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SECTION 800 – LANDSCAPE IMPROVEMENTS

800.1 Purpose

The purpose of these Standards and Specifications is to ensure high quality design and construction of water-wise, maintainable landscapes that balance citywide design consistency and sense of place with a variety of materials to support a sustainable landscape and livable City. The Standards and Specifications describe how specific portions of a development project shall be designed, installed, cultivated, and maintained. Reference the Development Code for landscape definitions and development landscape requirements, and reference Section 100 for inspection and warranty requirements.

801 GENERAL PROVISIONS

801.1 Description

These Standards and Specifications apply to: all landscape areas including, but not limited to, trails, park areas and facilities, detention and drainage channel areas, rights-of-way and median areas, and open space landscape improvements required by the development review process of the City, and constructed by private interests unless otherwise indicated.

801.2 Quality Assurance

A. For all residential landscapes, the Responsible Party and the landscape contractor shall attend a pre-construction meeting with the Senior Landscape Architect for each phase of construction, as depicted on the Developer's Agreement Phasing Map.

B. The Responsible Party shall provide all soil amendment load tickets and Soil Amendment Affidavits for each dwelling before the construction of the next phase when requested by the Senior Landscape Architect.

801.3 Preparation

Consult the records and drawings of adjacent work and of existing services and utilities, which may affect site work operations. Obtain on-site underground utilities locates prior to excavation**.**

801.4 Inspections

The following inspections are required before work shall proceed. See other inspection requirements in Sections 105.12 and 809.6 in these Standards and Specifications.

A. Weed Eradication

The soil shall be inspected for weeds, especially noxious weeds prior to soil amendment and tilling.

B. Compost Amendment

After weed control, yet prior to incorporation by tilling, the layer of required compost amendment shall be inspected for adequate quantity and quality.

C. Post Tilling

After tilling and fine grading, the prepared soil shall be inspected for the required 8" tilling depth, and for overall quality and absence of construction debris.

D. Post Planting

All plantings shall be inspected for proper planting per detail 800-1 and 800-2 prior to mulching.

E. Final Completion

The project shall be inspected for overall completion and compliance with the approved construction drawings or landscape plan.

802 SITE PREPARATION

802.1 General

The Responsible Party shall provide all labor, materials, and equipment necessary to complete site preparation work as shown on the drawings approved through the development review process and as stipulated in these Standards and Specifications. Features to be retained shall be properly protected in a manner approved by the

Development Engineering Manager. The Responsible Party shall identify and stake all surface and subsurface features of the project area, including all property corners. Refer to Sections 100 and 500 of these Standards and Specifications for related information.

802.2 Protection of Existing Plant Material

Refer to subsection 105.6 for protection of existing plant material.

803 SITE GRADING

803.1 General

The Responsible Party shall provide all labor, materials, and equipment necessary to complete all grading work as shown on the approved drawings and as stipulated in these Standards and Specifications. Refer to Section 100 and Subsections 802 and 804 for related information.
The following general design standards shall apply:

A. Positive drainage, at a gradient suitable for the surface material, shall be maintained into all proposed or existing drainage ways. Ponding of water shall be avoided, except in designated detention areas, in order to minimize compaction and undermining problems.

B. In general, no slopes within landscaped areas shall exceed four to one (4:1). Where needed, retaining walls shall be provided by the Responsible Party to keep slopes within acceptable ranges.

C. Transitions from existing to proposed grades, and from gentle to steep grades within the site, shall be rounded off to minimize sharp contrasts in landforms and to prevent "scalping" by mowing equipment.

D. Drainage from all public or private common landscaped areas shall not be conveyed onto private residential lots.

E. Turfgrass areas intended as programmable athletic fields shall be laser graded.

803.2 Testing

All classification testing shall be performed by a qualified independent testing laboratory under the supervision of a registered PE specializing in soils engineering at the expense of the Responsible Party. The Responsible Party shall coordinate with and fully comply with all recommendations made by the testing agency.

803.3 Process

A. All applicable safety standards shall be followed for grading operations.

B. All grading operations shall be tested and inspected in accordance with these Standards and Specifications.

C. The Responsible Party shall establish the horizontal and vertical limits of grading through use of stakes, properly labeled, and shall have such staking approved by the Development Engineering Manager. On turf grass areas intended for sports fields, laser grading shall be employed.

D. No grading operations shall be permitted on a soft, spongy, frozen, unstable, or otherwise unacceptable subgrade.

E. All disturbed soils shall be periodically wetted as needed to minimize blowing dust.

F. When filling is required to meet the desired grade, each lift of the fill material shall not exceed eight (8) inches in loose depth. The Responsible Party shall thoroughly mix fill materials to secure suitable uniform moisture content and to insure uniform density and proper compaction. Any backfilling done against a building shall meet the requirements of the engineered soils report for that parcel. The City shall reserve the right to have graded areas tested at appropriate times and locations, at the Responsible Party's expense.

G. Final rough grade shall allow for specified soil amendments and subsurface materials required for finished surfaces.

804 SOIL PREPARATION - LANDSCAPED AREAS

804.1 General

Prior to soil preparation the Responsible Party shall remove all construction debris from the soil including: large rocks, concrete, asphalt and soil clods; all building materials such as boards, insulation, shingles, rebar, wire,

and grading stakes. Before soil preparation, the Responsible Party shall rip the soil to a minimum depth of 12 inches if it has been compacted by heavy machinery or by working it while wet.

804.2 Materials

A. Organic Materials

Organic soil amendment for all landscape areas, including all turf, native seed, tree, shrub planting beds in their entirety, annual, vine, and groundcover areas shall be a Class I or Class II Compost that meets the U.S. Composting Council's testing requirements. The compost must be produced at a composting facility meeting EPA 40 CFR 503.13 requirements for the production and marketing of Class A material for unrestricted use and distribution. Amending only the planting hole is not acceptable.

804.3 Preparation

A. Noxious Weed Control

If the area to be developed is infested with bindweed, thistle or other noxious weeds, such vegetation shall be completely eradicated by application(s) of a systemic, non-selective herbicide like glyphosate (Roundup) or approved equivalent. All herbicides shall be applied by an applicator licensed by the State of Colorado Department of Agriculture at a rate and period required by the manufacturer's labeling instructions.

B. Ripping of Compacted Soils

Soils previously compacted by heavy machinery during construction, as identified by the Senior Landscape Architect, shall be ripped prior to required soil amendment incorporation. The ripping equipment used shall rip the soil in rows no greater than 18" apart, and shall be powerful enough to rip the soil to a minimum depth of 12". Ripping operations shall be timed to commence when soil moisture is adequate enough to allow penetration, but is not at all wet or muddy.

C. Soil Amendments

1. A minimum 4 cubic yards (6 cubic yards for City maintained landscapes and all metropolitan district parks) per 1,000 sf of a Class I or II compost shall be distributed across the soil surface of all landscape areas in a uniform 1⅓" (6 cubic yards = 2 inch layer) and incorporated into the top 8 inches of soil with a rototiller capable of tilling to 8 inches in depth. Shrub beds shall be amended throughout the entire bed prior to planting, not just the planting hole.

2. Native grass seeding: broadcast 1500 lbs/Ac Biosol Forte Mix 7-2-3, or approved equal, before seeding.

D. Landscaped Median Soil Preparation

Within landscaped medians, fill with 36 inches of A-1 Organics Amended Topsoil or equivalent in no greater than 12 inch lifts. In lieu of using premixed amended topsoil, planting bed soil shall be topsoil and professionally mixed with 27 cubic yards of a Class I or II compost per 1,000 sf of median landscape area and incorporated into the entire soil profile to a depth of 36 inches in no greater than 12 inch lifts after mixing.

E. Final Grading

The finished surface shall be even and uniform and no dirt clumps, stones, sticks, residual plant material, or other debris larger than one (1) inch in diameter shall appear on the surface. When sodded areas are next to fixed surfaces such as walks, curbs, or borders, finished grade prior to sodding shall be 1.5 inches below such surfaces.

804.4 Inspections

Refer to Subsection 105.12 and Subsection 803.6 of these Standards and Specifications.

A. Materials Inspection

The Contractor shall retain and submit to the Senior Landscape Architect upon request, an Affidavit of Soil Amendment Installation verifying the source, quantity, and identification of the soil amendment used. Unsatisfactory materials, as determined by the Senior Landscape Architect, shall be removed and replaced with materials conforming to these Standards and Specifications.

805 SEEDING SPECIFICATIONS

805.1 General

A. In general, grassed landscaped areas shall be sodded. In areas where sod installation of practical turf areas is not desired or possible, seeding with a mix of species shall be considered when justified by size of area, type of use, and level of anticipated maintenance, and with specific approval of the Senior Landscape Architect.

B. Mow strips at the edges of seeded areas shall be established if visibility is an issue, or to incorporate a maintained appearance to the perimeter.

C. A permanent, automatic irrigation system shall be provided to support establishment and maintenance of seeded areas or as approved through the Development Permit review process.

805.2 Submittals

A. The proposed seed mix, pounds pure live seed per acre and a note stating that all seeding will be installed in accordance with Section 805 of these Standards and Specifications shall be included in the appoved construction drawings and/or Development Permit for the project.

805.3 Materials

A. "Native" Seed Mixes: Per-acre seeding rates are based on 144 pure live seeds (PLS) per square foot, which is equivalent to one (1) pure live seed per square inch. These seed mixes are not intended to replicate the diversity of a truly natural, undisturbed stand of native grasses. Instead, they have been developed to provide a more uniform look, which is what the urban setting demands. Most of the species are native, some are naturalized, but all are water efficient and low maintenance, excluding the wet detention mix. Seed mixes have been purposefully developed with all warm or all cool season grasses to minimize the perception of a weedy look, and to optimize maintenance practices. Requests for alternative mixes, for special site conditions, shall be submitted to the Senior Landscape Architect for review.

1. Thornton Buff/Blue Grama Mix:
(This all native, all warm season, upland mix is our most commonly planted mix. These two spreading grasses are very similar and complement each other well. They provide a uniform carpet when mowed, but don't get very tall if left unmowed. This mix is also ideal for large detention pond bottoms that stay predominately dry.)

60% Buffalograss *(Buchloe dactyloides)*	37 lbs./Acre
40% Blue Grama *(Bouteloua gracilis)*	8 lbs./Acre
	45 lbs./Acre

2. Thornton Signature Warm Season Mix:
(This taller, all native, all warm season, upland mix has added color interest, especially when dormant. It's our most diverse and natural looking mix. It can tolerate mowing, but also has a wilder, natural look with variable height if left unmowed.)

40% Little Bluestem *(Schizachyrium scoparium)*	15 lbs./Acre
20% Side Oats Grama *(Bouteloua curtipendula)*	10 lbs./Acre
20% Blue Grama *(Bouteloua gracilis)*	3 lbs./Acre
20% Buffalograss *(Buchloe dactyloides)*	12 lbs./Acre
	40 lbs./Acre

3. Thornton Wheatgrass Mix:
(This taller, all native, all cool season, upland mix is best left unmowed after establishment, which will give it the "Amber Waves of Grain" look.)

40% Western Wheatgrass *(Pascopyrum smithii)*	32 lbs./Acre
40% Streambank Wheatgrass *(Elymus lanceolatus)*	18 lbs./Acre
20% Slender Wheatgrass *(Elymus trachycaulus)*	10 lbs./Acre
	60 lbs./Acre

4. Thornton Short, Cool Season Mix:
(This all cool season, upland mix contains both native and naturalized grasses. It's quick to establish and has a mottled dusty blue-green appearance that is most noticeable during the growing season. It can tolerate mowing, but also has a wilder, natural look with variable height if left unmowed. These grasses may handle extreme heat by going dormant in mid to late summer, but green-up again in early fall.)

50% Crested Wheatgrass *(Agropyron cristatum)*	20 lbs./Acre
25% Sheep Fescue *(Festuca ovina)*	3 lbs./Acre
25% Hard Fescue *(Festuca longifolia)*	4 lbs./Acre
	27 lbs./Acre

5. Thornton Moist and Salty Detention Pond Bottom Mix:
(This all cool season mix contains both native and naturalized grasses, and has a dusty blue-green overall color. This mix likes moist sites and is very salt tolerant, which makes it ideal for variably wet detention pond bottoms that get salty from sub- irrigation.)

40% Alkaligrass *(Puccinellia distans)*	2 lbs./Acre
30% Western Wheatgrass *(Pascopyrum smithii)*	22 lbs./Acre
30% Smooth Brome *(Bromus inermis)*	16 lbs./Acre
	40 lbs./Acre

6. Thornton Always Wet Detention Pond Bottom Mix:
(This all cool season mix is designed for perpetually wet and sometimes flooded detention pond bottoms that won't ever be mowed. These species are also suitable for growing on the bottom slopes of the pond, and canal and stream banks. Sedges, rushes and bulrushes can be added to the mix as desired.)

15% Meadow Brome *(Bromus riparius)*	8 lbs./Acre
15% Western Wheatgrass *(Pascopyrum smithii)*	11 lbs./Acre
15% Canada Wildrye *(Elymus canadensis)*	10 lbs./Acre
15% Basin Wildrye *(Leymus cinereus)*	9 lbs./Acre
15% Beardless Wildrye *(Leymus triticoides)*	8 lbs./Acre
15% Creeping Foxtail *(Alopecurus arundinaceus)*	2 lbs./Acre
10% Reed Canarygrass *(Phalaris arundinacea)*	2 lbs./Acre
	50 lbs./Acre

7. Flower seed may be added to mixes but shall not substitute for quantities of seed. Chemical weed control that may be needed to establish grasses will likely kill off any such flowers. Wait to plant the flower seed until after grass establishment .

805.4 Process

A. Seedbed Preparation

The seedbed shall be free of debris including weeds, plant matter, rocks, clods, and other impervious material over one (1) inch in diameter. Seedbed shall be smooth and free of large clumps, fluffy yet firm, moist but not wet.

B. Fertilization

Refer to section 804.3.C.2 or follow the site specific fertilization requirements outlined in the approved construction drawings or landscape plans.

C. Seeding

1. Seeding shall be done immediately after soil preparation operations to discourage weed competition. Seed shall be evenly distributed over fertilized ground on a still day into a slightly moist seedbed, using an approved grass drill followed by packer wheels. Hand-broadcasting methods shall be at double the seeding rate and shall be 'raked in' or otherwise covered with soil to a depth of ¼ inch. Hydraulic seeding can be used in areas not accessible for machine methods; seed and mulch shall not be applied in the same operation.

2. Seeding of irrigated "native" grasses can take place at any time during the growing season. For best and quickest results, warm season grasses should be seeded in May and no later than July. Irrigated cool season "native" grasses are best seeded in the spring. Generally, dormant seeding of cool season non-irrigated grass shall occur between November 15th and April 15th on unfrozen ground. Seeding of non-irrigated warm season grasses shall occur between March 15th and June 15th.

3. All seeded areas shall be hydromulched, applied with tackifier at rates recommended by the manufacturer. Hydraulic mulching shall not be performed in the presence of free surface water. In areas not able to be hydromulched, cover all seeded area with 100% biodegradable straw blanket with biodegradable blanket pins. Within 12 hours of seeding, water seeded area frequently and lightly. Water enough to keep the soil moist, but not so heavily as to cause soil washing and loss of the grass seed.

D. Weed Control

1. Weed control is an important factor for grass establishment. Timely mowing operations are the most successful method of control. Mow at six (6) inches with a flail type mower. No mowing for the first six (6) weeks after seeds sprout; mow weeds before annual seed set. It shall be necessary to mow several times the first growing season, depending on when grass was seeded. It shall be necessary

to mow in the second year. For perennial weed control, use spot chemical spraying or hand weeding after grass plants are up and fairly mature, at the minimum, past the three (3) to five (5) leaf stage.

2. The use of Journey selective, pre-emergent herbicide or approved equal shall be required in areas infested with Cheatgrass (*Bromus tectorum*) and other grassy weeds. Journey shall be applied in late summer prior to germination of Cheatgrass and other winter annual weeds.

805.5 Establishment Time and Acceptance

A. For both native and naturalized grass seed species, germination should start within three (3) to six (6) weeks. Depending on planting time, available moisture and success of weed control, full establishment and initial acceptance of irrigated seed can take a minimum of one (1) full growing season, but usually takes longer. Full establishment of non-irrigated seed can take three (3) to five (5) years or more. Higher seed rates, shallow drilling of no greater than ½", and narrow (2-4") seeder row spacing have proven to be critical in obtaining rapid establishment.

B. Seeded areas will not be accepted until the stand of grass displays uniform coverage of the seed mix planted, with all species of the mix being well represented, and minimal weeds are present, as determined by the Senior Landscape Architect.

806 SODDING SPECIFICATIONS

806.1 General

The Responsible Party shall provide all labor, equipment, and materials necessary to furnish and install all sod or plugs as required by the drawings and these Standards and Specifications.

806.2 Materials

A. Fertilizer

1. On public projects apply, a 18-46-0 starter fertilizer at a rate of 1 (one) pound per 1,000 (one thousand) square feet having the following composition by weight: Nitrogen, eighteen percent (18%), and phosphoric acid (P205), forty-six percent (46%). These elements may be organic, inorganic, or a combination of the two, and shall be measured according to the methods of the Association of Official Analytical Chemists. Or, follow the site specific fertilization requirements outlined in the approved construction drawings or landscape plans.

2. On private sod installations, follow the site specific fertilization requirements outlined in the approved construction drawings or landscape plans.

B. Sod

1. Turfgrass blends and mixes shall be selected based on site conditions, intended use, and water conservation; and shall be determined through the Development Permit review process.

2. Sod shall be healthy and certified by the State of Colorado as insect, disease, and noxious weed free. The cultivars that comprise each sod blend or mix must test well above average on the National Turfgrass Evaluation Program trials, as reviewed by the Senior Landscape Architect. The sod shall be mowed at two (2) inches and thoroughly watered before harvested. All sod shall be cut to provide a minimum thickness of three-fourths (¾) inch of soil adhering to the roots. Each sod strip shall be harvested in a minimum width of 16 inches and a minimum length of 24 inches. Sod may be supplied in wider and longer rolls.

3. The following turfgrass blends and mixtures are approved for use as sod in the City of Thornton and shall be specified on the approved plans:

a. Kentucky Bluegrass (*Poa pratensis*)
Must be a blend of at least three (3) improved cultivars (varieties) that are acclimated to Thornton's growing conditions.

b. Texas Hybrid Bluegrass (*Poa pratensis x Poa arachnifera*)
The minimum amount of Texas Bluegrass (*Poa arachnifera*) allowed in the hybrid is 25%. If the sod is a blend, it must be all Texas Hybrid Bluegrass; no mixes of predominantly straight Kentucky Bluegrass with small percentages of Texas Hybrid Bluegrass will be approved as Low Water Demand Turf. This turf has excellent heat tolerance that leads to drought tolerance as well.

c. Tall Fescue (*Festuca arundinacea*)
Must be a blend of at least three (3) improved cultivars. Rhizomatous cultivars are preferred.

d. Fine Fescue Mix (*Festuca ovina, Festuca glauca, Festuca longifolia, Festuca rubra, Poa compressa*)
Variations of this mixture must contain no more than 20% Creeping Red Fescue (*Festuca rubra*), as it is a moderate water demand turfgrass species. This mixture has increased maintenance requirements, and is generally more difficult to maintain than other turfgrasses. It is also less available, as many sod farms no longer carry it.

4. Warm season sod and plugs shall be 100% certified turf-forming variety Legacy or Prestige Buffalograss, or approved equal.

5. Cold-tolerant varieties of Hybrid Bermudagrass (Cynodon x transvaalensis), such as Yukon and Riviera, will be approved for a given site on a case by case basis.

6. Other types of sod, as approved through the Development Permit review process.

806.3 Process

A. Care and Handling

Care shall be exercised at all times to retain the soil on the sod roots during transportation, handling, and planting. Dumping sod from vehicles shall not be permitted. The sod shall be installed within 24 hours from the time it is cut, unless it can be stored to the satisfaction of the Senior Landscape Architect. During delivery and while in stacks, all sod shall be kept moist and protected from drying, sun, or freezing. All damaged sod shall be rejected. All sod discolored due to excessive drying shall be rejected.

B. Transporting Sod On-site

Sod can be transported on or across the site on pallets by forklift, bobcat, or equivalent. Damage to the sod bed by the vehicles shall be avoided; any damage shall be repaired prior to sodding of the area. Damage caused to paving, curbs, fences, plants or other objects from sodding operations shall be remedied by the Responsible Party at his expense, as directed by the Senior Landscape Architect.

C. Sodding

1. Sod shall be laid on a firm, pre-moistened, but not wet, bed by staggering joints with all edges touching so that no voids occur under or between strips. Sod roll length shall run perpendicular to all slope fall lines, with biodegradable sod staples employed on slopes, as necessary. End joints shall be staggered at least 18 inches between adjacent rows.

2. Sod shall be laid flush with paving, curbs, and irrigation heads and one (1) inch below the top edge of steel edging. All rolls terminating at the project edge shall be cut in a straight line. No sod shall be installed within a radius of three (3) feet around any tree.

3. Sod placed in drainage swales shall be staked, with stakes spaced not more than 30 inches apart, driven into the ground at an angle against the flow of the water. Sodding shall begin at the bottom and progress upward, with strips laid perpendicular to the flow of the water.

4. Warm season sod and plugs shall be installed between May 1st and July 15th. Plugs shall be planted on 12-inch centers with a requirement of at least nine (9) plugs per square yard of ground.

5. Immediately after the sod has been laid, it shall be rolled with approved equipment to eliminate air pockets and to provide a smooth and even surface, and watered. Sufficient water shall be applied to saturate the sod or plugs completely. The planting shall be protected from drying and shall be watered as often as needed to prevent drying. Settled sod areas shall be pulled, re-graded, and re-laid. Excessively shrunken sod (over ¾ inch shrinkage) shall be replaced with new sod.

806.4 Maintenance

A. Protect and maintain sod and plugs until Initial Acceptance. Maintenance shall include irrigation controller programming and watering, mowing, and trimming as necessary to prevent sod and plugs from drying and shrinking, and to maintain proper soil moisture and a neat appearance. Care should be given to avoid standing water, surface wash, or erosion from over-watering. Failure of the irrigation system shall not relieve the Responsible Party from applying the water required during this period.

B. Under normal weather conditions, after new, green top growth is seen, warm season sod and plugs will require between 1 and 1-½ inches of water per week for two (2) to three (3) months, to prevent drought stress, until deeper rooting takes place.

C. For public sod installations, apply fertilizer after initial mowing (within approximately 20 days after sodding), when grass is dry, using fertilizer that will provide actual nitrogen of at least 1 lb/1000 SF. 20-10-5 plus iron and 8% sulfur fertilizer (50% sulfur coated urea). Continue fertilizer applications every 30 days thereafter at the rate of ½ lb actual nitrogen per 1000sf until Initial Acceptance of project--in March, April, May, June, (0 nitrogen in July), ½ lb/1000sf in August, September, October and November (no fertilizer in July, December, January, February). Six months into maintenance program, take a soil sample and adjust fertilizer accordingly and as approved by COT.

807 PLANTING GUIDELINES AND SPECIFICATIONS

807.1 General

A. These planting guidelines and specifications address the location and installation of trees, shrubs and ground covers. There shall be a pre-construction conference prior to the beginning of any work or the ordering of any materials.

B. The work to be performed consists of installation of all plants, including the furnishing of materials, equipment, supplies, labor and transportation to the site. All work shall be performed under the direct supervision of an experienced, qualified superintendent.

C. Plant material installed prior to installation of the irrigation system shall be hand watered as necessary.

807.2 Materials

A. Mulch

1. As approved through the Development Permit review process.

2. Plant material located in rock mulch shall be selected from Ultra-Low and Low Water-Demand Plant Material lists.

B. Geotextile Landscape Fabric

1. Geotextile landscape fabric is required in all City maintained organic and inorganic mulched beds.

2. Planting beds mulched with inorganic material (rock, cobble, etc.) can include a porous geotextile fabric installed below the mulch covering. Landscape fabric is not recommended for placement under organic mulch materials.

