

**CITY OF LONGMONT  
SECTION 600 –LANDSCAPING AND IRRIGATION  
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**600.01 GENERAL**

1. All arterial rights-of-way, primary greenways, secondary greenways, park sites, other areas owned and/or maintained by the City shall comply with the City Code, Envision Longmont, these City Standards, the approved plans and the terms and provisions of the public improvements agreement if required.
  - a. Development adjacent to Ken Pratt Boulevard between Main Street (Highway 287) and the eastern extent of the City limits shall follow the Ken Pratt Boulevard Landscaping Guidelines located in the Appendix for the design of arterial rights-of-way improvements. Plant quantity requirements will be per the Development Standards Chapter 15.05 of the City Code current at the time of development.
  - b. Common areas and other areas not owned or maintained by the City, but maintained by a property owner's association, homeowner's association or other maintenance organization, shall conform to these City Standards.
  - c. Trees designated for saving or protection in a development submittal, capital improvement project, or tree preservation plan approved by the City, regardless of a trees location on publicly dedicated land or private property, shall be protected per the applicable criteria of Section 601 of these City Standards.
2. Consideration is to be given to provide for uniformity and proper alignment of sidewalks or sidepaths and associated landscaping within the regulated areas. Intersections, sidewalk or sidepath alignment and landscaping shall provide for safety, turning movements, and maintenance considerations.
3. Any deviation in layout of the landscaping design, irrigation system, sidewalk or sidepath location from the approved construction plans shall be reviewed and approved by the City Engineer prior to installation. If modifications are extensive, plan re-submittal and approval will be required. For minor modifications, per City determination, correction on record drawings may be sufficient. Determination on modification type shall be determined by City Engineer prior to work being completed.
4. Landscape and irrigation plans shall be included as part of City capital improvement projects and development submittals. Public improvement plans shall include only landscaping and irrigation plans for City owned and/or maintained areas including all arterial rights-of-way, primary greenways, secondary greenways, park sites or other areas and as outlined in the public improvement agreement.
5. Required landscape and irrigation design criteria and plan information is outlined per each type of submittal and is located in the Appendix of these City Standards.
6. The Contractor is required to schedule a separate pre-construction meeting for landscaping and irrigation with the City Project Manager and City Inspector prior to commencement of work for any publicly owned and/or maintained landscaped areas including primary greenways and arterial rights-of-way. The landscaping and irrigation pre-construction meeting shall cover clarification of work, contacts and questions. Failure to schedule this meeting or to 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 these City Standards. Any work that proceeds without approved City inspection shall be corrected at no cost to the City

7. The City will consider exceptions to these City Standards in an effort to reduce water consumption.
8. Untreated (raw) water sources for irrigation systems will be used when available per the Water Efficiency Master plan. Contact Water Resources for availability.
9. Xeriscaping within these City Standards shall be defined as reducing water use in landscaped areas through: proper planning and design (zoning plant materials and recognition of micro-climates); 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); and through appropriate maintenance practices. Additional design considerations regarding irrigation that must be included are: sloped areas to have separate zoning for sprinkler heads at the higher elevations from those at the lower elevation; check valves in sprinkler head to prevent low head drainage; and areas with different exposures to be zoned separately. For more information see Xeriscape Colorado at [www.coloradowaterwise.org](http://www.coloradowaterwise.org).

#### **600.02 MINIMUM DESIGN CRITERIA**

1. Additional plan design criteria and plan information as relevant shall be included per each sub-section in Section 600 of these City Standards.
2. The width of tree lawns between sidewalk or sidepath and back of curb or other hard surfaces is to be a minimum of eight (8) feet for ease of maintenance operations and long-term tree health. Where width of root zone is insufficient for tree species, a root barrier will be required to prevent concrete trail and/or curb heaving. Please reference the Parks and Open Space Approved Materials List located in the Appendix.
3. Provide optimally sized landscape areas on both sides of sidewalk or sidepath within the rights-of-way to allow for efficient irrigation and to eliminate narrow strips: optimal shrub areas four (4) feet minimum with eight (8) feet preferred; optimal turf areas 12 feet.
4. Place the sidewalk or sidepath at the edge of the rights-of-way where additional common areas are available behind the rights-of-way line. This layout will provide maximum separation between curbline and sidewalk or sidepath and also provide a visual definition of the boundary between private and public areas.
5. Where shrub beds are adjacent to curbs in arterial rights-of-way, an 18 inch wide, four (4) inch thick stamped and colored concrete strip along the curb edge is required. Color and pattern is to be determined in the project design.
6. Where a fence abuts an irrigated turf area to be maintained by the City, an 18 inch wide (centered on fence or nine (9) inches each side of fence), six (6) inch thick mow band is required along the fence. The mow band may be concrete, 3 to 6 inch cobble over weed fabric with a steel edged border or an approved equal.

## **601.00 GRADING AND FINE GRADING**

### **601.01 GENERAL CRITERIA**

The grading and fine grading requirements in this section apply specifically to landscaped areas including arterial rights-of-way, primary greenways, secondary greenways, park sites, other areas owned and/or maintained by the City.

### **601.02 MINIMUM DESIGN CRITERIA**

1. Grades in all areas are to be designed to allow for proper drainage and ease of maintenance operations. Grass swales shall drain at a minimum slope of two percent (2%). Hard surface routes shall drain at a minimum slope of one percent (1%). Berms and other slopes shall not exceed 4H:1V for areas scheduled for irrigated and mowed turf. Berms and other slopes shall not exceed 3H:1V for shrub beds and native grass areas that will be unmowed or mowed only during establishment
2. Irrigation ditch embankments shall be graded to 4H:1V maximum slope from the normal high flow elevation of the waterway, or as determined in the field by the City Inspector. A two percent (2%) maximum grade area should be maintained at the top of slope with a width adequate for landscaping and ditch maintenance access including sidepaths, as determined by the City and the Ditch Company.
3. Retaining walls, riprap or other structures will be used to bring grades into conformance with these City Standards. Retaining wall design shall conform to these City Standards and the IBC currently adopted by the City.
4. Site preparation shall take into account all desirable existing vegetation that is and identified to remain. Only hand grading with cut or fill not exceeding (6) inches shall be allowed within the drip line of existing trees identified to remain as part of the tree preservation plan. Tree protection fencing shall be utilized to protect existing trees per installation requirements in Detail 600-27 Tree Protection. Landscaping shall be designed to save as many mature, good quality and desirable species trees as possible as well as include removal of all invasive or undesirable trees, shrubs, vegetation and weeds per the Colorado Noxious Weed Act and Noxious Weeds List.
5. Weed control efforts shall be scheduled to occur to remove weed seeds and plants. Herbicide application records must be submitted to the City for all City owned properties.
6. Grading adjacent to sidewalks or sidepaths shall require a two (2) foot minimum shoulder with a two percent (2%) slope on the downhill side of the sidewalk or sidepath where slopes are 6H:1V or less. Downhill slopes steeper than 6H:1V, require a five (5) foot minimum shoulder. Wider shoulders may be requested upon design review.
7. Site preparation operations shall utilize all existing topsoil on the site, with no topsoil exported. Where excavation is needed to attain final design grades, topsoil will be stripped and stockpiled; subsoil excavated and final grades shaped; and topsoil shall be replaced at six (6) inch minimum depth. Additional topsoil needed to attain the six (6) inch depth to be imported from approved sources.
8. Landscaping shall adequately allow for a six (6) foot wide mowing deck including but not limited to berms and swales, etc.
9. Grading where shrub beds are steeper than 4H:1V and are adjacent to a sidepath, sidewalk or curb shall require a one (1) foot minimum width area at the toe of slope with a two percent (2%) maximum slope to prevent water and debris from washing onto trail.

10. For detention ponds to be owned and maintained by the City, the following improvements shall also be provided: a perimeter landscaped area, 10 feet in width, around the top of the pond to allow for landscaping and other amenities including, but not limited to, benches, picnic tables, play equipment, sports courts and/or fields. Required improvements shall be determined by the City and shall be in scale with the size of the detention facility. All equipment shall be placed on concrete pads, per the direction of City Engineer.
11. 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 in the design. Ultimate ROW improvements shall be designed and built to within five (5) feet of future curblines (horizontal and vertical elevation), as determined by the City. The space between the existing road edge and the ultimate curblines 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 50 lineal foot spacing. Refer to Section 603 of these City Standards for additional temporary seeding information.

### **601.03 MATERIALS**

1. For specific list of materials accepted by the City please reference the Parks and Open Space Approved Materials List located in the Appendix

#### **601.03.02 TOPSOIL**

1. A friable loam, typical of cultivated local topsoil, containing at least two percent (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. It shall not contain any weeds or weed seeds. No stones or other materials over 1/2 inch in size shall be allowed. It shall contain no toxic materials. Topsoil shall have an acidity in the range of pH 6.0 to pH 8.4. Topsoil may require additional testing including screen analysis to determine acceptability per the direction of the City Engineer.
2. Soil testing must be completed and submitted to the City for review for all City-owned landscaped areas to determine pH, soluble salts, organic matter, nitrate, nitrogen, phosphorus, potassium, zinc, iron, copper, manganese, lime and soil texture and shall be conducted by the Colorado State University Soils Lab or other certified lab. Quantity and location(s) of tests shall be determined by the Landscape Architect and test locations shall be shown on the drawings. Recommendations in the lab reports shall be followed in all cases. Generally this will include soil amendment and fertilizer recommendations; in some cases, new or additional topsoil will be required. The intent is for the soil tests to provide representative samples of all different soil types in disturbed areas onsite or for imported topsoil.

#### **601.03.03 SOIL AMENDMENT**

1. City approved soil amendments are identified as high quality composted materials classified as either Class I or Class II that shall be applied at a minimum rate of 4CY per 1000 square foot across the soil surface of all City owned landscaped areas or per the recommendations of the soil test results. The mixture shall be free from clay subsoil, stones, lumps, plants or roots, sticks, weeds, 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 6.0 to pH 8.4 that brings the soil pH within the acceptable standard. All material shall be sufficiently composted such that no material used is recognizable.

2. Submit sample and written confirmation from supplier of material composition including: percent organic matter, sodium, nitrogen, phosphorus, potassium, and salts along with nutrient composition and trademark. Sample is to be representative. Reference Parks and Open Space Approved Materials List located in the Appendix for pre-approved amendment types.
3. Soil amendment will be applied to all areas as recommended by soil test results.

#### **601.03.04 FERTILIZER**

1. Approved fertilizer will be applied as recommended per soil test results. Application of fertilizer to native grass areas shall only be allowed per the direction of the City Engineer.

#### **601.03.05 HERBICIDE**

1. A selective or general herbicide as needed to control weeds as determined by a licensed pesticide applicator or weed specialist.

#### **601.04 EXECUTION**

1. Install construction fencing, tree protection fencing, and/or erosion control measures as needed prior to any grading activities per installation requirements in Detail 600-27 Tree Protection and the Section 104 Stormwater Quality of these City Standards.
2. Contractor is required to notify residents in advance of herbicide application per the City of Longmont's Integrated Weed Management Plan. Herbicide must be applied by certified Contractors licensed by Colorado Department of Agriculture at the rate recommended by the manufacturer. Herbicide application records must be submitted to the City for all City owned lands. Precautions must be taken to avoid drifting of spray onto other properties and shall not be done in breezy conditions. Plant material that is damaged and was not designated for herbicide application 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. Note that seeding shall not be permitted in any areas with established, live weeds.
3. For arterial right-of-way landscaping adjacent to roadways 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 graded 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.
4. Accommodate proper drainage and flow during and after grading operations and soil preparation. Install and manage erosion control measures while providing a consistent grade.
5. Clear and grub the site by removing unsuitable vegetation, wood materials and rocks over 1/2 inch size in turf areas or two (2) inches in dryland areas present in the surface grade.
6. Strip topsoil for sites scheduled for cut and fill when ground is moist but not muddy or completely dry to a maximum depth, as determined by field inspection to maximize the recovery of quality topsoil material. If existing grades are to be maintained, topsoil can remain undisturbed. Stockpile topsoil at an optimum depth of two (2) feet and a maximum depth of 15 feet in a location separated from grading activities and cover to protect from weed establishment, wind and other erosion.



