

**PART 900  
LANDSCAPING AND IRRIGATION**

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## SECTION 901

### GENERAL

All areas disturbed by construction activities on City projects shall have the turf restored to existing conditions (or better), per the following, unless otherwise indicated in the plans or special provisions:

All areas disturbed by construction that are adjacent to developed properties shall be restored with sod to match the existing turf type. A property shall generally be considered developed if occupied by a residential or commercial structure, parking lot, or other facility used on a regular basis. Restoration of disturbed areas shall include, but not be limited to, top soil preparation, fertilizer and sod installation. All sodding work shall be in accordance with the specifications in this section and *City of Wichita Administrative Regulation Number AR 6.5* or the current version. The regulation governs cleanup and restoration or replacement following construction. The plans shall indicate the estimated square yards of disturbed area to be sodded, within the projected construction limits for the project. The contractor shall be responsible for restoring all areas disturbed by construction, including those outside construction limits shown on the plans. When the weather/season prevents the installation of sod the Contractor shall be responsible for installing approved erosion control blanket at the back of curb (8" minimum wide). All costs for this work shall be considered subsidiary to the bid item "Sodding", or equivalent. In the absence of a bid item for sod installation, all associated work shall be considered subsidiary to other bid items.

All areas disturbed by construction that are adjacent to non-developed properties shall be restored by seeding with a mixture of Ryegrass (applied at a rate of 50 lbs per acre) and Buffalo grass (applied at a rate of 200 lbs per acre). A property shall be considered non-developed if vacant land and/or is used primarily for agricultural purposes. Restoration of disturbed areas shall include, but not be limited to, topsoil preparation, fertilizer, and seeding. All seeding work shall be in accordance with the specifications in this section and *City of Wichita Administrative Regulation Number AR 6.5* or current version. The regulation governs cleanup and restoration or replacement following construction. The plans shall indicate the estimated square yards of disturbed area to be seeded, within the projected construction limits for the project. The contractor shall be responsible for restoring all areas disturbed by construction, including those outside construction limits shown on the plans. The Contractor shall be responsible for installing approved erosion control blanket over all seeded areas. All costs associated with permanent seeding and erosion blanket shall be considered subsidiary to the bid item "Seeding", or equivalent. In the absence of a bid item for seeding, all associated work shall be considered subsidiary to other bid items.

The project plans should indicate which areas are to be sodded and which areas are to be seeded, when applicable, with estimated quantities for each, provided as information only.

Turf restoration for new residential development projects shall be per the project plans.

Turf restoration for drainage channels and floodways shall be per the project plans, as approved by City Storm Water and Park Departments.

The extent of soil removal and replacement with approved topsoil will be as shown on the plans, if needed. Soil for median landscaping shall be approved by the Project Engineer prior to placement.

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## SECTION 902

### SEEDING OPERATIONS

#### 902.1 DESCRIPTION

This work shall consist of furnishing proper materials, soil preparation, fertilizing, seeding, mulching, erosion control blanket, temporary seeding and maintenance until acceptance.

#### 902.2 MATERIALS

##### Fertilizer

Fertilizer shall be of commercial grade in delivered in fully labeled bags or with a certified blender ticket conforming to the applicable State Fertilizer laws. Fertilizer is to be a 10-20-10 blend with the first number representing the percentage of nitrogen, the second number representing the percentage of phosphorous, and the third number representing the percentage of potassium. Custom blenders licensed by the Kansas State Board of Agriculture shall blend bulk fertilizers and firms registered by the Kansas State Board of Agriculture shall manufacture packaged fertilizers. Application rates are shown in Table 902-1.

##### Seed

The seed shall be new crop seed complying with and labeled in accordance with U.S. Department of Agriculture rules and regulations under the Federal Seed Act in effect at the time of purchase. All seed shall be furnished in standard containers. Seed that has become moldy, wet or otherwise damaged in transit or storage will not be accepted. Seed shall be stored in a cool, dry place.

The seed supplier shall furnish a certified statement for the seed furnished stating the purity percent, germination percent, and the sproutable seed percent. Sproutable seed is the product of the percentage of purity and the percentage of germination. All seed used will be Blue Tag Certified.

- a) **Fescue** - A turf-type blend of Fescue seed for south central Kansas shall be planted in areas adjacent to the developed properties that have established, maintained, turf grassed areas or yards. Fescue K-31 grass seed shall be planted in areas adjacent to undeveloped properties and developed properties that do not have established, maintained, grassed areas or other established, maintained, landscaped areas. Grass seed shall have a minimum purity of ninety-five percent (95%) with eighty-five percent (85%) germination and no listed noxious weeds or listed weeds of any kind in the turf-type fescue blend seed.
- b) **Buffalo** - Texoka, Sharp's Improved, Bison, Plains, Tatanka, Cody or Topgun grass seed shall be planted in all areas. Grass seed shall have been pretreated to enhance germination and have a pure live seed (PLS) content of ninety-three percent (93%) with eighty-five percent (85%) germination. Verifying colorant must be associated with pretreated seed.
- c) **Rye** - Annual rye grass used for temporary seeding shall have a purity of ninety-seven percent (97%) and a germination of eighty-five percent (85%).

##### Mulch

The materials for this item shall be either Prairie Hay or Bromegrass Hay. Prairie Hay shall consist chiefly of the Bluestem grasses, switchgrass, Indian grass, and other desirable native perennial grasses which are normally found growing in Bluestem pastures. Mulching material shall be free of field bindweed, Johnson grass, hoary cress, Russian knapweed or any noxious weeds. Areas to be mulched shall be as indicated on the plans or as ordered by the Engineer.

**TABLE 902-1**

<b>Seed/Sod</b>	<b>Application Rate</b>	<b>Fertilizer</b>	<b>Application Rate</b>	<b>Seeding Season</b>
Fescue	8 lbs PLS/1000 sf	12-24-12 N-P-K	45#/A	Dec 1 to May 1 or Aug 15 to Oct 15
Buffalo	2.5 lbs PLS/1000 sf	5-12-12	40#/A	Dec 1 to June 1
Rye	5 lbs/1000 sf			

**902.3 SOIL PREPARATION**

The area to be seeded shall be prepared prior by removal of clods and surface stones one inch (1") in diameter or larger. Areas of annual grasses such as cheat, crab grass, tripleawn, etc. shall be destroyed with an approved herbicide a minimum of one week prior to thorough disking and then planted using the specified seed.

The areas to be planted shall be prepared for planting by cultivation, removal of all objectionable material, and filling of gullies or depressions. The soil preparation shall be accomplished by disking, harrowing and firming. The minimum depth of the soil preparation shall be four inches (4"). Existing weed stubble, small weeds and grass that can be disked shall be cut by the disk and completely incorporated into the soil. Several disking and harrowing operations may be required on some areas to provide a satisfactory seed bed. Areas inaccessible for disking and harrowing shall be prepared by hand methods. The minimum depth of preparation for the seedbed where hand methods must be employed shall be two inches (2").