C. Staking Materials

1. The practice of staking trees at planting is not required except for City owned and maintained property, but is strongly recommended in certain planting situations. Staking is recommended for evergreen trees, especially those greater than six (6) feet in height. Staking is also recommended for deciduous trees greater than two (2) inches in caliper, and any tree planted on slopes or in predominantly windy conditions. Staking is not recommended for ornamental trees, especially multi-stemmed ornamentals.

2. All newly planted trees are expected to be monitored and straightened promptly if they develop a lean, whether they are staked or not.

3. All trees that are staked shall be done so using Details 800-1 and 800-2 in these Standards and Specifications.

D. Plant Materials

1. Plant material shall conform to current standards of the American Association of Nurserymen as published in the current edition of “American Standard for Nursery Stock”.

2. All selected plant material shall be subject to review, revision and approval by the Senior Landscape Architect. No substitutions shall be made to plant material on the approved drawings without written permission from the Senior Landscape Architect.

3. To support the development of a healthy urban forest by providing tree diversity, and to prevent uniform insect or disease susceptibility associated with planting a single species, a variety of trees shall be selected for planting as follows:

a. For 10-19 trees in the site or corridor, maximum 25% is allowed of any one species.

b. For 20-39 trees in the site or corridor, maximum 20% is allowed of any one species.

c. For 40 and over trees in the site or corridor, maximum 15% is allowed of any one species.

4. Trees that exhibit signs of injury, girdling roots or crushed trunks or root balls shall not be accepted. All trees shall be well branched; trees of the same species planted in groups shall be well matched. Unless characteristic of a species, trees with co-dominant leaders shall not be accepted unless one leader can be eliminated at planting time without compromising the balance of the canopy.

5. Plant material shall be free of disease and insect infestation and have healthy buds. Evergreen foliage (needles) shall be abundant and have healthy and intense color. Deciduous trees exhibiting one-fourth (1/4) to one-third (1/3) of the canopy dead and/or that exhibit uncharacteristically short annual twig elongation shall not be accepted.

6. All trees for City owned and maintained projects and metropolitan district parks shall be inspected and tagged with a locking tree tag by the Senior Landscape Architect, at the nursery prior to delivery to the site. Trees delivered to the site without a City locking tree tag must be inspected, accepted, and tagged prior to planting.

7. All plant material shall conform to the measurements as noted on the plans approved in the development review process. All deciduous trees shall be a minimum two (2) inch caliper. Evergreen trees shall be a minimum of six (6) feet in height. Shrubs shall be completely rooted within containers.

E. Tree Wrap

Tree wrapping material shall be first quality, four (4) inch wide, bituminous impregnated tape, corrugated or crepe paper, brown in color, specifically manufactured for tree wrapping.

F. Edging Material

Planting bed edging materials shall be approved through the Development Permit review process and shall be commercial grade and durable with minimal visual impact (unless the visual impact of such material is an essential element of a pleasing design).

G. Fertilizer

1. Where shown to be needed by the soil analysis, fertilizer shall be added to all planted areas. The selection of fertilizer type, rate, and method of application shall be based on anticipated maximum effectiveness in aiding plant establishment. Nitrogen shall not be applied to trees prior to planting or through the warranty period without specific approval of the Senior Landscape Architect.

2. Keep fertilizer off hardscape areas and maintain a minimum 10 foot buffer zone between application area and surface water bodies.

807.3 Process

A. Location Staking

1. Landscape and utility plans shall be coordinated. The Responsible Party shall arrange to have the locations of all utility lines (including, but not limited to, water, sewer, gas, electrical, phone, cable television, and irrigation) marked to assure safety and protection.

2. Deciduous trees shall be planted a minimum six (6) feet from sidewalks and planting bed edge or centered in parkways that are six (6) feet and over in width. Evergreen trees shall be planted a minimum 10 feet from sidewalks or planting bed edges. Evergreen trees should be located a minimum 10 feet from edge of buildings; deciduous trees a minimum of six (6) feet. Shrubs should be planted a minimum four (4) feet from sidewalks, planting bed edges or edge of buildings or one-half (1.5) their mature width, whichever is greater. Spacing for plant placement shall be measured from the centerline of the plant.

3. On City maintained landscape areas and metropolitan district parks the Responsible Party shall stake the proposed locations of all trees and planting beds on-site for approval prior to planting.

B. Delivery/Handling

1. Plants shall be protected from the time of digging to the time of Initial Acceptance from mechanical injury, excessive drying or winds, improper ventilation, over watering, freezing, high temperatures, or any other condition damaging to the plant. Any plants showing evidence of poor care or which are molded, mildewed, excessively wilted, or dried shall be rejected.

2. Evergreen plants and deciduous plant material that is in leaf shall be covered with shade cloth during transportation. Plant material not protected during transportation may be rejected. Plant material shall be planted on the day of delivery, if possible. All plants not planted on the day of delivery shall be placed in a temporary nursery and heeled-in immediately with mulch, and kept moist.

3. Plants with root balls that are loose, cracked, broken, man-made, or completely dry or plants with trunks loose in the root ball before or during planting operations shall not be accepted. Trees with branches broken or trunks injured during transportation or planting may be rejected. Plants that are rejected on site shall be removed within 24 hours at the Responsible Party's expense.

C. Planting

1. Ball & Burlap Trees and Shrubs

a. The planting pit shall not be excavated until the tree is on site and the true height of the top of the root ball has been properly identified. This true height must be identified by probing the top of the root ball as it came from the nursery and finding the flare of the first order major root at the trunk/root interface. Remove any soil from the top of the root ball that is greater than one (1) inch above this true height point, as it is common for trees to come from the nursery with too much soil added above the root system. Pits shall have a flat bottom and be excavated to a depth of two (2) inches less than the measured true height of the root ball of deciduous trees, and three (3) inches less than the measured true height of the root ball of evergreen trees. Planting pits shall be excavated to a width that is at least twice the diameter of the root ball with sides that have a 1:1 slope; loosen the sides to avoid glazing. The use of mechanical augers to dig the planting pit is prohibited. The base of all root balls shall be placed on undisturbed soil. Plants shall be set in the center of the pit, plumb and straight. Trees that are not centered or planted plumb, or which have been mechanically straightened, shall be rejected. Trees that are planted too deeply due to a failure to identify the true height of the top of the root ball will also be rejected. Trees shall be watered in by hand with a hose during the backfill process. Do not wait until the tree is completely planted to begin watering, as the water will not reach the bottom depths of the rootball, or there is a chance that the entire pit will be filled with water, risking the drowning of the tree. No soil should be added to the top of the rootball, to prevent soil interface problems.

b. It is not anticipated that planting shall be done where the depth of soil over underground construction obstructions or rocks is insufficient to accommodate the roots or where pockets in rock or impervious soil will require drainage. If such conditions are encountered in excavation of planting areas, and if the stone, boulders, or other obstructions cannot be broken and removed by hand methods in the course of digging plant pits of the usual size, other locations for the planting may be designated. Removal of rock or other underground obstructions and relocation of plant materials shall be done only as directed by the Senior Landscape Architect.

c. For balled and burlapped plant materials, strive to remove the entire wire basket and all rope, twine, and burlap from the root ball and trunk. If there is any concern about the integrity of the rootball it is acceptable to leave the bottom 1/3 of the wire basket and burlap. Do not fold excess burlap into the backfill area. Place the removed wire basket, rope or twine and burlap next to each planted tree for inspection by the Senior Landscape Architect.

d. Trees planted in sod, turf, or grass require tree trunk protectors. At the time of planting, install a nine (9) inch tall, expandable tree trunk protector such as Arborgard+ or approved equal. This requirement is in addition to the mulch ring specified on the planting detail 800-1. Trees damaged by string trimmers or mowers during the warranty period will be required to be replaced.

2. Containerized Trees

All trees are required to be ball and burlapped. If container grown trees are approved by the Senior Landscape Architect through the Development Permit process or during the construction process, they are to be planted like a ball and burlapped tree with the following exception. Shave 1" off of the surface of the sides of the root mass vertically with a sharp saw or knife around the entire perimeter of the root mass immediately prior to planting.

3. Containerized Shrubs and Perennials

a. Plants in containers shall be removed from the container prior to planting. If the root system of a container grown plant has become root bound, shave ½" off of the sides and bottom of the root mass with a sharp saw or knife prior to planting. The outside edge of the rootball shall be loosened on all container plants to increase the spreading of roots. See Detail number 800-3 of these Standards and Specifications.

b. Container plants are expected to be planted straight, and no higher than the surrounding soil grade. Cover the rootball with backfill soil, but no more than one (1) inch deep, to prevent moisture wicking and to allow roots to grow into the surrounding soil. Mulch shall be graduated from a three (3) inch depth outside the rootball perimeter to one (1) inch or less over the rootball.

c. Backfill for planting pits shall consist of a thoroughly blended mix of 1/3 soil amendment and 2/3 material removed for planting. Shrub beds shall be amended throughout the entire bed prior to planting. All plants shall be kept plumb and straight as the pit is filled with backfill mix. Any plant which is not plumb prior to Final Acceptance shall be rejected.

d. Locking tree tags shall remain on the plants until the time of Final Acceptance on all City owned and maintained Development projects and metropolitan district park projects.

e. The top of all edging material shall set flush with the finish grade of adjacent lawn and ½ inch above top of mulch.

D. Pruning of New Plant Materials

All pruning shall conform to current International Society of Arboriculture practices. Only dead and broken branches shall be removed. For most tree species, a tree with one leader should have been selected from the nursery. If a newly planted tree does have co-dominant leaders, it shall be corrected by removing the weaker of the two co-dominant stems immediately. All pruning shall be done with clean, sharp tools. Branch bark ridges and branch collars must be left intact after the final cut is made. Neither flush cuts nor unsightly branch stubs shall be allowed.

E. Wrapping

No tree wrapping shall be permitted until the Senior Landscape Architect has inspected the tree. It is the responsibility of the Responsible Party to wrap deciduous trees during the warranty period. Trees shall be wrapped between October 15 and November 1 of the year they are planted. Wrapping shall begin at the base of the trunk working upward to the lowest lateral branch and overlapping tightly on each turn by at least ½ inch. Tree wrap shall be taped securely at the top and bottom of the tree. In no instance shall staples be used to secure tree wrap. Tree wrap shall be removed again the following spring.

F. Staking and Guying

Tree stakes shall be driven into stable ground and not into disturbed backfill. Two (2) stakes, oriented northwest/southeast, shall be used for two (2) inch caliper deciduous trees; three (3) evenly spaced stakes shall be used for evergreen trees and deciduous trees over three (3) inches in caliper. Secure trees to stakes using a properly sized nylon strap with metal grommets for attachment of wire between strap and stake. Straps shall be of sufficient length in relation to tree caliper so that grommets do not touch tree trunk.

G. Mulching

1. Immediately prior to plant bed mulching, obtain inspection and approval of planting bed irrigation system in operation. Bed areas shall be free from grass and weeds immediately prior to mulching.

2. Shredded wood mulch shall be installed per the planting details using landscape fabric underneath.

H. Winter Watering

1. Winter watering of deciduous and evergreen trees and other plant material shall be arranged and at the expense of the Responsible Party until such time as Final Acceptance is received. Winter watering generally means a deep soaking once a month when temperatures are above 40° F.

2. The Responsible Party shall water rights-of-way and median landscapes, in magnesium chloride stress areas, a minimum once in early spring to flush salts and other toxins off foliage and down through the soil below the root zone.

807.4 Protection, Maintenance, Acceptance, Guarantee, and Warranty

Refer to subsection 105.16 for Protection, Maintenance, Acceptance, and Guarantee, and Warranty procedures.

808 TREE PRUNING SPECIFICATIONS

A. All work shall be performed under the direct supervision of a qualified Arborist and shall be performed in accordance to ANSI A 300 standard practices. Branch bark ridges and branch collars must be left intact after the final cut is made. Neither flush cuts nor unsightly branch stubs shall be allowed.

B. Tree work shall be required when a tree poses a hazard to persons or property or when age, disease or mechanical injury have so impaired the tree's ability to survive that harm to persons or property appears imminent, as determined by the Senior Landscape Architect.

C. Trees shall generally be pruned in such a manner as to prevent branch or foliage interference with requirements of safe public passage. Over-street clearance shall be kept to a minimum of 14 feet above the paved surface of the street, and eight (8) feet over the surface of a public sidewalk or pedestrian path.

809 IRRIGATION SYSTEMS

809.1 General

All irrigation systems required for City maintained properties shall conform to approved construction drawings and these Standards and Specifications.

Private irrigation systems installed with or as part of a Development Project shall conform to approved construction drawings and Section 809.9 of these Standards and Specifications.

Installation work for all irrigation systems shall be performed in accordance with the best standards of practice relating to the various trades and by an ALCC Certified Landscape Technician who is capable of interpreting drawings and specifications. The Responsible Party shall notify the Senior Landscape Architect as soon as any discrepancies between plans and specifications are discovered. Omissions from the specifications or drawings, or any mis-descriptions of detail work which are absolutely necessary to carry out the intentions of the drawings or specifications, shall be executed by the Responsible Party as if fully set forth in the specifications and drawings.

809.2 Irrigation System Design

A. General Requirements

Irrigation systems shall be designed by an Irrigation Association Certified Irrigation Designer. Irrigation systems shall be designed using the Low HGL static pressure available for the site. Head-to-head coverage and matched precipitation rates are required. Systems shall be designed for optimum uniformity and for an average Scheduling Coefficient of no greater than 1.2. The use of “Kicker” heads is strongly discouraged and is restricted to 2% of the total used for that type of head on the entire site.

Irrigation systems shall be designed to deliver at least 1½ inches of weekly precipitation with each individual control zone operating only between the hours of 10 p.m. and 5 a.m. Unless specifically approved otherwise, planting beds shall be zoned and controlled separately from turf areas.

Locate irrigation point of connection and electrical components together in mulched beds, including the controller, master valve, flow sensor and backflow preventer. See Details 800-11A and 800-11B.

The following irrigation design information shall be provided prior to design approval:

1. Location, sizing, and materials descriptions of all system components, including service lines, water meters, delivery lines, RPZ backflow prevention devices, automatic controller(s) and wires, mainline and lateral piping, control valves, isolation valves, quick coupling valves, and sprinkler heads.

2. Location of plant material on the irrigation plan relative to the irrigation system.

3. Each control valve shall be labeled displaying valve size, total zone flow in GPM and an identification number and/or letter.

4. Friction Loss Worksheet proving that ample pressure is delivered to the last head of the worst case or most critical zone.

5. Seasonal Operating Schedule that proves that the system is capable of watering the landscape with 1.5” of water per week within the 49-hour watering window.

6. If requested, a water budget shall be provided showing total estimated gallons used per month.

B. Point of Connection (Tap, Service Line, Curb Stop and Irrigation Meter)

1. All taps, service lines and curb stop gate valves shall be 4" unless otherwise approved by the Senior Landscape Architect. Curb stop gate valve boxes shall be 10" Round Carson with PVC access sleeve, just like a regular gate valve, or approved equal. Curb stop gate valve boxes shall be located in turf or landscape beds. See Detail 800-11A and 800-11B

2. Copper and ductile iron irrigation service lines shall be sized for maximum water velocities of seven and a half (7.5) feet per second. PVC and polyethylene mainlines and lateral lines shall be sized for maximum water velocity of five (5) feet per second.

3. All water taps, meters, and backflow prevention units shall be approved by the Senior Landscape Architect and installed in accordance with all pertinent City and State regulations and these Standards and Specifications. The service line is likely to be a different size than the water meter. Service line size transitions shall occur outside of the meter pit/vault. See Details 800-9. 800-10A, 800-10B and 800-10C.

4. Water meters shall be sized for maximum continuous flow and based on total irrigated area assuming a peak Irrigation Water Requirement of 4.29 gallons/square foot according to the following chart. The Irrigation Water Requirement and maximum irrigated area have been calculated using an assumed Irrigation Efficiency of 0.775 and a Landscape Coefficient of 0.9. The corresponding required service line size reflects a maximum velocity of 7.5 feet per second at the maximum continuous flow of the meter.

TABLE 800-1
METER SIZING

Meter Size	Maximum Continuous Meter Flow (Gallons per Minute)	Required Service Line Size @ Maximum Continuous Meter Flow	Maximum Meter Flow in 48-Hour/Week Watering Window	Maximum Irrigated Area	
				Acres	SF
⅝"x¾"	15	4" DIP or C900 PVC	189,000	1.01	44,090
¾"	25	4" DIP or C900 PVC	315000	1.69	73,483
1"	50	4" DIP or C900 PVC	630,000	3.37	146,966
1 ½"	80	4" DIP or C900 PVC	1,008,000	5.40	235,146
2" turbo	200	4" DIP or C900 PVC	2,520,000	13.50	587,865
3" turbo	450	6" DIP or C900 PVC	5,670,000	30.36	1,322,696
4" turbo	800	8" DIP or 10" C900 PVC	10,080,000	53.98	2,351,459
6" turbo	1000	10" DIP or C900 PVC	12,600,000	67.48	2,939,324

C. Backflow Prevention Device

The backflow prevention device shall be a Reduced Pressure Zone Assembly. The Febco 825 Y or YA model shall be used for all two (2) inch and smaller applications, and the Febco 880V shall be used for all applications greater than two (2) inch or approved equivalents. The backflow prevention device shall be protected by a Strongbox® Smooth-Touch enclosure by V.I.T. Products, Inc. or approved equivalent. The main housing shall be mounted on a stainless steel frame secured to a concrete pad. Provide sleeving through concrete pad. Locking mechanism shall be full release type that allows removal of the entire housing from its base without the use of tools. The handle controlling the locking mechanism shall be concealed within the surface of the housing and shall provide for either a single or dual padlock system. The inlet pipe entering the backflow unit shall be winterized by eliminating the remaining water from the winterization pipe. See Details 800-11A and 800-11B.

D. Booster Pump

When hydraulic analysis indicates that a booster pump is required, it shall be a Rain Bird CRE Series pump or approved equivalent, with magnetic starter, heater, and pump bypass piping and approved by the Development Engineering Manager prior to installation. The pump and ancillary equipment shall be enclosed in a ventilated, weather resistant, locking pump house with concrete floor. Provide sleeves through concrete pad.

E. Pipe and Fittings

1. Pipe shall be continuously and permanently marked showing the manufacturer's name, the size, and the class of the pipe. All pipe shall conform to the requirements of ASTM-D-2241. Provide a minimum six (6) inch clearance between pipe trenches.

2. Mainline pipe shall be Class 315 PVC. Use of 90 degree ells on mainline is prohibited. Use ring-tight, rubber-gasketed pipe and Leemco restrained fittings for mainline pipe two (2) or greater in size.

3. On systems where the service connection is one and one-half (1.5) inch or larger, lateral lines for rotary and spray zones shall be Class 200 PVC. The minimum allowed lateral pipe size is three-fourths (¾) inch. On systems where the service connection is one (1) inch or smaller, lateral lines for rotary and spray zones shall be either 1) Eagle 'Green Stripe' 80# polyethylene lifetime warranty pipe or approved equivalent; 2) 100# NSF polyethylene pipe, or 3) Class 200 PVC. All rotor and spray zone lateral piping shall be of the same material throughout the system.

4. Fittings for PVC pipe shall be solvent weld Schedule 40 PVC, or threaded Schedule 80 PVC. Fittings for polyethylene pipe shall be ASTM D2466 insert pipe fittings with stainless steel hose clamps with stainless steel screws.

5. PVC repair couplings shall be Slip-Fix® by Nibco or approved equivalent sized to pipe. No compression fittings will be allowed. No repair couplings will be allowed within five (5) feet from other fittings or control valves.

6. Piping from lateral lines to irrigation heads shall be connected by one (1) inch pre-manufactured, PVC swing joints for all Rain Bird 8005 rotors, and by flexible "funny" pipe for all Rain Bird 5505 rotors and 1800 Series pop-up spray heads.

7. Responsible Party shall use purple primer and then Weld-On 711 or equivalent solvent to make solvent-welded joints. The pipe and fittings shall be thoroughly cleaned and otherwise prepared before applying solvent. The manufacturer's recommendations and the best practices of the industry shall be followed when making any pipe connections.

8. The Responsible Party shall inspect the pipe and fittings carefully to assure conformance with the standards as outlined in these Standards and Specifications. Fittings and piping that do not have a friction fit before the pipe "bottoms" into the fitting shall NOT be accepted under the terms of the Responsible Party's work. Rejected pipe and fittings shall be removed from the site daily to prevent use of this material at another location on the work site.

F. Quick Coupler Valves

Quick coupler valves shall be Buckner QB44LCAR10 or equivalent, having a brass two (2) piece body designed for a working pressure of 150 psi, operable with a quick coupler key. The quick coupler valve shall be connected to the mainline using a pre-manufactured PVC swing joint and shall be equipped with a rubber cover and solid brass body with anti-rotation stabilizing wings. All Quick Coupler Valves shall be located in an approved heavy-duty Carson 10 inch round valve box or approved equivalent. Key size and type shall be shown on plans. Quick coupler valves shall be located a minimum of every 300 feet along the mainline, immediately following the Point of Connection components, and anywhere else specified on the approved plans.

G. Master Valve and Flow Sensor

1. On systems that require the Signature Constellation controller (see section 809.2.K.1), use the Netafim Hydrometer, which is a combination master valve and flow sensor, or approved equal. Place it above ground and within the same enclosure as the backflow prevention device. See Detail 800-11A and 800-11B.

2. On systems that require the Rain Master Eagle controller (see section 809.2.K.1), use the Toro 220 Brass Series globe valve as a master valve with a Data Industrial flow sensor or approved equal. Place this master valve underground and in a super jumbo valve box in the same manner as you would an automatic control valve. See Detail 800-8. The flow sensor shall be the same size as the mainline and shall access it per manufacturer's specifications using a tee specifically made for housing the sensor. The flow sensor shall reside within close proximity to the controller and be placed in a super jumbo valve box just as an automatic control valve would be.

H. Automatic Control Valves

All zone valves shall be Toro 220 Brass Series globe valves and shall be operated by the Spike Guard™ 24-VAC solenoid, and be equipped with the EZR-100 EZReg pressure regulator; this is specified as model number 220-27-0-x or approved equivalent. There shall be a union installed both immediately before and after the valve. A Schedule 80 PVC manual ball valve shall be installed within the valve box upstream of the zone valve immediately before the first union. Provide four (4) inches of clearance between ball valve and valve box. All piping, fittings, unions and ball valves shall be the same size as the zone valve. See Detail 800-8.

I. Isolation Valves

1. Install Leemco LMV Mainline Gate Valves at both sides of sleeving for streets along the main line, at mainline intersections, and as otherwise shown on the approved plans.

2. Also place a line-sized PVC ball valve in each valve box directly upstream of each control valve. See Detail 800-8.

J. Valve Boxes

1. All valves shall be installed in Carson valve boxes, or approved equal. All valve boxes shall be supported by a three (3) inch layer base of compacted three-fourths (¾) inch crushed granite that extends six (6) inches outward from all edges of the bottom of the box.

2. Spray and rotor zone control valves shall be installed in Carson 1324-15-3L, extra deep Super Jumbo Series, 23" x 32" x 15" rectangular boxes. A maximum of one (1) valve shall be installed per box. See Detail 800-8.

3. Quick coupling valves shall be installed individually in a 10 inch round box. Isolation gate valves shall also be installed in a 10 inch round box with appropriately sized vertical sleeving. All electrical wire splices shall be made with approved water-proof connectors, and placed in an appropriately labeled 10 inch round box with expansion loops.

4. All valve boxes shall be labeled by the Responsible Party. Control valves, gate valves, and quick coupling valves shall be labeled CV, GV, and QC respectively. CV designations shall be followed by the control valve number(s), e.g. 'CV 5'. Label electrical splices with ES. Valve box lids shall be labeled with a branding iron.

K. Irrigation Heads

1. Irrigation heads shall be spaced such that they provide a minimum of head-to-head coverage for the nozzle selected at the pressure required. Kicker heads shall not be used; head spacing shall be adjusted to eliminate the need for kickers.