7. Proceed with earthwork operation per approved plans. When complete with rough grading, obtain approval from the City Inspector before proceeding. Rough grade inspection allows for the installation of six (6) inch minimum depth of topsoil and specified soil amendments as part of the fine grading work. Establish swales and drainage as required per plans.
8. Rip to 12 inch depth in all areas to receive plantings.
9. Re-spread or import topsoil to achieve six (6) inch minimum depth in all landscaped areas and grade to smooth and even lines.
10. Evenly distribute soil amendment as required by the City per the recommendations of the soil test results.
11. Till topsoil and amendments if required to the full depth of topsoil and amendments plus two (2) inches. Compact to 80% of Standard Proctor Density at two percent (2%) optimum moisture. Soil amendment shall be applied no more than 15 days prior to planting operations.
12. Remove all rocks, dirt clods, roots, vegetation, etc. greater than 1/2 inch diameter in all irrigated turf areas (seed or sod). For native grass 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 for sodded areas and 1/2 inch for seeded areas at specified compaction.
14. Apply fertilizer at recommended rates per the soil test results.
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.

**602.01 GENERAL CRITERIA**

1. Comply with the current City adopted International Plumbing Code, Electrical Code and general industry standards for all areas.
2. All arterial rights-of-way, primary greenways, secondary greenways, park sites, other areas owned and/or maintained by the City shall have an automatic, clock-activated irrigation system of sufficient coverage to irrigate all plant material.
3. Installation of an irrigation system within City owned areas shall include sufficient taps, reduced pressure zone (RPZ) backflow prevention assemblies, irrigation meters, meter vaults and power source for each irrigation controller. Where raw water is used, potable water back-up shall also be provided in a manner acceptable to the City. No sub-meters allowed.
  - a. All potable irrigation systems shall be equipped with a RPZ backflow prevention assembly meeting these City Standards.
  - b. Backflow prevention assemblies will be installed above ground in an insulated enclosure per Detail 600-01 Irrigation Meter Vault and Downstream Assemblies. The irrigation controller shall be the pedestal-mounted variety or wall mounted with a lockable, weatherproof cabinet.
4. Any deviation in taps from the approved construction plans is to be approved by the City Engineer prior to installation. All taps two (2) inches in diameter or less shall be installed by the City upon payment of applicable fees. All taps larger than two (2) inches in diameter shall be installed by the Contractor and inspected for approval by the City upon payment of the applicable fees.
5. Applications for Tap fee waivers are to be submitted to the City and must indicate the size of the tap, address of the tap, and type of area to be irrigated from the tap. Eligible taps for the fee waiver include irrigated areas owned by the City including arterial rights-of-way, primary greenways, secondary greenways, and park site improvements. No water from these waived taps is to irrigate areas outside of the designated City owned areas.
6. 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 and building permits are obtained from the Building Inspection Division.
7. Final location of irrigation controller shall be coordinated and approved by the City Engineer for all City owned areas. Electric source shall be coordinated and approved by Longmont Power & Communications (LPC) for all areas. For controllers on irrigation systems 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 are required to 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 property owner or HOA.

**602.02 MINIMUM DESIGN CRITERIA**

1. The minimum design criteria for irrigation systems outlined in this section is specific to all City owned properties unless otherwise noted.
2. Irrigation systems are to be designed to provide head-to-head coverage with matched precipitation rates. Sprinkler heads shall not overspray walkways, pavements or other hard surface areas unless

approved by the City Engineer. Principles of Xeriscape shall be utilized in the design of irrigation system.

3. Use of untreated, raw water for irrigation may be approved by the City Engineer. Contractor shall install an approved pump in an approved secure pump enclosure. Pump system to include filtration equipment with self-flushing screens. Typical "raw" equipment shall be required for these systems, including purple valve boxes, scrubber valves, and sprinkler heads. At all times of use, a visible notice shall be posted warning that non-potable water is being used for irrigation. Reference Section 606 of these City Standards for more information on Signage.
4. For Dryland grass irrigation systems, an underground permanent system shall be installed for establishment of dryland grasses for on-going irrigation to shrubs and trees unless otherwise approved by the City. Exceptions to City Standards and materials may be allowed on a case by case basis but are required to provide a minimum 80% coverage and may also include additional design requirements.
5. For all areas, only materials, sizes and other requirements listed in this section and in Parks and Open Space Approved Materials List shall be specified for use, per type of landscaped area indicated.
6. Obtain available design pressure and flow from the City. For City-owned areas, system design shall not exceed available pressure at time of final build-out of area for the Longmont Planning Area. Where available pressure exceeds 85 psi, design the system to 85 psi and include pressure regulator installation at each valve to reduce actual system pressure to 85 psi if necessary.
7. The following irrigation tap sizing calculation is to be used to calculate the 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 in the future

The tap sizing calculation shall use the following formula:

\_\_\_\_\_ Total square feet of irrigated area (from that tap (including future build-out if applicable) / eight (8) = \_\_\_\_\_ x 7.48 (gallons per cubic feet per week) / five (5) (days per week) / seven (7) (hours per day) / sixty (60) = \_\_\_\_\_ gpm (gallons per minute).

Calculation plan note should read: \_\_\_\_\_sf /8 = \_\_\_\_\_ x 7.48 / 5 / 7 / 60 = \_\_\_\_\_ gpm

8. Tap size should be the same as the smallest copper pipe (Type K) that will not exceed seven (7) feet per second for this flow of water in gallons per minute. The number of days per week and hours per day are somewhat flexible, but those given above should be the typical
9. Remote control valves shall be located to minimize lateral piping and sleeving under walkways and hard surface areas.
10. Isolation ball valves shall be placed at both sides of each road crossing, at the upstream end of each leg in the irrigation main and at other areas as required to minimize disruption to overall irrigation system in the event of system failure.
11. No cross-connections between City potable water and untreated non-potable raw water shall be permitted.
12. Lateral piping shall be sized based on flow demands (GPM's): velocities shall not exceed 5-1/2 feet per second in any Class 200 piping. Copper pipe velocities shall not exceed seven (7) feet per second.
13. RPZ backflow prevention assemblies are required for all irrigation systems and shall meet the requirements in the Water Distribution Section 506 Backflow Control of these City Standards.

14. Sequence irrigation valve numbering in a logical continuous manner throughout the site.

### **602.03 MATERIALS**

For a specific list of materials pre-approved by the City, please reference the Parks and Open Space Approved Materials List located in the Appendix. Equipment proposed that is not on the Approved Materials List shall be approved by the City Engineer prior to installation.

#### **602.03.01 TAPS**

1. Contractor is responsible for supplying saddle specific to water main pipe material.

#### **602.03.02 BACKFLOW PREVENTION ASSEMBLY & IRRIGATION METER**

1. RPZ backflow prevention assemblies and irrigation meters shall meet the requirements in the Water Distribution Section 506 Backflow Control of these City Standards.
2. Above ground enclosed RPZ backflow prevention assemblies are required for all potable systems.

#### **602.03.03 IRRIGATION MAIN**

1. Master valve shall be sized to match size of irrigation main.
2. Copper shall be Type K rigid conforming to ASTM Standard B88.
3. Irrigation main shall be Class 200 PVC, NSF approved.
4. Irrigation pipe sizes smaller than three (3) inches shall be gasketed pipe. For pipe sizes larger than three (3) inches self-restrained mechanical joints shall be used. Thrust blocks are not required for three (3) inch diameter or larger irrigation piping.
5. Use ductile iron pipe and fittings for irrigation main crossings at bridges and other above ground locations as directed by the City Engineer.
6. Use HDPE pipe for irrigation main crossings at streams and other water crossing locations as directed by the City Engineer
7. No cold weather glue permitted

#### **602.03.04 LATERALS**

1. Class 200 PVC, NSF approved.
2. No laterals smaller than one (1) inch or sized at 1-1/4 inch shall be allowed in City owned areas
3. Polyethylene drip pipe utilized for drip applications shall be weather and UV resistant material, NSF approved, SDR pressure rated pipe.
4. No cold weather glue permitted.

#### **602.03.05 PIPE FITTINGS**

1. Pipe fittings shall be molded fittings manufactured of the same material as the pipe.
2. Funny pipe is allowed for pop-up sprinkler head installation only and shall be compatible with the elbows required for sprinkler heads with appropriately sized crimp-type clamps to be used.
3. PVC shall be Schedule 40, Type 1, PVC solvent weld with ASTM Standards D2466 and D1784.

4. No cold weather glue permitted.
5. Copper irrigation service line shall be wrought copper or cast bronze fittings, soldered or threaded per installation details.

#### 602.03.06 SLEEVING

1. Sleeving shall be Class 200 PVC under all paved surfaces. Use ductile iron pipe for bridge crossings and other above ground situations. Each main, lateral or wire crossing for any paved area shall be installed in a separate sleeve.
2. Sleeving size to be a minimum of two sizes larger than the pipe being sleeved. Minimum four (4) inch diameter, or larger where appropriate, for irrigation mains.
3. Wires to be in separate sleeve from pipe with a minimum two (2) inch size pipe for control wire sleeves. Size sleeves for large systems a minimum of two (2) inches larger than the full wire bundle.

#### 602.03.07 VALVES

1. Remote control zone valves including the systems master valve shall be electrically operated, appropriate for the water supply (scrubber type for raw water applications), with manual bleed device and flow control stem. Valves shall have a slow-opening and slow-closing action for protection against surge pressure. Reference Detail 600-06 Remote Control Valve Assembly for installation information.
2. Pressure regulating valves shall be used as needed per requirements per this section of the City Standards.
3. Drip remote control valves shall be same as the remote control zone valves sized to match system requirements, including upstream filter, pressure regulator and y-strainer. Reference Detail 600-07 Drip Remote Control Valve Assembly for installation information
4. Manual drain valves shall be 3/4 inch ball valves with tee handles. Reference Detail 600-08 Main Drain Valve Assembly for installation information
5. Quick coupling valves shall be one (1) inch brass units with rubber cover and one (1) inch brass key. Reference Detail 600-09 Quick Coupler Assembly for installation information
6. Isolation gate valves shall be able to withstand a continuous operating pressure of 150 psi. Clear waterway equal to full diameter of pipe. Shall be opened by turning square operating nut to the left, wheel operation is unacceptable. Valve size shall be the same as the irrigation main size however no valves smaller than one (1) inch are permitted. Reference Detail 600-10 Gate Valve Assembly for installation information.

#### 602.03.08 VALVE BOXES

1. Each valve shall be located in a separate valve box with matching locking cover. Jumbo size box installations shall be required as specified. Install a waterproof tag attached directly to each valve utilizing permanent marker to indicate the valve number for each tag.

#### 602.03.09 CONTROL SYSTEM

1. Controllers for public irrigation systems shall include a minimum of three extra stations for possible future use. The controller box shall be weather tight and vandal resistant with locking exterior disconnect.

