install meter, master valve, flow meter and drain valve inside specified vault per Detail 603.01. Install backflow, winterization assembly and drain valves as specified adjacent to precast vault per Detail 603.01. Inspection of service line (where appropriate), vault, water meter and backflow is to be coordinated with City Water Department.
1. City Owned Areas: Meter vaults are to be sixty (60) inch diameter for taps two (2) inches or less in size. For taps larger than two (2) inches,

the pipe layout inside the meter vault must be designed to determine the vault size.

2. City Owned Areas: Non-potable (raw water) irrigation systems with an in-line injection system are required to have a reduced pressure backflow device upstream of injection nipple, which cannot be placed in vault.
 - c. City Owned Areas: Install flow meter downstream of meter unit within meter vault with the following minimum spacing upstream and downstream of flow meter the first joint, bend or other fittings: ten (10) pipe diameters straight pipe upstream; five (5) pipe diameters straight pipe downstream.
 - d. City Owned Areas: Install master valve in meter vault within a reasonable distance downstream of flow meter (no closer than ten (10) pipe diameters).
 - e. All Areas: Copper pipe to be soldered so that a continuous bead shows around the joint circumference. Insert a dielectric union wherever a copper-based metal (copper, brass, bronze) and an iron-based metal (iron, galvanized steel, stainless steel) are joined.
 - f. All Areas: Install winterization assembly downstream of meter vault on PVC (with no size reduction) for mainlines greater than two (2) inch. Install winterization assembly on PVC (no size reduction) for mainlines two (2) inch or less.
4. Pipe trenching:
- a. All Areas: Install pipe in open cut trenches of sufficient width to facilitate thorough tamping/puddling of suitable backfill material under and over pipe. Puddling is not allowed where next to walks, curbs and concrete paths. Install mainline and lateral lines in separate trenches.
 - b. City Owned Areas: Pipe location to be offset two (2) foot maximum from walks and curbs to maximize tree planting zones. Field adjustments to this standard must be approved by City inspectors prior to work.
 - c. Trench depths:
 1. Mainline: All Areas: Minimum of twenty four (24) inches deep from top of pipe to finished grade.
 2. Lateral: All Areas: Minimum of eighteen (18) inches deep from top of pipe to finished grade.
 3. Drip laterals: All Areas: Minimum of twelve (12) inches deep from top of pipe to finished grade in the paved and sodded/seeded areas, four (4) inch minimum mulch cover in planting beds.
 4. Sleeves: All Areas: Install sleeving at a depth that permits the encased pipe or wiring to remain at the specified burial depth.

5. All Areas: Sleeving: Boring shall not be permitted unless obstruction in pipe path cannot be moved, or pipe cannot be re-routed.
 - a. Mainline installed in existing sleeves at greater depth than adjacent pipe, shall have a manual drain valve at the low end.
 - b. Install sleeve so both ends extend past edge of curb, gutter, sidewalk, concrete path or other obstruction, a minimum of two (2) feet.
 - c. Mark all sleeves with a "V" chiseled in walk (or other surface) directly over sleeve location.
 - d. Shall be laid to drain at minimum grade of 5"/100'.
 - e. Shall be bedded in two (2) inches of fill sand and covered by six (6) inches of fill sand.
 - f. Sleeves installed for future use shall be capped at both ends.
 - g. Separate sleeve two (2) inch minimum size) shall be used for all wiring.
 - h. Sleeving shall not have joints unless necessary due to length of sleeving run. If joints are necessary, only solvent welded joints are allowed.
 - i. Compaction of backfill for sleeves shall be 95% of Standard Proctor Density, ASTM D698-78. Use of water (puddling) around sleeves for compaction, will not be allowed.
6. All Areas except as noted below: Pipe Installation:
 - a. Use Teflon tape on all threaded joints; only schedule eighty (80) pipe may be threaded. All threaded joints shall be tightened to eliminate leaks per industry standards.
 - b. Reducing pipe size shall be with reducing insert couplings: at least six (6) inches beyond last tee of the larger pipe.
 - c. Snake PVC lateral pipe from side to side within trench.
 - d. Cut pipe ends square and debur. Clean pipe ends before using primer and solvent cement. Join in manner recommended by manufacturer and in accordance with accepted industry practices. No leaks shall be permitted. Cure for thirty (30) minutes before handling and twenty four (24) hours before allowing water in pipe. No cold weather glue permitted.
 - e. City Owned Areas: Backfill mid sections only of mainline pipe and entire lateral piping. Call City inspector to schedule a hydrostatic pressure test. All mainline joints should be open for inspection. Backfilling prior to passing hydrostatic pressure test is at the risk of the contractor. After test passes, backfill remaining mainline pipe. All Areas: Backfill as needed to run hydrostatic pressure test with inspection by irrigation design professional per Testing 603.06 below.

1. Backfill shall be free from rubbish, stones larger than two (2) inch diameter, frozen material and vegetative matter. Do not backfill in freezing weather. If backfill material is rocky, the pipe shall be bedded in two (2) inches of fill sand covered by six (6) inches of fill sand.
- f. After puddling or tamping, leave all trenches slightly mounded to allow for settling.
- g. Compact to proper densities depending on whether surface area over the line will be paved or landscaped.
- h. Drip system installation:
 1. Snake polyethylene hose in trenches at twelve (12) inch minimum depth. Where drip laterals enter shrub beds from turf areas, elbow up to finish grade. Snake hose in beds above grade and below fabric weed barrier and mulch. Secure pipe using galvanized tie down stakes (sufficient number to keep pipe stationary). City Owned Areas: Provide a tee connecting to a drip line circling each tree per details.
 2. Extend drip pipe to all trees located in native seeded areas, per detail. Extend drip line within shrub beds near each shrub or planting, snaking hose to backfill area of each plant. Where sloped, the drip line is to be placed on the uphill side of each plant.
 3. Install flush caps in separate valve box per details. Install flush caps at ends of each lateral or branch. Flush drip lines with full head of water for three minutes prior to installing emitters.
 4. Install buried tracer wire on top of all drip pipe buried a minimum of six (6) inches under the soil.
 5. Provide emitters to each plant per Section 603.05.13 of these standards. City Owned Areas: Do no use spaghetti tubing.
- i. All Areas: Funny Pipe: Attach funny pipe to elbows using appropriately sized crimp-type clamps to secure.
7. All Areas: Thrust blocks:
 - a. Shall be installed where PVC mainline (two and one half (2½) inches or larger) changes direction over twenty (20) degrees.
 - b. Minimum of one cubic foot of concrete bearing against undisturbed soil.
 - c. Keep pipe joint clean of concrete. Do not encase.
 - d. Place wiring away from thrust block to avoid contact with concrete.
 - e. #4 rebar wrapped with asphalt tar based mastic coating.