**902.4 FERTILIZING**

Fertilizer shall be distributed uniformly over the area to be seeded. The fertilizer shall be incorporated into the soil to a depth of at least two inches (2") by disking or harrowing. Fertilizer may be distributed by means of an approved seed drill, which is equipped to sow seed and distribute fertilizer in one operation.

See Table 902-1 for specific application rates.

**902.5 SEEDING**

See Table 902-1 for specific application rates and seeding seasons. Refer to Subsection 902.3 for the appropriate soil preparation. Planting depth shall be appropriate for the type of seed. Seeds shall be distributed by one, or a combination of the following three methods.

Seeds may be uniformly distributed with acceptable drills. The drills shall be capable of providing a uniform distribution at a known seeding rate. When a standard drill with a fertilizer attachment is used, certain mixed seeds may be placed in the seed box and the fertilizer placed in the fertilizer compartment. Both may be applied during one (1) operation, unless notes on the plans require separate applications. All drills shall be fully adjustable so that they will deliver the seeds and fertilizer at the rates specified on the plans or ordered by the Engineer (i.e. conventional seeding vs. native seeding). Drills shall be in good repair to be able to deliver the seeds and fertilizer uniformly in each drill furrow.

Seeds may be uniformly distributed by broadcasting only when approved by the Engineer. Seeding with an approved broadcasting grass seeder may be required on areas where it is impossible to operate a drill and this method may also be required for certain small seeds. The seeder shall be of appropriate size and suited for the site conditions. Broadcasting fertilizer is permissible on rough, rocky slopes where drills

cannot operate.

The grass seed should be planted in well-prepared and firm seedbeds. When the fertilizing and seeding operations start on an area, that area shall be completed as soon as possible. No seeding shall be done during windy weather or when the ground is wet or otherwise non-tillable. The grass seed shall then be covered, using a flexible toothed weeder or other suitable equipment. As soon as this covering operation has been completed, the seeded area shall be rolled again with a Culti-packer or similar roller equipment. The roller shall be run over the area only once parallel with the contours of the ground.

Seeds may also be applied by hydromulching or hydraulic-slurry, (except Buffalo Grass). Hydromulching may be substituted for standard seeding operations when approved by the Engineer. Specialized equipment shall include a pump, hose, nozzle and tank with both paddle and liquid-type agitators. After mixing the specified seed type with water, the seed-water suspension shall be applied by pumping through a hose-nozzle arrangement onto the site under a pressure of 90 to 150 psi. Fertilizer and pulp fiber mulches may also be placed in the hydroseeder tank for application in combination with the seed. Since hydroseeding applies seed to the surface, the Contractor shall ensure effective establishment by maintaining adequate soil moisture while minimizing erosion.

## **902.6 MULCHING**

This item shall consist of the placing of hay mulch, which will only be allowed when specified by the plans or project special provisions. The purpose of the mulch is to retard erosion on slope areas and to improve the physical condition of the soil so that plant growth will become established more readily. Areas to be mulched shall be as indicated on the plans or as ordered by the Engineer.

Machines for distributing hay mulch shall be approved by the Engineer prior to use and shall be maintained in good operating condition. Distributing machines for hay mulch shall be constructed for this purpose and shall include a blower for the hay. Sufficient power shall be provided on the machine to operate the hay blower in such a manner that the hay can be distributed over the designated area at the rate required below with a single pass of the machine. The machine shall be provided with an operating platform large enough to accommodate an operator and a supply of hay. Hay blowing distributing machines shall not be used in areas where blowing hay dust would be objectionable to adjacent properties. Such areas shall be mulched using hand methods as prescribed for small areas and/or steep slopes.

The mulching material as specified shall be placed over the designated areas after seeding and fertilizing has been completed. The mulching material shall be spread uniformly over the areas to a thickness of approximately one and one-half inches (1-1\2") loose measurement. This application rate normally will require approximately two (2) tons of hay per acre. The mulching material shall be crimped into the soil so that it is partially covered. The disking operation shall be performed longitudinally with any sloped surface. Several trips over the mulched areas will be necessary to work part of the hay into the soil, especially if heavy weights are not used on the disk. Care shall be exercised to obtain a reasonably even distribution of hay partly incorporated into the soil.

Hay mulch shall be "patted" with forks as it is placed in areas that require mulching by hand because the areas are too small or the slopes are too steep for disking. Soil from these areas shall be placed on top of the mulch to reduce loss due to wind.

The stem length of the hay mulch material is important in order for the mulch to intertwine and bind together. Short-stemmed mulching material is much more vulnerable to wind action, than long-stemmed mulching material. When hay mulch is applied with a blower, it may be necessary to remove some of the cutting knives to prevent cutting the mulch stems too short.

The Contractor shall arrange his work so that the mulch can be placed and disked immediately after each area is seeded. Mulching operations shall not lag behind seeding operations more than twenty-four (24)

hours during clear weather. When rain is threatening, the Contractor shall make every effort to mulch areas the same day on which they are seeded. Mulch shall be replaced before seeds germinate when remulching wind or rain damaged areas.

### **902.7 EROSION CONTROL BLANKET**

When permanent seeding is specified but weather or seasonal limitations prevent the planting of the permanent seed, an approved control blanket shall be installed at the back of curb (minimum 8" wide). The temporary erosion control blanket is to be removed before the permanent seed is planted. All costs for the temporary erosion control blanket shall be subsidiary to the bid item "Site Restoration", or equivalent.

When permanent seeding is specified, an approved control blanket shall be installed over the entire seeded area, unless otherwise indicated in the plans or provisions. All costs for the erosion control blanket shall be subsidiary to the bid item "Seeding", or equivalent.

### **902.8 TEMPORARY SEEDING**

#### **Description**

This work shall consist of furnishing temporary grass seed, soil preparation, the planting of temporary grass seed and mulching of the seeded area when required.

#### **Materials**

Material requirements for temporary seed and mulch are provided in Subsection 902.2.

#### **Soil Preparation**

Soil preparation shall be as described in Subsection 902.3.

#### **Temporary Seeding**

Temporary seed shall be planted when permanent seed or sod cannot be used due to seasonal limitation, but only when specified by the plans or provisions.

Temporary seed shall be planted if the project NPDES permit or SWPPP permit requires it, when construction ceases in an area for more than 14 days or a other duration stated by the applicable permit.

The Engineer may also direct temporary seed be planted in areas to control erosion.

The application rate for rye grass is provided in Table 902-1.

#### **Mulching**

When directed in the plan or by the Engineer, mulch shall be placed as described in Subsection 902.6.

When temporary seeding is placed, an approved erosion control blanket shall be installed at the back of curb (minimum 8" wide). The erosion control blanket is to be removed before the permanent seed is placed. All costs for the erosion control blanket shall be subsidiary to the bid item "Site Restoration".