2. Control system enclosure shall be a weatherproof security enclosure with a floor stand kit and a lock kit.
3. Satellite control field unit for systems to be maintained by the City shall include the following:
  - a. One (1) satellite control field unit is required per each irrigation tap.
  - b. Number of stations shall include a minimum of three extra stations for possible future use. System shall come pre-assembled with security enclosure.
  - c. Antenna with cable and 20 foot mast for grounding to meet manufacturer's specification. Separate not included in the control field unit package. All antenna wire will be cut to length so that no more than one (1) foot of cable is stored in the cabinet.
  - d. One (1) hand held remote control with charger per field controller.
  - e. Hand held unit, programmed to City control frequency, to be turned over to the City in new condition.
4. Surge protection required in all areas per manufacturer's recommendation.
5. Reference Detail 600-05 Controller, Satellite & Enclosure for installation information.

#### 602.03.10 ELECTRIC CONTROL WIRING

1. Tracer wire shall be 14 AWG solid copper direct burial underground feeder (UF) or polyethylene (PE) cable, Underwriters Laboratories Inc. (UL) approved, for systems up to 2,000 feet in length. For larger systems, tracer wire shall be 12 AWG solid copper direct burial UF or PE cable, UL approved per system design and manufacturer's recommendations.
2. Five (5) wires with consistent color scheme throughout:
  - a. Red = live
  - b. White = ground
  - c. Black = extra (to farthest end of main including each branch).
  - d. Blue = extra (to farthest end of main including each branch)
  - e. Green = extra (to farthest end of main including each branch)
3. Identify each wire with waterproof label and permanent marking at the controller, at each splice box, and the furthest end of each wire.
4. Wire connectors and waterproofing sealant specific for direct burial to be used to join control wires to remote control valves.

#### 602.03.11 SPRINKLER HEADS

1. All sprinkler 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.
2. Sprinkler head installations for City owned areas are required to be coordinated with the City Engineer to specify brand and models to match equipment used in public irrigation systems in the vicinity.
3. Include check valve in sprinkler head.

4. Gear driven rotor sprinkler heads with a stainless riser shall be installed in all City owned areas. Reference Detail 600-11 Rotor Sprinkler Head Assembly for installation information
5. Sprinkler head selection shall be made to provide adequate head-to-head coverage based on turf type.

#### 602.03.12 DRIP SYSTEM

1. Spiral barb emitters shall be required to individual plants. Install tracer wire over all buried drip pipes between shrub beds and/or individually spaced trees in native areas. Wire to be buried a minimum of six (6) inches under the soil. Reference Details 600-13 Drip to Shrub bed and 600-14 Drip to Trees and Large Shrubs for installation information.
2. Spaghetti tubing is not allowed in City owned areas.
3. In native areas the drip shall be zoned separately to each of the following areas:
  - a. Ornamental shrub beds including beds with trees
  - b. Individual trees
  - c. Naturalized shrub beds
4. In irrigated turf areas the drip shall not be provided for individual trees located outside of shrub beds.

#### 602.03.13 THRUST BLOCKS

1. Thrust block concrete shall be 3000 psi. Use #4 rebar wrapped with asphalt tar based mastic coating where irrigation pipe must be anchored to thrust block. Reference Detail 600-21 Concrete Thrust Block for installation information

#### 602.03.14 RAW WATER SYSTEMS

1. For all non-potable raw water irrigation systems, typical “dirty-water” equipment shall be required, including purple above ground pipe, valve boxes, sprinkler heads and scrubber valves. Drip equipment is allowed with proper filtration. Raw water systems typically include supply turn-out structure and a storage pond sized for three (3) days storage. Storage pond shall be lined and lining material product specifications shall be submitted to the City Engineer for review and approval. Riprap shall be installed around pond perimeter from high water elevation to a minimum of 12 inches below the lowest water level at draw-down of irrigation. Water inlet and outlet areas shall be armored with riprap including other material as needed to preserve pond liner. . Flow metering is required to meet State regulations for all raw water systems.
2. All raw water systems shall include provision for potable back up in the event of raw water delivery system failure. Potable backup shall be designed as a temporary secondary supply with physical disconnect from the irrigation system as determined by the City. These secondary systems may utilize a fire hydrant in close proximity to the storage pond or a piped connection from potable system with physical disconnect. Secondary system to have sufficient pressure to run the irrigation system.

#### 602.03.15 PUMP SYSTEMS

1. Irrigation pump systems for non-potable water use in City owned areas is to be coordinated with the City Engineer. Pump equipment information shall be submitted to the City Engineer for review and approval prior to plan approvals.

2. Basic system requirements shall include, but are not limited to:
  - a. Skid mounted pump system (variable speed pump and drives) capable of water delivery at required volume and pressure for final landscape build out.
  - b. Pump control system with interface to irrigation controller(s).
  - c. Filter with self-flushing screen.
  - d. Pump enclosure heating and fan systems to maintain a minimum 49 °F temperature at outside temperature of 0 °F and maximum 95 °F temperature within the enclosure.
  - e. Lighting, power and GFCI outlet on separate breaker from pump.
  - f. Precast enclosure with vandal resistant coatings and steel screen over vent openings.
  - g. Pump access hatch centered over pump.
  - h. Man door access using steel door with lock guard over door hardware.
  - i. Pump enclosure sized to provide adequate walking room around pump skid and controller systems.

#### 602.03.16 SUBSURFACE IRRIGATION SYSTEMS

1. Subsurface irrigation systems may be approved on a case by case basis. Proposed materials are to be approved by the City Engineer as part of the design review.

#### 602.03.17 SIGNS

1. Reference Section 606 of these City Standards for sign requirements and notifications for non-potable water use.

### **602.04 EXECUTION**

#### 602.04.01 GENERAL

1. Locate all utilities prior to trenching and protect from damage per the General Requirement Section 100 of these City Standards. Call PWNR Customer Service Center at 303-651-8416 for existing City irrigation system locates.
2. Inspect irrigation tap or other existing irrigation system, as applicable, prior to work.
3. Irrigation taps require Contractor to contact the PWNR Customer Service Center a minimum of 48 hours prior to installation in order to schedule the water main tap and to coordinate purchase and installation of equipment. Reference the Water Distribution Section 501.05 Tapping Authorization for more information. The City Operations Division will perform tap on water main if tap is two (2) inches in size or less. Tap sizes larger than two (2) inches must be made by the Contractor. All taps and installations are subject to approval by the City Inspector. Tap fee waiver request forms need to be submitted to the City Engineer and approved prior to tapping. For irrigation meters or RPZ backflow prevention assembly installations larger than two (2) inches in diameter a minimum of two (2) weeks prior notice is to be given to the City Water Meter Shop. Larger sized irrigation meters and RPZ backflow prevention assemblies are not always kept in stock and may have an ordering delay.
4. 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 Water Distribution Section 500 of these City Standards for related materials and procedures. All items in Section 500 pertain, including requirement that no soldered joints or fittings are allowed on buried water service lines. 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.

5. Install a ball valve for water shut off, irrigation meter, and drain valve inside the irrigation meter vault per the Water Distribution 1-1/2" to 2" Irrigation Meter in Vault Detail 500-2. Inspection of water service line, irrigation meter vault, irrigation meter and RPZ backflow prevention assembly is to be coordinated with the City Inspector.
6. After the irrigation meter vault install the RPZ backflow prevention assembly, drain valve, winterization assembly, master valve and flow meter as specified adjacent to precast vault per Detail 600-01 Irrigation Meter Vault and Downstream Assemblies.
7. Meter vaults are to be 60 inches in diameter for taps two (2) inches or smaller in size. For taps larger than two (2) inches, the pipe layout inside the meter vault must be designed by a Professional Engineer to determine the vault size. Design shall be approved by the City during construction plan review.
8. Install RPZ backflow prevention assembly in above ground enclosure.
9. Non-potable (raw water) irrigation systems with an in-line injection system are required to have a RPZ backflow prevention assembly upstream of injection nipple, which cannot be placed in vault.
10. 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.
11. Install winterization assembly in the downstream assemblies located after the irrigation meter unit and RPZ backflow prevention assembly on PVC pipe that has not been reduced in pipe size. Reference Detail 600-02 Winterization Assembly for installation information.
12. Install master valve in the downstream assemblies located after the irrigation meter vault and RPZ backflow prevention assembly within a reasonable distance upstream of the flow meter and no closer than 10 pipe diameters. Reference Detail 600-03 Master Valve Assembly for installation information.
13. Install flow meter as the last downstream assembly located after the irrigation meter vault and RPZ backflow prevention assembly with the following minimum spacing upstream and downstream of flow meter from the first joint, bend or other fittings: 10 pipe diameters straight pipe upstream; five pipe diameters straight pipe downstream. Reference Detail 600-04 Flow Meter Assembly for installation information.

#### 602.04.02 PIPE TRENCHING

10. Install irrigation pipe in open cut trenches with sufficient width to facilitate thorough tamping (puddling) of suitable backfill material under and over pipe. Puddling is not allowed where trench is located next to sidewalks, curbs and sidepaths. Install irrigation mains and laterals in separate trenches.
11. Irrigation pipe shall be located within two (2) feet maximum of edge of walks and curbs to maximize tree planting zones for all City owned areas. Field adjustments to these City Standards must be approved by City Engineer prior to installation.
12. Trench depths:

- a. Irrigation main shall be a minimum of 24 inches deep from top of pipe to finished grade. Tracer wire shall be buried at the same depth as irrigation main.
- b. Irrigation laterals shall be a minimum of 18 inches deep from top of pipe to finished grade. No shared trenches for laterals are allowed.
- c. Irrigation drip laterals shall be a minimum of 12 inches deep from top of pipe to finished grade in paved and/or sodded or seeded areas, and at grade with four (4) inch minimum mulch cover in planting beds (over weed barrier).
- d. Install sleeving at a depth that permits the encased pipe or wiring to remain at the specified burial depth.

#### 602.04.03 SLEEVING

- 1. Hand boring, or any method that disturbs sidewalk or sidepath subgrade, shall not be permitted unless obstruction in irrigation pipe path cannot be moved, or irrigation pipe cannot be re-routed. Sleeves to be installed before surface paving.
- 2. Irrigation mains installed in existing sleeves at greater depth than adjacent pipe, shall have a manual drain valve at the lower end.
- 3. Install sleeve so both ends extend past edge of curb, gutter, sidewalk, sidepath or other obstruction, a minimum of two (2) feet.
- 4. Mark all sleeves with a "V" chiseled in walk (or other surface) directly over sleeve location at both ends of sleeve within five (5) days of concrete installation. Provide temporary marking of sleeve location prior to permanent marking.
- 5. Shall be laid to drain at minimum grade of 20H:1V.
- 6. Sleeves installed for future use shall be capped at both ends.
- 7. Separate sleeve two (2) inch minimum size shall be used for all wiring.
- 8. Sleeves shall not have joints unless necessary due to length of sleeve run. If joints are necessary, only solvent welded joints are allowed.
- 9. 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.

#### 602.04.04 PIPE INSTALLATION

- 1. Use Teflon tape on all threaded joints; only Schedule 80 pipe may be threaded. All threaded joints shall be tightened to eliminate leaks per industry standards.
- 2. Reducing pipe size shall be achieved through the use of an insert reducing coupling installed at least six (6) inches beyond last tee of larger pipe size.
- 3. 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 30 minutes before handling and 24 hours before allowing water in pipe.
- 4. At the City's discretion, gluing of pipe may be temporarily suspended if weather conditions, pipe temperatures and/or soil temperatures are not conducive to quality work or strong pipe joints.