8. All Areas: Valve Installation: Install at least twelve (12) inches from and align with adjacent walls or paved edges.
 - a. Automatic Remote Valves: Install in such a way that valves are accessible for repairs. Make electrical connection to allow pigtail so solenoid can be removed from valve with twenty four (24) inch minimum slack to allow ends to be pulled twelve (12) inches above ground. Locate minimum twelve (12) inches from and align with walks, walls, etc.
 1. Thoroughly flush piping system under full head of water for three (3) minutes through furthest valve, before installing valves.
 2. Valve assembly to include ball valve and union per detail for ease of maintenance and repair.
 3. Install in locking valve box per details.
 4. Install a waterproof tag with permanent marker with each valve number. One tag shall be attached to each valve.
 - b. Manual Drain Valve: Install per plans, but in no case shall be less than at the low points of the system and at the end of the mainline. Install in six (6) inch CL-200 PVC sleeve access with ten (10) inch locking valve box lid. Install valves on swing joint assembly per detail. Sump to be four (4) cubic feet of crushed gravel over filter fabric.
 - c. Quick Coupler Valve: Install in ten (10) inch round locking valve box. Flush completely before installing valve. Thoroughly flush piping system under full head of water for three minutes through furthest valve, before installing valves.
 - d. Isolation Gate valves: Install in valve box.
 - e. Valve Boxes:
 1. Brand all valve boxes with the following codes as appropriate: "SV" and the controller valve number per as-built plans for all remote control valves; "DV" for all drain valves; "GV" for all isolation valves; "DRGV" for all drip system isolation valves; "QC" for all quick coupling valves; "WA" for all winterization assemblies; "FM" for all flow meter assemblies; and "MV" for all master valve assemblies. Use a branding iron stamp with three (3) inch high letters.
 2. Brand boxes in the center of the lids.
 3. Valve box shall NOT rest on mainline; use brick or other approved non-compressible material per detail. Top of valve box to be flush with finish grade.

4. All equipment shall be centered in valve boxes with adequate space to access equipment with ease. A hand should be able to pass unobstructed under the valve.
 5. Valves shall not be so deep as to be inaccessible for repairs. Three (3) inch depth of three quarters (3/4) inch washed gravel to be placed in the bottom of each valve box with enough space to fully turn valve for removal (see detail).
9. All Areas: Head Installation:
- a. Set heads plumb and level with finish grade. In sloped area, heads to be tilted to match slope to provide full radius spray pattern.
 - b. Flush lateral lines before installing heads. Thoroughly flush piping system under full head of water for three minutes through furthest head before installing heads. Cap risers if delay of head installation occurs.
 - c. Pop-Up Heads along walks and bikeways: Bed heads in six (6) inch layer of sand under the base of the head.
 - d. Nozzles: Supply appropriate nozzle for best performance.
 - e. Adjustment: Adjust nozzles and radius of throw to minimize overspray onto hard surfaces.
10. All Areas: Wiring and Electrical Connections:
- a. All wire connection and exposed ends to be sealed using wire connectors and waterproof sealant specific for direct burial applications.
 - b. Electrical installations will be inspected by the City of Longmont's Building Inspection Division and the final connection made by Longmont Power & Communications (LPC). Call 303-651-8386 to discuss the project scope and charges with the LPC engineering staff. Actual connection in the power source will be done by LPC when notification is received by the Building Inspection Division. All work other than actual connection, including the low voltage installation to the electric source where applicable, to be supplied by the contractor. All materials to be provided by the contractor. When working near any LPC facility, prior coordination and approval is required. Reference the building permit for telephone numbers to request an electrical inspection by the Building Inspector.
 - c. Label each wire with waterproof tape and permanent marker at the controller and the furthest end of each wire.
11. All Areas except as noted below: Controller Installation:
- a. City Owned Areas: Minimum four (4) weeks prior notice to be given Parks and Forestry Services for order of Toro Sentinel system assembly. Toro Sentinel systems are not always kept in stock and may have ordering delay.

- b. To be installed in an above-ground location suitable to prevent vandalism and provide protection from adverse weather conditions, and per City field direction. All exposed wiring to and from the controller shall be encased in galvanized metal conduit. Exterior controllers to be installed on six (6) inch thick concrete pad with compacted subgrade per concrete specification.
 - c. Install Controller or Satellite Control Units per City direction and in accordance with manufacturer's specifications. Install surge protection, grounding rods and other accessory components as specified.
 - d. Attach wire markers to the ends of control wires inside the controller unit. Label wires with the identification number of the remote control valve active by the wire.
 - e. Sequence wiring for irrigation zones in logical manner and so it matches as-built drawings.
 - f. City Owned Areas: (Optional - HIGHLY RECOMMENDED!): Install an additional control clock instead of Toro Sentinel unit during warranty/maintenance period for ease of contractor operation. City will not adjust watering schedules via Toro Sentinel system during warranty / maintenance period. If this option is selected, Toro Sentinel system to be fully operational by Final Acceptance site inspection. (If contractor installs Toro Sentinel system and requires Parks and Forestry instruction on use, Parks and Forestry will charge \$50/hr.)
12. All Areas except as noted below : Wiring:
- a. Comply with City electrical codes.
 - b. City Owned Areas: Power source brought to controller to a ground fault receptacle installed within controller casing. Clock shall be plugged into receptacle.
 - c. String control wires as close as possible to mainline, consistently along and slightly below one side of the pipe.
 - d. Leave minimum loop of twenty four (24) inches at each valve and controller, at each splice, at the ends of each sleeve, at one hundred (100) foot intervals along continuous runs of wiring, and change of direction of 90 degrees or more. Band wires together at ten (10) foot intervals with pipe wrapping tape.
 - e. Install common ground wire and one control wire for each remote control valve. Multiple valves on a single control wire are not permitted. Install three extra wires, as specified, to the furthest valve on the system and each branch of the system.
13. All Areas except as noted below: Drip Emitter Installation
- a. City Owned Areas: Install specified number of emitters directly onto lateral hose (spaghetti tubing not allowed). Groundcover: one single outlet emitter per square foot planting area. Shrubs: two single outlet emitters per shrub. Trees: four single outlet emitters per 2-3" tree; six single outlet emitters per

four (4) inch tree; eight single outlet emitters per six (6) inch + tree. No spaghetti tubing permitted. All Areas: Install specified number of emitters onto drip tubing. Groundcover: one single outlet emitter per square foot planting area. Shrubs: two single outlet emitters per shrub. Trees: four single outlet emitters per two to three (2-3) inch tree; six single outlet emitters per four (4) inch tree; eight single outlet emitters per six (6) inch + tree.

- b. All drip emitters are to be tested for operation prior to weed barrier and mulch installation.
14. All Areas: Signs
- a. Install Raw Water in use sign in prominent location. See Section 601.04 for post specification if needed.

603.06 TESTING

1. All tests to be run in the presence of City inspector for City Owned Areas, or Irrigation Design Professional for Common Open Space areas. Irrigation Design Professional conducting inspections is to sign the certification statement on the as-built drawings. All City irrigation inspections to be scheduled by calling 303-651-8745 for City Owned and Maintained areas or coordinating with City inspector for other areas. All Areas: Schedule all tests and inspections a minimum of 48 hours in advance of tests. Repeat any failed tests until full acceptance is obtained. No testing shall be done when seasonal conditions minimize the ability to sufficiently inspect the system. Generally, testing is not available between the months of November and April. No chemical spraying shall be done within ten (10) days of any irrigation inspections.
 - a. All Areas: Hydrostatic Test (during irrigation installation before sleeving and backfilling pipe joints): Maintain 120 PSI for four hours. No leakage or loss of pressure is accepted during test period. Test must be run in the presence of inspector as noted above. Contractors to provide at their own expense hydrostatic pump, water and other materials as necessary for test. The pressure gauge is to be onto the end of a fitting, rather than directly into a quick coupler. The pump is to be disconnected at the start of the test.
 1. Parks requires that the Contractor perform an independent pressure test prior to scheduling the required inspection for City Owned and Maintained areas. If numerous tests are required for a system, Parks reserves the option to bill the Contractor for numerous tests at \$50/hr. (with a one (1) hour minimum)
 - b. All Areas: Operational Test (at Construction Acceptance punchlist walk-through): Activate each remote control valve from the controller in the presence of City inspector for City Owned and Maintained areas, or irrigation design professional for Common Open Space areas. Replace, adjust or move heads and nozzles as needed to obtain acceptable performance of system. Replace defective valves, wiring or other appurtenances to correct operational deficiencies.
 - c. All Areas: Drip Operational Test (after drip lateral installation, but prior to weed barrier and mulch installation): Activate remote control valves in presence of City

inspector for City Owned areas, or irrigation design professional for common open space areas. Replace any emitters that are clogged or not operational. Adjust lateral hose as needed to effectively irrigate plantings.