### **902.9 MAINTENANCE/ACCEPTANCE**

The seeded areas shall be protected against traffic or other use immediately after planting. **The Contractor shall be responsible for the proper care of all seeded areas, including erosion control, weeding and mowing until Project Final Acceptance has been given by the Engineer, excluding final acceptance of trees.** Seeded areas shall be mowed when vegetation is a maximum height of twelve inches (12"). Debris and trash shall be removed prior to mowing operations. Caution shall be



taken during the mowing so that the grass is not gouged or dug up.

The Contractor shall keep seeded areas thoroughly watered for a minimum of 30 days after the seed has been planted. The seed shall be watered with deep soaking every two weeks during dry periods until a mature stand of grass (75%) is obtained in all seeded areas. The City reserves the right to determine what areas are not acceptable and require reseeding, at any stage of payment.

All seeded areas shall be approved and accepted by the Engineer and Park Department representative prior to each stage of payment.

#### **902.10 PAYMENT**

The Contractor shall be paid 75% of the seeding bid item total when the seed has been applied to all areas, including any temporary seeding that was required. An additional 15% will be paid to the Contractor at approval of a 75% mature stand. The remaining 10% will be paid at Project Final Acceptance, provided a minimum 75% stand has been maintained, the grass is free of weeds, and has been mowed within the last 3 days.

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## SECTION 903

### SODDING OPERATIONS

#### 903.1 DESCRIPTION

This work shall consist of the furnishing and placing of living grass sod in reasonable conformity with those locations indicated on the plans or ordered by the Engineer and in accordance with these specifications.

#### 903.2 MATERIALS

##### Fertilizer

Fertilizer shall be of commercial grade in delivered in fully labeled bags or with a certified blender ticket conforming to the applicable State Fertilizer laws. Fertilizer is to be a 10-20-10 blend with the first number representing the percentage of nitrogen, the second number representing the percentage of phosphorous, and the third number representing the percentage of potassium. Custom blenders licensed by the Kansas State Board of Agriculture shall blend bulk fertilizers and firms registered by the Kansas State Board of Agriculture shall manufacture packaged fertilizers. Application rates are shown in Table 903-1.

##### Sod

Sod shall be cut uniformly according to customary practice for the kind of sod being supplied. Badly torn, broken or dry sod will not be accepted. Sod containing noxious weeds or excessive quantities of foreign grass will not be accepted. Strips that crumble will not be accepted. The sod shall be kept moist until it is placed. Sod furnished under this specification shall be approved for use by the Engineer.

- a) **Fescue** - Fescue grass sod shall be a turf-type blend of Fescue suitable for south central Kansas and approved by the Engineer.
- b) **Bermuda** – Bermuda grass sod shall be Kansas Improved P-16 Mid-Iron, Midlawn, Midfield or Astro.
- c) **Zoysia** – Zoysia sod shall be Z-52 Meyer.
- d) **Buffalo** – Buffalo sod shall be 609, Prairie, Legacy or Prestige.

TABLE 903-1

Sod	Fertilizer Rate (per 1000 sf)	Sodding Season
Fescue	10 lb	April 1 - June 1 & Sept 1 - Nov 1
Bermuda	5 lb	May 1 - Sept 1
Zoysia	5 lb	May 1 - Aug 15
Buffalo	1.5 lb	May 1 - Sept 1

#### 903.3 SOIL PREPARATION

The area to be sodded shall be prepared prior to placing the sod by thorough cultivation, smoothing, removal of clods, surface stones one inch (1") in diameter or larger and weeds. Areas of annual grasses such as cheat, crab grass, tripleawn, etc. shall be destroyed with an approved herbicide and removed prior to sod placement.

Grades established by the grading Contractor shall be maintained. The soil grade shall be below the paved grade of adjacent sidewalks and curbs such that the sod and pavement grades will match.

Cultivation shall consist of pulverizing the soil to a minimum depth of two inches (2") prior to smoothing, finishing, moistening the soil and placing the sod.

#### **903.4 FERTILIZING**

Fertilizer shall be distributed uniformly at rates shown in Subsection 902.2 and over the area to be sodded, and shall be incorporated into the soil to a depth of at least two inches (2") by disking, harrowing or other methods approved by the Engineer. Distribution shall be done by means of an approved fertilizer spreader.

See Table 903-1 for specific application rates.

#### **903.5 SODDING OPERATIONS**

See Table 903-1 for Sodding Seasons.

##### **Placing and Cultivation of Sod**

Sod placed on slopes of 2:1 or steeper and in ditch bottoms shall be staked with six (6) stakes per square yard. Sod placed on slopes flatter than 2:1 shall be staked with two (2) to four (4) stakes per square yard or roll, as determined by the Engineer. Stakes shall be of lath or similar materials and shall be driven six inches (6") into the ground, leaving approximately one and one-half inch (1-1/2") of the top above the sod line. Sod may also be staked using wire staples of 11-gauge ungalvanized wire. Staples shall be driven flush with the ground.

Strips of sod shall be hand placed tightly against curbs, pavement or previously placed sod strips such that the entire area designated to be sodded will be completely covered. Sod shall be placed to match elevations of existing grass sod, curbs, driveways and sidewalks. Joints in successive rows of sod shall be staggered in a running bond pattern such that the ends of the strips being placed will line up with the centerline of strips placed in adjacent rows. Ends and edges of sod shall be top dressed with soil to prevent drying.

##### **Firming Sod**

After placing, all sod shall be firmed by use of an approved roller, a tamper or other approved method. On steep slopes the sod may be firmed by compacting with sod tampers or hand shovels. The firming process shall ensure good sod-soil contact and allow optimum establishment and rooting of the grass.

#### **903.6 EROSION CONTROL BLANKET**

When the weather/season prevents the installation of sod the Contractor shall be responsible for installing an approved erosion control blanket at the back of curb (8" minimum wide). All costs for this work shall be considered subsidiary to the bid item "Sodding", or equivalent.

#### **903.7 MAINTENANCE/ACCEPTANCE**

The sodded areas shall be protected against traffic or other use immediately after placing. **The Contractor shall be responsible for the proper care of all sodded areas, including weeding and mowing until Project Final Acceptance has been given by the Engineer, excluding final acceptance of trees.** Sod shall be mowed when vegetation is a maximum height of six inches (6"). Debris and trash shall be removed prior to mowing operations. Caution shall be taken during the mowing so that the sod is not gouged or dug up.

The Contractor shall keep sodded areas thoroughly watered for a minimum of 30 days after the sod has been placed. The sod shall be watered with deep soaking every two weeks during dry periods. The City

reserves the right to determine what areas are not acceptable and require resodding, at any stage of payment.

All sodded areas shall be approved and accepted by the Engineer and Park representative prior to each stage of payment.

### **903.8 PAYMENT**

The Contractor shall be paid 75% of the sodding bid item total when the sod has been installed in all areas. An additional 15% will be paid to the Contractor at approval of the sod at the end of the 30-day watering period. The remaining 10% will be paid at Project Final Acceptance, provided the sod remains in acceptable condition, is free of weeds, and has been mowed within the last 3 days.