5. Backfill mid-sections of irrigation mains and entire irrigation lateral piping. Contact the City Inspector to schedule a hydrostatic pressure test on all City owned areas. Contact the Irrigation Design Professional to schedule a hydrostatic pressure test on all non-City owned areas. All irrigation main joints shall not be backfilled until inspection and hydrostatic testing is complete. Backfilling prior to passing hydrostatic pressure test is at the risk of the Contractor. Failed tests may result in the Contractor being required to expose any covered joints. After the test passes, backfill remaining irrigation pipe.
6. Backfill shall be free from rubbish, rocks larger than two (2) inches in 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.
7. After tamping (puddling), leave all trenches slightly mounded to allow for settling.
8. Compact to proper densities depending on surface type over the irrigation pipe.
9. Drip system installation:
  - a. Snake polyethylene hose in trenches at 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 above fabric weed barrier but below mulch. Where sloped, the drip line is to be placed on the uphill side of each plant. Secure pipe using galvanized tie down stakes (sufficient number to keep pipe stationary). Provide a tee connecting to the drip line circling each tree for all City owned areas.
  - b. Extend drip pipe to all trees located in native seeded areas. 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.
  - c. Reference Details 600-13 Drip to Shrub bed and 600-14 Drip to Trees and Large Shrubs for installation information and the Materials Section regarding separate zoning for drip system based on specific landscape areas.
  - d. Install flush caps in separate valve box and at ends of each lateral or branch. Reference Detail 600-15 Flush Cap Assembly for installation information.
  - e. Flush drip lines with full head of water for three (3) minutes prior to installing emitters.
  - f. Install buried tracer wire on top of all drip pipe buried a minimum of six (6) inches under the soil.
  - g. Provide emitters to each plant per requirements in this section of these City Standards.
  - h. Contact City Inspector for evaluation of operation of drip system after emitters are installed but prior to installation of mulch in shrub beds.
10. Attach funny pipe to elbows using appropriately sized crimp-type clamps to secure.
11. Self-restrained mechanical joints shall be installed for changes in direction over 20° angles where PVC irrigation main are three (3) inches in diameter or larger.

#### 602.04.05 VALVE INSTALLATION

1. Install at least 12 inches from and align with adjacent walls or paved edges.
2. Install automatic remote valves in such a way that valves are accessible for repairs. Make electrical connection to allow pigtail so solenoid can be removed from valve with 24 inch minimum slack to allow ends to be pulled 12 inches above ground. Align and locate valves a minimum 12 inches from curbs, sidewalks, sidepaths, and retaining walls, etc.

- a. Thoroughly flush piping system under full head of water for three (3) minutes through furthest valve, before installing valves.
  - b. Valve assembly to include ball valve and unions for ease of maintenance and repair.
  - c. Install in locking valve box.
  - d. Install a waterproof tag with permanent marker with each valve number. One tag shall be attached to each valve.
  - e. Reference Details 600-06 Remote Control Valve Assembly and 600-07 Drip Remote Control Valve Assembly for installation information.
3. Install manual drain valves per plans and at all locations of system low points and at the end of each irrigation main. Install drain valve in a six (6) inch Class 200 PVC sleeve access with 10 inch locking valve box lid. Install valves on swing joint assembly. Sump to be four (4) cubic feet of pea gravel over filter fabric. Reference Detail 600-08 Main Drain Valve Assembly for installation information
  4. Install quick coupler valves per plans. Install in 10 inch locking valve box. Flush system completely before installing valve. Thoroughly flush irrigation system under full head of water for three (3) minutes through furthest valve, before installing valves. Reference Detail 600-09 Quick Coupler Assembly for installation information
  5. Install ball type isolation valves in valve boxes.
  6. Valve Boxes:
    - a. 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 "WS" for wire splice. Use a branding iron stamp with three (3) inch high letters.
    - b. Brand boxes on top of the lids where clearly identifiable with above designation of valve type and automatic remote valve number.
    - c. Valve box shall not rest on irrigation main; use brick or other approved non-compressible material. Top of valve box to be 1/2 inch above finish grade.
    - d. 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.
    - e. Valves shall be installed at a depth accessible for repairs. Three (3) inch depth of 3/4 inch washed gravel to be placed in the bottom of each valve box (without fabric) with 3 to 4 inches of space under valve for union operations and valve removal.
    - f. Three spare wires to be looped and coiled up into each valve box.
    - g. Reference Detail 600-06 Remote Control Valve Assembly for installation information.

#### 602.04.06 SPRINKLER HEAD INSTALLATION

1. Set sprinkler heads plumb and level with finish grade. In sloped areas, sprinkler heads to be tilted to match slope to provide full radius spray pattern.

2. Flush lateral pipes before installing sprinkler heads. Thoroughly flush irrigation system under full head of water for three (3) minutes through furthest sprinkler head before installing sprinkler heads. Cap risers if delay of sprinkler head installation occurs.
3. Install pop-up sprinkler heads along walks and bikeways. Bed sprinkler heads in a six (6) inch layer of sand or clean fill material under the base of the sprinkler head. Reference Detail 600-12 Pop-Up Spray Sprinkler Head Assembly for installation information.
4. Supply appropriate nozzle for best performance. Adjust nozzles and radius of throw to minimize overspray onto hard surfaces.
5. Contractor is required to schedule a field inspection with the City for proposed sprinkler head layout prior to irrigation installation for all native or dryland seeded areas.

#### 602.04.07 ELECTRICAL CONNECTIONS

1. All wire connections and exposed ends to be sealed using wire connectors and waterproof sealant specific for direct burial applications.
2. Electrical installations will be checked by the City Building Inspector and the final connection made by Longmont Power & Communications (LPC). Call the City Engineer to discuss the project scope and LPC fees. 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, is to be supplied by the Contractor. All materials are to be provided by the Contractor. When working near any LPC equipment, prior coordination and approval is required. Reference the building permit for telephone numbers to request an electrical inspection by the City Building Inspector.
3. Identify each wire with waterproof label and permanent marking at the controller and the furthest end of each wire or as noted on the valve box brand.

#### 602.04.08 CONTROLLER INSTALLATION

1. Controller is to be installed in an above-ground location suitable to prevent vandalism and provide protection from adverse weather conditions, and per City Inspector. All exposed wiring to and from the controller shall be encased in galvanized metal conduit. Exterior controllers to be installed on four (4) inch thick concrete pad with compacted subgrade per concrete specification in Section 200.
2. Install controller system per Detail 600-05 Controller, Satellite & Enclosure and in accordance with manufacturer's specifications. Install surge protection, grounding rods and other accessory components as needed.
3. Attach wire labels 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.
4. For City owned areas, the City will not adjust watering schedules via Toro Sentinel system during warranty or maintenance period. Toro Sentinel system to be fully operational by Final Acceptance site inspection. If Contractor requires City instruction on use, the City will charge \$50/hr.
5. Recommended for development projects to install an additional control clock instead of Toro Sentinel unit during warranty or maintenance period for ease of Contractor operation. Replace this temporary clock with the Toro Sentinel unit at the end of the warranty period.

#### 602.04.09 WIRING

1. Comply with City adopted electrical codes.
2. Power source brought to controller to a GFCI (grounded fault) receptacle installed within controller casing for all City owned areas. Clock shall be plugged into receptacle.
3. String control wires as close as possible to irrigation main, consistently along and slightly below one side of the pipe.
4. Leave minimum loop of 24 inches at each valve and controller, at each splice, at the ends of each sleeve, at 100 foot intervals along continuous runs of wiring, and changes in direction of a 90° angle or more. Band wires together at 10 foot intervals with pipe wrapping tape.
5. 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 to each branch of the system.

#### 602.04.10 DRIP EMITTER INSTALLATION

1. Install specified number of emitters directly onto lateral pipe.
  - a. Groundcover: one single outlet emitter per square foot planting area.
  - b. Shrubs: two single outlet emitters per shrub.
  - c. Trees: four single outlet emitters per 2 to 3 inch caliper tree or 6 to 8 foot height conifer; additional emitters may be required for larger trees.
2. Reference Details 600-13 Drip to Shrub bed and 600-14 Drip to Trees and Large Shrubs for installation information.
3. All drip emitter operations are to be part of system wide operations test after weed barrier placement and prior to mulch installation.

#### 602.04.11 SIGNS

For non-potable irrigation systems install Ditch Water sign in prominent location as approved by the City per Section 606 for signage requirements.

#### 602.05 TESTING

1. All tests to be run in the presence of City Inspector for City owned areas. All City irrigation inspections are to be scheduled by calling 303-651-8416 for City owned and maintained areas or coordinate with City Inspector for capital projects.
2. Schedule all tests and inspections a minimum of 48 hours in advance of testing. 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. All required testing shall be completed before Construction Acceptance can be granted for the project. At the City Inspector's discretion, a repeat of tests may be required prior to Final Acceptance.
3. No chemical spraying shall be done within two (2) days of any irrigation inspections.
4. Required Tests:

- a. Hydrostatic Test: Occurs during irrigation installation before sleeving and backfilling irrigation pipe joints. Maintain 120 PSI for four (4) hours. No leakage or loss of pressure is accepted during test period. Test must be run in the presence of City Inspector as noted above. Contractors to provide at own expense hydrostatic pump, water and other materials as necessary for test. The pressure gauge is to be installed onto the end of a fitting, rather than connected directly into a quick coupler. Pumps are to be disconnected after the system reaches 120 psi, at the start of the test.

The City 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, the City reserves the right to bill the Contractor for each additional test at \$50/hr. with a one (1) hour minimum.

- b. Operational Test: Activate each remote control valve from the controller in the presence of the designated inspection authority. Replace, adjust or move sprinkler heads and nozzles as needed to obtain acceptable performance of system. Replace defective valves, wiring or other appurtenances to correct operational deficiencies.
- c. Drip Operational Test: Occurs after drip lateral installation, after weed barrier but prior to mulch installation. Activate remote control valves in presence of the designated inspection authority. Replace any emitters that are clogged or not operational. Adjust laterals as needed to effectively irrigate plantings.
- d. Central Control System Acceptance Test: Required for City owned areas only. Activate each remote control valve from the Central Control System base station using the hand-held remote device to ensure proper function. The City Inspector will also ensure that the Satellite Control Field Unit communicates with the Central Control Station. For current radio frequency requirements contact the City.

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 Satellite Control Field Unit must be installed and fully operational prior to Final Acceptance.

- e. Raw Water Pump Control Inspection: Must obtain a certified control start up in the presence of the City Inspector. The pump supplier will be required to attend this inspection and provide any training.

## **602.06 COMPLETION SERVICES**

### **602.06.01 GENERAL**

1. Clean up and remove all excess materials, tools, trash and debris from site.
2. Complete additional checklist items if determined necessary by City Inspector or Irrigation Design Professional.
3. Schedule re-inspection by City Inspector or Irrigation Design Professional to verify completion and acceptance of all checklist items if necessary.
4. The City shall assist property owner or homeowner's association upon request by turning over a hard copy and digital file of the irrigation record drawings and will retain a digital copy.
5. An irrigation operator's training session with PWNRR personnel may be requested during acceptance.

**602.06.02 DEMONSTRATE SYSTEM TO INSPECTOR**

1. When project construction is ready for Construction Acceptance, request an inspection from City Inspector per Section 100 of these City Standards.