2. In turf areas 30 feet or wider use Rain Bird 5505 and 8005 series rotor heads. In turf areas smaller than 30 feet use Rain Bird RD 1806 heads (RD-06-S-P30-F) with Rain Bird U-Series nozzles.. Irrigation heads shall be installed for head-to-head coverage and matched precipitation nozzling.

   a. Always use the head's bottom inlet; never use automatic drains.

   b. Use Rain Bird RD 1812 heads (RD-12-S-P45-F) for the irrigation of all medians with a planted area of 15' or less, or approved equal. Check with the Senior Landscape Architect for the best nozzle to use on a case by case basis.

3. Design Sports Fields with the Rain Bird 8005 head at a minimum of 60 psi operating pressure. Use the #12 nozzle and a head spacing of 55 feet.

4. All irrigation heads shall have check valves to avoid low head drainage. If necessary on steep slopes, stronger check valves shall be installed in the lateral line to prevent low head drainage. Ideal pressure for each zone with its type of head shall be set using an EZ Reg adjustable pressure regulator at the Toro 220 automatic control valve.
5. Pressure at the base of all heads within a single zone shall not vary more than 10%. The system shall be designed in such a manner that the following minimum pressures are delivered to each head, including the most critical, worst case zone: 60 psi for Rain Bird 8005's, 50 psi for Rain Bird 5505's and 30 psi for Rain Bird RD 1806's with U-Series nozzles.

L. Controllers

1. For all projects greater than 36 zones use the Signature Constellation Series CON/SHTS1/CP---/S/O irrigation controller with steel pedestal, spread spectrum radio adder and premium surge protection, or approved equivalent. For systems with 36 zones or less use the Rain Master Eagle-i RME-XXEGi-SPED controller with cellular modem or approved equal. Depending on the project hydraulics, the Senior Landscape Architect reserves the right to require the Constellation controller when there are fewer than 36 zones.

2. The power supply (120V) for all irrigation controllers shall be routed through a fused UL listed service disconnect panel and 110/120V AC power line suppressor.

3. Provide an eight (8) foot copper-clad grounding rod at controller location. A rain sensor shall be connected to the controller as shown in the rain sensor. The Senior Landscape Architect shall approve all features.

4. Controllers shall be located in a landscape bed and adjacent to the irrigation pump and electrical meter pedestal. All electrical components, including the pump if required, shall not be sprayed on by the irrigation system. Design the system to eliminate overspray onto these components.

M. Electrical Wire (24 Volt)

1. All electrical splices and conductor connections shall be made with a waterproof 3M DBY or DBR connector, or approved equivalent. Do not directly bury connections or splices; they shall reside in a valve box or a labeled splice box.

2. The control wire shall be a minimum of 14-gauge UF listed, AWG, direct burial solid copper wire with the insulation being a consistent color throughout the entire length of the wire. Larger gauge control wire shall be provided when lengths require.

3. Control wire insulation shall be a solid color red; common wire insulation shall be white.

4. Three (3) extra black insulated wires shall be looped through each valve box and provided to the farthest valve on each mainline branch.

5. Tracer Wire
Install one (1) 14-gauge UF single strand, direct burial solid copper wire with yellow insulation in all trenches containing irrigation piping (mainline and laterals). The purpose of this wire is for locating all underground piping. The lateral tracer wire end shall be accessible at each zone valve box.

N. Sleeving

1. Install separate sleeve beneath hardscape areas to route each run of irrigation pipe or wiring bundle. Extend sleeve ends six (6) inches beyond edge of all paved surfaces. Install isolation valves on both sides of sleeves that convey irrigation water. Bore for sleeves under obstructions that cannot be removed. Mark all sleeves with an 'X' chiseled in hardscape directly over sleeve location.

2. Sleeving material shall be PVC Class 200 pipe with solvent welded joints. Diameter shall be as indicated on the drawings and installation details or equal to a minimum of twice that of the pipe or wiring bundle.

O. Drip Control Zone Assemblies

Drip assemblies are prohibited from use on City owned and maintained landscapes, including medians and parking lot islands.

809.3 Site Conditions/"As-Builts"

A. The Responsible Party shall coordinate the work with that of other trades wherever possible to prevent conflicts and future site disruption. Before starting work, the Responsible Party shall inspect the site and check all existing conditions to ensure that the work may safely proceed. Before proceeding with any work, the Responsible Party shall carefully check and verify all dimensions as shown on the approved plans.

B. Changes or alterations in the system to meet site conditions shall be made at the Responsible Party's expense. If any work is installed in locations other than those shown in the accompanying irrigation plan, the Responsible Party shall show on the as-built plans the exact location of those changes. Exact measurements of buried valves and wire locations shall be shown. Hand-written changes to the plans will not be accepted; the changes to the original CD's must be made using CAD.

C. The Responsible Party shall present the as-built plans as a PDF file via email or on a compact disk at the time of Initial Acceptance.

D. The Responsible Party shall be responsible for all costs incurred for supplying the electrical needs required for the job. The electrical meter pedestal shall be located in the same landscape bed as the irrigation pump and controller. The appropriate electric company should be contacted for information on possible electrical sources.

809.4 Excavation

A. Pipe shall be installed in a trench. Trenches shall be dug true to the alignment shown on the approved plans. Excavation of the trenches shall be done in a workman-like manner, resulting in a trench that is straight and true with a flat bottom and containing no rocks or other deleterious material that may damage the pipe.

B No trench shall be left open overnight without specific prior written approval by the Senior Landscape Architect. Sufficient barricades to protect the public shall be provided at all times, as needed.

809.5. Process

A. Verify available static water pressure at the point of connection, ensuring that it matches the design pressure identified in the plans.

B. Prior to excavating or trenching, the Responsible Party shall stake out the irrigation system including sprinklers, sleeving, mainline and lateral lines, valves, and controller. Stake out or flag all proposed and existing utilities. Stakes or flags shall be color-coded for materials and shall be maintained throughout the irrigation installation process.

C. Separate trenches shall be dug for each line; no doubling up of lines in a single trench shall be allowed. Trenches shall be of sufficient depth to allow the following cover over the top of the pipe:

Lines	Minimum Cover to Top of Pipe
Laterals	14 inches
Mainline	18 inches

D. Gasketed mainline pipe three (3) inches or greater in size shall be mechanically restrained with Leemco, Piping Solutions ductile iron self-restrained fittings with fusion bonded epoxy coating or approved equal.

E. Control valves shall be installed with the top of the valve stem three(3) inches below grade and covered by a valve box with the lid set at the finished grade. All zone valves shall be placed in valve boxes. The bottom of valve boxes shall be lined with a geotextile fabric and a layer of three (3) inches of three-fourths (¾) inch crushed granite shall be placed on top of the fabric. A service loop of both common and zone wire, twice the depth of the buried wire, shall be coiled and placed inside the valve box. Where connecting to the valve, a wire coil shall be made by tightly wrapping the control wire around a one-half (½) inch piece of pipe, then removing the pipe and placing the coil inside the valve box. The bottom of the control valve shall be four 4) inches above the granite in the bottom of the valve box.

F. Whenever possible, the electrical valve control wires shall be buried under and to one side of the mainline. Where more than one (1) wire is placed in a trench, the wires shall be bundled together at 10 foot intervals. Only 3M DBY connectors or approved equivalent shall be used in making wire connections; all connectors must be within a valve box. All wire shall be kept deep enough to maintain a minimum cover of 24 inches when not along the mainline and shall have a yellow, six (6) inch wide warning tape placed 12 inches above all wiring.

G. Provide minimum wire loop of 24 inches at each valve box and controller, at each change of direction greater than 90°, at both ends of sleeves, and at 100-foot intervals along continuous runs of wire.

H Install a common wire and one (1) control wire for each remote control valve. Multiple valves on a single control wire are not permitted.

I. All trenches shall be inspected prior to backfilling.

J. All backfill material shall be free of rocks and soil clods one (1) inch in diameter and larger. Backfill material shall be compacted to 90% standard proctor density.

K. Backfill shall be tamped under the irrigation head flange and around the head for a distance of one (1) foot by a suitable means.

L. Prior to head installation, all pipelines shall be flushed with water. Install heads of matched precipitation rates being careful not to get dirty water or debris in the riser and flush again prior to nozzle installation. All sprinklers shall be checked for the proper operation and proper alignment for direction of throw.

M. Locate rotary sprinklers six (6) inches and overhead spray sprinklers three (3) inches from adjacent walls, fences, or edges of paved areas.

N. After the system is thoroughly flushed and ready for operation, each zone of sprinklers must be tested to insure proper operating pressure at the farthest head on the zone (refer to Subsection 809.6 D).

O. Design plans, including specifications and details, shall be approved, and a pre-construction meeting held, prior to the commencement of any irrigation work.

1. Surplus material resulting from the Responsible Party's work shall be removed from the site by the Responsible Party. During the work, the Responsible Party shall keep the site as clean and free of rubbish as possible.

2. The Responsible Party shall guarantee all material and workmanship for a minimum period of one (1) year commencing with the date of Initial Acceptance.

P. Work shall include all labor, materials, equipment, and appliances as required to complete the irrigation system as indicated on the approved irrigation plan and as herein specified. The work shall comply with all City Codes. The Responsible Party shall apply for all necessary permits as required by the City prior to the beginning of any work. There shall be a pre-construction conference prior to the beginning of any work or the ordering of any materials. All existing utilities shall be located before any excavation work is started.

The Responsible Party shall furnish the City with:

1. Two (2) quick coupler keys and hose swivels

2. Two (2) drain valve keys

3. Two (2) manual valve keys

4. Two (2) control clock keys

5. Warranty cards on irrigation controller

6. Equipment manual on booster pumps

7. Color coded, laminated, reduced copy of the irrigation system as-built for irrigation controller, sized to fit inside controller cabinet

809.6 Inspections

Refer to Subsection 105.12 of these Standards and Specifications.

A. Irrigation Location Staking

The staked locations of all lines and heads shall be inspected for conformance to the approved plans and these Standards and Specifications. The Senior Landscape Architect reserves the right to move, shift, and adjust any of the stakes, with the designer's concurrence, to better achieve the design intentions as shown on the approved plans. No trenching shall be done until the inspection is complete and the staked locations are approved.

B. Mainline Pressure Test Inspection

The depth of all joints, stop and waste valves, manual drain valves, sumps, control valves, and solvent welds shall be inspected for conformance to the drawings and these Standards and Specifications before they are buried. A pressure test shall be conducted at 120 psi or 40 psi over static pressure, whichever is greater, for a period of two (2) hours to ensure that the system is watertight.

C. Wiring Inspection

Once the wiring has been installed, it shall be inspected for conformance to the approved plans and these Standards and Specifications. No partial acceptance shall be made.

D. Coverage and Pressure Test

After the irrigation heads have been installed and backfilling operations are complete, the Responsible Party, in the presence of the Senior Landscape Architect, shall perform a coverage test to ensure that there is complete and uniform coverage. No partial acceptance regarding coverage or pressure test shall be made. Coverage shall be 'head-to-head' for all spray and rotor heads.

809.7 Drought Management Irrigation Guidelines

A. Use evapotranspiration and precipitation data to schedule irrigation by hydrozone, and according to soil type and plant material root depth. Seasonally adjust the irrigation schedule to maximize water conservation.

B. Water infrequently but deeply using the cycle and soak method.

C. Under severe drought conditions, consider allowing Kentucky Bluegrass lawns to go summer dormant to conserve water.

809.8. Private Irrigation Systems

A. Private irrigation systems shall be designed by an Irrigation Association Certified Irrigation Designer. "Design-Build" irrigation systems will not be accepted. Head-to-head coverage is required; and the use of "kicker" heads is restricted to two (2) % of the total of that type of head used on the site.

B. Systems must be designed with a fast acting rain sensor such as Hunter Rain-clik or approved equal, master valve, pressure regulation and check valves as needed to minimize the most common causes of water waste. The use of smart/ET controllers, weather stations and/or moisture sensors, and high uniformity emission devices like MP Rotators and in-line drip irrigation is encouraged.

C. The following irrigation system design information shall be provided with the approved construction drawings, or as stand alone Irrigation Plans, after the landscape plans have been approved or are near approval as part of the Development Permit process:

1. Friction loss worksheet proving adequate operating pressure is supplied to the last head of the most critical zone at design capacity. State the design capacity (maximum flow). Identify this zone on the worksheet by its designated letter or number.

2. Use available static pressure at the point of connection as calculated using the low hydraulic grade level for that portion of the City water zone.

3. Point of connection (POC) information including water meter, service line, and backflow prevention device sizes and locations. Water meters shall be sized for maximum continuous flow and based on total irrigated area assuming a moderate peak Irrigation Water Requirement of 3.37 gallons/square foot according to the following chart. The Irrigation Water Requirement and maximum irrigated area have been calculated using an assumed Irrigation Efficiency of 0.775 and a Landscape Coefficient of 0.73 (14.99 gallons/square foot per year). The corresponding required service line size reflects a maximum velocity of 7.5 feet per second at the maximum continuous flow of the meter, with four (4) inches being the minimum size allowed unless otherwise approved by the Senior Landscape Architect through the plan approval process.

TABLE 800-2
PRIVATE IRRIGATION METER SIZING

Meter Size	Maximum Continuous Meter Flow (Gallons per Minute)	Required Service Line Size @ Maximum Continuous Meter Flow	Monthly Water Allowance	Maximum Irrigated Area	
				Acres	SF
⅝" x ¾"	15	4" DIP or C900 PVC	142,000	.97	42,136
¾"	25	4" DIP or C900 PVC	200,000	1.36	59,347
1"	50	4" DIP or C900 PVC	259,000	1.76	76,855
1 ½"	80	4" DIP or C900 PVC	502,000	3.42	148,961
2" t	200	4" DIP or C900 PVC	715,000	4.87	212,166
3" t	450	6" DIP or C900 PVC	1,771,000	12.06	525,519
4" t	800	8" DIP or 10" C900 PVC	1,819,000	12.39	539,763
6" t	1000	10"DIP or C900 PVC	4,000,000	27.25	1,186,944

4. The order of POC components are displayed as shown in Detail 800-11A & 11B. The order of the most common POC scenarios is: service line, curb stop, water meter, isolation valve, reduced pressure zone backflow assembly, master valve, quick coupler valve.

5. The spot elevation at the point of connection. Show proposed grade lines grayed back significantly, and identified every five (5) feet.

6. A legend with all components listed with their size, brand, model number and any other pertinent information. Choose symbols to represent components and show them on the legend as well as the plan.

7. The details of all components as necessary to communicate installation instructions to the irrigation contractor. City of Thornton water meter and POC detail are required; choose the appropriate detail at the end of Section 800 of these Standards and Specifications.

8. A note shall be provided stating that the system is designed to meet a three (3) day per week watering schedule operating between 6:00 PM and 10:00 AM at the design capacity.

9. Irrigation system designs for single family home typicals shall be approved through the Development Permit approval process.

10. Private irrigation systems shall be installed per approved plans, and any changes must be approved and then documented on As-Builts.

11. Specific hydraulic information must be provided for every drip irrigation zone in like manner as any other zone. Simply labeling zones as "drip" is not sufficient.

12. All irrigation backflow prevention devices shall be safeguarded from theft by using a locking enclosure or other approved locking device.

13. All private irrigation systems installed with or as part of a Development Project shall be inspected by the Senior Landscape Architect following installation and prior to the issuance of the Certificate of Occupancy. At the inspection, the Senior Landscape Architect shall be supplied with a set of accurate and complete As-Builts. Another set of As-Builts must be placed in or near the controller cabinet. The controller shall be programmed accurately considering site soil properties, zone precipitation rate, and zone distribution uniformity for each zone. A seasonal irrigation schedule outlining monthly water requirement changes by % shall be placed in or near the controller cabinet. Final inspection will be performed using the following checklist, verifying:

    a. sprinkler coverage, and dynamic pressure if necessary.
    b. that components used match the approved plans.
    c. that the quick acting rain sensor is installed and functional.
    d. As-Built plan completeness.
    e. that a copy of As-Built plans has been placed in or near the controller.
    f. correct controller programming.
    g. seasonal irrigation schedule calculation accuracy.
    h. that the seasonal irrigation schedule is posted in or near the controller.

810 PARKS & OPEN SPACE AREAS AND RECREATION FACILITIES

810.1 General

A. The design of all parks and open space areas and recreational facilities including but not limited to, athletic fields, swimming pools, tennis courts and other hardscape recreational areas and playgrounds shall be reviewed and approved by the Senior Landscape Architect on a case-by-case basis. Construction shall not begin without an approved construction plan.

B. All parks and open space areas shall be designed to blend with adjacent areas and, to the degree possible, shall be organized as a continuation of existing or proposed landscape areas.

C. Adequate bicycle parking at activity generators shall be installed as appropriate.

D. City properties shall include signage with a minimum five (5) foot clear zone from pedestrian areas. Other site furnishings shall be required including benches, trail lighting, trash receptacles, dog waste stations, and other furnishings.

E. Any outdoor steps proposed on parks and open space properties shall be designed in accordance with the International Building Code as adopted by the City.

F. All site furniture shall have a powder coated paint finish.

G. All site furniture for City owned and maintained parks shall be installed with in-ground mounts.

H. As much as possible park perimeters shall be bordered by streets and have attached, eight (8) foot wide sidewalks unless otherwise determined through the development process.

810.2 Playgrounds

A. All playgrounds shall comply with the Consumer Product Safety Commission Technical Guidelines for equipment, surfacing, and area requirements. All playgrounds shall comply with all applicable standards to include the ASTM standards for equipment and surfacing and shall comply with ADA guidelines where applicable. All playground equipment shall comply with all guidelines found within the list provided as well as all other guidelines produced by CPSC, ASTM, and ADA. The Responsible Party is to verify that all statements contained within the list are accurate and current.

B. Guarantee

The Responsible Party shall guarantee the work against defective materials or faulty workmanship for a period of one (1) year from the date of Initial Acceptance. All equipment warranties accompanying any equipment shall be submitted to the City.

C. Playground Site Preparation

1. Description of Work
   The contract work to be performed under this section consists of furnishing all required labor, materials, equipment, implements, parts and supplies necessary for, or appurtenant to, the site preparation and grading of playgrounds in accordance with these Standards and Specifications.

2. General Site Layout
   Per approved construction drawings.

3. Materials
   a. Subgrade Materials
      After topsoil has been stripped, the existing subgrade material may be used unless aggregate fill is called for on the approved construction drawings.

   b. Execution

D. Playground Drainage Systems

1. Description of Work

   a. The work to be performed under this section consists of furnishing all required labor, materials, equipment, implements, parts and supplies necessary for, or appurtenant to, the construction of the subsurface drainage systems required.

   b. Playground areas shall be provided with a subsurface drainage system sufficient to adequately drain the playground area. Provide a cleanout in a 10 inch round Carson valve box outside of playground area. Playground drains shall be conveyed to storm drainage systems or shall be suitably day-lighted in a non-obtrusive area, away from playfields to a planting bed, as possible. Install protective concrete daylight collar as necessary.

2. Materials

   a. Subsurface Drainage Pipe. Four (4) inch diameter perforated corrugated polyethylene drainpipe shall be installed within play lot confines. Non-perforated Class 200 PVC or smooth interior/corrugated exterior polyethylene pipe shall be installed outside of play lot confines as needed to daylight drainage pipe. No filter fabric shall be allowed on perforated pipe.

   b. Subsurface Drainage Pipe Backfill. Backfill shall be three-eighths (3/8) inch clean, washed pea gravel, with a minimum four (4) inch depth around and over drainage pipe.

   c. Drains shall have a clean out and shall have piping to daylight, or to another piped drainage outlet.

3. Execution

   a. The site preparation shall be done to provide positive drainage away from playground areas, and if needed, to provide intercepting landscaped swales to prevent drainage into the playground areas.

   b. Subsurface drainage pipe shall be oriented diagonally to prevailing slope of play lot subgrades, and shall be spaced to allow water to move laterally along subgrade a maximum of 20 feet before being intercepted by a drainpipe. Locate drainage pipe to avoid interference with play equipment. Drainage pipe layout shall be field adjusted as needed to best accommodate play equipment layout and for best interception of water.

   c. Install drainage pipe in minimum eight (8) inch wide by 10 inch deep trenches. The underdrain trench shall be encased with a non-woven filter fabric. Trench depth may vary greater than 10 inches as needed for minimum pipe gradients. Minimum drainage pipe and trench gradients shall be 0.5%. Backfill trenches with three-eighths (3/8) to one (1) inch pea gravel. Drainage pipe shall be encased with a minimum four (4) inch layer of pea gravel on both sides and bottom, with minimum four (4) inch pea gravel cover on top.

E. Playground Loose-fill Surfacing

1. Description of Work

   a. The Responsible Party shall install loose-fill surfacing in playgrounds and other outdoor applications where safety surfacing is required.

   b. The contract work to be performed under this specification consists of furnishing all of the required labor, materials, equipment, implements, parts and supplies necessary for, or appurtenant to, the installation of the loose-fill surfacing material within the interior of the playground curb.

2. Materials

   Loose-fill material for all playgrounds shall consist of Fibar material or equal, to meet CPSC guidelines. Material depths shall meet critical height requirements as set forth by ASTM, ADA, and CPSC after compaction.

3. Execution

   Depths shall be a minimum 12 inches unless otherwise indicated on approved construction drawings, and may vary due to varying height of any play equipment installed. The Responsible Party shall be responsible for the verification of depths depicted within any stamped construction plans to conform to the critical height criteria prior to the installation of any loose-fill material. All areas within the vertical curb shall conform to critical height criteria, as required by the referenced publications, with no exceptions. The Responsible Party shall submit a sample of the loose fill material to be used for approval prior to installation. The Responsible Party shall verify the required depth one (1) to two (2) months after installation. If material has settled, the 12 inch depth shall be re-established.

F. Resilient Cast-In-Place Playground Surfacing
The Responsible Party shall install cast-in-place surfacing in playgrounds and other outdoor applications where safety surfacing is required.

1. Description of Work

   a. General

      The work to be performed under this section of these Standards and Specifications consists of furnishing all of the required labor, materials, equipment, implements, parts and supplies necessary for, or appurtenant to, the installation of resilient safety surfacing for the accessible areas of the playground surface.

   b. Weather Limitations

      Surfacing shall be adhered to cured and stable concrete or aggregate base, as detailed on the approved plans, when surface temperatures are above 40° F. Do not install when surface temperature has been below 40° F for 12 hours before application. Do not apply when base contains excess moisture.

   c. Grade and Horizontal Control

      Establish and maintain required lines and elevations. Concrete shall slope to provide positive drainage at a minimum of one (1) inch per 10 feet and shall not pond water at any locations. If surfacing is to be laid on an aggregate base, provide subsurface drainage where shown on approved plans.

2. Materials

   a. Submittals
      Submit manufacturer's product and supporting data certifying that each material component complies with or exceeds the specified requirements prior to the beginning of any work in the following form:

      i. Manufacturer's sales brochures marked to annotate the specific product to be utilized.

      ii. Test data conforming to ASTM-F1292 at 30° F, 72° F, and 120° F for no less than the height specified on the approved drawings certified by a recognized independent testing laboratory within the past 12 months.

      iii. Statement of compliance with volatile emission regulations for all components, including adhesive systems or binders.

iv. Guarantee and warranty for no less than one (1) year. Two (2) representative samples and the recommended manufacturer's installation instructions shall be submitted.

b. Base

The concrete base shall consist of six (6) inch concrete slab with fiber mesh reinforcement. Concrete shall be placed on top of subgrade compacted to a minimum of 95% standard proctor density. Concrete shall meet the criteria as set forth in Section 600 of these Standards and Specifications.

c. Cast-In-Place Surface

The surface shall be manufactured on-site from UV stabilized polyurethane and rubber granules, no less than the specified thickness. Product components shall conform to the following physical test data:

i. Polyurethane Binders

One component, solvent free pre-polymer, methylene dephenyl iscyanate (MDI) type, and shall not incorporate any heavy metals.