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## **SECTION 904**

### **ALTERNATE PLANTING METHODS**

#### **904.1 GENERAL**

The following alternate planting methods may be used when approved by the Engineer, or when directed in the plans or specifications. The appropriate planting season will be based on the type of seed or sod to be planted and the planting method used.

#### **904.2 PLUGGING**

Soil shall be prepared as described in Subsection 902.3.

Fertilizer shall be applied as described in Subsection 903.4.

Plugs from established sod shall be at least two inches (2") in diameter with two to three inches (2"-3") of soil and roots. Plugs shall be set at a maximum of twelve-inch (12") intervals and firmed into the soil so the tops are level with the soil surface.

#### **904.3 SPRIGGING**

Soil shall be prepared as described in Subsection 902.3.

Fertilizer shall be applied as described in Subsection 903.4.

Sprigs, obtained by tearing apart or shredding established sod, shall be four to six inches (4"-6") long and include rhizomes, stolons, roots and shoots. Sprigs shall be planted in shallow trenches two inches (2") deep and a maximum of six inches (6") apart. Fresh sprigs, not dry, shall be planted four to six inches (4"-6") apart in the row. When planted, one end of each sprig shall be at least two inches (2") below the soil surface, but part of each sprig must be above ground.

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**SECTION 905**  
**PLANT MATERIALS**

**905.1 DESCRIPTION**

This work shall include the furnishing, planting and maintaining healthy plant material. The Contractor is responsible for the location of all utilities in the project area and their protection during the scope of the work. Any damage to these lines during planting operations shall be repaired by the Contractor in a manner approved by the Engineer and at no additional cost to the City.

**Referenced Specifications and Standards**

The following specifications and standards of the issues listed below (including the amendments, addenda, and errata), but referred to thereafter by basic designation only, form a part of this specification to the extent required by the reference hereto.

American Joint Committee on Horticultural Nomenclature Standard (AJCHNS):  
1942 Edition - Standardized Plant Names

American National Standards Institute, Inc.: ANSI Z60.1-1986,  
American Standard for Nursery Stock

**Inspection**

The Contractor shall be responsible for all inspection and approval of plant material that may be required by state, federal and other authorities, and he shall secure any permits and certificates that may be required.

All plants shall be subject to inspection and approval at the place of growth before digging, or upon delivery; such approval shall not impair the right of rejection at the project site during progress of work. Rejected plants shall be removed immediately from the project site.

**905.2 MATERIALS**

**General**

Provide freshly dug plants. Do not prune prior to delivery except as approved by the Engineer and Park and Recreation Forestry Division Representative. Provide adequate protection of root systems and balls from drying winds and sun. Do not bend or bind-tie plants in such manner as to damage bark, break branches or destroy natural shape. All plant materials shall be free of mechanical injury, decay, or other defects. Provide protective covering during delivery. Do not drop balled and burlapped stock during delivery. Deciduous trees within fifty (50) feet of street intersections shall be single trunked trees with branches no less than five (5) feet above the ground. All plants shall be symmetrical in growth with balanced root and top growth and shall be No. 1 grade or type. All trees shall have well-developed scaffold branches with wide branch angles characteristic of the species. Trees with multiple narrow branch angles will be rejected.

**Plants Required**

The plan shall show plant quantities, size, manner in which to be furnished, scientific name and common name. In case of any discrepancy between a Plant List and the actual planting plan, the planting plan shall govern.

**Nomenclature**

Scientific and common names of plants herein specified conform to the approved names given in Standardized Plant Names prepared by the AJCHNS.

**Quality and Size**

Plants shall be in accordance with ANSI Z60.1. All plants shall have a normal habit of growth and shall be sound, healthy, vigorous and free from disease and insect infestations. The minimum acceptable sizes of all plants, measured before pruning with branches in normal position, shall conform to the measurements specified on the plan. Plants larger in size than specified may be used with the approval of the Engineer, but at no change in the contract price. If larger plants are used, the ball or earth or spread or roots shall be increased proportionately. Minimum branching height for shade and street trees shall be 4 feet unless otherwise specified on planting plans. Tree trunks shall be centered within the rootball or container. Trees with double leaders or bark inclusions will not be accepted.

### **Balled and Burlapped Plants**

All plants shall be adequately balled with firm, natural balls of soil in sizes and ratios conforming to Table of Minimum Ball Sizes as set forth in ANSI Z60.1. Smaller diameter root balls will be accepted upon approval by the Engineer and Park and Recreation Forestry Division Representative for plant material produced in "root control" in ground containers. The fabric bag must be removed and the earth ball secured with burlap. Balls shall be firmly wrapped with burlap. Broken balls will not be accepted. Only nursery stock which has been harvested during the current season will be accepted. Nursery stock which has been held over through the year and re-burlapped will be rejected.

### **Container Plants**

Plant material specified in containers is meant as a guide for the minimum acceptable root volume. The soil mixture must hold intact when plant material is removed from the container. Plant material shall have been grown in the container for a minimum of four months. All container plants shall be of the size indicated by the plans. Containers shall be removed from such plants at the time of planting. Soil mixture of container plants must be thoroughly moistened at the time of planting.

### **Topsoil**

The Engineer reserves the right to have the Contractor amend or replace the existing site topsoil upon recommendation from the Consulting Engineer/Architect and/or the City Parks and Recreation representative. The Contractor shall have site soils and any imported topsoil tested by a certified testing laboratory and obtain recommendations for amendment type and quantities specific to the plant materials being used on the project. Test results that include major nutrient availability, pH, and organic matter will be submitted to the Engineer and Park and Recreation Forestry Division Representative for review. Topsoil shall be a natural friable loam of uniform quality, representative of good productive soils in the area. Topsoil shall be free of a mixture of subsoil, weeds, construction debris, clods or stones larger than 1 inch, and any foreign matter or substance that may be harmful to plant growth.

### **Mulch**

Mulch shall be wood chip mulch as used by the City of Wichita Park Department or as approved by the Engineer. Mulch shall be free of any disease organisms, nematodes or larvae.

### **Fertilizer**

Fertilizer shall be of commercial grade delivered in fully labeled bags or with a certified blender ticket conforming to the applicable State Fertilizer laws. Fertilizer is to be a 10-20-10 blend with the first number representing the percentage of nitrogen, the second number representing the percentage of phosphorous, and the third number representing the percentage of potassium. Custom blenders licensed by the Kansas State Board of Agriculture shall blend bulk fertilizers and firms registered by the Kansas State Board of Agriculture shall manufacture packaged fertilizers.

### **Water**

Water shall be furnished by the Contractor for execution of all work specified in this Contract. The Contractor shall verify that the water available is suitable for irrigation and free from ingredients harmful to plant life. The Contractor shall water all plant material until final acceptance.

### **Wire**

Wire shall be pliable No. 12 gauge, twisted in a double strand allowing for tightening or loosening the guywire during the guarantee period.