**602.06.03 SUBMIT TURN-OVER ITEMS**

1. Items must be accompanied by a transmittal letter and submitted to the City Engineer for the following:

- a. Provide list of equipment ordering information including model numbers, size and style for all components.

Record drawings shall be provided per the requirements in Section 108 for Record Drawings in these City Standards. Irrigation plans are required to contain the information identified in the Appendix for the Irrigation Record Drawings Checklist as a minimum.

- b. Provide one set of all irrigation sheets reduced to 11 x 17 inches, with each zone color coded, and each sheet plastic laminated. Provide two sets where the system is to be turned over to non-City personnel for maintenance.
- c. Provide on-going maintenance personnel with one of each operating keys, servicing tools, remote hand-held radios programmed to City frequency for City owned areas only, warranties or guarantees, and maintenance manuals as needed for on-going maintenance of area. Any exceptions to this requirement are to be submitted in writing to City Engineer.
- d. An irrigation schedule including system run times for each zone shall be included with the record drawings.

**602.06.04 FINAL ACCEPTANCE INSPECTION**

1. Request Final Acceptance inspection per requirements in Section 100 of these City Standards.
2. Problems identified during the warranty period shall be identified by a site inspection and documented in a final acceptance checklist performed by either the City Inspector or Irrigation Design Professional with solutions executed by the Contractor. Contractor shall complete final acceptance checklist items requiring resolution prior to issuance of Final Acceptance.
3. At the discretion of City Inspector or Irrigation Design Professional, a new pressure test may be required at the time of Final Acceptance inspection.
4. Schedule a project re-inspection with City Inspector or Irrigation Design Professional to verify completion of checklist items if necessary.
5. Provide additional project clean-up as necessary.

**602.07 GUARANTEE OR WARRANTY**

1. 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 or warranted against defects. Settling of trenches or other depressions, damages to structures or landscaping caused by settling, straightening of sprinkler heads 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 Inspector or Irrigation Design Professional unless an emergency or hazardous situation dictates immediate correction. Guarantee or warranty applies to all originally



installed materials and equipment, and to replacements made during the guarantee or warranty period.

2. The Contractor shall make periodic adjustments to the irrigation system to achieve most desirable application of water. Reduce watering seasonally as appropriate. Provide all necessary maintenance including mowing and fertilizing turf areas, wrapping or unwrapping trees (at beginning and end of dormant season), securing and removing tree 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, reseeding areas until established, weed control, erosion control, irrigation maintenance and repairing 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 24 hours.

**603.00****SEEDING****603.01 GENERAL CRITERIA**

1. Seeding shall be done in accordance with industry standards for all landscape areas. All proposed seeded areas are to be approved by the City Engineer.
2. Seeding is allowed in the following areas:
  - a. Primary greenways with City Engineer approval.
  - b. Detention ponds to be maintained by the City that are not within the five (5) year flood area.
  - c. Dry land applications.
  - d. City Parks and facilities on a project specific basis.
3. Seeding is not allowed in the following areas:
  - a. Bottom of detention ponds to be maintained by the City below the five (5) year flood area.
  - b. Arterial rights-of-way except on a temporary basis where the road is planned to expand.
  - c. City Parks and facilities around high use areas (playgrounds, etc.).
4. All dry land-seeded areas must have an in-ground irrigation system for establishment purposes except as allowed by the City Engineer.
5. Drought-tolerant turf grasses are recommended in all areas and are required in City owned areas with the exception of athletic fields.
6. Design and planning criteria shall be in conformance with the Water Efficiency Master Plan, as amended. Xeriscaping is required within all City owned areas.

**603.02 MINIMUM DESIGN CRITERIA**

1. Seed mix shall be approved by City Engineer based on the activity to take place, planned irrigation method and maintenance to be performed in the area being seeded.
  - a. For a specific list of pre-approved grass mixes accepted by the City, please reference the Parks and Open Space Approved Materials List located in the Appendix.
  - b. Custom seed mixes shall be submitted to the City for approval along with soil test results; additional plan review time may be required.
2. Turf grass or residential area seed mix shall be used between the property line and the sidepath in primary greenways adjacent to residential developments and on detention pond side slopes. Sod shall be used in detention pond bottoms below the five (5) year flood elevation. A dryland grass and forb seed mix shall be used between the sidepath and ditch and on the opposite side of the greenway from the trail.
3. Reference Section 606 of these City Standards for traffic delineators required along arterial streets with no curb and gutter for protection and indication of areas seeded along road ways.
4. A temporary sign shall be installed in all permanent native areas after seeding, per Section 606 of these City Standards. Signs shall be located at entrance point within each large native grass areas located within that project, as determined by City Engineer.

5. A mow band is required beneath fencing where it abuts irrigated or dryland grass areas to be maintained by the City.

#### **603.03 SUBMITTALS**

1. Certificates showing source and origin of all seed and weed-free mulch materials per applicable Local, State, Federal or other regulations.
2. Seed mix and seed lab analysis for each seed lot in the proposed mix prior to purchase of seed.
3. Seed tags from bags prior to seeding operation.
4. Soils test results per Section 601 of these City Standards for custom seed mixes.

#### **603.04 MATERIALS**

1. For a specific list of materials accepted by the City, please see the Parks and Open Space Approved Materials List located in the Appendix

##### **603.04.02 SEED**

1. Seed shall be of fresh, clean, new crop seed composed of the varieties approved by the City. Viability testing is required. Tetrazolium chloride testing of seed viability is not an acceptable method for germination testing. All seed shall be free of Poa annual and all objectionable weeds with a maximum crop of 0.10% and maximum weeds of 0.10% weeds.

##### **603.04.03 MULCH**

1. For slopes 3H:1V and flatter certified weed free straw or native grass hay for dry land seeded areas shall be installed. Certification shall be submitted to City Engineer prior to transporting to the site and delivered straw or native grass hay shall have a visual indicator of weed free status. At least 75% of the straw or hay by weight shall be 10 inches or more in length.
2. For slopes steeper than 3H:1V and inaccessible areas, with City approval, utilization of a hydromulch application containing wood cellulose fiber that does not contain any substance or factor which might inhibit germination or growth of grass seed. Hydromulch shall be dyed a green color to allow metering of its application.
3. Reference Parks and Open Space Approved Materials list in the Appendix for Tackifier requirements. Tackifier is mandatory for hydromulch and straw crimp applications.

##### **603.04.04 NETTING**

1. For slopes steeper than 3H:1V installation of jute or other netting that will break down within three (3) years is required per manufacturer's recommendations.

##### **603.04.05 FERTILIZER**

1. Incorporate slow release type Nitrogen for irrigated turf areas and per the soil test result recommendations for native grass areas. Provide soil test results for fertilizer recommendation to the City Engineer prior to plan approval.

603.04.06 MISCELLANEOUS

1. A temporary sign is to be erected in all permanent dry land seeded areas per Section 606 of the City Standards.
2. Traffic Delineator placement for landscape protection: Reference Section 606 of these City Standards and the Parks and Open Space Approved Materials List located in the Appendix for more information.

**603.05 EXECUTION**

603.05.01 HERBICIDE

1. Seed shall only be sown into a weed free seed bed. Application of herbicides shall be timed to break down sufficiently to avoid seed germination damage and provide a full kill of weeds prior to seeding operations.

603.05.02 FERTILIZER

1. Apply fertilizer per the soil test result recommendations to all seeded areas, and rake lightly into top 1/8 inch of soil just prior to seeding operation.

603.05.03 SEEDING

1. Seed shall be sown within 15 days of soil amendment and/or topsoil tilling. Do not sow seed in windy weather or when ground is frozen, muddy or otherwise untillable. Seeding shall be scheduled between March 1<sup>st</sup> and October 15<sup>th</sup>. Dormant seeding for dryland areas without supplemental irrigation is preferred after October 15<sup>th</sup> and prior to March 1<sup>st</sup> as long as soil conditions allow.
2. Seed bed shall be firmed to the point that a footprint does not sink more than 1/4 to 1/2 inches into the soil. No rutting of finish grade is allowed from seeding operations.
3. Equipment:
  - a. All equipment is to be clean prior to mobilization. Ensure hopper is free of previous seed materials.
  - b. Use Brillion seeder or approved equal for turf grass installation on slopes less than 3H:1V in grade. Drill seed in manner such that after surface is raked and rolled, seed has 1/4 inch of cover.
  - c. Use rangeland no-till drill for dryland grasses and forbs where applicable on slopes less than 3H:1V in grade. Drill seed between 1/4 and 1/2 inch depth. Seeding shall be perpendicular to slopes to reduce erosion. The drill shall include the following features:
    - i. Multiple seed boxes for different types of seed.
    - ii. Double disc furrow openers.
    - iii. Depth bands with functioning scrapers.
    - iv. Seed tubes of a diameter large enough to allow fluffy seed to pass through without clogging.
    - v. Packer wheels with adjustable tension.
    - vi. Coulter wheels.
4. Hydraulic seeding methods can be used only if hand seeding has not been approved by City Engineer on slopes steeper than 3H:1V or in areas that are not accessible to drilled seeding methods. Hydraulic pump capable of being operated at 100 gallons per minute and at 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 of estimating the volume used or remaining in the tank. Seed and mulch application is not allowed in the same operation.

5. Hand (Broadcast) seeding can be used only on areas not accessible to drilled seeding equipment as approved by City Engineer. Hand rake or harrow soil bed immediately before seeding to eliminate any soil crusts. Hand rake or harrow over broadcasted seed to cover at 1/4 to 1/2 inch depth. Lightly compact soil covering seed to insure good seed to soil contact.
6. Seeding rates:
  - a. Dryland Grass Mix: Reference the rate identified in the Parks and Open Space Approved Materials List located in the Appendix
  - b. Turf Grass Mix: Reference the rate identified in the Parks and Open Space Approved Materials List located in the Appendix or as specified by seed supplier and approved by the City.
  - c. Broadcast and hydraulic seeding: Double the seeding rate from drilled rates.
  - d. Custom Seed Mixes: Specified by a seed supplier based on soil test results and approved by the City Engineer.

#### 603.05.04 MULCHING

1. Native Grass Hay shall be applied at a rate of two (2) tons per acre. Crimp into seed bed with disk set straight forward and two (2) inches deep. Crimp seeded areas in two directions perpendicular to each other to maximize hay stability. Mulch seed beds within 24 hours after seeding.
2. Wood Straw shall be applied according to manufacturer's recommendations with City Engineer approval. Mulch seed beds within 24 hours after seeding.
3. Hydromulching requires the wood cellulose fibers to become evenly dispersed when agitated in water during the application. 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 tackifier at a rate of 120 pounds per acre. Unless otherwise indicated for specific areas, fiber mulch shall be applied at the rate of 2,000 pounds per acre.
4. Hydraulic mulching shall not be performed in the presence of free surface water resulting from rains, melting snow or other causes.
5. Install netting in areas with slopes greater than 3H:1V per manufacturer's specifications. If Contractor fails to net and subsequent soil erosion occurs, Contractor shall re-establish finish grade, soil preparation, and seed bed and apply netting at no cost to the City. .
6. Immediately after seeding and mulching, water seeded areas lightly to a depth of two (2) inches, but with care so that no erosion takes place and gullies are not 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. No water is to be applied if application is for a dormant seeding in late fall.

7. Remove all hydromulch and other mulch materials from all areas outside seed bed including plant materials, fences, site furnishings, crusher fines, signs, and concrete.
8. Provide and install barriers and signage as needed or as directed by the City to protect seeded areas from pedestrian and vehicular damage.