(1) NCO content - no less than 10%
(2) Tensile strength > 1,850 PSI (ASTM D-412)
(3) Elongation > 450% (ASTM D-412)

ii. Base Course Rubber

100% recycled SBR black rubber, free of all dust and extraneous fiber, metal, and similar substances. Foam rubber fillers are not acceptable.

iii. Top Course Rubber 100% new EDPM rubber, peroxide cured, UV stabilized, size one (1) to three (3) millimeters.

iv. Minimum Performance Standards

In addition to meeting CPSC recommendations for critical full fall heights, the wearing course of all play surfaces shall possess the following minimum characteristics:

(1) Shore A > 50; < 70
(2) Elongation >100%
(3) Tear > 35%
(4) Abrasion Loss < 1.75 gm/200 cubic yards

v. Color

The Responsible Party shall provide color(s), as specified on the stamped construction plans, which may vary by area.

3. Execution

a. Surface Preparation

i. Concrete Base

Concrete shall have obtained a minimum of 80% of the required structural strength prior to placement of the surfacing. Cleaning of the concrete surface shall be completed prior to placement of the surfacing. Any surface irregularities greater than one-half (½) inch in 12 inches are to be filled with an approved structural bonding type filler prior to placement of surfacing.

ii. The Responsible Party shall request inspection prior to placement of any surfacing and shall be responsible for correction on any noted deficiencies prior to placement of any surfacing.

b. Layout

The Responsible Party shall plan the layout and placement of varying thickness zones by string lines, chalk lines, and grade stakes to provide reference points throughout the installation process.

c. Installation of Surfacing

i. The Responsible Party shall ensure that the sub base is clean, dry, and ready to accept wet mix. All components shall be pre-measured by individual weight to achieve consistency by high quality control during installation. All components shall be mixed in a clean, approved mixer taking care not to over mix or permit pre-cure. The mix cycle shall uniformly coat all rubber particles in batches that can be transported and placed without delays.

ii. The entire area shall be primed with a polyurethane binder at a rate of not less than .15 pounds per square yard, if site conditions warrant. A minimum of 15 minutes of cure time shall be allowed before base course application.

iii. The base course shall be placed in one or more lifts to achieve the specified attenuation values. Cold joints shall be primed but should not be over-worked in a manner that might create hard spots and/or joints. Raking and hand troweling shall be done to provide an even, uniform surface. The base course of surfacing shall not be compacted.

iv. After cure of the base course, the top EPDM course shall be screened and hand troweled to a smooth, uniform, seamless surface, of the minimum specified thickness.

d. Protection and Curing

The Responsible Party shall ensure that the surfacing is protected from all types of vehicle, equipment, and foot traffic and vandalism until the surfacing material is completely cured.

G. Playground Vertical Curb

1. Description of Work

The contract work to be performed under this section consists of furnishing all required labor, materials, equipment, implements, parts and supplies necessary for, or appurtenant to, the construction of a concrete vertical curb surrounding each playground.

2. Materials

Vertical curbs shall be constructed of concrete reinforced with Number Four (4) rebar spaced at 12-inch centers horizontally and vertically, or as depicted on stamped construction plans. Concrete shall meet the criteria of Section 600 of these Standards and Specifications. The vertical curb shall have a minimum six (6) inch top width and may have variable heights as according to approved plans. A minimum of eight (8) inches of the vertical curb shall be buried in compact subgrade. The Responsible Party shall submit drawings of the proposed curb section and layout before play equipment has been installed.

3. Execution

a. Forming

Forms shall be set to the lines and grades shown on stamped construction plans within plus or minus (+/-) one-fourth (¼) inch of finished grades indicated on said plans. Forms shall be securely braced to prevent settlement of movement during placement of concrete. Forms shall remain until concrete has taken final set.

b. Reinforcement

Reinforcement shall be installed in such a manner to as to keep it a minimum of three (3) inches above the ground by ties and/or chairs to prevent settlement or movement during placement of concrete.

c. Concrete Vertical Curb

i. Concrete shall be poured in accordance with Section 600 of these Standards and Specifications. Control joints shall be spaced as depicted on approved plans.

ii. Top of play lot curb shall be set at an elevation needed to provide a four (4) inch clear dimension between top of curb and top of play lot surfacing.

H. Play Equipment

1. Description of Work

The contract work to be performed under this section of the specifications consists of furnishing all required labor, materials, equipment, implements, parts and supplies necessary for, or appurtenant to, the installation of any play equipment and footings for said equipment.

2. Design Submittal

The Responsible Party shall provide detailed design and materials information specific to the play equipment line to the Senior Landscape Architect for review and approval. Design submittal shall include the following information:

a. Detailed plan view of play components within shown curb confines, at scale of 1/8" = 1'-0"; and a color rendered 3-D perspective rendering;

b. transfer station;

c. accessible surfacing layout, depths, and area measured in sq.ft.;

d. deck and stair heights;

e. fall zone delineations and dimensioning, and critical fall heights;

f. grab bars, stair kick plates, and railings;

g. materials specifications, product cut sheets, and pictures of each component and of main frame structure;

h. materials specifications, product cut sheets, and details for accessible surfacing and surfacing edge detail;

i. materials specifications for all clamps, fittings, and fasteners;

j. footing details and/or dimensions, including bury depths;

k. color specifications and color samples for all components, main frame, decking, post clamps, grab bars, and railings;

l. warranty descriptions;

m. a statement of conformance with CPSC, ASTM, and ADA guidelines as are current at the time of design submittal; and

n. a statement of IPEMA certification

3. Materials

Contractor shall supply all equipment shown on plans in the same configuration as shown on said plans. All equipment shall meet current ADA, CPSC, and ASTM guidelines for safety and accessibility. No equipment shall be changed or substituted without the expressed written consent of the Senior Landscape Architect . Equipment shall be arranged to conform to all fall zone requirements as set forth by ADA, ASTM, and CPSC. It shall be the responsibility of the contractor to verify that all designed play equipment configurations, as shown on plans, conforms to the ADA, CPSC, and ASTM guidelines.

a. Main Frame Posts

Minimum five (5) inch o.d., minimum 0.12" wall thickness, round steel tubing with a yield test of at least 50,000 psi. and tensile strength of at least 55,000 psi., complying with ASTM A-135 and ASTM A-500 Grade A. Tubing interiors and cut ends shall be coated with a corrosion resistant compound. Exteriors shall be galvanized, coated with chromate conversion coating, and then finished with electrostatically applied, oven cured dry polyester powder coat. Post caps shall be UV resistant, high-density, injection-molded plastic, or powder coated steel or aluminum, factory riveted to post, and color matched to post. Concrete post footings shall be the greater of

manufacturer's recommendations or 12-inch diameter and 34-inch deep as measured from finished top of surfacing.

b. Stairs and Stair Decks

Minimum 13-gauge steel decks, minimum 14-gauge steel stairs. Perforated on the standing surface, flanged and braced for structural integrity and bonded vinyl clad. Side flanges slotted for post attachment. Modular in design.

c. Main Frame Rails and Handloops

Minimum 1-1/8" o.d. galvanized, powdercoated steel. All welds shall be free of excessive splatter.

d. Climbers, Fire poles, and Horizontal Ladders

Galvanized, powder coated tubular steel, with concrete footings per manufacturer's recommendations. All welds shall be free of excessive splatter.

e. Slides and Slide Hoods

i. On City maintained and metropolitan district park playgrounds a minimum of one (1) slide shall be a minimum 96 inches high at the starting platform.

ii. Rotationally molded, linear low density, UV color stabilized polyethylene. Slide sections shall be connected with recessed fasteners. All steel tubing supports shall be powder coated. All steel welds shall be free of excessive weld splatter. Hoods shall attach to slides and provide full enclosure. Support footings shall be per manufacturer's recommendations. Spiral slide main support footings shall be at least 16-inch diameter and 34-inch deep, as measured from top of surfacing, or per manufacture's recommendation, whichever is greater.

iii. Playground wear mats shall be installed at all slide landings to slow erosion of the Fibar material.

f. Swings

i. See "Main Frame Posts" for post specifications. Concrete post footings shall be the greater of manufacturer's recommendations or 18-inch diameter and 44-inch deep as measured from finished top of surfacing.

ii. Pipe beam swing hangers shall be galvanized, malleable iron with oil-impregnated bearings, with double clevis chain attachment.

iii. Chains shall be hot galvanized 4/0 straight link welded, 670 lb. working load limit. Chain-to-seat attachment shall be by single clevis bolt link – no 'S' hooks will be allowed.

iv. Playground wear mats shall be installed under each individual swing to slow erosion of the Fibar material.

g. Clamps, Fittings, and Fasteners

i. Clamps: Powder coated, die cast aluminum alloy, pinned to posts with solid steel pins, and recessed clamp fasteners.

ii. Fittings & Fasteners: Tamper resistant, stainless steel or other approved non-corrosive material, free from protrusions.

4. Execution

The Responsible Party shall submit shop drawings for all play equipment, layout and footings. Shop drawings shall be submitted to the Senior Landscape Architect for approval before any equipment is ordered. Once shop drawings have been approved, play equipment shall be installed according to approved plans. Footings shall be installed below all surfacing and aggregate fill in compact subgrade.

a. Quality Assurance

Installation shall be in accordance with City approved construction drawings, specifications and manufacturer's recommendations.

b. Materials Delivery and Storage

Deliver materials to site undamaged. Store and protect materials on site in a manner that prevents damage. Materials shall be placed and stored so that water will drain and not accumulate.

I. Timing Sequence for Playground Installation

1. The following order shall be adhered to for the construction/reconstruction of any playground:

a. Surveying and staking of curb and subgrade, and subgrade finishing.

b. Installation of concrete vertical curb.

c. Installation of new or replacement equipment and footings.

d. Installation of playground sub drain system.

e. Installation of cast-in-place surfaces over any concrete foundations or aggregate base, as required on approved plans.

f. Fill playground area with fill material as required on approved plans.

g. Repair and/or replace sod and irrigation system around playground.

810.3 Athletic Fields

Athletic fields, including but not limited to football, soccer, softball, and baseball fields, shall comply with the following general requirements:

A. Slopes of fields shall be uniform. Significant grade breaks in field area shall not occur. Laser grading shall be employed.

B. Slopes of fields shall be between one and one-half (1.5) to two (2) %.

C. Athletic fields intended for programmed sports play shall be laser graded.

810.4 Tennis Courts and Basketball Courts

Courts shall conform to the following minimum construction standards:

A. Courts shall have a base of post-tensioned concrete.

B. Tennis courts shall have an all-weather, non-fading, glare-free strongly bonded surface finish. Paint shall not be permitted as a surface finish. The Senior Landscape Architect shall approve colors. Chain-link tennis court fencing shall be bonded vinyl-clad, dark green or black in color, as approved by the Senior Landscape Architect . Chain-link fencing framework shall be sized to support wind loads associated with windscreens.

810.5 Trails and Sidewalks

All multiple use trails and sidewalks shall be designed and constructed in accordance with "Guide for the Development of Bicycle Facilities," AASHTO at a design speed of 30 miles per hour and signed with City approved signage.

A. Multiple use trails and sidewalks shall be constructed per Section 100, 500 and 600 of these Standards and Specifications.

B. Multiple use trails shall be designed and constructed per Detail 800-5 and 800-6

C. Trails and sidewalks shall be constructed of concrete unless otherwise approved by the City. Concrete shall be a minimum of six (6) inches thick and shall be made of concrete with a compressive strength of 4,500 psi at 28 days using three-fourths (¾) inch aggregate, four (4) inch maximum slump, five (5) to eight (8) % air content, and a water/cement ratio of not more than 0.45, using cement in conformance with Subsection 602.1 of these Standards and Specifications. All concrete shall have an approved synthetic fiber added at a rate of one and one-half (1.5) pounds per cubic yard with three-fourths (¾) inch to one (1) inch length fibers required to reduce cracking. All concrete control joints shall be saw cut not less than 25% and no more than 33% of the slab thickness, at regular intervals. Provide expansion/ construction

joints every 100 feet minimum and saw cut joints every 10 feet minimum. Concrete surfaces shall receive a medium broom finish with the direction of broom strokes being perpendicular to the length of the trail.

D. Alternative trail materials such as crushed granite or other crusher fines may be allowed as surfacing, if approved by the Senior Landscape Architect.

E. No trail shall cross an arterial or collector road at mid-block at grade. All crossings shall be approved through the Development Permit approval process.

810.6 Open Space Areas

Minimal structures such as, but not limited to, restrooms, open pavilions, directional and name signs and impervious areas (such as parking areas and trails) may be located thereon. Benches located along trails in open space areas shall be black in color (reference appropriate section). Open space areas disturbed during construction practices shall be at the minimum, rehabilitated with native vegetation.

810.7 Rights-of-Way and Median Landscaping

A. Consider the location of buried and overhead utilities for plant material selection and spacing.

B. Refer to City of Thornton plant list for acceptable street tree species, especially for salt tolerant plant materials suitable for streets treated with Magnesium Chloride in winter.

810.8 Recreation Facility Lighting

A. Playgrounds, Trails, & Parks

LED lights shall be utilized on playgrounds, trails, pedestrian underpasses and parks. A photometric lighting plan shall be included in the approved construction drawings.
A light fixture shall be required at each at grade trail intersection with a public or private street. In addition, one (1) light fixture shall be required along each 300 linear feet of trail or sidewalk, or as warranted by safety concerns and as determined through the development review process.

B. Tennis Courts

All tennis court lighting shall use metal halide lamps. The minimum standard for uniformity shall be one (1) to three (3). No area on the court should be less than one-third (1/3) of the brightest illumination point on the court. In addition, to assure smoothness of lighting across the court, there shall be no variation in light greater than one (1) % per foot. All tennis court lighting shall meet "recreational" standards established at 38 initial foot-candles resulting in 30 maintained foot-candles using an 80% maintenance factor to determine light levels to be maintained on the court for the extended life of the lighting system (e.g. 38 X 0.80 = 30). There shall be one (1) transformer and a simple service entrance with two (2) circuits and individual breakers for each fixture to avoid gang failure of the lights and make it easier to locate problems that may occur.

D. Unless otherwise required, all light fixtures shall be mounted on an 18-foot metal or fiberglass pole.

810.9 Shelters

A. General Provisions

1. Complete manufacturer's literature and technical data shall be submitted to the Building Division. Literature must include address of manufacturer's physical facility and manufacturer's telephone number.

2. Certification shall be submitted to the Building Division via a transmittal properly identified with project name, location, date, certification of manufacturer's compliance with the requirements specified herein signed and sealed by a PE registered in the State of Colorado. Data shall be specific to the project indicating exactly what will be supplied, with no exceptions.

3. A complete set of shop drawings shall be submitted. Said drawings shall be signed and sealed by a PE registered in the State of Colorado. Drawings shall be specific to the project indicating specifically what will be supplied and not of a general nature, with no exceptions.

4. Samples, certifications, and specification sheets on roof decking, beams, panels, welding, columns, facia, interior finish, exterior siding, and footing design based on site specific soil analysis shall by submitted for review and approval prior to ordering.

5. Fabrication using open "I" beams, open "CEES", or open channels shall not be accepted. Only tubular structural members shall be allowed to minimize moisture permeation and ensure structural integrity. Tapered columns shall not be accepted.

6. Foundation and anchor bolt configurations shall be the same design as that of the specified structure as shown on approved plans. Surface mounting with a minimum of four (4) high strength hidden anchor bolts per column shall be the only accepted method.

7. A two (2) year warranty shall be provided by the Responsible Party for workmanship and materials.

8. The structure shall be as depicted on approved plans. It shall be designed in strict accordance with the IBC as adopted by the City, using a minimum snow load of 30 pounds per square foot (psf), with a minimum wind load based upon a 90 mile per hour wind speed, and a seismic (earthquake) load based on Category B.

9. All structural framing of the structure shall be tubular steel with no place for bird nesting or moisture accumulation. All connections shall be field welded by certified welders to minimize moisture permeation.

10. All tubular steel members of the structure shall be designed in strict accordance with the requirements of the AISC specifications and the American Iron and Steel Institute (AISI) specifications for cold formed members.

11. All structural field connections for the structure shall be designed and made with high strength bolted connections using structural bolts as required by a State of Colorado licensed PE.

12. All shop-welded connections of the structure shall be designed and made in strict accordance with the requirements of the American Welding Society (AWS) specifications. Structural weld shall be in accordance with AWS requirements.

13. Any steel frame parts not primed and finished with powder-coating at the factory shall be prime painted at the factory with a rust inhibitive modified alkyd primer according to Steel Structures Painting Council (SSPC-SP2) as outlined in AISC 6.5. The structural steel shall be thoroughly cleaned upon arrival on the job site by the Responsible Party. Prior to erection, the primer coating may be checked for uniform coverage and thickness. If the minimum thickness of primer is not found, additional primer shall be added in the field, as determined by the Senior Landscape Architect. The frame shall be finish painted in the field with a weather resistant paint compatible with primer used. The finish paint shall be supplied and applied by the Responsible Party, or designated contractor. Color shall be as shown on approved plans. Finish paint shall show no signs of "runs," discoloration, bleaching, or fading.

14. At least one (1) photocell-controlled, peak-mounted light fixture and at least two (2) exterior grade 120 VAC outlets shall be provided per shelter. All shelter electrical outlets shall be recessed and lockable with all wiring conduit interior to the column.

15. A separate permit from the City's Building Inspection Division must be obtained.

B. Roof Pitch

The roof pitch shall be at least 6:12 and no more than 8:12.

C. Frame

1. Columns shall be square or round tubular structural steel.

2. The compression ring, tension members, and truss members shall be a structural steel tube.

D. Roof System

1. Roof panels for the structure shall be not less than 24-gauge painted standing seam metal roof decking with one and one-fourth (1¼) inch high ribs, 12 inches on the center. They shall be precut into panels corresponding to the length from eave to ridge. Angles shall be precut. Ribs shall run with the pitch of the roof for proper drainage.

2. Panels and matching trim shall be pre-painted with a Kynar 500 paint system or approved equal..

3. A complete trim package shall be supplied. Unless otherwise specified, trim parts shall be a minimum of 26-gauge galvanized steel painted.

4. Ridge trim shall be as follows:

a. Panel end caps shall be pre-bent to a "U" shape to fit over ridge end of roof panels. The inside of caps shall match the roof color.

b. Eave splice channels shall be provided to fit behind "J" channel butt joints to create strength at the joint and maintain a straight eave line.

c. Special "J" channel corner trim shall be provided which fits over the main "J" channel to simplify final detailing of corners.

E. Surface Mounting on Concrete Foundation

The shelter shall be set on prepared footings. Footings will be constructed in accordance with local codes and specific site conditions. The structure shall be attached to the top of the footing by use of anchor bolts as required by a State of Colorado licensed PE and torqued to a tightness required by the applicable ASTM standards. The bolts shall be furnished by the manufacturer. The Responsible Party shall submit shop drawings signed and sealed by a State of Colorado registered PE for all footings for columns.

F. Timing of Construction

1. Installation of structure and footings for columns must take place before pouring any concrete slab.

STAKING: INSTALL 6' METAL T-POST STAKES OUTSIDE PLANTING PIT IN UNDISTURBED MULCHED SOIL. USE #12 GAUGE GALVANIZED WIRE.

ALLOW FOR SOME TRUNK MOVEMENT

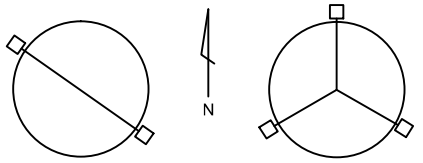
ATTACH TO 2" NYLON STRAPS THROUGH METAL GROMMETS, WITH 1/2" x 15" WHITE PVC SLEEVE ON EACH WIRE.

NYLON STRAPS SHALL BE LONG ENOUGH TO ACCOMMODATE 1-1/2" OF TRUNK GROWTH.

ADD PROTECTOR CAP TO TOP OF POST.

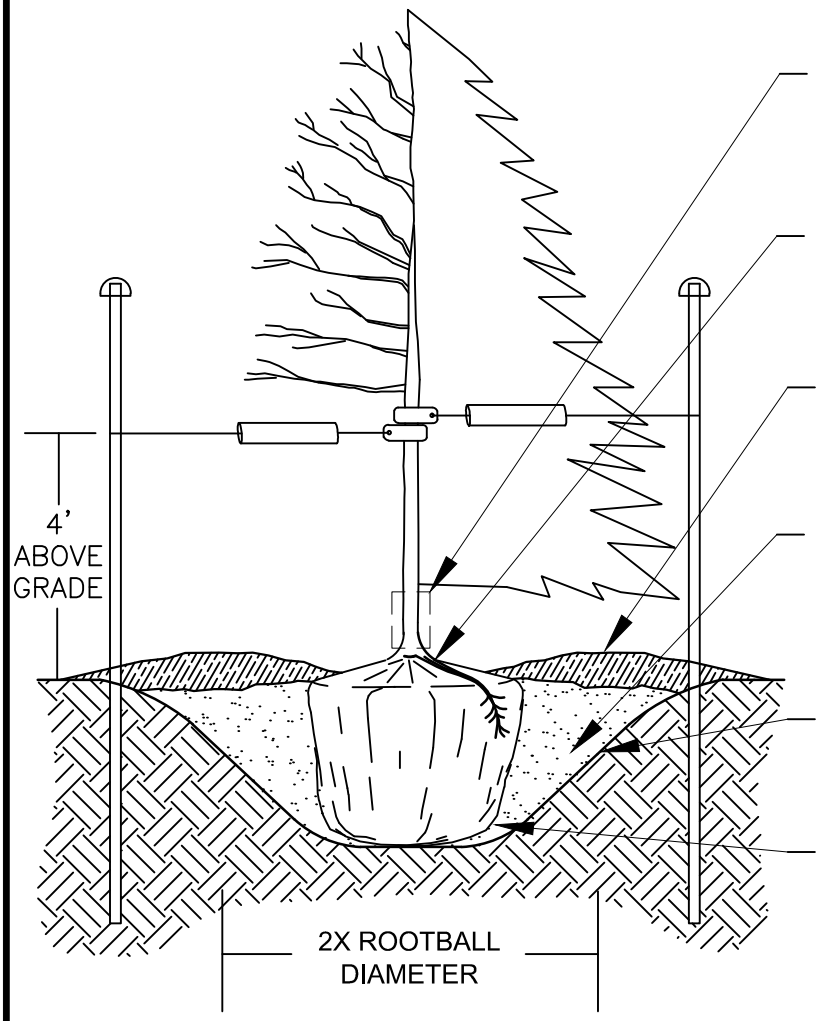
WRAP TREES TO FIRST BRANCH IF PLANTED IN THE FALL. DO NOT WRAP IF PLANTED IN SPRING.

TREE STAKING PLAN VIEW



3" OR LESS CALIPER

MORE THAN 3" CALIPER & ON ALL EVERGREENS



INSTALL TRUNK PROTECTOR, DESIGNED TO EXPAND WITH TRUNK GROWTH (DECIDUOUS ONLY).

PLANT TREE SUCH THAT FIRST ORDER MAJOR ROOT IS 1" TO 2" ABOVE GRADE AND TRUNK FLARE IS VISIBLE.

SPECIFIED MULCH (4" DEPTH X 6' DIAMETER) PULLED BACK 6" FROM BASE OF TRUNK.

BACKFILL PIT WITH MIXTURE OF 2/3 EXISTING SOIL AND 1/3 APPROVED AMENDMENT. WATER THOROUGHLY WHILE BACKFILLING. DO NOT COMPACT OR TAMP.

SIDE SLOPES OF PLANTING HOLE SHALL BE 1:1. ROUGHEN SIDES OF PLANTING PIT PRIOR TO SETTING.

PLACE ROOTBALL ON UNDISTURBED SOIL TO PREVENT SETTLEMENT. REMOVE ENTIRE WIRE BASKET, ALL ROPE, TWINE AND BURLAP FROM ROOTBALL AND TRUNK.

N.T.S.

CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

DECIDUOUS AND EVERGREEN TREE PLANTING DETAIL

ISSUED:
MARCH 1996
REVISED:
APRIL 2010

DRAWING NO.
800-1A

ARRODRIGAR: INSTALAR ESTACAS METÁLICAS EN FORMA DE T DE 6' FUERA DEL HOYO DE PLANTACIÓN EN TIERRA SIN DISTURBAR CUBIERTA DE MANTILLO. USE ALAMBRE GALVANIZADO DE ANCHO #12.

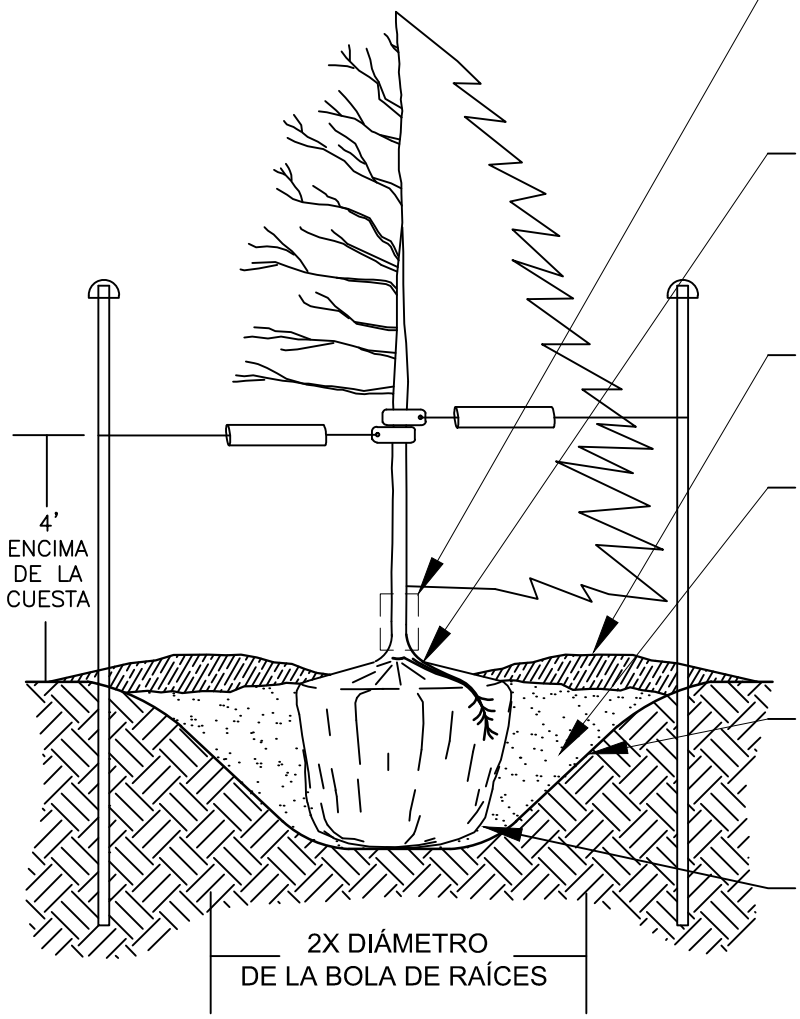
DEJE ESPACIO PARA QUE EL TRONCO SE PUEDA MOVER

PONER CORREAS DE NYLON DE 2"A TRAVÉS DE OJALES METÁLICOS, CON UNA MANGA DE PVC BLANCA DE ½"X 15"EN CADA ALAMBRE.

LAS CORREAS DE NYLON SERÁN LO SUFICIENTEMENTE LARGAS PARA PERMITIR QUE EL TRONCO CREZCA 1 –½"

AGREGAR TAPA PROTECTORA A LA PARTE DE ARRIBA DE LA ESTACA.

ENVOLVER LOS ÁRBOLES HASTA LA PRIMERA RAMA SI SE PLANTA EN EL OTOÑO. NO ENVOLVER SI SE PLANTA EN LA PRIMAVERA.



INSTALAR PROTECTOR PARA EL TRONCO, DISEÑADO PARA EXPANDIRSE CON EL CRECIMIENTO DEL TRONCO (SÓLO DECIDUO)

PLANTAR EL ÁRBOL DE TAL MANERA QUE LA PRIMERA RAÍZ PRINCIPAL ESTÉ 1"A 2" ARRIBA DE LA CUESTA Y EL ENSANCHAMIENTO DEL TRONCO SEA VISIBLE.

MANTILLO ESPECIFICADO (4" DE PROFUNDIDAD X 6" DE DIÁMETRO) RETIRADO 6"DE LA BASE DEL TRONCO.

VOLVER A LLENAR EL HOYO CON UNA MEZCLA DE 2/3 DE LA TIERRA EXISTENTE Y 1/3 DE LA ENMIENDA APROBADA. RIEGUE BASTANTE CON AGUA MIENTRAS SE VUELVE A LLENAR. NO COMPACTAR O APISONAR.

LOS LADOS DE LAS CUESTAS DEL HOYO PARA PLANTAR SERÁN 1:1. PONER RUGOSO LOS LADOS DEL HOYO DE PLANTACIÓN ANTES DE COLOCAR.

PONER EL CEPELLÓN EN TIERRA SIN DISTURBAR PARA PREVENIR QUE SE ASIENTE. QUITE TODA LA CESTA DE ALAMBRE, TODA LA SOGA, CUERDA Y ARPILLERA DEL CEPELLÓN Y EL TRONCO.

N.T.S.

CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

DECIDUOUS AND EVERGREEN TREE PLANTING DETAIL

ISSUED:
MARCH 1996
REVISED:
APRIL 2010

DRAWING NO.
800–1B

ARRODRIGAR: INSTALAR ESTACAS METÁLICAS EN FORMA DE T DE 6' FUERA DEL HOYO DE PLANTACIÓN EN TIERRA SIN DISTURBAR CUBIERTA DE MANTILLO. USE ALAMBRE GALVANIZADO DE ANCHO #12.

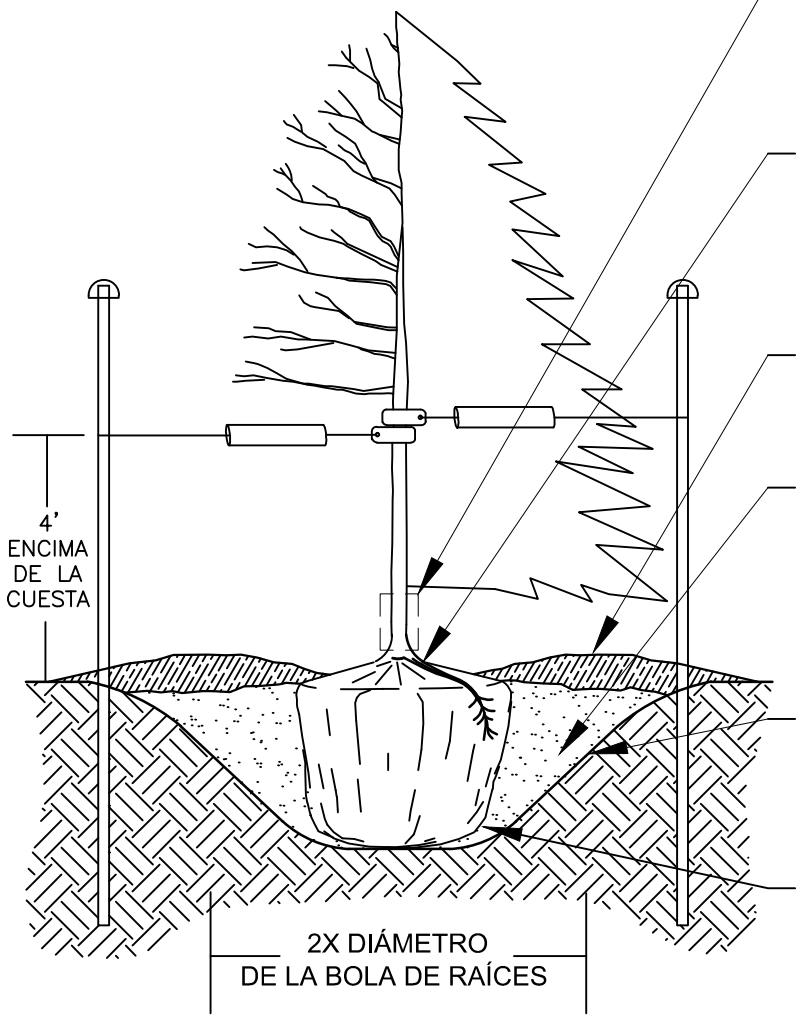
DEJE ESPACIO PARA QUE EL TRONCO SE PUEDA MOVER

PONER CORREAS DE NYLON DE 2"A TRAVÉS DE OJALES METÁLICOS, CON UNA MANGA DE PVC BLANCA DE ½"X 15"EN CADA ALAMBRE.

LAS CORREAS DE NYLON SERÁN LO SUFICIENTEMENTE LARGAS PARA PERMITIR QUE EL TRONCO CREZCA 1 –½"

AGREGAR TAPA PROTECTORA A LA PARTE DE ARRIBA DE LA ESTACA.

ENVOLVER LOS ÁRBOLES HASTA LA PRIMERA RAMA SI SE PLANTA EN EL OTOÑO. NO ENVOLVER SI SE PLANTA EN LA PRIMAVERA.



INSTALAR PROTECTOR PARA EL TRONCO, DISEÑADO PARA EXPANDIRSE CON EL CRECIMIENTO DEL TRONCO (SÓLO DECIDUO)

PLANTAR EL ÁRBOL DE TAL MANERA QUE LA PRIMERA RAÍZ PRINCIPAL ESTÉ 1"A 2" ARRIBA DE LA CUESTA Y EL ENSANCHAMIENTO DEL TRONCO SEA VISIBLE.

MANTILLO ESPECIFICADO (4" DE PROFUNDIDAD X 6" DE DIÁMETRO) RETIRADO 6"DE LA BASE DEL TRONCO.

VOLVER A LLENAR EL HOYO CON UNA MEZCLA DE 2/3 DE LA TIERRA EXISTENTE Y 1/3 DE LA ENMIENDA APROBADA. RIEGUE BASTANTE CON AGUA MIENTRAS SE VUELVE A LLENAR. NO COMPACTAR O APISONAR.

LOS LADOS DE LAS CUESTAS DEL HOYO PARA PLANTAR SERÁN 1:1. PONER RUGOSO LOS LADOS DEL HOYO DE PLANTACIÓN ANTES DE COLOCAR.

PONER EL CEPELLÓN EN TIERRA SIN DISTURBAR PARA PREVENIR QUE SE ASIENTE. QUITE TODA LA CESTA DE ALAMBRE, TODA LA SOGA, CUERDA Y ARPILLERA DEL CEPELLÓN Y EL TRONCO.

N.T.S.

CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

DECIDUOUS AND EVERGREEN TREE PLANTING DETAIL

ISSUED:
MARCH 1996
REVISED:
APRIL 2010

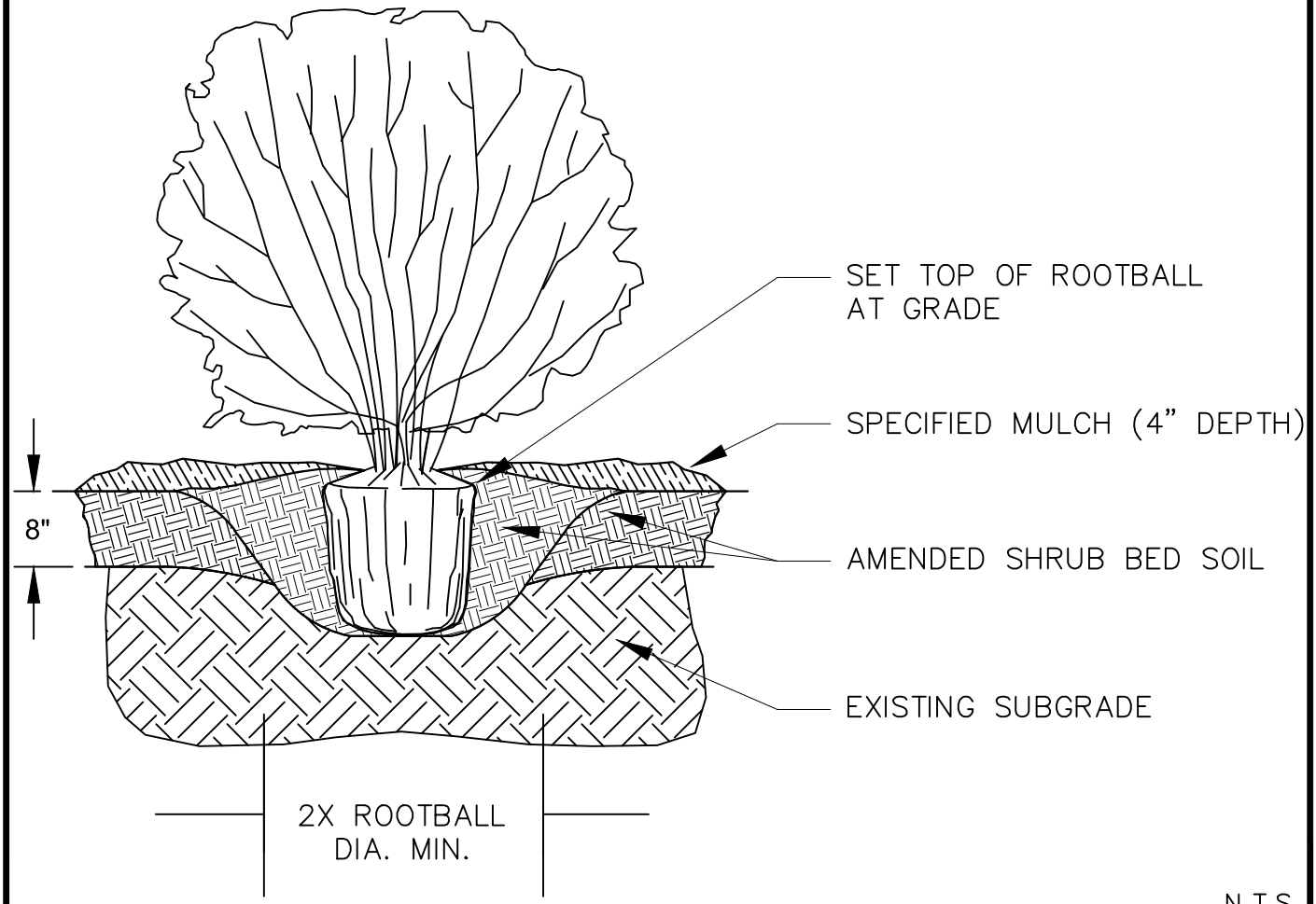
DRAWING NO.
800–1B

PLANT SHRUBS 1/2 MATURE WIDTH OR 4' FROM EDGE OF WALK, CURB OR EDGING.

ENTIRE SHRUB BED AREA SHALL BE AMENDED WITH 4 CUBIC YARDS (6 CUBIC YARDS FOR CITY MAINTAINED PROJECTS) OF CLASS I OR CLASS II COMPOST PER 1000 S.F. TILLED TO DEPTH OF 8".

IF PLANT IS ROOT BOUND AND HAS CIRCLING ROOTS, SHEAR 1/2" OF THE ROOTMASS OFF OF ALL SIDES AND BOTTOM.

DO NOT PLANT SHRUBS HIGHER THAN SURROUNDING GRADE. BACKFILL SOIL SHOULD BE PULLED OVER TOP OF ROOTBALL (NO MORE THAN 1") TO PREVENT MOISTURE WICKING AND TO ALLOW ROOTS TO GROW INTO SURROUNDING SOIL.



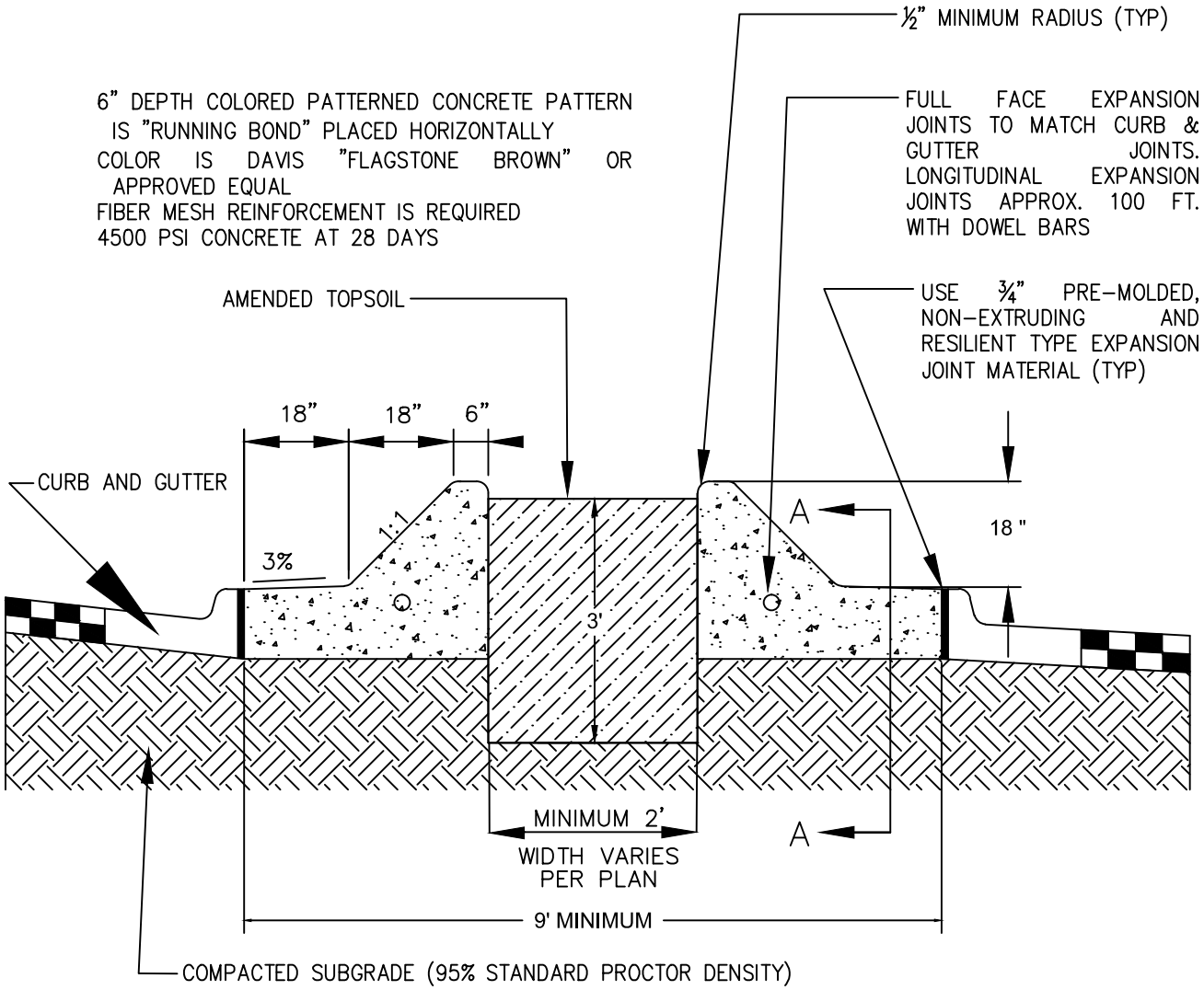
N.T.S.

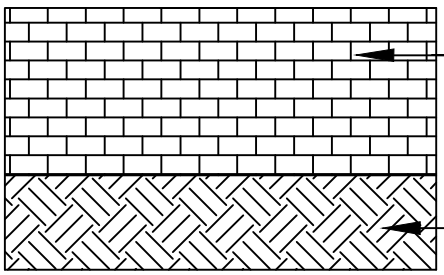
CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

SHRUB PLANTING DETAIL

ISSUED:
MARCH 1996
REVISED:
APRIL 2010

DRAWING NO.
800–2





SECTION A–A

N.T.S.

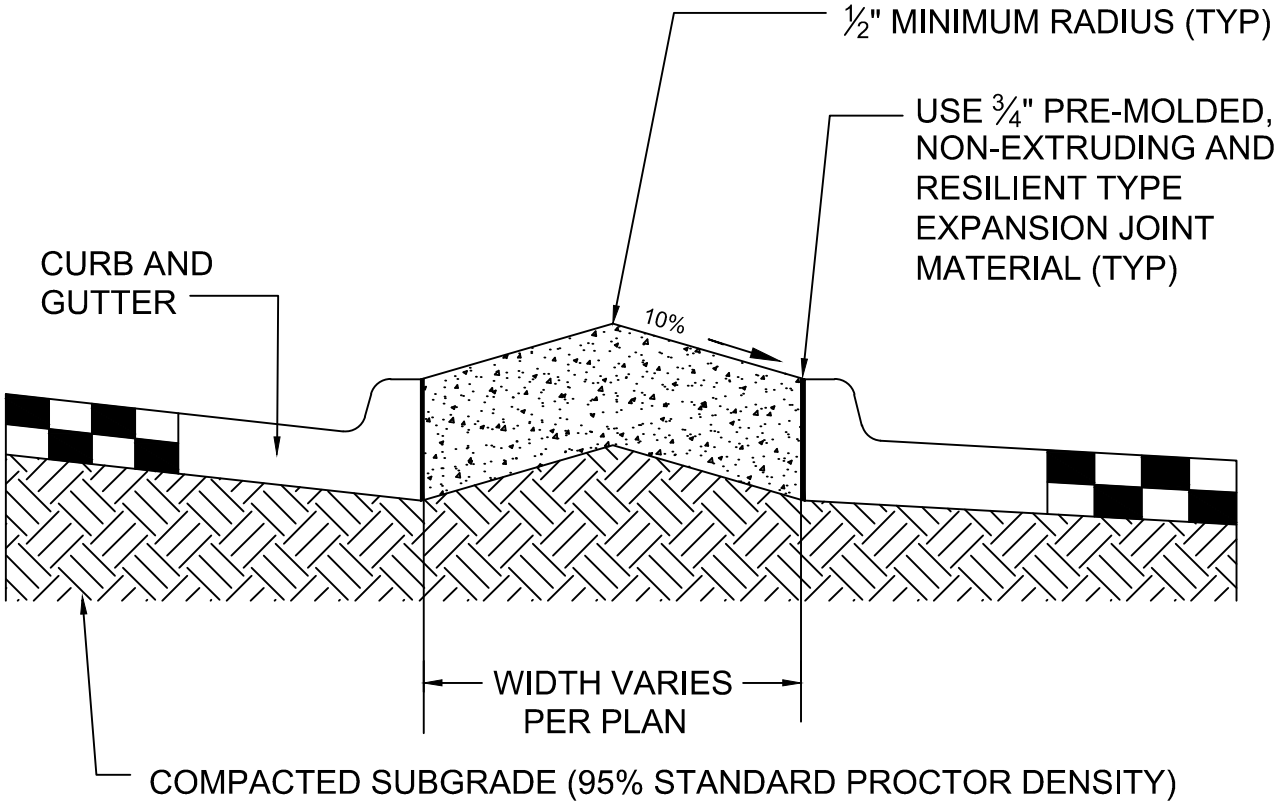
CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

LANDSCAPED MEDIAN (ARTERIAL)

ISSUED:
JUNE 2003
REVISED:
APRIL 2010

DRAWING NO.
800–3

6" DEPTH COLORED PATTERNED CONCRETE PATTERN IS "RUNNING BOND" PLACED HORIZONTALLY COLOR IS DAVIS "FLAGSTONE BROWN" OR APPROVED EQUAL FIBER MESH REINFORCEMENT IS REQUIRED
4500 PSI CONCRETE AT 28 DAYS



N.T.S.