**Protection of Trees from Wire**

Hose to encase wire used for fastening trees to stakes shall be new, two-ply reinforced rubber garden hose, having an inside diameter of not less than 1/2-inch and with sufficient length to protect the trunk from abrasion. Nylon „tree rope“ is acceptable only when girdling and abrasion of the trunk are prevented.

**Stakes**

Stakes for supporting trees shall be a minimum of six feet (6') long heavy-duty steel tee posts in accordance with the plan detail drawings. Wooden stakes are not acceptable.

**905.3 PLANTING****Planting Season**

The planting dates for trees shall be between October 1 and May 15. The planting dates for shrubs, perennials, and ground cover (not including grass seed or sod) shall be between April 1 and October 15. Grass seeding and sodding seasons are established elsewhere in the specifications. Planting shall only be performed when weather and soil conditions are suitable and in accordance with locally accepted practice. Deviation from the above planting dates will be permitted only when approved by the Engineer and Park and Recreation Forestry Division Representative.

**Transport**

Shipping and delivery of plant material will not be acceptable when the air temperatures are below 30 degrees F, unless approved by the Engineer and Park and Recreation Forestry Division Representative.

**Temporary Storage and Heeling-in**

When temporary storage or heeling-in is required, the Contractor shall provide and prepare a suitable heeling ground or heeling-in nursery conveniently located near the planting site.

Plant material unloaded and accepted by the Engineer shall be immediately heeled-in or transported to the planting site and planted. Material left out of ground overnight or left with its roots bare to the sun, or otherwise unprotected during transit, unloading or storage shall be rejected by the Engineer if in his judgment such lack of protection has caused damage to the roots of the plant or in any other way injured the plant.

**Layout**

The Contractor shall stake the location of all plant material for verification by the Engineer prior to planting. The Contractor is to secure approval from the Engineer's representative and the Park Department's representative prior to installing any plant materials. Rocks and other underground obstructions shall be removed to the depth necessary to permit proper planting according to the plans and specifications. Where below ground or overhead obstructions are encountered, the plants shall be relocated as directed by the Engineer.

**Plant Pits**

Excavation of plant pits shall extend to the required depths below finished grade. Plant pits shall be square or circular and have vertical sides and flat bottoms. Plant pits shall be 18 to 24 inches larger in width than the ball or container on the plant. No excavated plant pits will remain open overnight.

**Setting**

Balled and containerized plants shall be placed on the undisturbed bottom of the excavated planting pit such that the root flare will be level with or within one (1) inch above the adjacent ground line. The root flare shall be visible and clear of backfill or mulch. Backfill shall be with material excavated from the planting pit that shall be thoroughly settled by tamping and a thorough watering. A saucer 4 inches deep shall be formed by placing a ridge of topsoil 3" outside the edge of each planting pit. All twine, rope or binding material shall be cut and removed from around the stem or trunk of the plant. Containers shall be

removed from all plants furnished in containers immediately before planting.

### **Pre-Emergent Herbicide**

Apply pre-emergent herbicides to all planting beds in accordance with standard practices and label directions. Herbicides are to be approved by the Engineer and compatible with the soil type and plant materials being used. Make the application prior to mulching the beds. Additional herbicide applications may be necessary to provide control until final acceptance. The Contractor shall provide the Engineer with verification of applications.

### **Mulch**

Trees are to be mulched with wood chip mulch spread evenly to a depth of 4 inches within the saucer immediately after placement. Shrubs shall be mulched with wood chip mulch as directed by the Engineer. A depression shall be formed in the mulch around the trunk of the tree or base of the plant in such a manner that the root flare is visible.

### **Fertilizer**

Fertilize the mulched area immediately after planting by spreading fertilizer at the rate of 30 lb per 1000 sq ft. This will require 0.6 lb per 5' diameter saucer. The Contractor shall provide the Engineer with verification of the fertilizer application.

### **Pruning**

No pruning shall be done on plants except to remove dead or injured branches. Such pruning shall be done to preserve the plant's natural form and character and in a manner appropriate to its particular requirements. No central leaders shall be cut. All pruning shall be done with clean, sharp tools. Remove and replace excessively pruned and malformed stock resulting from improper pruning. Limbs from pruning will be removed from the planting site or cut into small pieces and placed with mulch.

### **Staking**

For all plant materials requiring staking, the staking shall be completed by the end of the day on which they were planted. All trees shall be staked according to standard detail drawings. The Contractor shall remove all staking material after one growing season and prior to final acceptance.

### **Clean-up**

Upon completion of the planting, all excess soil, stones, and debris which have not previously been cleaned up shall be removed from the site or disposed of, as directed by the Engineer. All ground area disturbed as a result of planting operations shall be restored to original condition or to the desired new appearance. All labels, flagging, tape, ribbons and twine shall be removed from all plant material and disposed of by the Contractor as approved by the Engineer. The Contractor will also be responsible for removing and disposing of all flags used for marking underground utilities after the plantings are complete.

The existing grass and sod previously installed shall be protected from damage during installation of additional plant material or subsequent construction activities. The Contractor shall provide planking and/or other means to protect grass, sod, etc.

## **905.4 MAINTENANCE - PRIOR TO ACCEPTANCE**

### **General**

Maintenance operations shall begin immediately after each plant is planted and shall be continued as required until final acceptance by the Engineer and Park and Recreation Forestry Division Representative. Plants shall be kept in a healthy growing condition by pruning, spraying, and any other necessary operation of maintenance. The Contractor shall inspect plants during the maintenance period and needed maintenance shall be performed promptly. Mulched areas shall be kept free of weeds. The Contractor shall submit a written schedule of plant maintenance for approval by the Engineer and Park and Recreation Forestry Division Representative at the time of plant material installation. The

schedule shall include inspection, watering, pruning, spraying, and other necessary maintenance activities.

### **Watering**

The Contractor shall water all plant material until final acceptance.

## **905.5 ACCEPTANCE, ESTABLISHMENT MAINTENANCE, REPLACEMENT**

### **Initial Acceptance**

All plants to be planted on the project shall be planted in accordance with Subsection 905.3. All deciduous plants, except when planted as replacement plants, shall be planted when the plants are dormant. At the conclusion of plant installation, an inspection shall be made by the Engineer in April. The purpose of this inspection shall be for the acceptance of the contract work. If there are any deficiencies in the work, the Contractor will be notified and the work subject to reinspection before final acceptance. If there are any dead or unhealthy plants identified as a result of the April inspection, they shall be replaced prior to May 15th.

### **Establishment Maintenance Period**

After provisional acceptance of the initial plant installation by the Engineer in May the Contractor will be required to provide establishment maintenance care for all plants planted on the project until the following October, at which time the Engineer will again inspect the plants. All plants found to be unhealthy or dead at the time of this October inspection shall be replaced in kind and in compliance with the project specifications. The Contractor's responsibility will end at the time of inspection for any plants replaced or accepted in October. During the establishment maintenance period, the Contractor shall inspect the plant materials twice a month (or more as necessary) for watering and other maintenance needs. Maintenance should be extended to 30 days on watering. Contractor shall keep the plants in a healthy growing condition during the establishment maintenance period by providing the necessary care consisting of pruning, spraying, watering, and any other maintenance type operation required. The mulched areas around the plants shall be kept free of weeds and grasses for the full duration of any required establishment maintenance period.