**603.06 COMPLETION SERVICES**

1. Turn over seed tags to City Inspector to verify seeded mixture matches approved plans.

**603.07 MAINTENANCE**

1. Mowing equipment shall be maintained clean of vegetative debris and with sharp blades.
  - a. In the Spring and Fall, when turf grass reaches three (3) inches in height, mow to two (2) inches in height. Repeat in areas where mowing is to be standard maintenance practice, to maintain grass height at 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.
  - b. In the Summer and during periods of drought, when turf grass reaches four (4) inches in height, mow to three (3) inches in height. Repeat in areas where mowing is to be standard maintenance practice, to maintain grass height at 3 ½ 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.
  - c. Dryland grass areas shall be mowed to control weeds and at the end of the growing season to disperse seed heads. Adjacent paved areas to be swept after mowing.
2. During establishment, timing of mechanical weed control should be employed to prevent weed flowering and seed set. Mowing of weeds shall be done selectively or at a height above the tops of dry land grasses. Excessive weed debris that would inhibit growth of seeded grasses shall be removed from dry land areas. When grasses are sufficiently established, chemical weed control can be applied to selectively eradicate weeds.
3. Apply balanced fertilizer to maintain turf vigor during warranty period. Fertilizer shall not be applied to dry land grass areas unless recommended by the soil test results.
4. Re-seed as needed to ensure a successful stand of grass as accepted by the City.
5. Remove erosion control measures per Stormwater Quality requirements located in Section 104 of these City Standards. Re-grade and reseed as necessary during warranty maintenance period to result in a fully established stand of grass prior to City acceptance.

**603.08 GUARANTEE OR WARRANTY**

1. Warrant seeded areas for consistency and completion of coverage. Once a vigorously growing stand of grass is achieved and after the one (1) year warranty period, 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 of species seeded. Maximum single bare spot acceptable in turf grass areas is one (1) square foot, and in dry land areas is two (2) square feet. All seeded areas that do not meet the satisfactory standard of establishment qualifications shall be re-seeded, mulched and maintained until the establishment criteria are met.

2. 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 weeds.
3. Extended warranty period may be required as determined by City Inspector.

## **604.00 SODDING**

### **604.01 GENERAL CRITERIA**

1. All sod is to be installed according to current industry standards for all landscape areas.
2. Design and planning criteria shall be in conformance with the Water Conservation Master Plan, as amended. Xeriscaping is required within all City owned areas.
3. The City will consider exemptions to the minimum design criteria below in an effort to reduce water consumption.

### **604.02 MINIMUM DESIGN CRITERIA**

1. Turf mix for all areas shall be approved by City Engineer based on the activity to take place, planned irrigation method and maintenance to be performed in the area being sodded. A drought tolerant mix shall be required unless otherwise approved by the City Engineer.
2. For pre-approved Sod Mixes, reference the Parks and Open Space Approved Materials List located in the Appendix for more information.
3. Sod is required for landscaped areas in arterial rights-of-way and in the bottoms of detention ponds to be maintained by the City that are up to the five (5) year flood level Other areas may require use of sod as determined by the City Engineer.
4. If the detention pond area to top of embankment is to be owned by the City is 1/2 acre or less, then the entire area shall be sodded.
5. Design irrigated turf areas to minimize narrow, hard to maintain strips of turf.

### **604.03 SUBMITTALS**

1. Certificates showing source and origin per applicable Local, State, Federal or other regulations.
2. Sod composition from grower showing types of seed in the mix and percentages of each.

### **604.04 MATERIALS**

1. For a specific list of materials accepted by the City, please reference the Parks and Open Space Approved Materials List located in the Appendix

#### **604.04.02 SOD**

1. 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 weeds. It shall be free of nematodes, pests and pest larvae as certified by the Colorado State Department of Agriculture.
  - a. Thickness: one (1) inch thick excluding top growth and thatch.
  - b. Thatch: Not to exceed 1/2 inches uncompressed.

- c. Width: 18 inch wide strips or 42 inch wide rolls.

**604.04.03 FERTILIZER**

- 1. Incorporate fertilizer per recommendations and rates identified in the soil test results.

**604.05 INSPECTION**

- 1. Inspect finish grade and trim and verify that irrigation system is fully operational prior to sodding.

**604.06 EXECUTION**

- 1. Clean out drainage inlet structures prior to initiating irrigation.
- 2. Adjust sprinkler heads to proper height according to depth of sod material but lower than mower blade height to enable lawn mowers to cut grass freely without damage to irrigation system.
- 3. Cut sod no more than 24 hours prior to delivery. Sod shall be installed within 24 hours of delivery.
- 4. 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. Sod is recommended to be installed between spring and fall. Do not install on frozen or saturated soil.
- 6. Distribute fertilizer uniformly on finish grade at rates recommended by soil test results. Apply within 48 hours before sod installation.
- 7. Sodding:
  - a. Lay sod on slightly moist soil.
  - b. Lay with longest dimension parallel to contours in continuous rights-of-way.
  - 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 sod terminating at property lines to a straight line.
  - d. Cut sod around sprinkler heads, valve boxes and other permanent features.
  - e. After first watering, when sod and soil are moist, roll sod with enough weight to ensure contact with soil for proper rooting and smooth surface.
  - f. Add topsoil along exposed edges to match existing grades adjacent to sodded areas; feather topsoil out approximately one (1) foot.
  - g. Pin sod on slopes as directed by the City Inspector.
  - h. Make sure finished sodded areas positively drain so that no irrigation water or storm water will pond in sodded areas. Re-install sod if necessary to correct.
  - i. Water thoroughly immediately after planting and as needed to establish sod.
  - j. Prevent access onto newly laid sod to avoid damage to grade. Add barricades, fencing and signage as needed to protect sod until rooted. Reference Section 606 of the City Standards for more information

**604.07 MAINTENANCE**

- 1. After sod rooting, begin mowing:



- a. In the Spring and Fall, when grass reaches three (3) inches in height, mow to two (2) inches in height and remove all grass clippings with first mowing. Thereafter mow weekly and maintain grass between 2 to 2-1/2 inches in height. Do not cut off more than 1/3 of grass leaf in a single mowing. Remove grass clippings from all paved surfaces immediately after each mowing. Mowing operations should only take place in non-saturated conditions; ruts are to be repaired and resodded immediately
  - b. In the Summer and during times of drought, when turf grass reaches four (4) inches in height, mow to three (3) inches in height. Repeat in areas where mowing is to be standard maintenance practice, to maintain grass height at 3 ½ inches. Do not cut off more than 1/3 of grass leaf in a single mowing operation. Remove grass clippings from all paved surfaces immediately after each mowing. Mowing operations should only take place in non-saturated conditions; ruts are to be repaired and resodded immediately
2. Distribute fertilizer uniformly at a rate of five (5) pounds of balanced fertilizer per 1000 square feet of sodded area unless otherwise recommended by soil test results, three (3) 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. During establishment use mechanical means to control weeds. When sod is sufficiently established, chemical weed control can be applied to selectively eradicate weeds.
  4. Re-sod spots larger than one (1) square foot not having uniform stand of grass prior to Final Acceptance.

**604.08            GUARANTEE OR WARRANTY**

1. Warrant sodded areas for full coverage in a weed-free condition with no dead areas. Once a vigorously growing stand of grass is achieved, the request for Final Acceptance may be made.

## **605.00 TREES, PLANTS AND GROUNDCOVER**

### **605.01 GENERAL CRITERIA**

1. All nursery stock shall conform to the American Standard for Nursery Stock ANSI Z60.1 and the Colorado Nursery Act Title 35, Article 26.
2. Design and planning criteria shall be in conformance with the Water Conservation Master Plan, as amended. Xeriscaping is required.

### **605.02 MINIMUM DESIGN CRITERIA**

1. Plant material to be selected and installed for ease of maintenance operations and safety. Site distance triangles at intersections and offset of materials from edge of street curbing to comply with Section 200 of these City Standards. Restricted planting areas are as follows:
  - a. No trees, shrubs, ground cover, boulders, berms, fences or other improvements exceeding 36 inches in height measured from surface of travel lane adjacent to planting area shall be planted within the site distance triangle or within six (6) feet of a vehicle travel lane.
  - b. No trees shall be planted to obstruct traffic control signs.
  - c. No trees shall be planted within the Excess Urban Runoff Volume.
  - d. No trees shall be planted within the 100-year water surface of a detention basin to avoid loss of capacity and nuisance spreading of root systems within the facility
  - e. No landscape improvements exceeding six (6) inches in height measured from ground level at the base of the plant shall be placed within three (3) feet of a fire hydrant. Turf or 3 to 6 inch cobble stone are recommended around fire hydrants.
  - f. Plants with aggressive, shallow root systems (Cottonwood, Willow, Poplar, etc.) with high potential to cause damage to facilities and utilities, such as roadways and sewer and water lines, are not permitted within 25 feet of any such facility.
2. Landscape to be designed and plant materials installed for long term vigor of urban forest. Diversity of species or cultivars within a species, selection for hardiness, and suitability for areas shall all be considered in the design.
3. There shall be a minimum distance of eight (8) feet between trees and any adjacent vertical surface unless an exception is obtained. Trees to be spaced to accommodate the full canopy of the mature tree and proper root zone. Large deciduous trees to have minimum spacing of 40 feet, mid-sized trees to have minimum spacing of 25 feet and small trees (ornamental) to have minimum spacing of 15 feet. Coniferous trees to have a minimum spacing of 25 feet for large spreading varieties and 10 feet for upright columnar varieties.
4. Trees shall be planted in the center of the tree lawn area between edge of sidewalk and back of curb when space is less than 12 feet wide. No trees are to be planted in areas narrower than eight (8) feet in width without approval from the City Forester.
5. Trees are not to be planted on slopes that are steeper than 3H:1V.
6. Trees to be located five (5) feet minimum away from all underground utilities measured from the edge of utility pipe.

- a. Where underground or overhead utilities unduly restrict planting areas within the rights-of-way, planting in areas immediately adjacent to the rights-of-way may be allowed on case by case basis. Request for this exception is to be made by a note on the landscape plans during project design.
- b. For required clearances between plants and existing or proposed electrical cabinets, vaults or other infrastructure, refer to Longmont Power and Communications Section 700 in these City Standard for more information
- c. Electrical facility height restrictions:
  - i. Residential metering pedestal or pit: six (6) inch maximum height within four (4) feet of the window (meter) side of the cabinet and 40 inches maximum height within two (2) feet elsewhere.
  - ii. Utility poles: no climbing vines.
  - iii. Electrical Vaults: no landscape material on top of the vault and six (6) inch maximum height within four (4) feet.
  - iv. Pad mount switchgear and cabinets: sod, cobble, mulch or other low growing shrubs or groundcover only within 10 feet of the unit doors. Residential pad mount transformers: no landscape material on top or front (street side) shall be used.
7. Large canopy deciduous trees are encouraged in the landscape design where placed between the curb and the sidewalks or sidepaths along streets. Small canopy deciduous trees shall be used in areas where space is limited and species shall be selected to avoid low limb conflicts with sidewalks or sidepaths.
8. Where approved by the City Engineer, ornamental trees can only replace large canopy deciduous trees at a rate of three 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 sidewalks, sidepaths or streets as calculated from mature canopy width of tree. Tree to be selected based on size of mature canopy.
9. 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 identified for burial within 10 years, large canopy deciduous trees shall not be planted under overhead lines. Ornamental trees with mature height less than the power line height shall be used.
10. 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, sidewalk or sidepath intersections and curves, site distance restricted areas, or narrow areas. Select species and place conifers so mature spread will not overgrow walks or streets – low limb pruning is not desired.
11. Shrubs to be a mixture of evergreen and deciduous species of reasonable diversity. All shrubs to be arranged based on mature size and to prevent encroachment on walks, roads, etc. Large species over four (4) feet in height should be placed between the sidewalk or sidepath and the property line to provide buffering. Shrubs four (4) feet and smaller in height are to be used between the sidewalk or sidepath and curb along street rights-of-way to maintain visual safety from street. Shrubs four (4) feet and smaller in height to be used between the nearest road or parking area and restroom or other structures to enhance visibility. Shrubs should be selected for wildlife habitat value along primary

greenways. Shrubs along primary greenway bankfull channels shall be selected for water tolerance, flood frequency and velocity.