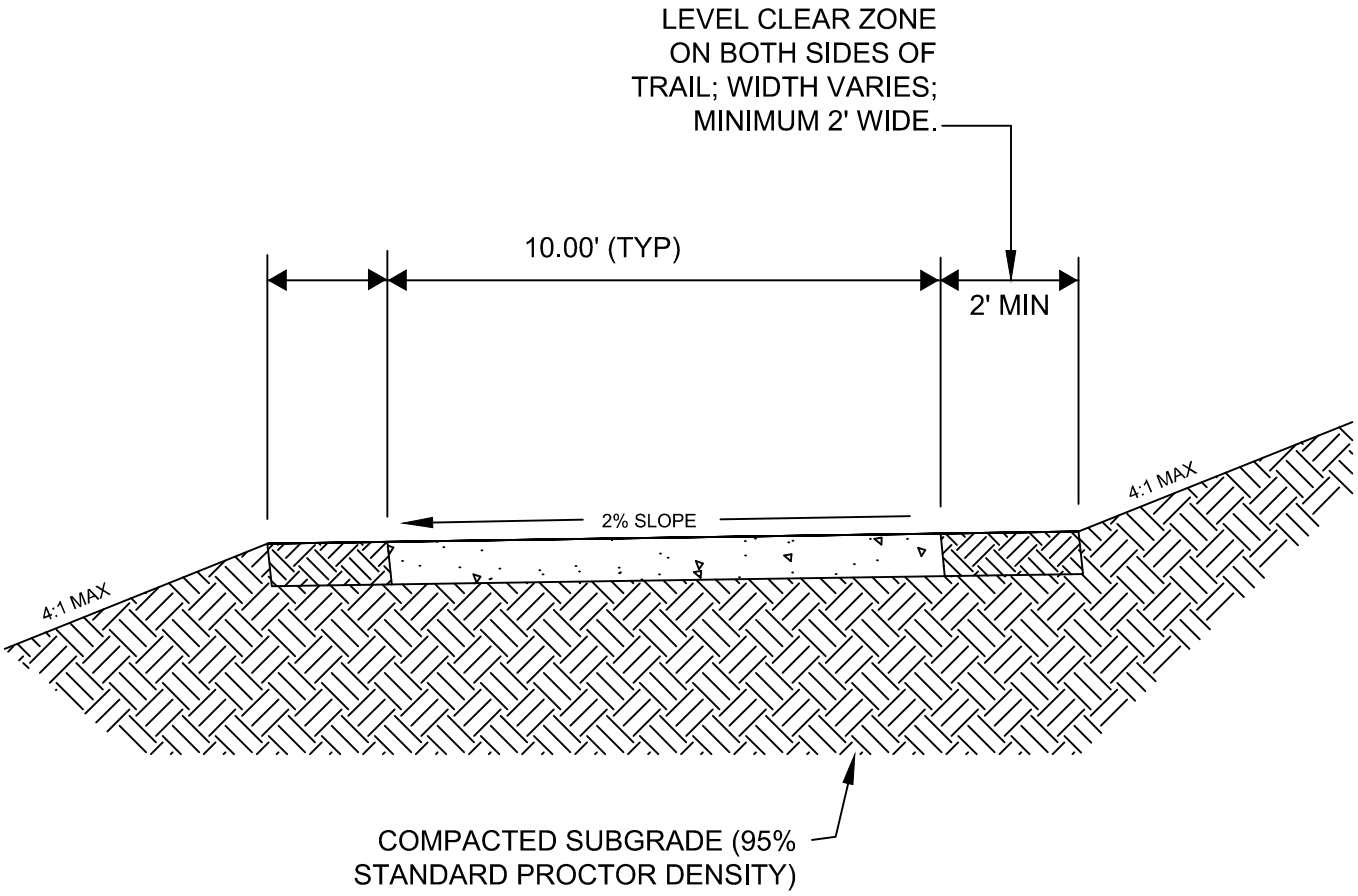
CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

PAVED MEDIAN

ISSUED: JUNE 2003
REVISED: JAN 2012

DRAWING NO. 800–4

6" DEPTH
SAWCUT JOINTS EVERY 10' AND EXPANSION JOINTS EVERY 100'
FIBER MESH REINFORCEMENT IS REQUIRED
4500 PSI CONCRETE AT 28 DAYS



N.T.S.

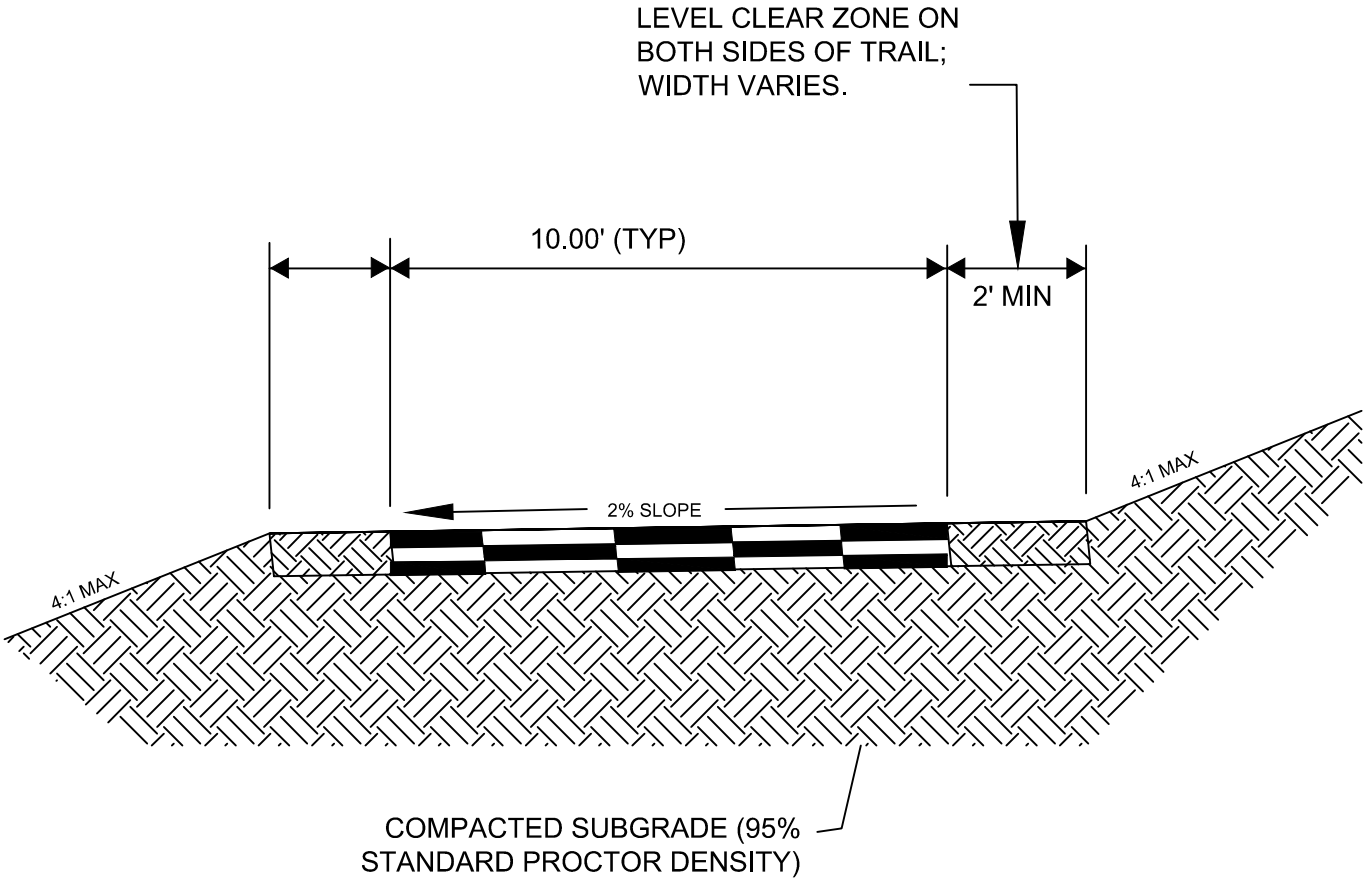
CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

CONCRETE TRAIL TYPICAL SECTION

ISSUED:
JUNE 2003
REVISED:
APRIL 2010

DRAWING NO.
800-5

6" DEPTH TRAIL
2" LIFTS W/FABRIC BETWEEN LIFTS
SX BASE
HIGH OIL CONTENT TOP LIFT



N.T.S.

CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

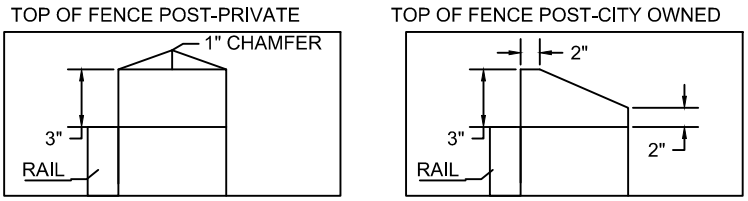
ASPHALT TRAIL TYPICAL SECTION

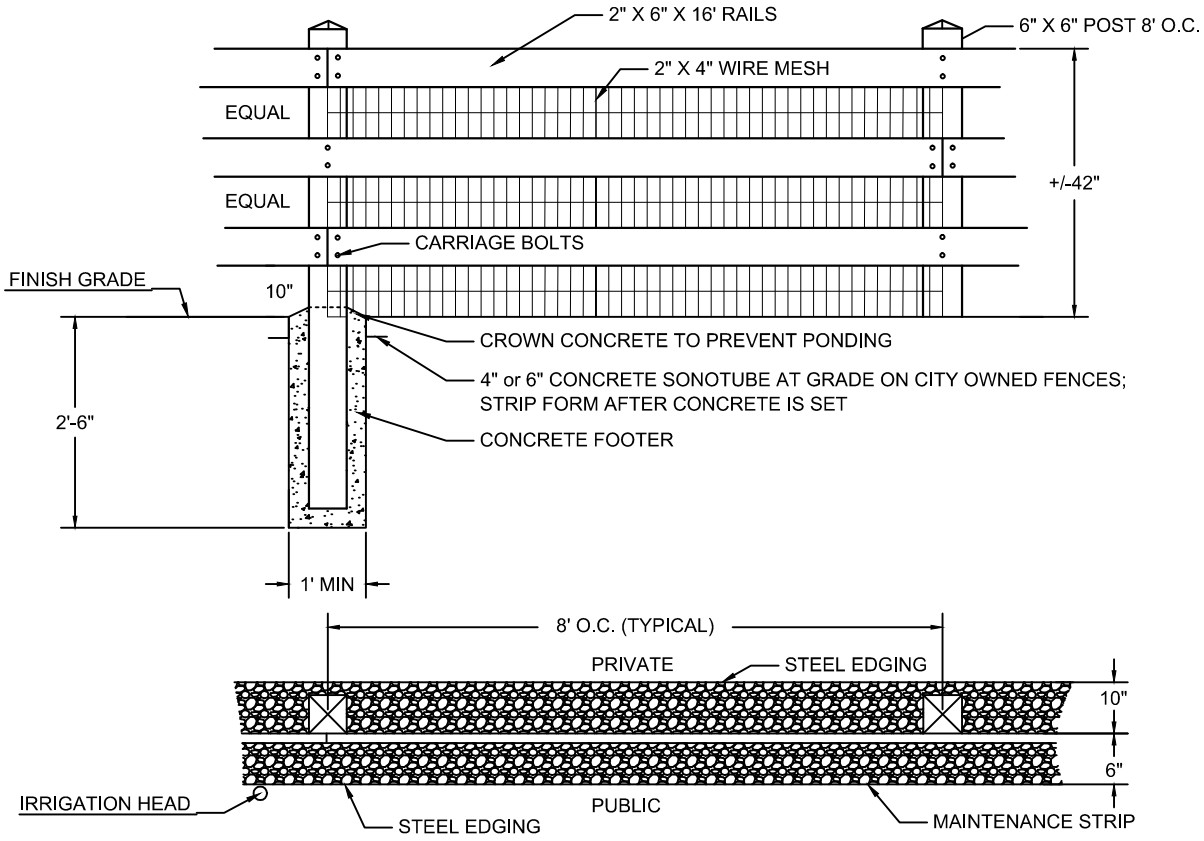
ISSUED:
JUNE 2003
REVISED:
APRIL 2010

DRAWING NO.
800-6

MATERIALS

- POST AND RAILS: DIMENSIONAL CUT GRADE 1 CEDAR
- RAILS: 2" X 6" X 16'; ALTERNATE JOINTS (CHAMFER ENDS AT CORNER & ENDS).
- WELDED WIRE FABRIC (WHEN REQUIRED): 14 GAUGE 2" X 4"; SANDWICH FABRIC BETWEEN POST AND RAILS, ATTACH WITH FENCE STAPLES TO BACKSIDE OF FENCE EVERY 24 INCHES.
- CARRIAGE BOLTS: 1/2" X 6" GALVANIZED; COUNTERSINK NUTS; SHEER BOLTS EVEN WITH POST; FILE ENDS SMOOTH.
- MAINTENANCE STRIP: CRUSHER FINES OR UP TO 1–1/2" ROCK UNLESS OTHERWISE APPROVED TO A DEPTH OF 3 INCHES. LOCATE ALL IRRIGATION HEADS OUTSIDE OF MAINTENANCE STRIP.
- STAIN: CITY OWNED FENCES SHALL BE STAINED; APPLY TWO COATS OF APPROVED EXTERIOR, SEMI–TRANSPARENT OIL STAIN TO WOOD; DIAMOND VOGEL AG–SERIES GRAIN STAIN OR EQUAL.





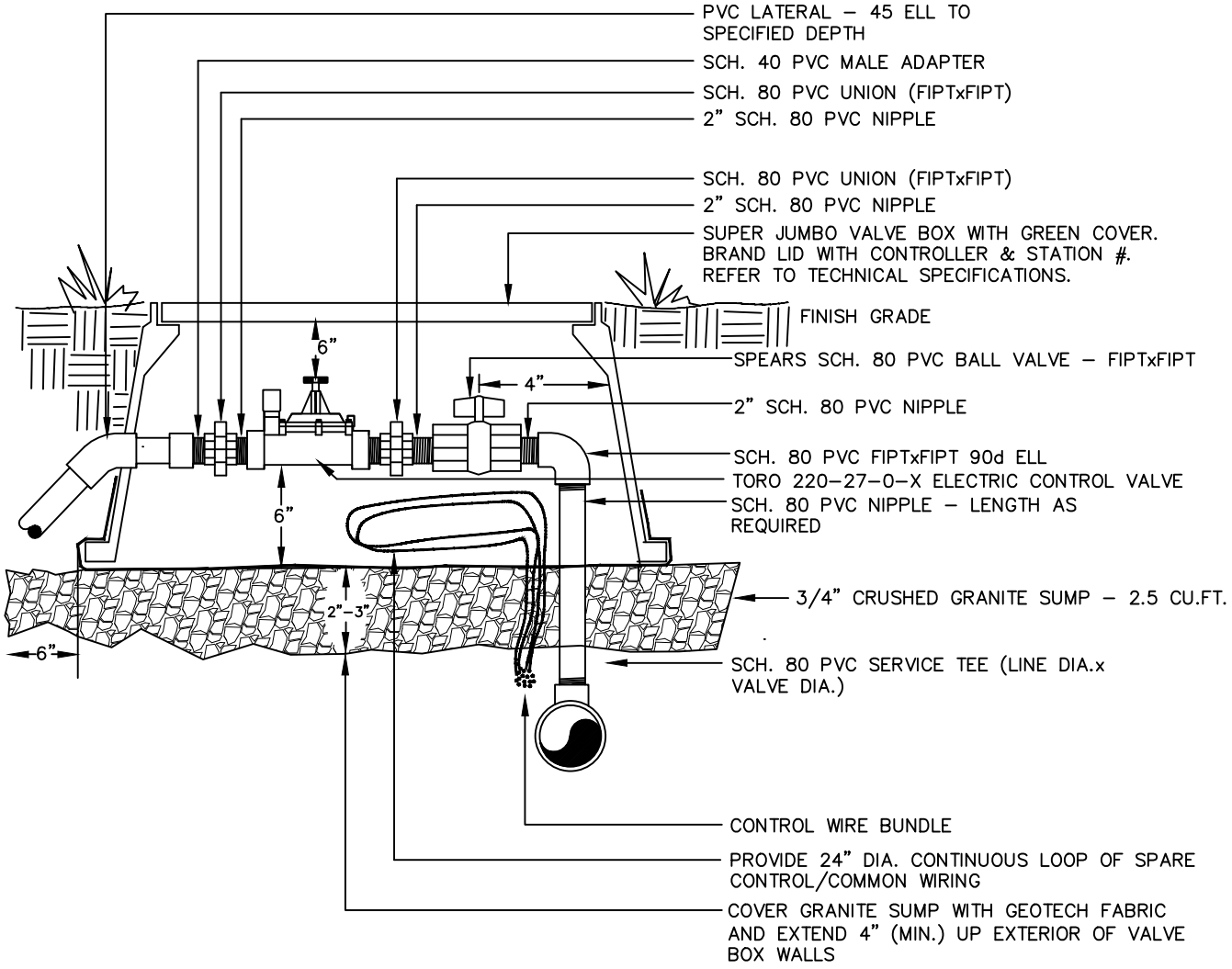
N.T.S.

CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

OPEN 3–RAIL FENCE WITH MAINTENANCE STRIP

ISSUED:
APRIL 2010
REVISED:
APRIL 2010

DRAWING NO.
800–7



NOTES:

1. DIAMETERS OF BALL VALVES, PVC FITTINGS, AND NIPPLES SHALL EQUAL ELECTRIC CONTROL VALVE DIAMETER
2. VALVE BOXES SHALL BE INSTALLED PARALLEL OR PERPENDICULAR TO ADJACENT SIDEWALKS AND HARD SURFACES WHERE APPLICABLE
3. USE BRAND NAMES SPECIFIED OR APPROVED EQUAL
4. BALL VALVE IN SEPARATE BOX FOR VALVES THAT ARE 3" OR GREATER

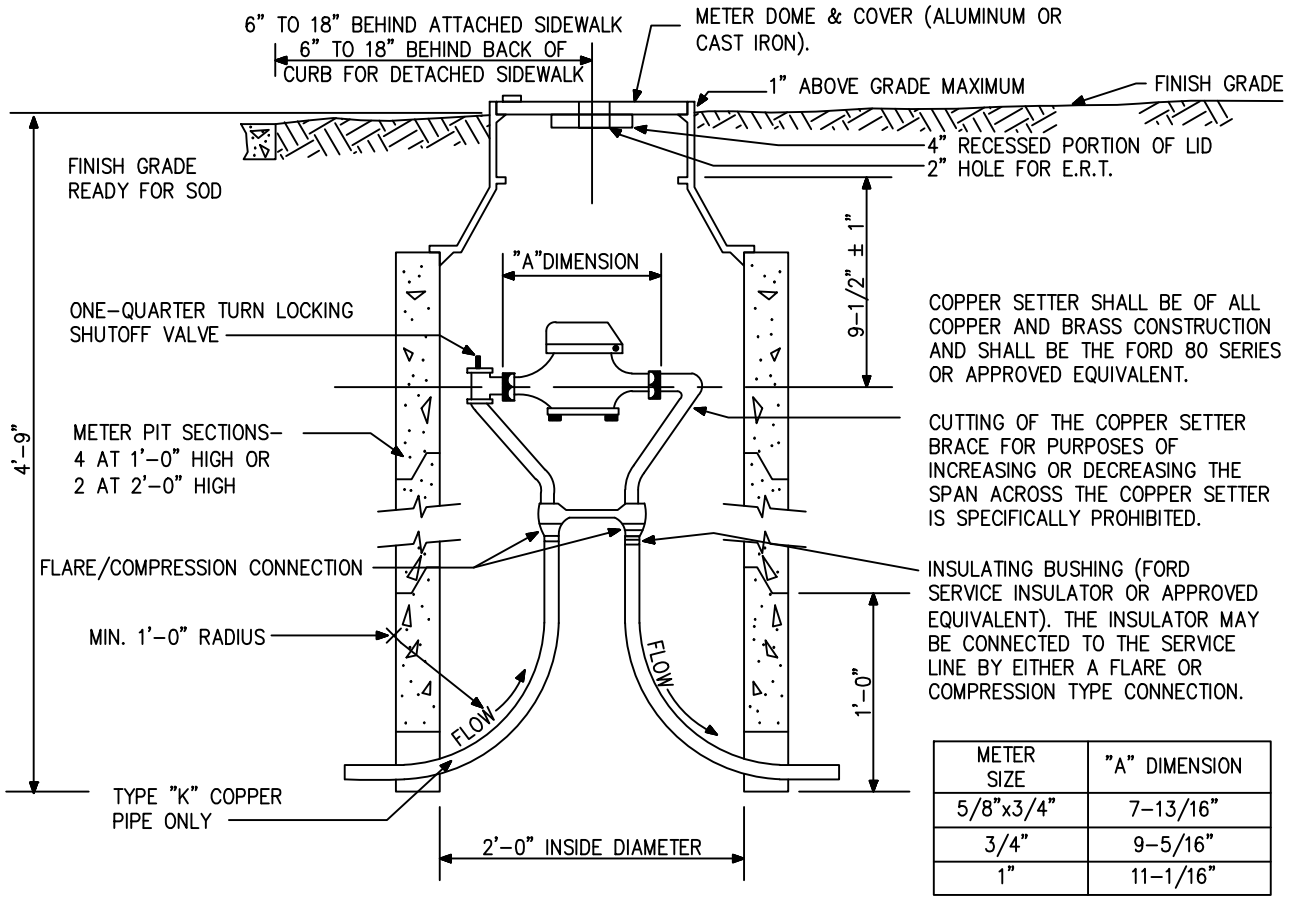
N.T.S.

CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

AUTOMATIC CONTROL VALVE

ISSUED:
APRIL 2010
REVISED:

DRAWING NO.
800-8



METER SIZE	"A" DIMENSION
5/8"x3/4"	7-13/16"
3/4"	9-5/16"
1"	11-1/16"

IF SERVICE LINE IS A DIFFERENT SIZE THAN THE METER, THEN THE REDUCTION SHALL OCCUR OUTSIDE THE METER PIT.

WATER METER PITS, COPPER SETTERS, DOMES AND COVERS SHALL BE INSTALLED BY THE RESPONSIBLE PARTY. THE WATER METER SHALL BE INSTALLED BY THE CITY. METER PITS MAY NOT BE INSTALLED IN ANY TYPE OF VEHICULAR OR PEDESTRIAN TRAFFIC ZONE WITHOUT THE APPROVAL OF THE DEVELOPMENT ENGINEERING MANAGER. IN THE EVENT A METER PIT IS INSTALLED WITHIN A VEHICULAR OR PEDESTRIAN TRAFFIC ZONE, A TRAFFIC RATED DOME SHALL BE INSTALLED BY THE RESPONSIBLE PARTY AT THE SOLE EXPENSE OF THE RESPONSIBLE PARTY.

IF INSTALLATION IN A RESIDENTIAL DRIVE IS PERMITTED, THE CONCRETE JOINT PATTERN SHALL CONSIST OF JOINTS ALLOWING THE LEAST AMOUNT OF DAMAGE TO THE SURROUNDING CONCRETE AS POSSIBLE.

METER PITS SHALL BE CONSTRUCTED OF CONCRETE OR PLASTIC. PLASTIC METER PITS SHALL BE MID-STATES PLASTIC, MODEL NO. MS202448B OF DFW PLASTICS, MODEL NO. 2048 B OR EQUAL AS APPROVED BY THE DEVELOPMENT ENGINEERING MANAGER. PLASTIC METER PITS SHALL MEET SAME DIMENSION REQUIREMENTS AS THE CONCRETE PITS. THE INTERIOR OF THE PLASTIC METER PITS SHALL ALSO BE WHITE.

METER PITS GRADE ADJUSTMENT SHALL BE MADE UTILIZING CONCRETE RINGS. THE TRENCH FLOOR UNDER THE CONCRETE RINGS SHALL BE COMPACTED EARTH. COPPER SERVICE PIPE ENTERING AND LEAVING THE PIT BENEATH THE BOTTOM CONCRETE RING SHALL BE OF SUFFICIENT LENGTH SO AS TO MEET THE DEPTH SPECIFICATIONS WHEN THE COPPER SETTER IS INSTALLED. THE PIT SHALL NOT BEAR ON THE SERVICE PIPE. UNDER NO CIRCUMSTANCES SHALL THE SERVICE PIPE ENTER AND EXIT ON THE SAME SIDE OF THE PIT.