### **Replacement Plants**

All dead and unhealthy material identified at the time of any specified inspection shall be removed from the site and replaced with plants of the same kind and sizes as originally specified. Such replacements shall be made in the same manner as specified for the original plantings and at no extra cost to the City. All dead and unhealthy plants shall be removed within 14 days after the Contractor has been notified that the plant must be replaced. A penalty of \$50 per plant per day will be charged to the Contractor for all days in excess of the 14 days required by the Contractor to remove any plant. Healthy plants must have live and growing branches with foliage of normal size, color, and density. Plants with significant branch die back will be considered as unhealthy and unacceptable. Plants with sparse foliage, foliage that has been significantly damaged by insects or disease, permanently wilted foliage or plants that have defoliated prematurely will be identified as unhealthy and unacceptable. Damage to existing plant materials, sod, etc., during plant replacements shall be repaired without cost to the City.

## **905.6 PAYMENT**

Work required for furnishing and planting plant materials shall be paid for at the Contract unit prices per each for the various kinds, sizes, and grades of plants as identified in the bid form in the project proposal. These prices shall be full compensation for furnishing and planting all plants and shall include all excavation, backfill, tree stakes, guy wire, mulch, watering, establishment maintenance care and for all labor, tools, equipment, and incidentals necessary to complete the work and maintain the plants in a healthy growing condition for the duration of time required. Only 75% of the contract unit price for each plant will be paid to the Contractor at the time of planting of each individual plant. An additional 15% will be paid to the Contractor for any individual plant found to be healthy and growing at the Provisional

Acceptance Inspection, which will be the first May following completion of all planting. The remaining 10% will be paid for any plant when it is accepted or replaced as a result of the Final Acceptance Inspection, which will be the next October after the Provisional Acceptance Inspection. Retainage will not be withheld on partial payments for landscaping items.

## SECTION 906

### IRRIGATION

#### 906.1 DESCRIPTION

The Contractor shall provide all labor and materials to design and install an irrigation system in the area designated in the project plans. The following specifications detail the type of products and installation practices required for this project. The Base bid shall include all Labor and Materials to design and install the sprinkler system at the project that will include controller, appropriately sized water meter, mainline, wire and all associated costs for that result. Any polyethylene drip tube based low-volume irrigation system will not be approved. An Irrigation Association Certified Irrigation Designer shall design the irrigation system.

#### **Contractor Experience Requirement**

The Irrigation Contractor shall be required to demonstrate 8 years experience in the installation of similar sized systems. A written document showing a minimum of three references with contact information for three separate projects of equivalent size and complexity shall be required. The Contractor must also show experience with control systems of a type similar to this project. The Contractor will not be allowed to begin work until after references are checked and found to be satisfactory by the City of Wichita Park Department.

#### **Summary**

This section includes pipe and fittings, valves, sprinkler heads and accessories and the irrigation control system.

#### **Quality Assurance - Regulatory Agency Requirements**

All work and materials by the Contractor shall be in full accordance with the latest rules and regulations of safety, order of Division of Industrial Safety, the Uniform Building Code and other applicable laws and regulations, including any regulatory authorities having jurisdiction, and Plumbing Codes. Should the contract documents be at variance with any aforementioned rules and regulations, the Contractor shall notify the City for instructions before proceeding with work affected.

The City shall make a final inspection prior to acceptance of the project. The Contractor shall notify the City at least 72-hours prior to this inspection.

Any permits for the installation or construction of any work included under this contract, which are required by any of the legally constituted authorities having jurisdiction, shall be obtained and paid for by the Contractor.

#### **Submittals**

The Contractor shall submit shop drawings or irrigation system design, including but not limited to piping, sprinkler heads, valves, wiring and controls. These submittals shall be furnished within ten (10) calendar days after the Contractor has received notice to proceed and shall include a layout of the entire project including any adjacent right-of-ways, which are required to be irrigated. The drawings and specifications shall show the following as a minimum.

- a) Static pressure (psi) and gallons per minute (gpm) upon which the design is based.
- b) Complete layout of the system indicating placement of all piping, controls, control boxes, valves, required sleeves, etc.
- c) All pipe sizes, materials, and class ratings.
- d) All manufacturers and model numbers.
- e) Specifications for each type of sprinkler head showing nozzle, spray pattern, radius, gpm/head, operation psi, size, etc.

All design, drawings, specifications and materials must be approved by the City's Department of Park and

Recreation prior to the start of any installation of the irrigation system.

The Contractor shall furnish two (2) keys for the controller, and two (2) sets of special tools required for removing, disassembling and adjusting each type of sprinkler head on this project.

### **Record drawings**

The Contractor shall maintain one (1) record set of blue-line prints of the irrigation system in good condition at the site and mark on them the exact „record“. The Contractor shall make a daily record of all work installed during each day. Drawings shall indicate on the prints the exact location of check valves, gate valves, wire locations, head layout, automatic valves, quick couplers, all irrigation and drainage piping, etc. Locations should be shown by the triangular system of measurements from easily identified permanent features, such as buildings, curbs, fences, walks, etc. Drawings shall show approved substitutions if any, of material including manufacturer's name and catalog number. Drawings shall be to scale and all information shall be recorded in a neat, orderly way.

On or before the date of final inspection, the Contractor shall deliver two (2) sets of “as-built” drawings to the City. The delivery of the prints shall not relieve the Contractor of the responsibility of furnishing required information that may have been omitted.

### **Substitutions**

The Contractor shall use materials as specified herein. Material other than that specified will be permitted only after written application by the Contractor and written approval from the City's Department of Park and Recreation.

Substitutions will only be allowed when in the best interest of the City.

The installation of any approved substitution remains the Contractor's responsibility. Any changes required for installation of any approved substitution must be made to the satisfaction of the City and without additional cost to the City.

## **906.2 MATERIALS**

All material to be incorporated in this system shall be new and without flaws or defects and of quality and performance as specified and meeting the requirements of this system.

### **Backflow Preventer**

Backflow preventers shall conform to local authorities having jurisdiction, which shall be incorporated into the irrigation system. If products and procedures specified with these documents do not meet local codes and regulations, the correct backflow prevention devices will be provided and installed by the Contractor. They shall be reduced pressure principle backflow preventers.

### **Pipe**

All piping shall be from virgin parent material. The pipe shall be homogeneous throughout and free from visible cracks, holes, foreign materials, blisters, deleterious wrinkles and dents. All pipe shall be National Sanitation Foundation (NSF) approved.