12. Shrubs to be spaced no closer than 2/3 of mature width on center and no further than 1-1/4 times mature width on center. Spacing shrubs at the distance of mature width on center is preferred to minimize large open areas in shrub beds after plants are established.
13. Crime Prevention Through Environmental Design (CPTED) practices to be utilized during project landscaping design. Reference the Appendix for CPTED information and guidance documents.
14. Snow storage areas to be considered as part of design around large paved areas; free of trees and shrubs.
15. No Juniper shrubs shall be within five (5) feet of back of curb, as they are easily damaged by de-icing chemicals.
16. No artificial or synthetic plant materials such as artificial grass, shrubs, trees or flowers shall be used to fulfill any landscaping requirement.
17. All landscaping materials shall consist of healthy specimens compatible with the local climate, soil characteristics, drainage and water supply. Species selected shall have proven hardiness for the area. 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.
18. Ground cover other than turf may be planted in regulated landscape areas if Contractor is reasonably able to provide complete coverage within two growing seasons and can provide cover year-round. Vines shall not be used adjacent to pedestrian areas.
19. Materials such as river rock, cobble, boulders, patterned concrete, and approved wood mulch shall be limited to shrub beds and other small areas that shall not exceed 10% of the regulated landscape area. Lightweight matter such as bark mulches shall not be used in areas unshielded from high wind.
20. No wood mulch shall be used between curb and sidewalk or sidepath or in center medians on arterial streets.
13. Cobble greater than three (3) inch minimum aggregate size is only permitted in areas abutting public streets or sidewalks. In commercial areas where on-street parking is prevalent and the sidewalk is offset from the curb, the area between the curb and sidewalk shall be landscaped to safely and comfortably accommodate pedestrians crossing to the sidewalk. Cobble and gravel mulches and other uneven surfaces shall not be permitted.
21. Spade cut edging with no weed barrier is required in shrub beds detached from sidewalks or sidepaths where native grasses are adjacent to the bed in City maintained areas. Steel edging and weed barrier are required when bed abuts irrigated turf or is adjacent to a sidewalk or sidepath with native turf.
22. Street tree minimum standards are as follows:
  - a. Species that generally have branches less than 15 feet above the roadway or trail at maturity shall not be used as street trees unless located such that no interference with the roadway will occur at maturity.
  - b. Minor trimming and branch removal should be performed to maintain the 15 feet requirement and eight (8) feet minimum clearance over sidewalks and sidepaths.

23. Trees prohibited from planting within City rights-of-way, unless otherwise approved by the City Forester, include fruit and/or thorn bearing trees within five (5) feet of sidewalk or sidepath as measured from edge of mature canopy. Native area plantings may allow some restricted species with the approval of an exception by the City Engineer.
24. Contractor is required to provide pruning maintenance to any existing trees and shrubs designated to remain within the project limits, according to the City of Longmont Forestry Standards and Specifications, and under the direction of the City Inspector. A City Licensed Tree Contractor shall be utilized. The Forestry City Standards and a current list of licensed Contractors are available by calling 303-651-8416 or visiting the City website.
25. All trees to be removed for a project shall be cut to grade and treated with blue Hi-light dye herbicide as directed by City Forester within 15 minutes of the cut to prevent re-growth. Other areas including where hardscape is proposed, the stump must be completely pulled, ground and removed. All Russian Olives, tamarisk and other noxious tree species are to be removed.

#### **605.03 SUBMITTALS**

1. Certificates showing source and origin per applicable Local, State, Federal or other regulations.
2. Provide samples for mulch, canvas strap or approved equal when requested by City.

#### **605.04 MATERIALS**

1. Reference the Plant Materials List located in the Appendix under the Parks and Open Space Approved Materials List for all approved plant species as well as restrictions such as limitations on quantities, offset location from walks, and trees prohibited in the City.

##### **605.04.02 PLANTS**

1. Plants shall be high quality representatives of specified species or variety, in healthy condition with normal developed branch and root systems, free of objectionable features. Shall conform to: American Joint Committee on Horticulture; American Standard for Nursery Stock ANSI Z60.1; Colorado Nursery Act.
2. Only plants grown in hardiness zones 2, 3, 4, and 5 are acceptable.
3. Plants classified by the State of Colorado as a noxious weed or on the watch list are not allowed.
4. All material shall be free of disease, insects, eggs, larvae, and parasites of objectionable or damaging nature.
5. Plants shall meet minimum size requirements identified on the plans. Trees shall have one dominant central leader unless specified as multi-stemmed, canopy shall be mostly symmetrical and free of large voids; and trunk and limbs free of wounds or damage.
6. Minimum plant sizes and condition:
  - a. Shade trees smaller than 30 foot mature height: Minimum two (2) inch caliper measured six (6) inches above ground, balled and burlapped.
  - b. Ornamental trees smaller than 30 foot mature height: Minimum 1-1/2 inch caliper measured six (6) inches above the ground, balled and burlapped.
  - c. Evergreen trees: six (6) feet minimum in height, balled-and-burlapped.

- d. Shrubs: #5 minimum plastic container with deciduous shrubs approximately two (2) feet high and spreading shrubs having 18 to 24 inch spread.
  - e. Groundcovers, vines, perennials: #1 minimum plastic container.
7. Substitutions where plants species, size or condition are not available must be approved by the City Engineer.

**605.04.03 BACKFILL MIX**

- 1. Mix shall consist of the following and be used in backfilling all plant materials:
  - a. One (1) part composted soil amendment; three parts native soil from planting pits.
  - b. All materials to be thoroughly blended.

**605.04.04 STAKES**

- 1. For stakes, guys and other materials related to this section reference both the Parks and Open Space Approved Materials List located in the Appendix and planting details.

**605.04.05 MISCELLANEOUS**

- 1. For mulch, weed barrier fabric, and steel edging reference the Parks and Open Space Approved Materials List located in the Appendix for more information.
- 2. For wildlife protection information reference Section 606 of these City Standards.

**605.05 INSPECTION**

- 1. For City projects with tree deliveries of 40 trees or more, a pre-delivery inspection is encouraged. This inspection is to be coordinated by the Contractor at a single nursery within 40 miles of Longmont. All trees are to be previously tagged by the Contractor who must be onsite during the inspection. Additional trees of each species need to be available to allow for City selection of the best specimens.
- 2. Schedule a tree delivery and layout inspection with the City Inspector. 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 the City Inspector. 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.
- 3. Shrubs and perennials shall be inspected on site once off-loaded.
- 4. For all capital projects a tree planting demonstration is needed prior to tree planting operations and where exceptions allow non balled-and-burlapped trees. Schedule tree planting demonstration with City Engineer to verify planting practices are consistent with these City Standards.

**605.06 EXECUTION**

- 1. Locate all utilities prior to trenching and protect from damage, per the Utility Locates requirements located in Section 100 of these City Standards. Call 303-651-8416 for City irrigation system locates.
- 2. Trees, shrubs and plantings shall be scheduled between March 1<sup>st</sup> and October 15<sup>th</sup>.

#### 605.06.02 DELIVERY AND STORAGE OF PLANT MATERIALS

1. Shade cloth shall be used to cover trees during transportation. Balled-and-burlapped (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&B stock shall be heeled in immediately upon delivery to the site unless it is planted within one (1) day. Store other plants in shade and protect from adverse weather and drying out. When handling, do not lift plants by trunk or stem; handle only ball or container.

#### 605.06.03 LAYOUT

1. Stake plant locations or set out plants per plans. Verify prior to planting that plants when mature will not interfere with adjacent roads and trails, existing trees, irrigation, lighting, utilities and other equipment, both underground and overhead. Also verify proper spacing between trees and other hard surfaces. Notify City Engineer for approval if plant locations must be changed.
  - a. Tree layout inspection shall be done at the same time the tree materials are delivered using stakes or flags. Utility line locates (and property lines if applicable) are to be visible in all planting areas. Stakes or flags for proposed tree locations to be placed in planting areas requiring inspection by the City Inspector.
  - b. Shrub and perennial inspections shall be performed in under two separate inspections; the first occurs after materials are off-loaded and inspected for approval and the second is when materials have been moved to final planting locations.
2. Obtain new utility locates and property line staking if required. All utilities must be clearly visible at the time of plant material layout inspection by the City Inspector.
3. Shrub quantities may be required to be adjusted to allow for mature plant size without resulting in large open areas in shrub beds. Quantities to be increased or decreased per direction of City Engineer, or bed size can be adjusted with necessary irrigation adjustments.

#### 605.06.04 EXCAVATION OF PLANTING SITE

1. Excavate planting pits per Details 600-23 Tree Planting Irrigated Turf, 600-24 Tree Planting Dryland with Drip Irrigation, 600-25 Tree Planting on a Slope, 600-26 Tree Planting in Sidewalk/Pavement and 600-27 Shrub Planting; dispose of any rocks off-site.
2. Trees shall be planted at a depth where the root flare above the solid root ball is at grade in non-irrigated areas and four (4) inches above grade in irrigated turf areas. Contractor to contact City Inspector if unsure where the root flare is located on the tree. Modify depth of pit if soil type or conditions warrant and/or per direction of City Inspector. Minimum diameter of the base of the planting pit shall be two times (2x) the diameter of the root ball. The width of the hole at the top of the pit shall be three times the diameter of the root ball
3. For shrubs, perennials and ground cover the top of root ball shall be positioned slightly higher, 1 to 2 inches, than finish soil grade so that water will drain away from plant in spray irrigated areas and at grade in drip irrigated areas. Modify depth of pit if soil type or conditions warrant and/or per direction of City Inspector. The minimum diameter of the pit shall be two times (2x) the diameter of the root ball.

#### 605.06.05 PLANTING

1. Balled-and-burlapped trees:

- a. Do not plant if tree trunk is loose in root ball or if ball is cracked or broken before or during planting process.
  - b. Remove bottom 1/3 of wire basket from root ball.
  - c. Place in pit with burlap intact on undisturbed soil in center of pit to proper grade, and plumb.
  - d. Face for best effect.
  - e. Cut and remove remaining wire and twine. Do not pull wrapping or wire from under ball as it may damage the root ball.
  - f. Wire basket must be completely removed. Place wire on tree stakes for City Inspector confirmation of removal prior to Contractor disposal.
  - g. Backfill 2/3 of pit; remove top 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.
  - h. Install five (5) inch high watering basin around trees.
    - i. Remove and grade out berm around basin after two thorough waterings in irrigated areas. Mulch after berm basin is removed.
    - ii. Mulch and leave basin in dryland areas.
2. Container grown stock:
- a. Do not plant if root ball is cracked or broken before or during planting process.
  - b. Carefully remove plants from containers without injury or damage to root ball. Do not cut containers with spade or ax.
  - c. Vertically score root ball using sharp knife, about 1/8 inch deep and about every 2 to 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.
  - d. Set plant plumb, face for best effect, make sure crown of root ball is at correct grade.
  - e. 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.
3. Completion of planting:
- a. Shape surface of finish grade around root ball so water drains away from trunk or stems and matches finish grade at the edge of the planting pit.
  - b. Remove plant tags, flagging, etc. from trees and shrubs.