WATER METER PIT INSTALLATIONS SHALL NOT BE GIVEN FINAL INSPECTION OR THE WATER METER INSTALLED UNTIL FINAL GRADING HAS BEEN COMPLETED. AFTER THE CITY HAS MADE THE FINAL INSPECTION, ANY NECESSARY GRADE ADJUSTMENTS TO THE PIT SHALL BE THE RESPONSIBILITY OF THE RESPONSIBLE PARTY.

THE USE OF CONCRETE RISER RINGS FOR THE PURPOSE OF DOME HEIGHT ADJUSTMENT IS PERMITTED PROVIDED SPECIFICATIONS ARE MET AFTER THE INSTALLATION IS COMPLETED (FOR PLASTIC METER PITS RISERS SHOULD BE PER MANUFACTURER'S RECOMMENDATION). THE USE OF BROKEN RINGS OR WOOD SHIMS UNDER THE DOME IS SPECIFICALLY PROHIBITED.

GALVANIZED PIPE AND FITTINGS ARE SPECIFICALLY PROHIBITED. SEE DETAIL 200-15 FOR CORROSION PROTECTION INFORMATION.

WATER SERVICE LOCATIONS SHALL BE MARKED WITH A "V" ON THE CURB. SANITARY SEWER SERVICE LOCATIONS SHALL BE MARKED WITH AN "X" ON THE CURB. MARKINGS SHALL BE NEATLY STAMPED , CHISELED OR SAWCUT, NOT PAINTED.

N.T.S.

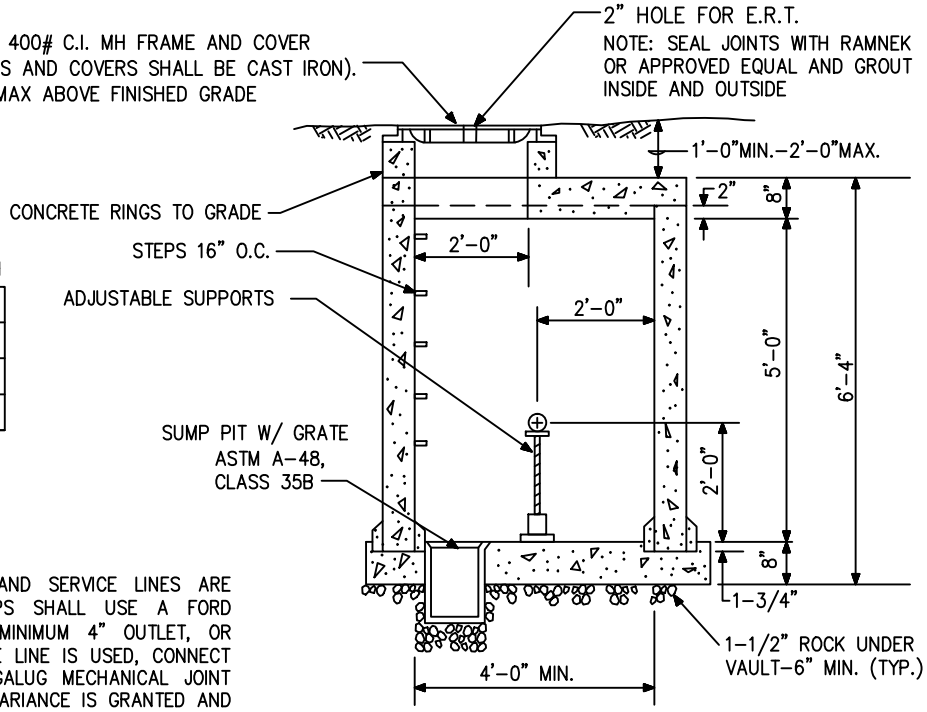
CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

STANDARD IRRIGATION METER PIT DETAIL 5/8" X 3/4", 3/4" & 1" METERS ONLY

ISSUED:
APRIL 1992
REVISED:
JAN 2012

DRAWING NO.
800-9

SIZE	LAYING LENGTH
1–1/2" COMPOUND	13–1/2"
2" TURBINE	10–3/4"
3" TURBINE	12–1/4"
4" TURBINE	14–1/4"



VAULT PROFILE

ALL IRRIGATION WATER CONNECTION TAPS AND SERVICE LINES ARE REQUIRED TO BE A MINIMUM OF 4". TAPS SHALL USE A FORD STAINLESS STEEL TAPING SLEEVE WITH A MINIMUM 4" OUTLET, OR APPROVED EQUIVALENT. IF C900 PVC SERVICE LINE IS USED, CONNECT IT TO THE TAPPING SLEEVING USING A MEGALUG MECHANICAL JOINT RESTRAINT OR APPROVED EQUIVALENT. IF A VARIANCE IS GRANTED AND A SMALLER TAP AND SERVICE LINE IS APPROVED, THEN REFER TO WATER SERVICE INSTRUCTIONS IN DETAILS #200–14, 17A, & 18B.

CORPORATION STOPS SHALL BE AWWA TAPER THREAD TO COPPER CONNECTION OF PACK JOINT AND SHALL BE A FORD TYPE F600 OR AN APPROVED EQUAL. TAPS SHALL BE MADE BY THE RESPONSIBLE PARTY.

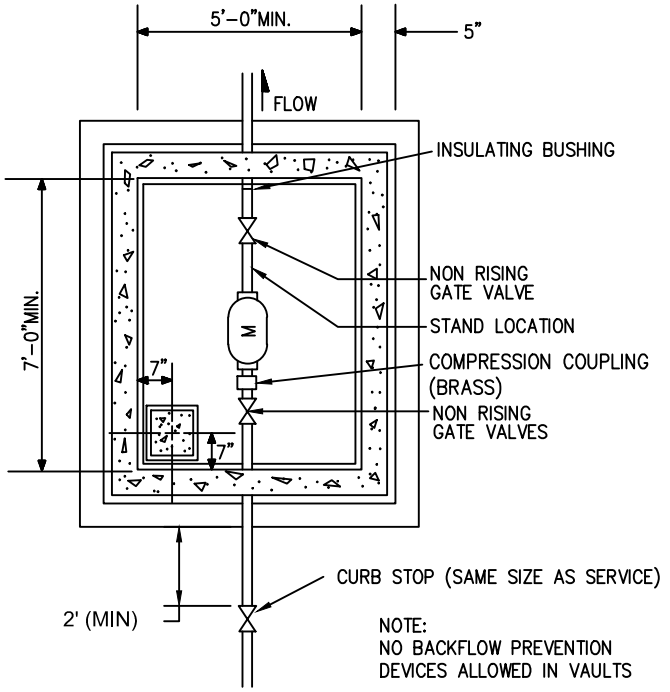
A MINIMUM 4" GATE VALVE CONFORMING TO DETAIL #200–6A/B OF THESE STANDARDS AND SPECIFICATIONS SHALL BE INSTALLED ON EVERY IRRIGATION SERVICE BETWEEN THE WATER MAIN AND THE METER, WHICH IS AT A POINT AT OR NEAR THE PROPERTY LINE. THE VALVE SHALL BE ACCESSIBLE THROUGH A TYLER 6860 3–PIECE VALVE BOX WITH STANDARD OVAL BASE AND A DROP LID.

INSIDE THE METER PIT, PIPE SHALL BE TYPE K CLASS, RIGID COPPER PIPE. THE METER VAULT PIPING SHALL BE OF THE SAME INSIDE DIAMETER AS THE METER ORIFICE. ANY SERVICE PIPE MATERIAL CHANGES SHALL OCCUR OUTSIDE THE METER VAULT.

JOINTS SHALL BE OF A SWEAT COPPER DESIGN. SOLDER USED IN CONNECTION OF THE JOINTS SHALL BE OF A LEAD CONTENT OF 0.20 OR LESS.

GATE VALVES SHALL BE AWWA APPROVED GATE VALVES OF BRASS CONSTRUCTION. THE VALVES SHALL BE COUNTERCLOCKWISE OPEN. REFER TO SUBSECTION 204.1(D) OF THESE STANDARDS AND SPECIFICATIONS. VALVES LOCATED IN VAULTS SHALL HAVE HANDWHEELS IN LIEU OF A TWO (2) INCH SQUARE OPERATING NUT.

WATER SERVICE LOCATIONS SHALL BE MARKED WITH A "V" ON THE CURB, AND SEWER SERVICE SHALL BE MARKED WITH AN "X". MARKINGS SHALL BE NEATLY STAMPED, CHISELED OR SAWCUT, AND SHALL NOT BE PAINTED.



VAULT PLAN

N.T.S.

CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

STANDARD IRRIGATION METER SETTING VAULT DETAIL FOR 1–1/2", 2", 3" & 4" METERS

ISSUED:
APRIL 1992
REVISED:
JAN 2012

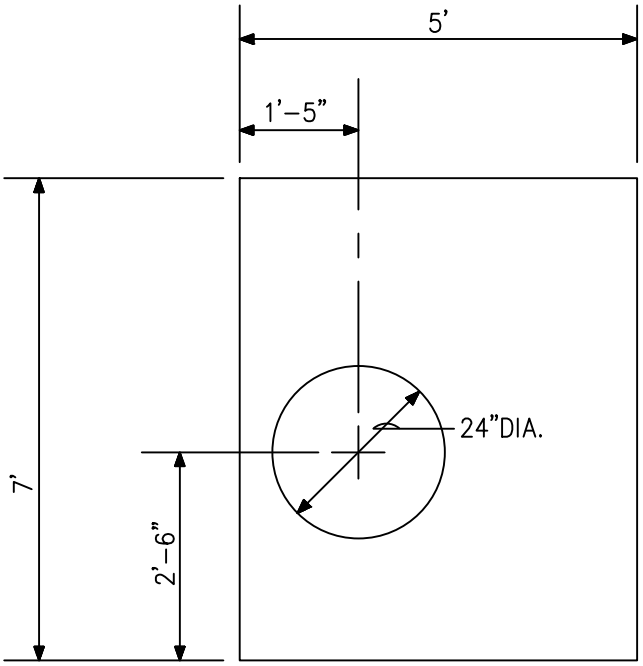
DRAWING NO.
800–10A

METER VAULT LIDS AND COVER SHALL BE CAST IRON.

PIPE SHALL BE TYPE K CLASS, RIGID COPPER PIPE. THE METER VAULT PIPING SHALL BE OF THE SAME INSIDE DIAMETER AS THE METER ORIFICE. JOINTS SHALL BE OF SWEAT COPPER DESIGN. SOLDER USED IN CONNECTION OF THE JOINTS SHALL BE OF A LEAD CONTENT OF 0.20 OR LESS. THE OUTLET SIDE OF THE COPPER SETTERS SHALL BE ISOLATED FROM THE SERVICE LINE WITH A FORD SERVICE INSULATOR OR APPROVED EQUIVALENT.

GATE VALVES SHALL BE AWWA APPROVED GATE VALVES OF BRASS CONSTRUCTION. THE VALVE STEMS SHALL BE OF NON-RISING DESIGN. VALVES SHALL BE COUNTERCLOCKWISE OPEN, AND SHALL HAVE HANDWHEELS IN LIEU OF A TWO (2) INCH SQUARE OPERATING NUT. VALVES SHALL BE INSTALLED BOTH UPSTREAM AND DOWNSTREAM OF THE WATER METER WITHIN THE VAULT.

BRASS UNIONS OF A COMPRESSION TYPE SEALING DESIGN SHALL BE INSTALLED BETWEEN THE GATE VALVE AND THE WATER METER, EITHER UPSTREAM OR DOWNSTREAM OF THE METER TO FACILITATE REMOVAL OF THE WATER METER FROM THE SERVICE LINE.



ROOF SLAB

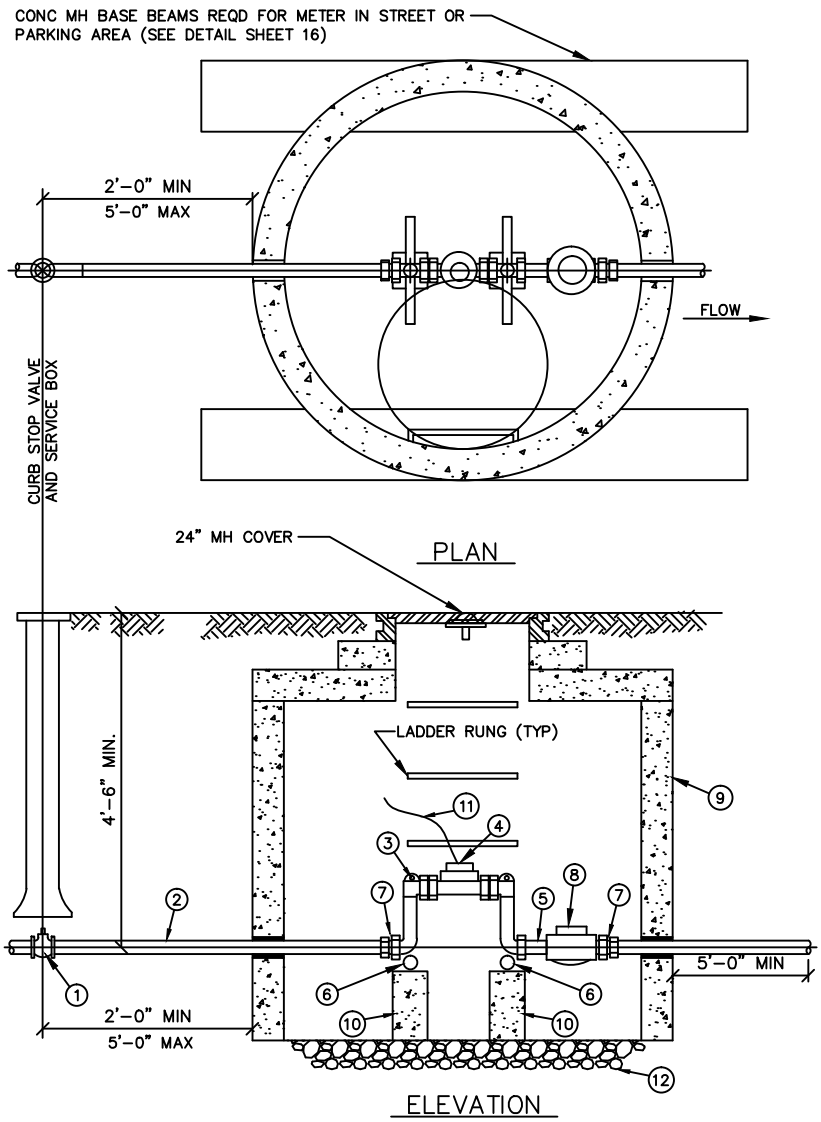
N.T.S.

CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

STANDARD IRRIGATION METER ROOF SLAB DETAIL FOR 1-1/2", 2", 3", & 4" METERS

ISSUED:
APRIL 1992
REVISED:
APRIL 2010

DRAWING NO.
800-10B



NOTES:

1. METER VAULT SHALL BE INSTALLED IN LANDSCAPED AREA UNLESS APPROVED BY METER INSPECTOR.
2. CURB STOP SHALL BE 24" TO 60" FROM THE INLET SIDE OF THE METER VAULT, IN LANDSCAPED AREA.
3. FOR VAULT INSTALLATIONS IN ROADWAYS AND DRIVEWAYS, WHEN APPROVED, MH BASE BEAMS ARE REQD. METER VAULT MAY NOT BE INSTALLED IN PARKING AREA.
4. NO CONNECTIONS OF ANY TYPE, PIPE BENDS, OR CHANGES IN PIPE SIZE ARE PERMITTED INSIDE THE VAULT.
5. METER SHALL BE FURNISHED WITH ELECTRONIC DIGITAL REGISTER OR ELECTRONIC ENCODED REGISTER AND AN ITRON PIT ERT. IN SPECIAL CIRCUMSTANCES, REMOTE ERT MAY BE REQD (SEE SHEET 50), TO BE INSTALLED ON NEARBY BUILDING OR POST.
6. JOINTS INSIDE METER VAULT SHALL BE THD OR SHALL BE SOLDERED WITH 95-5 TIN/ANTIMONY SOLDER IN ACCORDANCE WITH ASTM B 32.
7. DISTANCE BETWEEN RUNGS, CLEATS AND STEPS SHALL NOT EXCEED 12" AND SHALL BE UNIFORM THROUGHOUT THE LENGTH OF THE LADDER.
8. VAULT WALL PENETRATIONS SHALL BE GROUTED WITH CONC.
9. COPPERSETTER OR METER YOKE SHALL BE NO MORE THAN 12" HIGH.

SIZE	LAYING LENGTH
1 ½" COMPOUND	13-1/2"
2" TURBINE	10-3/4"

DETAILS:

1. CURB STOP
2. TYPE K COPPER TUBING
3. 12" COPPERSETTER / METER YOKE WITH BYPASS
4. METER UNIT
5. 3" NIPPLE BETWEEN COPPERSETTER AND CHECK VALVE
6. 1" x 23" PIPE
7. IRON PIPE TO FLARE COUPLING FROM INLET SIDE OF COPPERSETTER AND OUTLET SIDE OF CHECK VALVE
8. CHECK VALVE (CHECK VALVES ARE NOT REQUIRED WHERE A BACKFLOW PREVENTION DEVICE IS INSTALLED)
9. 48" CONC MH WITH FLAT LID
10. CONC BLOCK SUPPORTS 4" x 4" x 24"
11. SIGNAL WIRE TO ITRON ERT
12. 1 ½" FRACTURED ROCK BEDDING OR CONCRETE FLOOR WITH DRAIN HOLE

N.T.S.

CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

1.5IN & 2IN IRRIGATION METER SETTING VAULT DETAIL

ISSUED:
MARCH 1996
REVISED:
APRIL 2010

DRAWING NO.
800-10C

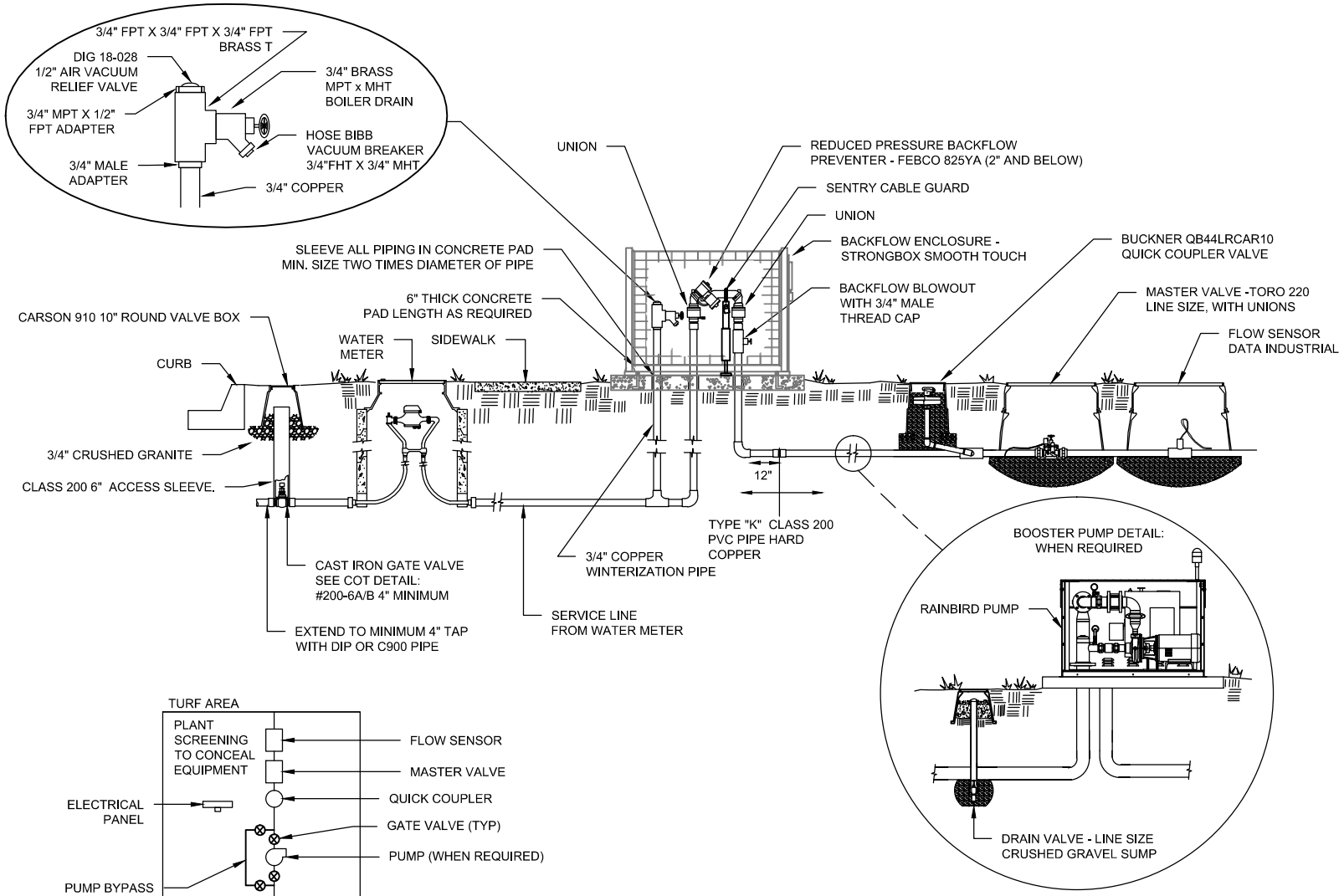
CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

1" & SMALLER IRRIGATION METER
POINT OF CONNECTION DETAIL

ISSUED: APRIL 2010
REVISED:

DRAWING NO. 800-11A

N.T.S.



NOTE:

- CONCRETE PAD PENETRATION TO BE 1" LARGER THAN SLEEVING DIAMETER.
- REFER TO ENCLOSURE INSTRUCTIONS FOR CONCRETE PAD DIMENSIONS.
- ALL VALVES AND FITTINGS INCLUDING RPZ SHALL MATCH SIZE OF THE SERVICE LINE FROM METER. SEE TABLE 800-1&2 IN THESE STANDARDS AND SPECIFICATIONS FOR MORE INFORMATION.
- SEE DETAIL 800-9 FOR SPECIFIC METER SETTING REQUIREMENTS.
- SEE SECTION 800 OF THE WRITTEN SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS OF COMPONENTS.
- EXTEND CRUSHED GRAVEL SUMP 6" BEYOND THE PERIMETER OF EACH ACCESS BOX FOR SUPPORT AND DRAINAGE.

CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

1.5" & LARGER IRRIGATION METER POINT OF CONNECTION DETAIL

ISSUED: APRIL 2010
REVISED:

DRAWING NO. 800–11B

N.T.S.

NOTE:

CONCRETE PAD PENETRATIONS TO BE 1" LARGER THAN SLEEVE DIAMETER.

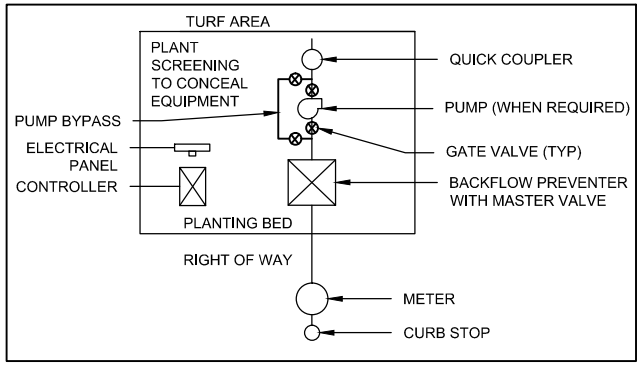
REFER TO ENCLOSURE INSTRUCTIONS FOR CONCRETE PAD DIMENSIONS.