- d. City Owned Areas: Central Control System Acceptance Test (at Construction Acceptance punchlist walk-through): City inspector will activate each remote control valve from the Central Control System base station using the hand-held remote device.
 - 1. The Contractor may elect to install an additional controller for use during the maintenance period between Construction Acceptance and Final Acceptance. If this option is selected, the Central Control system must be installed and fully operational prior to Final Acceptance.
- e. All Areas: Raw Water Pump Control Inspection: Demonstrate to City inspectors for City Owned Areas or irrigation design professional for Common Open Space Areas at pump start up that pump system correctly operates automatically, all sensors perform properly and the system is built per approved plans. The pump supplier will be required to attend this inspection.

603.07 COMPLETION SERVICES

- 1. All Areas: When project construction is substantially complete, request from City inspector for City Owned areas a punch list inspection per Section 600.03. Coordinate with irrigation design professional for inspection of Common Open Space areas
 - a. Demonstrate system to inspector.
- 2. All Areas: When project construction is ready for Construction Acceptance, request from City inspectors for City Owned areas an inspection (all punchlist items must be complete) per Section 600.03. Coordinate with irrigation design professional for inspection of Common Open Space areas
 - a. Demonstrate system to inspector.
 - b. Submit turn-over items (items must be accompanied by a transmittal letter and delivered to the City inspectors' offices - delivery at the project site is not acceptable) as following:
 - 1. All Areas: Provide list of equipment ordering information including model numbers, size and style for all components.
 - 2. All Areas: Provide one mylar, one blueline set and one pdf format electronic file (for all projects), and one electronic file able to be opened in AutoCAD Release 2006, in .dwg format (for all City capital projects), of as built irrigation drawings no larger than twenty four (24) inch x thirty six (36) inch. Common Open Space as-built drawings are to be a separate drawing package from City Owned areas as-built drawings. The City may require .dwg AutoCAD files for development projects if future development is anticipated in the area. (Construction plans may be used for as-built base map information. Coordinate with developer and

consultant team to obtain). Drawings to have the following information as a minimum:

- aa. System shown as installed with each sheet clearly marked "RECORD DRAWINGS".
 - bb. The name of the project, date of installation, date of as-built drafting, company name of installer, name of as-built drafter, installer company phone number and back-up phone number for night and weekend contact.
 - cc. Sleeves and valves noted with dimensions to each from two different permanent objects.
 - dd. Control valves noted with gpm, valve number and valve size clearly indicated for each valve. Valve numbering to match as-built controller sequencing.
 - ee. Horizontal verification of all irrigation pipes, irrigation heads valve boxes, wiring, electrical boxes, controller, meter, and backflow prevention devices. Noted information shall include all pipe sizes, zone numbers, valve locations, head types, valve types and model numbers, controller type and model number, and drip emitter chart.
 - ff. Irrigation record drawings shall include all pertinent physical features (such as concrete paths, sidewalks, fences, ponds, buildings, pump house, parking lots and athletic fields).
 - gg. No contour lines shall be shown on irrigation record drawings unless required by the City.
 - hh. Common Open Space Areas: Certification statement, signed and executed by irrigation design professional and contractor, see 600.02.4.c.8.
3. All Areas: Provide one set of all irrigation sheets reduced to eleven (11) inch x seventeen (17) inch, with each zone color coded, and each sheet plastic laminated. Provide two (2) sets where the system is to be turned over to non-City personnel for maintenance.
4. All Areas: Provide on-going maintenance personnel with one (1) each of all operating keys, servicing tools, test equipment, remote hand-held radios (programmed to City frequency – City Owned areas only), warranties/guarantees, and maintenance manuals as needed for on-going maintenance of area. Any exceptions to this requirement are to be obtained in writing from City inspector.
- c. All Areas: Clean Up: Remove all excess materials, tools, trash and debris from site.

- d. All Areas: Complete additional punchlist items if determined necessary by City Inspector or irrigation design professional.
 - e. All Areas; Schedule re-inspection by City inspector or irrigation design professional to verify completion and acceptance of all punchlist items if necessary.
3. Request Final Acceptance inspection per Section 600.03.
- a. All Areas: Problems identified during the punchlist inspection and project work-through will be coordinated with City inspector or irrigation design professional with solutions executed by the Contractor. Contractor shall complete punch list of items requiring resolution prior to issuance of Final Acceptance.
 - 1. At the discretion of City inspector or irrigation design professional , a new pressure test may be required at the time of Final Acceptance inspection.
 - b. All Areas: Clean up: Remove all excess materials, tools, trash and debris from site.
 - c. All Areas: Schedule a project re-inspection with City inspector or irrigation design professional to verify completion of punchlist items and project work-through issues if necessary.

603.08 GUARANTEE/WARRANTY

- 1. All Areas: For the period following Construction Acceptance notice by City and prior to Final Acceptance, all irrigation materials, equipment, workmanship and other appurtenances are to be guaranteed/ warranted against defects. Settling of trenches or other depressions, damages to structures or landscaping caused by settling and other defects to be corrected by the contractor at no cost to the City or homeowners association. Make repairs within seven (7) days of notification by the City staff representative or irrigation design professional unless an emergency or hazardous situation dictates immediate correction. Guarantee/Warranty applies to all originally installed materials and equipment, and to replacements made during the guarantee/warranty period.

604.00 SEEDING

604.01 GENERAL CRITERIA

- 1. Seeding shall be done in accordance with the professional standards of the industry for all landscape areas.
- 2. Seeding is allowed in primary greenways where approved by City, on all areas of detention ponds to be maintained by the City that are not within the five year flood area, and in some temporary dry land applications. No seeding is allowed at the bottom of detention ponds to be maintained by the City. Seeding is allowed in private development areas. No seeding is allowed along arterial rights-of-way. Seeding within City Parks and facilities is allowed on a project specific basis. All proposed seeded areas are to be specifically approved by City staff.

3. All dry land-seeded areas must have a temporary irrigation system for establishment purposes.
4. Drought-tolerant grasses are encouraged in all areas and required in City owned areas. Dry land grasses may be permitted in required landscape areas if deemed appropriate by City staff. These grasses shall be maintained free of weeds and debris and shall not present a fire hazard. The use of several species is encouraged (required in City-owned areas).
5. All Sections (as applicable) shall apply to all City capital projects that reference these Standards. References to the "Developer" in these Standards shall be considered references to the Contractor. In the event of any conflict between these Standards and the project specifications, the more stringent of the two shall apply.