#### 605.06.06 EDGING

- 1. Install steel edging so top of edging is a maximum of two (2) inches above finish grade and flush with the top elevation of the paved surface which it abuts. Edging shall meet paved surface at a 90° angle and bend with a minimum of 18 inches running parallel to the paved surface with a minimum of three stakes. Stake at manufacturer's recommended intervals, at bends, corners and to create a smooth radius using steel stakes. Add additional stakes adjacent to trails to avoid safety issues. Punch holes as needed for drainage.



2. Where steel edging is not utilized cut a six (6) inch deep vertical straight sided trench at shrub bed edge with approval by the City Engineer. For individual trees, edger cut is to be a three (3) foot radius from trunk of tree. Transition six (6) inch deep cut edge to specified mulch depth of four (4) inches at a 45° angle.

#### 605.06.07 WEED BARRIER AND MULCHING

1. Place geo-textile landscape fabric in all areas to be mulched per design section above except in individual tree rings and groundcover beds or in any other areas specifically approved for omission. Lay fabric straight and even with eight (8) inch overlap at edges. Staple along edges with steel U pins on 24 inch spacing. Staple folds in fabric to keep below mulch material.
2. Reference Section 602 of these City Standards for drip irrigation testing prior to mulch installation.
3. Mulch depth:
  - a. Tree rings- three (3) inches deep, keep two (2) inches from trunk.
  - b. Shrub beds - four (4) inches deep.
  - c. Groundcover beds – three (3) inches deep.
4. Mulch a six (6) foot diameter tree ring area centered on the tree which shall encompass tree stakes within mulch area.
5. Recommend 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 (2) days of planting or after specified number of waterings for individual trees and shrubs.

#### 605.06.08 STAKING AND GUYING

1. Pound six (6) foot long metal or wood stakes with a minimum four (4) feet of post exposed into undisturbed soil beyond the planting pit so that stake is secure. Secure guying strap 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. Adjust tension on guy as needed to be taut but not tight. If metal t-posts are used, place PVC caps on top of stakes. Wooden pole stakes 2 x 6 inch may be used without PVC caps.

#### 605.06.09 TREE PRUNING

1. Prune minimal amount necessary to remove injured twigs and branches, deadwood and suckers to insure healthy tree. Also prune to improve growth habit, only as directed by the City Forester. Do not prune central leader.

#### 605.07 COMPLETION SERVICES

1. Remove all excess materials, tools, rubbish and debris from site. Leave plant identification tag until City inspection; remove prior to Final Acceptance.
2. Include a list of all plant materials installed, including sizes and quantities as certified by a Landscape Architect on the Record Drawings.

**605.08            GUARANTEE OR WARRANTY**

1. For the period prior to Final Acceptance, all plant materials, landscape materials, workmanship and other appurtenances are to be guaranteed or warranted against defects. This applies to areas to be maintained by Developer or subsequent property owners or HOAs as well. 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 natural shape due to dead branches or excessive pruning of dead branches are to be replaced at no cost to the City. Guarantee or warranty applies to all originally installed materials, and to replacements made during the guarantee or warranty period.

## **606.00 SIGNAGE, SITE FURNISHINGS AND WILD LIFE PROTECTION**

### **606.01 GENERAL CRITERIA**

1. Signage used in all off-street public park & greenway areas shall follow the Longmont Parks & Greenways Signage Manual and must be approved by the City Engineer.
2. Site furnishings and wildlife barriers used in all public parks, greenways and open space areas shall comply with the Parks and Open Space Approved Materials List located in the Appendix.

### **606.02 MINIMUM DESIGN CRITERIA**

1. Consider appropriate signage messages and placement.
2. Projects shall consider all signs found in the Longmont Parks & Greenways Signage Manual as well as additional custom signs as needed.
3. All project signs shall conform to the material requirements listed in this Section 606 of the City Standards.
4. Projects with prairie dogs will be required to comply with the City Code regarding relocation, removal and extermination of prairie dogs. The City shall determine if prairie dogs are to remain on a property or to be removed according to the City of Longmont Wildlife Management Plan or other plans that cover the project area. The City may require the installation of an approved prairie dog barrier to keep prairie dogs located outside of public property from entering the project area. Projects with prairie dogs established within the project limits and scheduled to remain will be required to install a prairie dog barrier to contain the prairie dogs to a specific location within the public property. The size of the area to be enclosed is to be determined by the City Engineer.
5. Projects near or adjacent to waterways, including ditches, streams, lakes, ponds, creeks, beaver, or other wildlife active in the area may be required to include wildlife protection at the direction of the City Engineer with barriers installed per the requirements of this Section. Coordinate with the City Engineer to identify wildlife issues as part of the design.

### **606.03 MATERIALS**

1. Reference the Parks and Open Space Approved Materials List located in the Appendix for the approved materials list for signs, sizes, materials, posts, site furnishings, traffic delineators and other information.

#### **606.03.02 SIGNAGE**

1. Signage shall comply with applicable sections of MUTCD and Longmont Parks & Greenways Signage Manual including sign faces, specifications and construction details. City Engineer shall provide electronic formats for signs included in the manual.
2. Aluminum signs shall meet ASTM B209, alloys 6061-T6, 5052-H36, or 5052-H38. Graphics shall be silk-screened with 3M ink on .080 inch thick aluminum blanks for 14 x 14 inch sign sizes or smaller, and 1/8 inch thick for larger signs. All corners shall be rounded with a radius of 1 in x 14 in x 14 in signs and 1-1/2 inch for larger signs. No electronically cuttable "EC" film shall be permitted, unless approved by the City Engineer.
3. All MUTCD signs; low clearance signs, and bicycle signs shall be retro-reflective to show the same shape and color both day and night regardless of light conditions. "Path Closed" and wayfinding signs

shall also include retro-reflectivity. Retro-reflectivity shall be achieved by using sheeting that conforms to the requirements of ASTM D4956 and shall be applied in accordance with the manufacturer's specifications.

4. Signs to include Spanish translation where indicated by the City Engineer.
5. Sign faces to be color matched to specific project specifications. Text, color samples and full color proof of each sign shall be reviewed and approved by the City Engineer prior to manufacturing.
6. Posts shall be per specific sign type per the Longmont Parks & Greenways Signage Manual.

#### **606.03.03 SITE FURNISHINGS**

1. Includes trash containers, recycling containers, dog dispenser and benches.
2. Benches are required along primary greenways at 1/2 mile intervals or as directed by the City Engineer. All benches along accessible routes are to meet ADA regulations.
3. Trash and recycling stations are to be installed at trailheads and major congregation points or as directed by the City Engineer.
4. Six (6) inch thick concrete pads are required for surface mounting site furnishings per the Transportation Section 200 of these City Standards.

#### **606.03.04 TRAFFIC DELINEATORS**

1. Traffic delineators are to be in-ground mounted, white with reflectors per the Parks and Open Space Approved Materials List located in the Appendix.

#### **606.03.05 WILDLIFE PROTECTION.**

1. Prairie Dog Barrier: Four (4) foot cedar fence using 4 in x 4 in x 5 ft cedar fence posts, with two –2 in x 4 in x 8 ft cedar rails for attaching 1 in x 6 in x 3 ft cedar pickets. Also including four (4) foot width of one (1) inch poultry wire and six (6) inch minimum fabric pins.
2. Beaver Barrier:
  - a. Four (4) foot minimum width with 2 x 4 inch mesh poultry wire, six (6) foot steel tee stakes and six (6) inch galvanized fabric pins.
  - b. Mix 25 pounds of playground sand with 2-1/2 gallons of flat exterior latex paint with color that resembles tree bark to be painted.

#### **606.04 EXECUTION**

1. Locate all utilities prior to installation of all signs and fencing per the General Requirement Section 100 of these City Standards.
2. Notify City Inspector to verify sign placement, orientation and concrete pad layout for benches and trash & recycling containers.
3. Install signs at locations in concrete footing per City Inspector and per Longmont Parks & Greenways Signage Manual. Install posts to meet MUTCD standards with a minimum of 24 inches between sign edge and the sidewalk or sidepath edge. City Engineer may require additional concrete pads between trail edge and sign for "Rules and Regulations" and "Dog Waste Signs" as needed. Install sign faces in

correct orientation to sidewalk or sidepath for sign message as directed by the City Inspector. Install sign face using vandal resistant fasteners per the Longmont Parks & Greenways Signage Manual.

4. Install site furnishings on six (6) inch thick concrete pads per approved plans and per these City Standards. Trash Receptacles to have lids attached using a galvanized chain.
5. Install traffic delineators with reflectors in areas where seed is installed along a road without curb and gutter at 50 foot intervals set two (2) feet off the edge of roadway. Posts to be installed to break away for on-coming traffic per Transportation Section 200 of these City Standards.
6. Prairie dog barrier requires installation of cedar fence with posts eight (8) foot on center buried in concrete in 12 inch wide minimum by 24 inch deep holes per industry standards. Smooth ground prior to fence panel installation to provide minimal gap between ground level and bottom of pickets. Install pickets as close to the ground as possible. Secure poultry wire to the inside, smooth face, of the fence facing the prairie dog colony with 12 inches of wire stapled to the interior of the cedar fencing and the remaining 36 inches of mesh bent at 90° angle to ground level and secured with six (6) inch landscape pin anchors. The landscape pin anchors are to be placed in one (1) foot intervals alternating every six (6) inches, one directly up against the fence and the next on the outside edge of the poultry wire. Additional pin anchors shall be placed in a consistent 12 inch pinning pattern to fully secure the fencing to the ground with no raised areas or loose edges.
7. For beaver barriers inspect the site with the City Forester and select trees to be protected trees (trees shall be greater than two (2) inches in diameter) and within 150 feet of a waterway.
  - a. Fencing option: Install fencing in circle around all deciduous trees (existing and new) and shrubs in areas prone to harvesting or damage by wildlife and as determined by City Engineer. Fencing shall be cut in lengths long enough to provide full enclosure around each tree or shrub bed with a minimum 12 inch separation between shrubs or trunk and branches and fence on all sides. Additional sections of fencing are to be wired together in sections if needed to fully cover tree trunk from ground to first branch or around shrub beds. Ends and additional sections of wire fence loop to be securely fastened with additional steel posts added as needed for fence stability. Fencing shall be cut into lengths in such a manner as to allow cut ends to be bent to secure enclosure around trees or shrub beds. Ends to be bent in toward tree or shrub to prevent safety hazards and projections to the exterior side of the enclosure. Fence must be in contact with ground around entire enclosure using six (6) inch galvanized fabric pins to secure.
  - b. Painted Option: Thoroughly mix paint and sand. Apply a thick coat of paint and sand mixture using brushes or spray gun and apply from three (3) inches above the base of the tree up to three (3) feet above the base all the way around the trunk.

#### **606.05 COMPLETION SERVICES**

1. Clean up site debris and materials.

#### **606.06 GUARANTEE OR WARRANTY**

1. Warrant signs, site furnishings and wildlife protection for one (1) year or until Final Acceptance.