Piping on the pressure side of irrigation control valves for sizes 2” and larger shall be polyvinyl chloride (PVC) 1120 Gasket Joint SDR-21 meeting ASTM D-2241 sized to maintain a flow velocity of less than 5 feet per second. For sizes 1-1/2” and smaller the piping shall be polyvinyl chloride (PVC) 1120 Bell-Ended SCH-40 ASTM D-1785 sized to maintain a flow velocity of less than 5 feet per second.

Piping on the non-pressure side of irrigation control valves shall be polyvinyl chloride (PVC) 1120 Bell-Ended SCH-40 ASTM D-1785 sized to maintain a flow velocity of less than 5 feet per second.

Piping for Sleeving shall be polyvinyl chloride (PVC) 2110 minimum Schedule 40.



Piping for threaded nipples shall be polyvinyl chloride (PVC) 1120 SCH-80 ASTM D-1784.

### **Fittings**

Fittings on the pressure side of irrigation control valves shall be polyvinyl chloride (PVC) ASTM D-1785 Class 200 conforming to requirements of SDR-21. Fittings shall be designed to withstand a minimum of 630 psi quick burst pressure at 73 degrees F, tested in accordance with ASTM D-1599. The bell shall be a gasketed joint conforming to ASTM D-3139 with gaskets conforming to ASTM F-477. Push joint or mechanical joint ductile iron fittings meeting AWWA C153 shall be allowed as an alternative when PVC sizes are not available. For sizes 1-1/2" and smaller, fittings shall be polyvinyl chloride (PVC) SCH 40 or 80, to meet ASTM D-2466-7 or D-2467-73. Threaded PVC nipples shall be Schedule 80. The use of reducing male adapters shall be prohibited.

Fittings on the non-pressure side of irrigation control valves shall be polyvinyl chloride (PVC) SCH 40 or 80, to meet ASTM D-2466-7 or D-2467-73. Threaded PVC nipples shall be Schedule 80.

### **Main and Manual Shut-Off Valves**

Shut-off valves up to 3 " size shall be 125 pound bronze construction, non-rising stem type, sized to the line.

### **Quick Coupling Valves**

The valves and key shall be RainBird Model 44 with purple (non-potable) lid. The Contractor shall supply one RainBird Model 44 key and hose swivel per quick coupling valve installed up to a total of three (3) valves.

### **Valve Boxes**

Valve boxes shall be injection-molded of polyester and fibrous inorganic, temperature resistant components. The box shall be black in color and the lid shall be green in color. The body shall have a stainless steel nut molded into it and have the ability to be locked with a stainless steel bolt through the lid.

For remote control valves, the boxes shall be rectangular in shape and sized to provide adequate clearance to operate and service the valve. For shut-off valves and quick coupler valves, the boxes shall be round, approximately 10 inches in diameter.

### **Manual Drain Valves**

Manual drain valves shall be manual angle valves.

### **Sprinkler Heads**

Rotors shall be Hunter I-20 with 360 degree heads for the middle and adjustable heads on the sides. Spray heads shall be RainBird Model 1800.

### **Spray Nozzles**

Spray nozzles shall be RainBird fixed arc. Low volume, water saving nozzles may be used in appropriate areas with approval from the Engineer and the Department of Park and Recreation.

### **Automatic Controller**

Fully automatic controllers shall be Hunter I-CORE. The controllers shall have the following features:

- a) Master on/off switch that permits system shutdown with programming maintained
- b) Independent station programming
- c) Independent station timing
- d) Manual operation option
- e) Variable day cycle
- f) Battery powered models shall not be permitted where 110 volt power is available.

**Rain Shut-Off Device**

Rain shut-off devices shall be provided on this project and shall be installed per the manufacturer's specifications. Acceptable manufacturers and models are RainBird Rain-Check or Hunter Mini-Click.

**Electrical Conduit and Fittings**

Conduit and fittings shall be underground plastic conduit, Class III, FS W-C1094.

**Control Wires**

Control wire shall be 14AWG minimum, UL listed for direct bury in ground. The common ground wire shall be white. Valve wires shall be red and the spare wire to the furthest valve shall be blue. Field wire shall not be installed by "pulling" with a vibratory plow.

**Control Wire Splicing Materials**

Splicing materials shall be 3M Direct Bury (DBY) splice kits by 3M Corporation, Austin, TX (512) 984-5667 or 3M 314 IR Splices.

**Remote Control Valves**

Remote control valves shall be RainBird Model DV, PGA or PEB, slow opening and slow closing, globe configuration, 24 volt solenoid and flow control system, and shall be approved by the City's Department of Park and Recreation prior to installation. The valves shall be threaded and reducing male adapters are prohibited.

**Backflow Preventer Cover**

Backflow preventer covers shall be Strong Box Products Inc., Escondido, CA, (800) 729-1314 or Saf-T-Cover by Hydro-Cowl, Nashville TN (800) 245-6333.

**Swing Joint Assemblies**

All heads with a velocity greater than 5 fps will be required to have a Schedule 80 swing joint riser assembly. The assemblies shall be Spears Part #5807-01010 or approved equal. Heads with velocity below 5 fps shall have a swing pipe assembly made of 12" minimum and 18" maximum of swing (funny) pipe and 2 barb x mipt elbows.

**Thrust Blocks**

Main line piping shall have concrete thrust blocking at all changes in direction and pipe size. The thrust block sizes shall be determined by the pipe size and type of soil that will bear the load. Thrust blocks shall be installed between the pipe or fitting and undisturbed soil. Thrust blocks against backfill will not be accepted. The Contractor shall refer to the pipe manufacturer's specifications for details of minimum size and bearing capacity for the blocks.

**906.3 INSTALLATION****General**

The Irrigation Contractor shall carefully schedule his work with the Landscape Contractor and all other site developments.

Sleeves are required wherever piping or electrical wires are placed under paved surfaces.

No consideration will be given to any design changes. Should any changes be deemed necessary after award of contract, for proper installation and operation of the system, the City shall negotiate such changes.

Lay out work as accurately as possible to the submitted shop drawings.

Full and complete coverage is required. Contractor shall make any necessary adjustments to the layout as required to achieve full coverage of irrigated areas at no additional cost to the City.

Where piping is shown on drawings to be under paved areas but running parallel and adjacent to planted areas, the intent is to install piping in planted areas. The Contractor shall not install directly over another line in same trench.

It shall be the Contractor's responsibility to establish the location of all sprinkler heads in order to assure proper coverage of all areas. In no case shall spacing of sprinkler heads exceed distances shown on the drawings and/or those specified. Pipe sizes shall conform to those shown on the drawings. No substitutions of smaller pipe sizes will be permitted, but substitutions of larger sizes may be approved. All pipe damaged or rejected because of defects shall be removed from the site at the time of said rejection, at no additional cost to the City.

Install irrigation system after completion of site grading. Coordinate with the City Department of Park and Recreation in order to determine what landscape materials will be removed. The irrigation system shall be installed and completely operational three days prior to the installation of any planting operations.

All main and lateral line piping shall be sized to keep velocity rates of the water below 5 fps or as specified in the drawings.