604.02 MINIMUM DESIGN CRITERIA

1. Seed mix: Shall be approved by City staff based on the activity to take place, planned irrigation method and maintenance to be performed in the area being seeded. In all cases, a drought tolerant seed mix is encouraged and shall be required in all City owned areas with a seed mix that does not contain more than 10% bluegrass.
 - a. For pre-approved Native Grass Mixes, see the Approved Materials List
 - b. For pre-approved turf grass mixes, see the Approved Materials List.
2. Turf grass seed mix shall be used between the property line and the concrete path in primary greenways and on detention pond side slopes. Native grass mix may be used between the concrete path and ditch.
3. In areas where seed is installed along a road without curb and gutter, traffic delineators with reflectors shall be required at fifty (50) feet intervals set five (5) feet off the edge of asphalt. Posts to be installed to break away in direction of on-coming traffic. The post shall be located near irrigation heads (on the road side of the heads) to protect and shall not obstruct the irrigation system.
4. A sign shall be supplied by the developer in all permanent native seeded areas after seeding, per Section 604.04.6 of these standards. Signs shall be located at all entrance points into the Greenway.
5. Where a fence abuts an irrigated turf area to be maintained by the City, a twenty four (24) inch wide, six (6) inch thick mow band is required along the fence. The mow band may be concrete, three (3) inch cobble over weed fabric with a steel edged border or an approved equal.

604.03 SUBMITTALS

1. Certificates showing State, Federal or other inspection showing source and origin.

604.04 MATERIALS

1. For a specific list of materials accepted by the City, please see Parks and Open Space Divisions Approved Materials List.
2. Seed: Seed shall be of fresh, clean, new crop seed composed of the varieties approved by the City with tested minimum percentages of purity and germination clearly labeled on the package. All seed shall be free of Poa annual and all noxious objectionable weeds with a maximum crop of .10% and maximum weeds of .10% weeds.
3. Mulch:
 - a. For slopes 3:1 and less: Certified weed free hay for dry land seeded areas and hydromulch for irrigated turf seeded areas.
 - b. For slopes steeper than 3:1, and inaccessible areas: Hydromulch using wood cellulose fiber for hydraulic mulching shall not contain any substance or factor which might inhibit germination or growth of grass seed. It shall be dyed a green color to allow metering of its application.
 - c. Tackifier: Per approved materials (Mandatory for hydromulch).
4. Netting: For slopes steeper than 3:1, use Soil Saver jute netting, or approved equal. Netting to be stapled with No. 11 gauge steel wire forged into a six (6) inch long U shape, and painted for viability in mowed areas.
5. Fertilizer: Slow release type Nitrogen.
6. Native grass seeded area signs: A sign is to be erected in all permanent dry land seeded areas in Primary Greenways reading "Native grass seeding is being established in this Primary Greenway. Prior to establishment, the grasses will be mowed approximately four to five (4-5) times per year to help control noxious weeds. After establishment, the dry land grass will be maintained according to approved maintenance procedures and accepted industry standards, including growth heights of over twelve (12) inches and the irrigation system will be turned off. Eventually, these grasses will provide habitat for wildlife in the greenway and will help conserve water. Please call 303-651-8446 with any questions. Thank you for your cooperation." The sign shall be brown with white letters with City logo and shall be mounted on six (6) inch x six (6) inch wood post, mounted five to six (5-6) feet above grade. See Section 601.04.6 for other sign requirements.
7. Traffic Delineators: In-ground mounted, white with reflectors. See Approved Materials List.

604.05 INSPECTION

1. Inspect finish grade and trim where needed to obtain finish grades of one (1) inch below adjacent pavements. Verify positive drainage away from all structures. Verify or complete removal of rock and debris larger than one half (1/2) inch from all turf grass areas to be seeded, and rock larger than two (2) inches from all native grass areas to be seeded.

604.06 EXECUTION

1. Fertilizer: Apply eight (8) lbs. per 1000 sq. ft. of turf grass seeded area (two to three (2 – 3) lbs. per 1000 sq. ft. of native grass seeded areas), unless soil test recommendation provides alternative fertilization rates, and rake lightly into top one eighth (1/8) inch of soil just prior to seeding operation. Native grass areas do not require fertilizer unless recommended on Soil Fertility test report.
2. Seeding:
 - a. Do not sow seed in windy weather or when ground is frozen or otherwise untillable.
 - b. Use brillion type drill for slopes less than 3:1 in grade. Drill seed in manner such that after surface is raked and rolled, seed has one quarter (¼) inch of cover.
 - c. Hydraulic seeding methods can be used only on slopes steeper than 3:1 or in areas that are not accessible for machine methods. Hydraulic pump capable of being operated at one hundred (100) gallons per minute and at one hundred (100) pounds per square inch pressure to be used. The equipment shall have an acceptable pressure gauge and a nozzle adaptable to hydraulic seeding requirements. Storage tanks shall have a means of agitation and a means of estimating the volume used or remaining in the tank. Do not seed and mulch in the same operation.
 - d. Broadcast seeding can be used only on areas not accessible for machine methods and too small to justify hydraulic seeding. Where broadcast seeding is done, seeding rates are to be doubled. Hand rake seed to cover at one quarter (¼) inch depth.
 - e. Seeding rates (drilled and hydraulic):
 1. Urban, Non-wildlife Native Grass Mix – twenty (20) lbs. pure live seed per acre.
 2. Native Grass Mix – twelve (12) lbs. pure live seed per acre.
 3. Turf Grass Mix - 150 lbs. pure live seed per acre.
3. Mulching:
 - a. Native Grass Mulch: Apply at a rate of two (2) tons per acre. Crimp into seed bed with disk set straight forward and two (2) inch deep. Disk mulch across slopes to prevent erosion. Mulch seed beds within twenty four (24) hours after seeding.
 - b. Hydromulching: Wood cellulose fibers must become evenly dispersed when agitated in water. When sprayed uniformly on the soil surface, the fibers shall form a blotter like ground cover, which readily absorbs water and allows infiltration to the underlying soil. Cellulose fiber mulch shall be added with the proportionate quantities of water and other approved materials in the slurry tank.

All ingredients shall be mixed to form homogenous slurry. Using the color of the mulch as a metering agent, apply the slurry mixture by spraying uniformly over the seeded area. Apply with the specified tackifier at a rate of one hundred twenty (120) pounds per acre. Unless otherwise ordered for specific areas, fiber mulch shall be applied at the rate of two thousand (2,000) pounds per acre.

1. Hydraulic mulching shall not be performed in the presence of free surface water resulting from rains, melting snow or other causes.
4. Netting: Net areas with slopes greater than 3:1. If contractor fails to net and subsequent soil erosion occurs, contractor shall re-establish finish grade, soil preparation, seed bed and apply netting at no cost to the City. Staple per manufacturer's specifications.
5. Watering: Immediately after seeding and mulching, water seeded areas lightly to a depth of two inches, but with care so that no erosion takes place and no gullies are formed. Water lightly as needed to maintain moist seedbed until turf is established. Sloped areas should be hand watered until turf is established to prevent erosion; water these areas more often but for shorter periods of time.
6. Clean Up: Remove all hydromulch and other mulch materials from all plant materials, fences, site furnishings, signs, concrete and other areas except for seed bed.
7. Protection: Provide and install barriers as required to protect seeded areas from pedestrian and vehicular damage. Provide signage and barricades if needed.