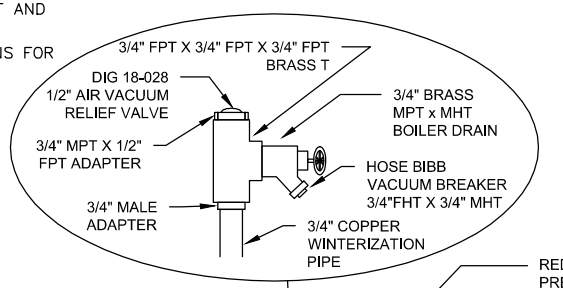
ALL VALVES AND FITTINGS INCLUDING RPZ SHALL MATCH SIZE OF THE SERVICE LINE FROM METER. SEE TABLE 800 – 1 & 2 IN THESE STANDARDS AND SPECIFICATIONS FOR MORE INFORMATION.

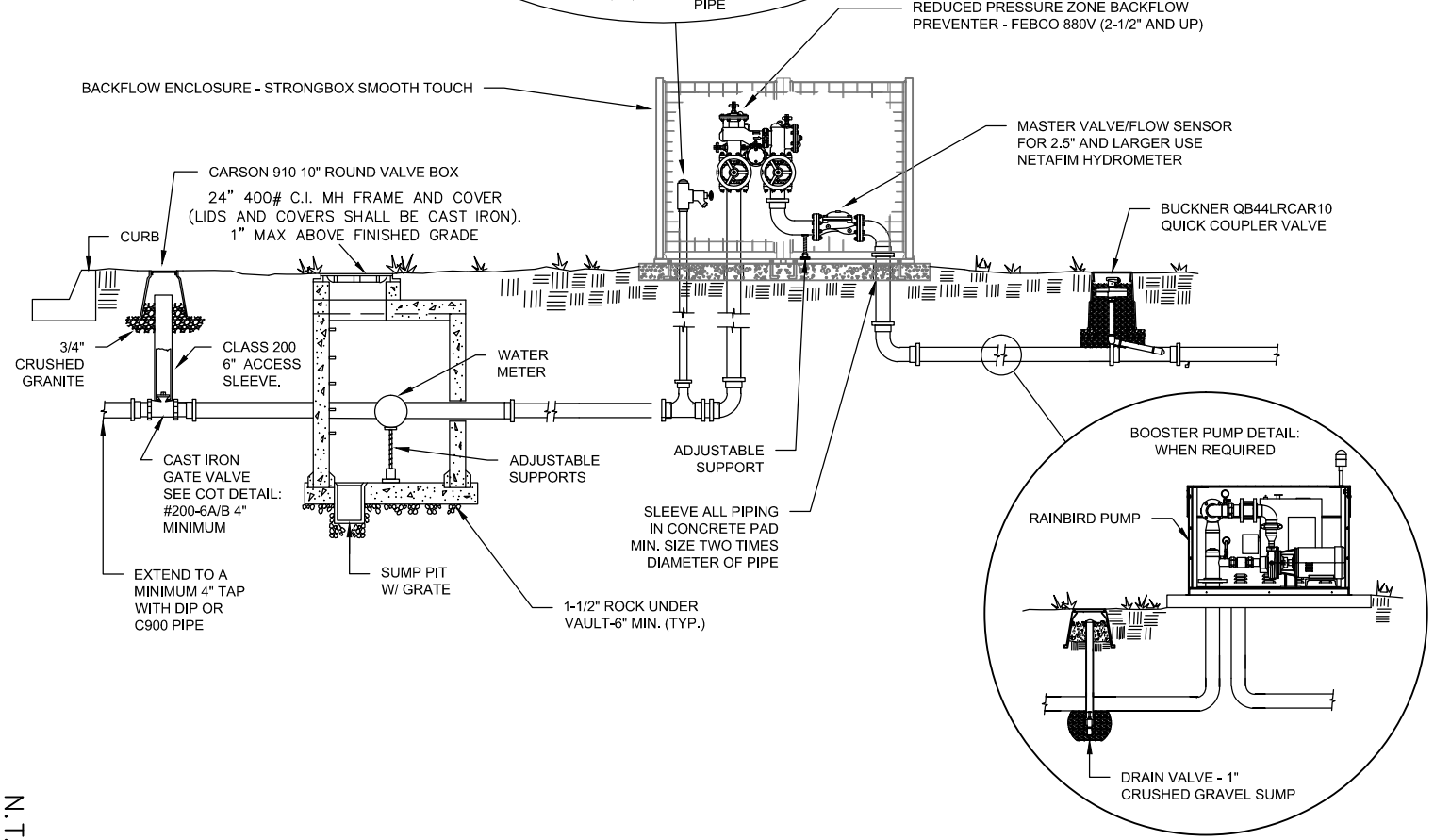
SEE DETAIL 800–10A & 10B FOR SPECIFIC VAULT AND METER SETTING REQUIREMENTS.

SEE SECTION 800 OF THE WRITTEN SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS OF COMPONENTS.

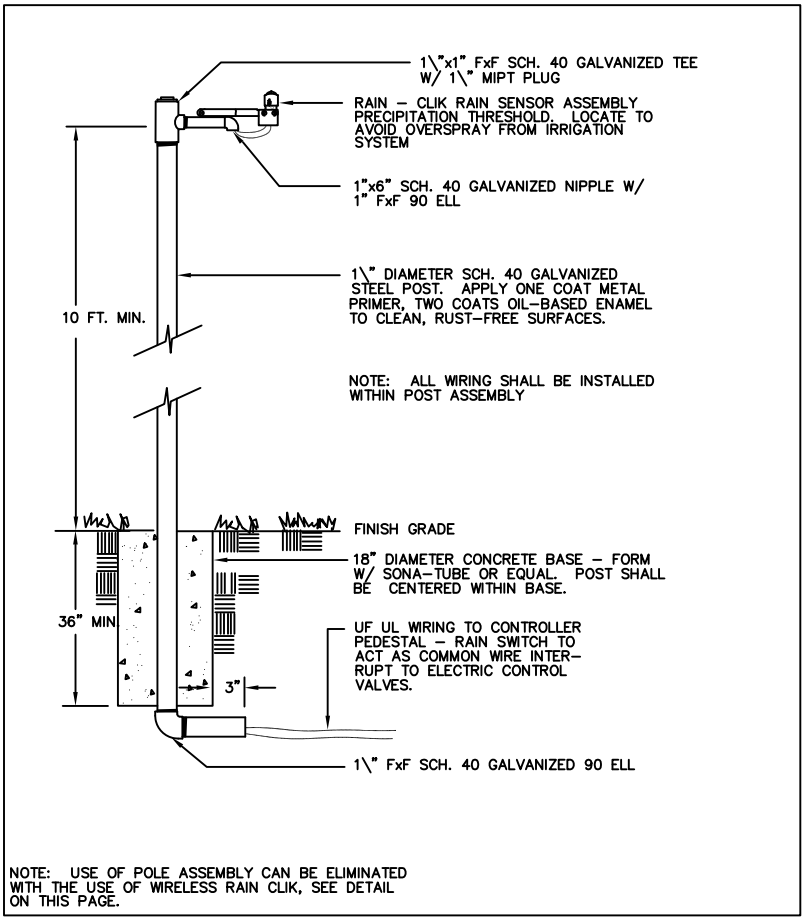
EXTEND CRUSHED GRAVEL SUMP 6" BEYOND THE PERIMETER OF EACH ACCESS BOX FOR SUPPORT AND DRAINAGE.



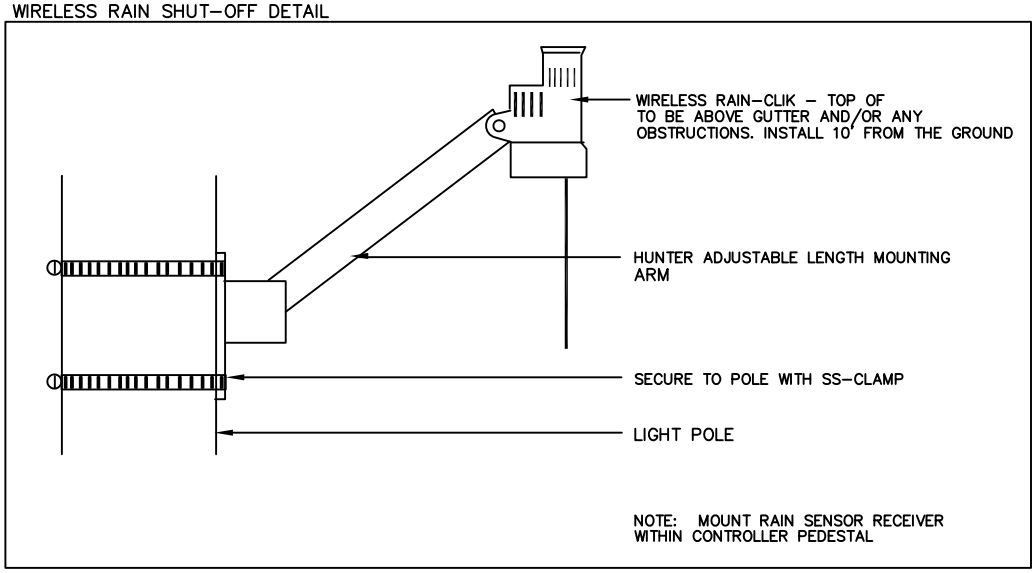




RAIN SHUT–OFF DETAIL WITH POLE ASSEMBLY



WIRELESS RAIN SHUT–OFF DETAIL



N.T.S.

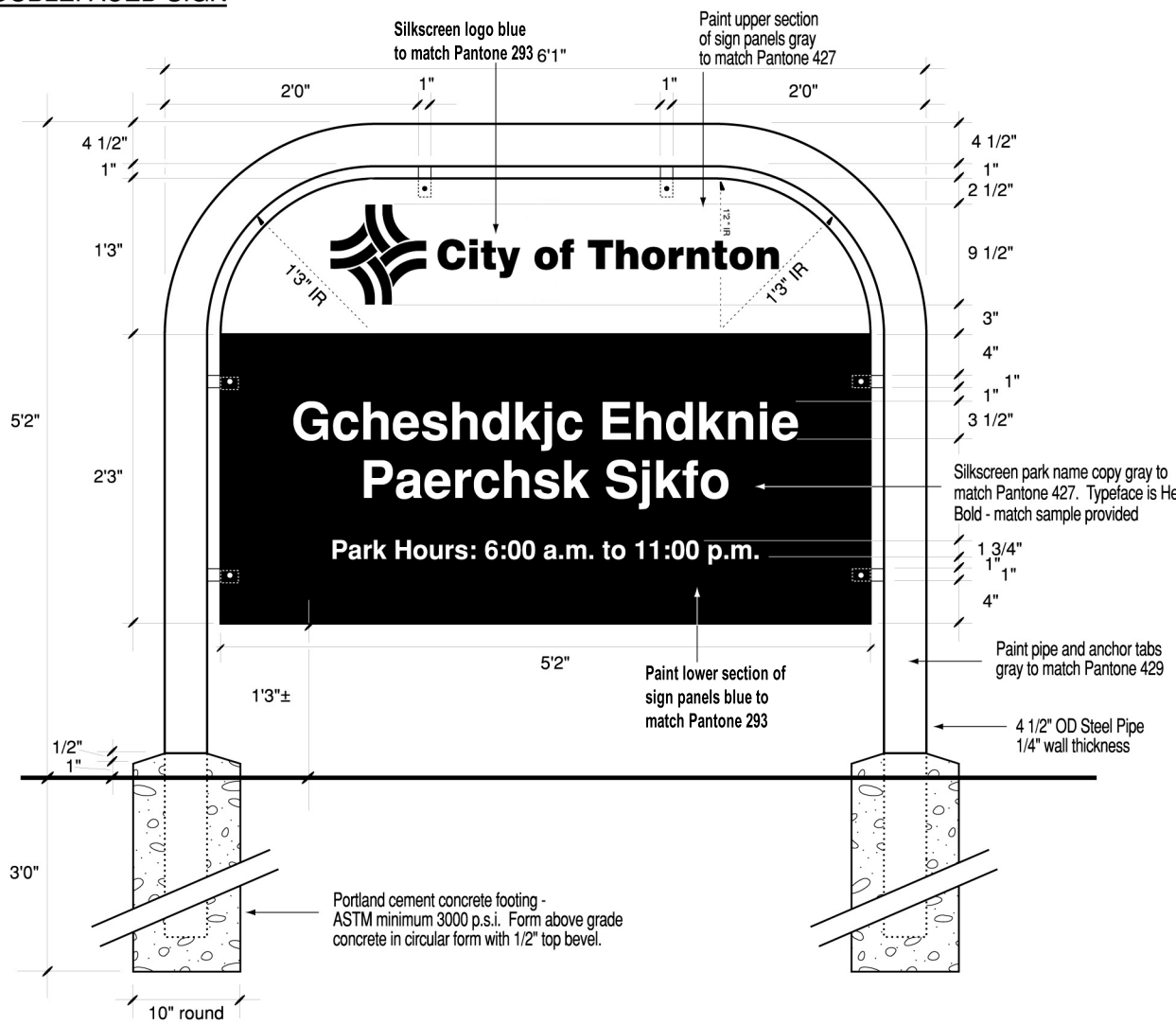
CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

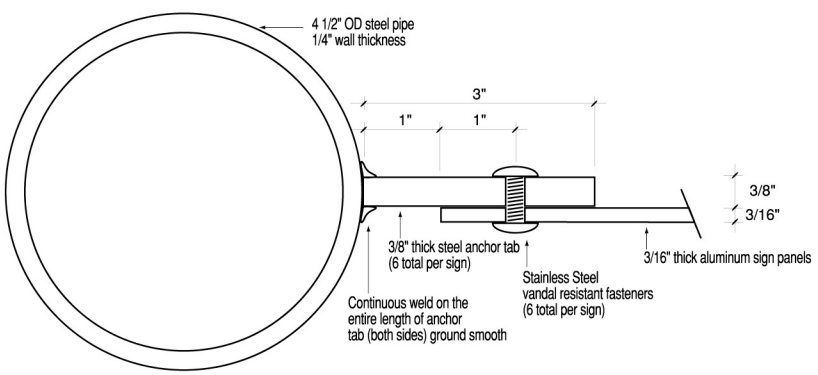
RAIN SHUT–OFF SWITCH DETAIL

ISSUED:
APRIL 2010
REVISED:

DRAWING NO.
800–12

DOUBLEFACED SIGN





PAINT SPECIFICATIONS

Primers:

Aluminum: Pre-treatment coating consisting of Polyvinyl Butyrate Resin and Zinc Chromate Corrosion Inhibiting Pigments, to be activated with an Acid Etch Compound. Applied directly to metal surfaces to provide corrosion resistance and adhesion.

Steel: Two part Lead/Chromate free Corrosion Inhibiting Epoxy/Polymide Primer.

Paint:

All paint to be specified should be an Ultraviolet Inhibited Aliphatic Isocyanate/Acrylic Polyol system engineered for extreme color and gloss retention. Follow manufacturers instructions for paint thickness.

ATTACHMENT DETAIL

N.T.S.

CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

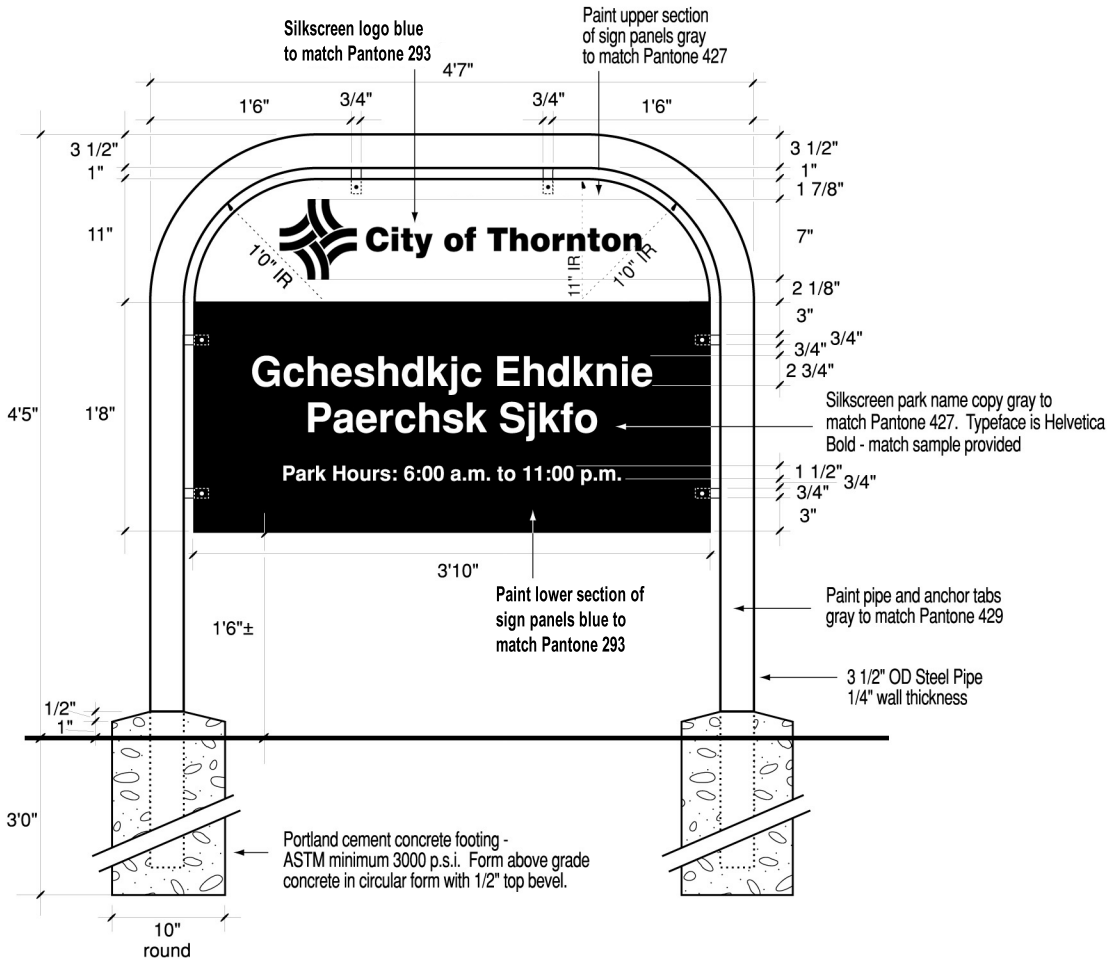
PARK SIGN A

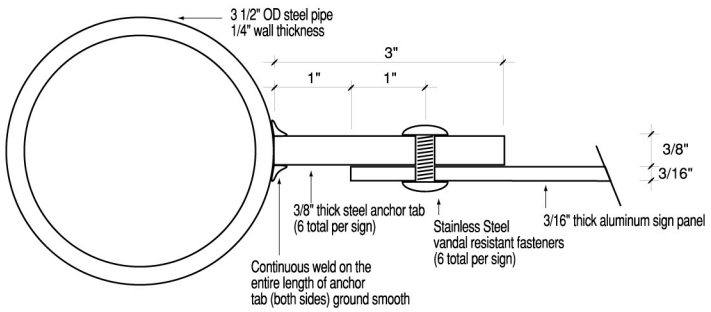
ISSUED:

REVISED:

DRAWING NO.
800-13

DOUBLEFACED SIGN





PAINT SPECIFICATIONS

Primers:
Aluminum: Pre-treatment coating consisting of Polyvinyl Butyrate Resin and Zinc Chromate Corrosion Inhibiting Pigments, to be activated with an Acid Etch Compound. Applied directly to metal surfaces to provide corrosion resistance and adhesion.

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Paint:
All paint to be specified should be an Ultraviolet Inhibited Aliphatic Isocyanate/Acrylic Polyol system engineered for extreme color and gloss retention. Follow manufacturers instructions for paint thickness.

ATTACHMENT DETAIL

N.T.S.

CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

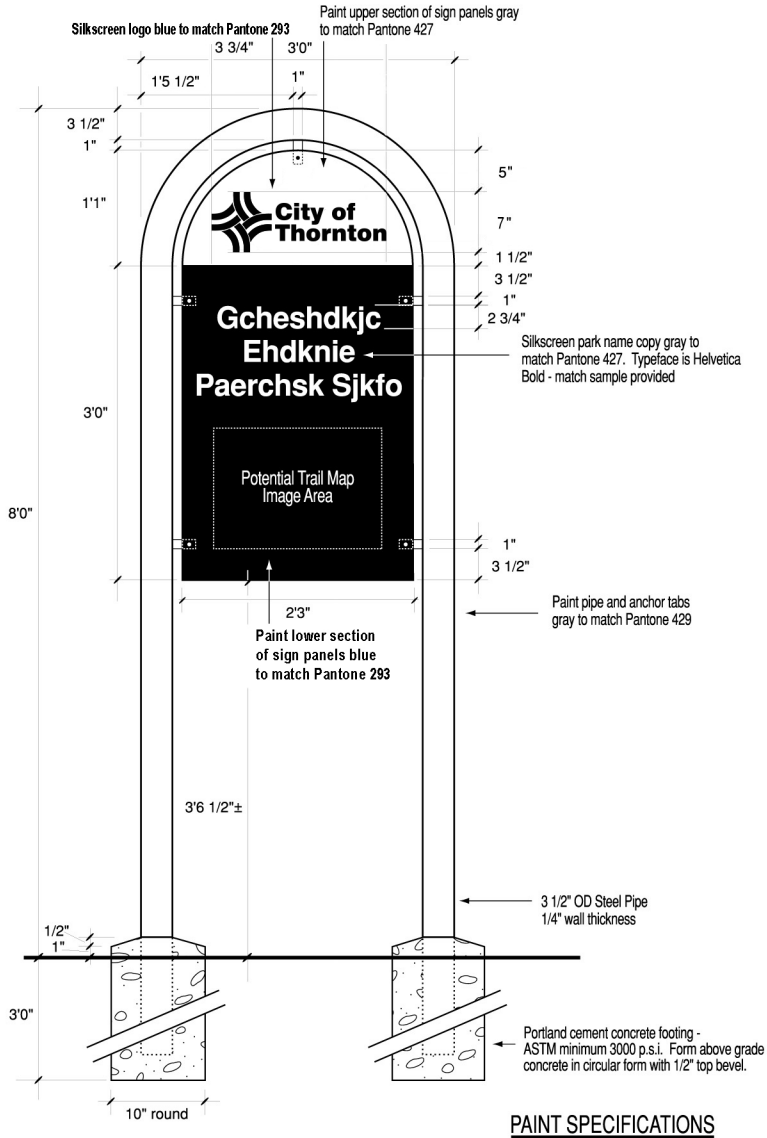
PARK SIGN B

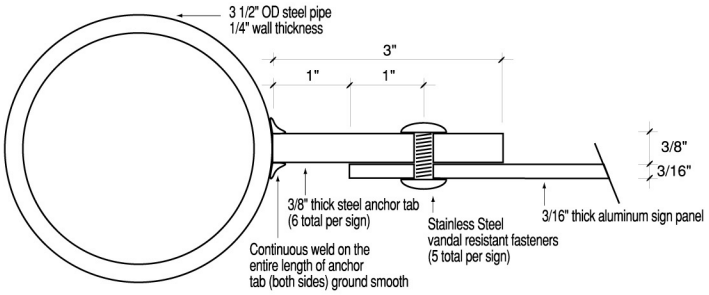
ISSUED:

REVISED:

DRAWING NO.
800-14

DOUBLEFACED SIGN





PAINT SPECIFICATIONS

Primers:

Aluminum: Pre-treatment coating consisting of Polyvinyl Butyrate Resin and Zinc Chromate Corrosion Inhibiting Pigments, to be activated with an Acid Etch Compound. Applied directly to metal surfaces to provide corrosion resistance and adhesion.

Steel: Two part Lead/Chromate free Corrosion Inhibiting Epoxy/Polymide Primer.

Paint:

All paint to be specified should be an Ultraviolet Inhibited Aliphatic Isocyanate/Acrylic Polyol system engineered for extreme color and gloss retention. Follow manufacturers instructions for paint thickness.

ATTACHMENT DETAIL

N.T.S.

CITY OF THORNTON, COLORADO
STANDARDS & SPECIFICATIONS

TRAIL SIGN

ISSUED:

REVISED:

DRAWING NO.

800-15