604.07 COMPLETION SERVICES

1. Turn over items to City inspector: Seed tags to verify seeded mixture matches approved plans.

604.08 MAINTENANCE

1. Mowing: When grasses reach three (3) inches in height, mow to two (2) inches in height. Repeat as needed in dry land areas to encourage spread of grass stolons and prevent seed development of weeds. Repeat in areas where mowing is to be standard maintenance practice, to maintain grass height at two and one half (2-1/2) inches. Do not cut off more than 1/3 of grass leaf in a single mowing operation. Excessive clippings to be removed from turf areas. Adjacent paved areas to be swept after mowing.
2. Weed control: During establishment mechanical weed control should be employed to prevent weed flowering and seed set. When grasses are sufficiently established, chemical weed control can be applied to selectively eradicate invasive and noxious weeds.
3. Fertilizing: Apply balanced fertilizer to maintain turf vigor during warranty period.

604.09 GUARANTEE/WARRANTY

1. Warrant seeded areas for consistency and completion of coverage. Re-seed as needed to ensure a successful stand of grass as accepted by the City. Once a vigorously growing stand of grass is achieved, the request for Final Acceptance may be made. A

stand of grass is considered to be acceptable when each square foot of grass area has at least 90% coverage in turf grass areas. In native grass areas, it is considered established when the grass area has at least 70% coverage. Maximum single bare spot acceptable in dry land areas is two (2) sq. ft. All seeded areas that do not meet the satisfactory standard of establishment qualifications shall be re-seeded and mulched.

- a. It is the developer's responsibility to maintain seeded areas in a weed free manner. Eradication of weeds prior to Final Acceptance shall be done on an as-needed basis to generally eradicate the noxious weeds.
- b. Extended warranty period may be required as determined by City inspector.

605.00 SODDING

605.01 GENERAL CRITERIA

1. All sod is to be installed according to current industry standards for all landscape areas.
2. All Sections (as applicable) shall also apply to all City capital design and construction projects that reference these Standards. References to the "Developer" in these Standards shall be considered references to the Consultant or Contractor. In the event of any conflict between these Standards and the project specifications, the more stringent of the two shall apply.

605.02 MINIMUM DESIGN CRITERIA

1. Sod Mix: Turf mix for all areas shall be approved by City staff based on the activity to take place, planned irrigation method and maintenance to be performed in the area being sodded. In all cases a drought tolerant mix shall be encouraged. In City-owned areas a drought tolerant mix shall be required using a mix that does not contain more than 10% bluegrass.
 - a. For pre-approved Sod Mixes, see the Approved Materials List.
2. Sodded Areas: Sod is required for landscaped areas on arterial rights of way and in all areas of detention ponds to be maintained by the City that are within the five year flood areas. Other areas may require use of sod as determined by the City staff.
 - a. If the size of a detention pond area to be owned by the City is ½-acre or less, then the entire area shall be sodded.
3. Sodded areas should be designed to minimize narrow, hard to maintain strips of turf.
4. Where a fence abuts an irrigated turf area to be maintained by the City, a twenty four (24) inches wide, six (6) inches thick mow band is required along the fence. The mow band may be concrete, three (3) inch cobble over weed fabric with a steel edged border or an approved equal.

605.03 SUBMITTALS

1. Certificates showing State, Federal or other inspection showing source and origin.

605.04 MATERIALS

1. For a specific list of materials accepted by the City, please see Parks and Open Space Division Approved Materials List.
2. Sod: Sod shall have a clay-loam base that will not break, crumble or tear during sod installation. Netted sod is acceptable. It shall have a healthy, vigorous root system that has undergone a program of regular fertilization, mowing and weed control to obtain thick turf free of objectionable weeds. It shall be free of nematodes, pests and pest larvae as inspected by the entomologist of the Colorado State Department of Agriculture.
 - a. Thickness: one (1) inch thick excluding top growth and thatch.
 - b. Thatch: Not to exceed one half (½) inches uncompressed.
 - c. Width: Eighteen (18) inch wide strips or forty two (42) inch wide rolls.
3. Fertilizer: Ammonium sulfate and diammonium phosphate, with chemical analysis of N 20%, P 10%, K 5%, S 8%, Fe 3% (Urea and sulphur coated Urea only), unless soil test recommendation provides alternative rates.

605.05 INSPECTION

1. Inspect finish grade and trim where needed to obtain finish grades of one (1) inch below all adjacent paved surfaces. Verify or complete removal of rock larger than one half (1/2) inch which may hinder sodding and perform fine grading as necessary to maintain drainage per plans. Verify that irrigation system is fully operational prior to sodding.

605.06 EXECUTION

1. Clean out drainage inlet structures.
2. Adjust irrigation heads to proper watering height according to depth of sod material but lower than mower blade height to enable lawn mowers to cut grass freely without damage to sprinkler system.
3. Sod Cutting and Delivery: Cut no more than twenty four (24) hours prior to delivery, laid in place within twenty four (24) hours of delivery.
4. Transportation: Do not pile sod more than two (2) feet deep. During delivery process, protect roots from exposure to drying sun, winds and heat. Store in shady area and keep moist or store covered with moistened burlap.
5. Timing: Install sod only between spring and fall. Do not install on frozen or saturated soil.
6. Watering: Lightly water area to be sodded.
7. Fertilizer: Distribute fertilizer uniformly at a rate of fifty (50) lbs. per acre, unless otherwise recommended by soils test. Apply within forty eight (48) hours before laying sod.

8. Sodding:
 - a. Lay sod on slightly moist soil.
 - b. Lay with longest dimension parallel to contours in continuous right-of-ways.
 - c. Tightly butt ends of sod together. Stagger joints. Compact vertical joints between sod strips by rolling so sod will be in contact with the ground surface. Cut right-of-ways terminating on property lines to straight line.
 - d. When sod and soil are moist, roll sod lightly as soon as possible after laying. Roll with enough weight to ensure contact with soil for proper rooting.
 - e. Add topsoil along exposed edges to match existing grade; feather topsoil out approximately one (1) foot.
 - f. Make sure finished sodded areas positively drain so that no irrigation water or storm water will pond in sodded areas. Relay sod if necessary to correct.
 - g. Water thoroughly with fine spray immediately after planting.
9. Re-sodding: Re-sod spots larger than one (1) sq. ft. not having uniform stand of grass prior to Final Acceptance.

605.07 MAINTENANCE

1. Mowing: When grass reaches three (3) inches in height, mow to two (2) inches in height. Mow weekly and maintain grass between two (2) inches and two and one half (2-1/2) inches in height. Do not cut off more than one third (1/3) of grass leaf in a single mowing. Remove grass clippings from all paved surfaces.
2. Fertilizing: Distribute fertilizer uniformly at a rate of five (5) pounds of balanced fertilizer per one thousand (1,000) square feet of sodded area unless otherwise recommended by soils test, three weeks after sodding is complete. Fertilizing thereafter is to be in accordance with standard maintenance practices for turf areas, and as needed to achieve and maintain a vigorous and healthy stand of grass.
3. Weed control: During establishment use mechanical means to control weeds. When sod is sufficiently established, chemical weed control can be applied to selectively eradicate invasive and noxious weeds.

605.08 GUARANTEE/WARRANTY

1. Warrant sodded areas for consistency and completion of coverage. Re-sod areas as needed to obtain acceptance by the City. Once a vigorously growing stand of grass is achieved, the request for Construction Acceptance may be made.

606.00 TREES, PLANTS AND GROUNDCOVER

606.01 GENERAL CRITERIA

1. All nursery stock shall conform to the American Standard for Nursery Stock (ANSI Z60.1) and the Colorado State Nursery Act.
2. All Sections as applicable shall also apply to all City capital design and construction projects that reference these Standards. References to the "Developer" in these Standards shall be considered references to the Consultant or Contractor. In the event of any conflict between these Standards and the project specifications, the more stringent of the two shall apply.

606.02 MINIMUM DESIGN CRITERIA

1. Plant material to be designed and installed for ease of maintenance operations and safety. View triangles at intersection and offset of materials from edge of street curbing to comply with Section 205.02 of the City Standards and Specifications. Restricted planting areas are as follows:
 - a. No trees, shrubs, ground cover, boulders, berms, fences or other improvements exceeding thirty six (36) inches in height shall be planted within this view triangle or within six (6) feet of a vehicle travel lane.
 - b. No landscape improvements exceeding six (6) inches in height shall be placed within three (3) feet of a fire hydrant. No mulch or small rock is to be used around a fire hydrant.
2. Landscape plans to be designed and plant materials installed for long term vigor of urban forest. Diversity of species, selection for hardiness, and suitability for areas shall all be considered in the design (see Plant Materials List in Appendix A of these Standards and Specifications).
 - a. FOR ANY ONE PROPOSED DEVELOPMENT PROJECT (including common open space areas): Diversity requirements shall insure that no more than 15% of any one species of tree (for trees considered hardy in this area), or 10% of any one species of tree considered average or marginally hardy for this area, are proposed. This shall be measured per total trees in the development, including existing trees.
 1. Up to 20% of the proposed trees for a project may be of fast-growing species. The remainder of the proposed trees shall be varieties with slower and medium growth rates.
 - b. FOR SMALL DEVELOPMENT PROJECT (where there are no or very small common open space areas): Variances from the above diversity requirement may be allowable where size of development makes minimum diversity percentages unreasonable. In such cases, a specific request for variance to the City Forester is to be made by the developer citing reasons that diversity requirements are unreasonable. Variance request to be made by a note on the landscape plans.

3. There shall be a minimum distance of eight (8) feet between trees and any adjacent vertical surface unless a variance is obtained. Trees to be spaced to accommodate the full canopy of the mature tree. Large deciduous trees to have minimum spacing of forty feet (40'), mid-sized trees to have minimum spacing of twenty-five (25) feet and small trees (ornamental) to have minimum spacing of fifteen feet (15'). Coniferous trees to have a minimum spacing of twenty-five (25) feet for large spreading varieties, ten (10) feet for upright columnar varieties.
 - a. When space is limited or a special design effect is desired, closer spacing may be allowed upon agreement from the City Forester.
 - b. In City owned areas, trees shall be planted in the center of the tree lawn (area between sidewalk and curb) when the space is less than twelve (12) feet wide. No trees are to be planted in turf areas narrower than eight (8) foot in width without approval from the City Forester. Narrow tree lawns approved as a variance would be required to use ornamental or small canopy trees (See Approved Materials List – Tree Recommendations).
 - c. Spacing in tree lawns between hard surfaces (including concrete paths and curbs) to be a minimum of eight (8) foot, where possible.
4. Trees are not to be planted on slopes that are steeper than 3:1.
5. Principles of Xeriscaping are to be followed in all City owned landscape areas, and are strongly encouraged for all other areas.
6. Trees to be located five (5) foot minimum away from all underground utilities, measured from the pipe edge.
 - a. Where underground or overhead utilities unduly restrict planting areas within the right-of-way, planting in areas immediately adjacent to the right-of-way may be allowable in certain cases. Request for this variance is to be made by a note on the landscape plans.
 - b. Electrical facility height restrictions:
 1. Residential metering pedestal/pit: six (6) inch maximum height within four (4) feet of the window (meter) side of the cabinet and forty (40) inches maximum height within two (2) feet elsewhere.
 2. Residential pad mount transformers: no landscape material on top or front (street side) shall be used.
 3. Utility poles: no climbing vines.
 4. Vaults: no landscape material on top of the vault and six (6) inch maximum height within four (4) feet.
 5. Pad mount switchgear and cabinets: sod, cobble, mulch or other low growing shrubs or groundcover only within ten (10) feet of the unit doors.

- c. Plants with aggressive, shallow root systems with high potential (Cottonwood, Willow, Poplar, etc.) to cause damage facilities and utilities, such as roadways and sewer and water lines, are not permitted within twenty five (25) feet of any such facility.
7. Large canopy deciduous trees are encouraged in the design for placement between the curb and the concrete path/ walkway along streets. Ornamental and small canopy deciduous trees shall be used in these areas where space is limited.
8. Ornamental trees can only replace large canopy deciduous trees at a rate of three (3) ornamental trees to one large canopy deciduous tree and not to exceed 25% of the total tree requirement when calculating minimum materials per City code requirements. Ornamental trees may be used in addition to large canopy deciduous trees. Fruit bearing or thorny trees are not allowed within five (5) feet of concrete paths or streets (as calculated from mature canopy width of tree).
 - a. Where overhead lines or other site-specific restriction prohibits use of large canopy deciduous trees, ornamental trees can be used at a 1:1 ratio for large canopy deciduous trees. Where overhead power lines exist and are not proposed for burial within ten (10) years, large canopy deciduous trees shall not be placed under those lines. Ornamental trees with mature height less than the power line height shall be used.
9. Coniferous trees shall comprise 25% of any landscape area where suitable. Unsuitable areas include areas where icy conditions may be created with the use of conifers at road intersections, road curves, concrete path intersections, concrete path curves, site distance restricted areas, or narrow areas. Place Conifers so mature spread will not overgrow walks or streets.
10. Shrubs to be a mixture of evergreen and deciduous species of reasonable diversity. Large (over four (4) feet in height) species should be placed between the concrete path and the property line to provide buffering. Shrubs four (4) feet and less in height to be used between the concrete path and the curb along street rights of way to avoid safety obstructions. Shrubs four (4) feet and less in height to be used between the nearest road / parking area and restroom or other structures to enhance visibility. Shrubs should be selected for wildlife habitat value along primary greenways. Shrubs within primary greenway low-flow channels shall be selected for water tolerance, flood frequency and velocity.
11. Arterial rights-of-way shrub beds placed between the curb and concrete path to have an eighteen (18) inch minimum wide bomanite (or approved equal) strip along the curb edge to prevent mulch displacement into streets and to ease sand removal in the spring.
12. No Junipers shall be within five (5) foot of back of curb, as they are easily damaged by magnesium chloride used in snow removal.
13. No artificial or synthetic plant materials such as artificial grass, shrubs, trees or flowers shall be used to fulfill any landscaping requirement.

14. All landscaping materials shall consist of healthy specimens compatible w/ local climate, soil characteristics, drainage and water supply. All plant material shall be reasonably resistant to drought and disease. The use of native and drought-tolerant species is encouraged. Non-nursery derived stock shall not be used to satisfy these requirements.
15. Ground covers other than grass may be planted in required landscape areas if they are reasonably able to provide complete coverage within two growing seasons and if they provide cover year-round. Vines shall not be used adjacent to pedestrian areas.
16. Materials such as river rock, cobble, boulders, patterned concrete, mulch and pole peelings shall be limited to shrub beds and other small areas that shall not exceed 25% of the required landscape area. Lightweight matter such as bark mulches shall not be used in areas unshielded from high wind.
17. All tree and shrub excavations shall be backfilled per Details 606.01 and 606.02 of these Standards and Specifications.
18. Loose gravel shall not be used in areas abutting public streets or sidewalks. Cobble greater than three (3) inch minimum aggregate size is permitted in these areas. In commercial areas where on-street parking is prevalent and the sidewalk is off set from the curb, the area between the curb and walk shall be landscaped to safely and comfortably accommodate pedestrians crossing to the walk. Cobble, gravel and other uneven surfaces shall not be permitted.
19. CITY CAPITAL PROJECTS – Cut edging is allowed in some cases if approved by Parks. ALL AREAS – Steel edging is the typical standard.
20. Street tree minimum standards are as follows:
 - a. Species that generally have branches less than fifteen (15) feet above the roadway at maturity shall not be used as street trees unless they are located such that no interference with the roadway will occur at maturity. Minor trimming and branch removal should be performed to maintain the fifteen (15) feet requirement and eight (8) foot minimum clearance over sidewalks and concrete paths.
21. Trees prohibited from planting within the City include the following: cotton-bearing Cottonwood, Lombardy Poplar, Box-elder, Siberian Elm, and Russian Olive.
 - a. Trees prohibited from planting within City street right-of-ways, unless otherwise approved by the City Forester, include the above plus the following: Fruit and/or thorn bearing trees (prohibited from within five (5) feet of concrete path as measured from edge of mature canopy), willow (all varieties), Tree of Heaven, Cottonwood (all varieties), and Silver Maple.
 - b. No plant material also classified as a noxious weed or invasive species is allowed.
22. A Developer is required to provide maintenance pruning to any existing trees and shrubs designated to remain on a project within the project limits, according to the City Forestry Standards, ANSI A300 Standards and under the direction of the City Forester. A tree

service Contractor licensed with the City must be used. A current list of licensed Contractors is available by calling 303-651-8446 or the City website.

23. Where Siberian Elm or Russian Olive trees exist within land to be dedicated to the City, these trees shall be removed by the Developer as part of Construction. The trees shall be cut to grade and treated with tinted Garlon herbicide to prevent re-growth except where hardscape is proposed, where stump must be ground and removed in its entirety.
24. Beaver Protection: Projects by or adjacent to waterways, including ditches, streams, lakes, ponds, creeks, etc. may be required to include beaver protection at the direction of the City inspector. A site visit to coordinate this issue is to be scheduled during construction design.
25. Prairie Dog Protection: Projects with prairie dogs established near the project limits will be required to comply with the City of Longmont Wildlife Management Plan. Installation of an approved prairie dog barrier to keep the prairie dogs outside of the public property will be required. Projects with prairie dogs established within the project limits and approved to remain will be required to install prairie dog barrier to contain the prairie dogs to a manageable space within the public property. The size of the area to be enclosed is to be determined by Parks and Open Space staff. A prairie dog inventory is required prior to development, or on an annual basis from the time of the project's first phase to the end of it's last phase, with information on the number of prairie dogs present, date of survey, and management proposal for maintaining population within the prescribed management areas and proposed removal techniques, if any. The City of Longmont highly recommends humane management techniques.
26. Trees recommended for use within the City include those listed in Plant Materials List found in the Approved Materials List of these Standards and Specifications.

606.03 SUBMITTALS

1. Certificates: State, Federal and other inspection certificates showing source or origin, (when requested by City).
2. Samples: Mulch; canvas strap or approved equal (when requested by City).

606.04 MATERIALS

1. Plants: Plants shall be first class representatives of specified species or variety, in healthy condition with normal developed branch and root systems, free of objectionable features. Must conform to: American Joint Committee on Horticulture (plant names); American Standard for Nursery Stock (ANSI Z60.1); Colorado Nursery Act.
 - a. Only plants grown in hardiness zones 2, 3, 4, and 5 are acceptable.
 - b. All material shall be free of disease, insects, eggs, larvae, and parasites of objectionable or damaging nature.
 - c. Inspect plants to make sure they meet minimum size requirements of the ordinance and the plans, and for proper form including strong central leader and good branching pattern on trees and number and length of canes on shrubs:

1. Large or small canopy deciduous trees (>thirty (30) foot mature height): two (2) inch caliper measured six (6) inches above ground, balled and burlapped.
 2. Ornamental deciduous trees (< thirty (30) foot mature height): One and on half (1½) inch caliper measured six (6) inches above the ground, balled and burlapped.
 3. Evergreen trees: six (6) feet in height, balled and burlapped.
 4. Shrubs: #5 plastic container with deciduous shrubs approximately two (2) feet high and spreading shrubs having eighteen to twenty four (18 – 24) inch spread.
 5. Groundcovers, vines, perennials: #1 plastic container.
2. Backfill mix: Mix shall consist of the following and be used in backfilling all plant materials:
 - a. One part composted soil amendment; Two parts topsoil; Three parts native soil from planting pits; superphosphate amendment.
 - b. All materials to be thoroughly blended.
 3. Stakes and Guys: Shall be guying system unless previously approved by City Parks and Forestry.
 - a. Guying System:
 1. Stakes – See approved materials list.
 2. Guys - See approved materials list.
 4. Miscellaneous - See approved materials list.
 5. Mulch: See approved materials list.
 6. Weed barrier fabric: See approved materials list.
 7. Steel edging: See approved materials list.
 8. Beaver protection: See approved materials list.
 9. Prairie Dog enclosure: If required, contact Parks and Open Space at 303-774-4691 or the Colorado Division of Wildlife for recommended enclosures.

606.05 INSPECTION

1. Locate all utilities prior to trenching and protect from damage, per Section 107.04 of these Standards. Call 303-651-8446 for Parks Division irrigation locates.

2. Schedule a tree delivery and layout inspection with City Foresters by calling 303-651-8446. Trees will be inspected for form, condition and health. Rejected trees to be removed immediately from site and replaced. Replacements are subject to re-inspection by City Forester. Inspection requirements include trees to be off-loaded from trucks to allow for full access. Binding material and trunk protection to be removed by Contractor prior to inspection.
 - a. Tree layout inspection shall be done at the same time the tree materials are delivered. Utility line locates to be visible in all planting areas. Stakes for proposed tree locations to be placed in planting areas requiring City inspection.

606.06 EXECUTION

1. Delivery and storage of Plant Materials:
 - a. Shade cloth shall be used to cover trees during transportation. Balled (B&B) trees should have limbs bound to prevent injury during delivery. Keep root systems moist and protect plants from adverse climate and transportation conditions. B and B stock shall be heeled in immediately upon delivery to the site unless it is planted within four (4) hours. Store other plants in shade and protect from adverse weather and from drying out. When handling, do not lift plants by trunk or stem; handle only ball or container. Obtain City inspection per 606.05.2.a.
2. Layout:
 - a. Stake plant locations or set out plants per plans. Verify prior to planting that plants when mature will not interfere with existing trees, irrigation, lighting, utilities and other equipment, both underground and overhead. Also verify proper spacing between trees and other hard surfaces. Notify City for approval if plant locations must be changed.
 - b. Obtain new utility locates if needed – all utilities must be clearly visible at the time of City plant material layout inspection.
 - c. Obtain City inspection per 606.05.2.
3. Excavation of Planting Site: Excavate planting pits per City details; dispose of any rocks off site.
 - a. Trees: Trees shall be planted at a depth where the root flare above the solid rootball is at grade in non-irrigated areas and four (4) inches above grade in irrigated turf areas. Contractor to contact City staff if they are not sure where the root flare is located on the tree. Modify depth of pit if soil type or conditions warrant and/or per City direction. Minimum diameter of the base of the planting pit shall be two (2) times the diameter of the root ball. The width of the hole at the top of the pit shall be three (3) times the diameter of the root ball
 - b. Shrubs, perennials and ground cover: top of root ball shall be positioned slightly higher (one to two (1-2 inches) than finish soil grade so that water will drain away

from plant. Modify depth of pit if soil type or conditions warrant and/or per City direction. Diameter of the pit shall be two (2) times the diameter of the root ball (minimum).

4. Planting:

- a. Balled and Burlapped trees (B&B) (Do not plant if tree trunk is loose in root ball or if ball is cracked or broken before or during planting process.):
 1. Remove bottom one third (1/3) of wire basket from root ball. Wire basket must be completely removed. Place wire on tree stakes for City inspection prior to removal from site.
 2. Place in pit with burlap intact on undisturbed soil in center of pit to proper grade, and plumb.
 3. Face for best effect.
 4. Cut and remove remaining wire and twine. Do NOT pull wrapping or wire from under ball as it may damage the root ball.
 5. Backfill two thirds (2/3) of pit; remove top one third (1/3) of burlap; complete backfill. DO NOT compact backfill mix by tamping. DO NOT backfill over crown of root ball or exceed soil depth of root ball; crown must be at proper planting depth.
 6. Install five (5) inch high watering basin around trees.
 - aa. Remove and grade out berm around basin after two thorough waterings in irrigated areas. Mulch after berm basin is removed.
 - bb. Mulch and leave basin in dryland areas.
- b. Container grown stock (Do not plant if root ball is cracked or broken before or during planting process):
 1. Carefully remove plants from containers without injury or damage to root ball; do not cut cans with spade or ax.
 2. Vertically score root ball using sharp knife, about one eighth (1/8) inch deep and about every two to three (2-3) inches in circumference. If stock is root bound, butterfly root ball by cutting ball in half, halfway up from the bottom; flair root ball out to sides when planting.
 3. Set plant plumb, face for best effect, make sure crown of root ball is at correct grade.
 4. Backfill and install four (4) inch high watering basin around planting pit. DO NOT compact backfill mix by tamping. DO NOT backfill over crown of root ball or exceed soil depth of container; crown must be at or slightly above finished ground level. Mulch after two thorough waterings.

- c. Completion of planting:
 - 1. Shape surface of finish grade around root ball so water drains away from trunk or stems and to match finish grade at the edge of the planting pit.
 - 2. Remove plant tags from trees and shrubs.
- 5. Edging:
 - a. Steel Edging: Install so top of edging is two (2) inch maximum above finish grade and flush with the top elevation of curb or pavement which it abuts. Edging shall meet pavement or curb at right angle. Stake at manufacturer's recommended intervals on smooth radius using steel stakes. Punch holes as needed for drainage.
 - b. Cut Edging: Where steel edging is not used, cut six (6) six deep vertical straight sided trench at shrub bed edge. For individual trees, edger cut is to be a three (3) foot radius from trunk of tree. Transition 6" deep cut edge to specified mulch depth of four (4) inches at a 45 degree angle.
- 6. Mulching:
 - a. Mulch depth:
 - 1. Tree pits - four (4) inches deep, keep two (2) inches from trunk.
 - 2. Shrub pits – three (3) inches deep (minimum).
 - 3. Remaining shrub bed - four (4) inches deep (minimum).
 - 4. Groundcover beds – three (3) inches deep (minimum).
 - b. Place geo-textile landscape fabric under mulch in all areas except in individual tree rings or in any other areas specifically approved for omission. Lay straight and even with eight (8) inch overlap at edges. Staple along edges with steel U pins on twenty four (24) inch spacing. Staple folds in fabric to keep below mulch material.
 - c. Tree rings – mulch to extend to edge of planting pit and shall encompass tree stakes in mulch area.
 - d. Timing: The City recommends delaying mulch application at tree rings in irrigated turf areas until after turf is established to minimize moisture build-up at tree bases. All other plants shall be mulched within two days of planting or after specified number of waterings for individual trees and shrubs.
- 7. Staking and Guying:
 - a. Pound six (6) foot long metal or wood stakes into undisturbed soil beyond the planting pit so that stake is secure. Secure STRAP-X or wire through metal grommets on canvas strap to tree and wrap above first branch on deciduous

trees or at mid-point of tree on coniferous trees. Secure guy to stake so that it is taut but allows some movement. Where wire is used as a guy, secure it so that no sharp projections are extending from post and flag it with one half (½) inch PVC pipe or white plastic flagging for visibility. Adjust tension on guy if needed. If metal t-posts are used, place PVC caps on top of stakes. Wooden pole stakes two by six (2x6) inch may be used without PVC caps.

8. Pruning: Prune minimum necessary to remove injured twigs and branches, deadwood and suckers to insure healthy tree. Do not prune central leader.
9. Beaver protection: Install fencing in circle around all deciduous trees (existing and new) in areas prone to harvesting by beaver, as determined by Parks and Forestry. Fencing to be cut in lengths long enough to provide a minimum twelve (12) inch separation between trunk and fence (all sides). Additional sections of fencing are to be wired together in sections if needed to fully cover trunk from ground to first branch. Ends and additional sections of wire fence loop to be securely fastened. Fencing to be cut into lengths in such a manner as to allow cut ends to be bent to secure enclosure around trees. Ends to be bent in to tree to prevent safety hazards and projections. Fence must be in contact with ground around entire tree using steel U pins to secure, if needed.
10. Prairie Dog enclosure: Contact Parks and Open Space at 303-774-4691 or Colorado Division of Wildlife for recommended installation.

606.07 COMPLETION SERVICES

1. Project Clean Up: Remove all excess materials, tools, rubbish and debris from site.
2. Record Drawings: List of all plant material installed, including sizes and quantities as certified by a Landscape Architect.

606.08 GUARANTEE/WARRANTY

1. For the period prior to Final Acceptance, all plant materials, landscape materials, workmanship and other appurtenances are to be guaranteed/warranted against defects. Settling of depressions, replacement of dead or diseased plant materials and other defects are to be corrected by the contractor at no cost to the City. Plant materials that are in an unhealthy or unsightly condition or that have lost their natural shape due to dead branches or excessive pruning of dead branches are to be replaced at no cost to the City. Guarantee/Warranty applies to all originally installed materials, and to replacements made during the guarantee/warranty period.
2. For areas to be maintained by Developer or subsequent property owners/HOAs, requirements per 606.08.1 apply in perpetuity.