### **Trenching**

Perform all excavations as required for installation of work included under this subsection, including shoring of earth banks, if necessary. Restore all surfaces, existing underground installations, etc., damaged or cut as a result of the excavations, to their original condition.

Should utilities not shown on the drawings be found during excavations, the Contractor shall promptly notify the City for instructions as to further action. Failure to do so will make the Contractor liable for any and all damage thereto arising from his operations subsequent to discovery of such utilities. Indicate such utility crossings on the record drawings promptly.

Trenches shall be open, vertical sides constructed wide enough to provide free working space around work installed and be the minimum necessary to provide space for backfilling and compacting. When two (2) pipes are to be placed in the same trench, a six inch (6") space is to be maintained between pipes. The Contractor shall not install two (2) pipes with one directly above the other.

Depth of trenches shall be sufficient enough to provide a minimum cover above the top of the pipe as follows or as shown in drawings if greater:

- 18 inches over non-pressure lateral lines
- 18 inches over non-pressure lateral lines under paving
- 18 inches over control wires
- 18 inches over sprinkler main line
- 24 inches over sprinkler main line under paving

The Contractor shall cut trenches for pipe to required grade lines and compact trench bottom to provide accurate grade and uniform bearing for the full length of the line.

All laterals and mainline shall be sufficiently sloped to provide positive drainage through drain valves.

All excavations shall be completely backfilled as soon after inspection as practicable. Adequate precaution shall be taken to insure proper compactness of backfill around piping without damage to such piping. Trenches shall be backfilled in thin layers to twelve (12) inches above the top of the piping with clean earth which shall not contain stones, boulders, cinderfill, frozen earth, construction debris, or other materials which would damage or break the piping or cause corrosive action. Mechanical devices may be used to complete the backfill to grade. Fill shall be properly compacted. Suitable precaution shall be taken to insure permanent stability for pipe laid in filled or made ground. Soak, as required, all trenches to prevent settlement and uneven grades.

Contractor shall be responsible for the continual backfill and grading of any settling trenches for the entire warranty period.

The Contractor shall be held responsible for any damages caused by these operations and shall immediately repair or replace damaged parts.

### **Pipeline Assembly**

#### **General**

- a) Install pipe and fittings in accordance with manufacturers latest printed instructions.
- b) Clean all pipes and fittings of dirt, scale and moisture before assembly.
- c) All pipe, fittings and valves, etc. shall be carefully placed in the trenches. Interior of pipes shall be kept free from dirt and debris and when pipe laying is not in progress, open ends of pipe shall be closed by approved means.
- d) All lateral connections to the mainline as well as all other connections shall be made to the side of the mainline pipe. No connections to the top of the line shall be allowed.

#### **Solvent-Weld Joints for PVC Pipes**

- a) Use primer, purple in color meeting ASTM F-656. Clear primer will not be accepted. Use PVC medium bodied solvent cement, clear in color meeting ASTM D-2564 and use methods of joining approved by pipe and solvent manufacturers.
- b) Cure all joints a minimum of 15 minutes before applying any external stress on the piping and at least 24 hours before placing the joint under water pressure, unless otherwise specified by manufacturer.

#### **Threaded Joints for PVC Pipes**

- a) Use Teflon tape on all threaded PVC fittings.
- b) Use strap-type friction wrench only. Do not use metal-jawed wrench.
- c) When connection is plastic to metal, male adapters on the plastic pipe shall be used. The male adapter shall be hand tightened, plus one (1) turn with a strap wrench.

#### **Laying of Pipe**

- a) Pipes shall be bedded in at least two (2) inches of finely divided material with no rocks or clods over one (1) inch diameter to provide a uniform bearing.
- b) Pipe shall be snaked from side to side of trench bottom to allow for expansion and contraction. One (1) additional foot per one hundred (100) feet of pipe is the minimum allowance for snaking.
- c) Do not lay PVC pipe when there is water in the trench.
- d) Plastic pipe shall be cut with PVC pipe cutters or hacksaw, or in a manner so as to ensure a square cut. Burrs at cut ends shall be removed prior to installation so that a smooth unobstructed flow will be obtained.
- e) All plastic to plastic joints will be solvent-weld joints or slip seal joints. All plastic pipe and fittings shall be installed as outlined and instructed by the pipe manufacturer and it shall be the Contractor's responsibility to make arrangements with the pipe manufacturer for any field assistance that may be necessary. The Contractor shall assume full responsibility for the correct installation.

#### **PVC Sleeves and Electrical Conduit**

- a) All PVC sleeves shall be a minimum of twice (2x) the diameter of the pipe to be sleeved.
- b) All PVC control wire conduit shall be of sufficient size to hold the required quantity of control and common wires.

## **906.4 EQUIPMENT INSTALLATION**

### **Shut-Off Valves**

All shut-off valves shall be located after water meters and shall be in valve boxes.

### **Irrigation Control Valves**

Install irrigation control valves in valve boxes grouped together where practical. Place no closer than twelve (12) inches to walk edges, buildings and walls. Irrigation control valves shall be installed as shown in details and in accordance with manufacturer's instructions and the specifications.

### **Manual Control Valves**

Install manual control valves in valve boxes grouped together where practical. Place no closer than twelve (12) inches to planter edges, walk edges, buildings and walls.

### **Quick Coupling Valves**

Install quick coupling valves in lawn areas with the top flush with the finish grade, and eight (8) inches from pavements and heads. Install quick coupling valves in planting areas with tops two (2) inches above grade and eight (8) inches from pavement and heads. Stake each quick coupling valve with 2"x2" knot-free redwood stake set at least 24 inches into the earth, and extended sufficiently above the surface to ensure stability of the riser. Secure the riser to the stake with an adjustable stainless steel geared clamp.

Quick coupling valves shall be installed on three (3) inch elbow PVC Schedule 80 swing joint assemblies.

### **Valve Boxes**

Valve boxes shall be set flush with finish grade in lawn areas and one-half (1/2) inch above finish grade in ground cover and shrub bed areas.

### **Sprinkler Heads**

All sprinkler heads within a zone shall have matched precipitation rates. All heads operating on one valve (zone) shall do so at the same pressure.

All heads shall be pop-up type heads. Permanent shrub risers are not permitted. Do not mix different types of heads within any zone. Shrub beds and lawn areas are to be on separate valves (zones).

Place part-circle pop-up sprinkler heads two (2) inches from edge of adjacent walks, curbs and mowing bands, or paved areas at time of installation.

All sprinkler nozzles shall be adjusted for the proper radius and direction of spray pattern. The Contractor shall make adjustments where possible to prevent overspraying onto walks, pavement or buildings.

Sprinkler heads and quick coupling valves shall be set perpendicular to finished grade unless otherwise designated on the drawings.

All heads with flows greater than 5 fps shall have a Schedule 80 swing joint riser assembly.

### **Shrub Spray Heads**

Install where indicated on the drawings and in accordance with the manufacturer's recommendations as approved by the City's Department of Park and Recreation.

Install part-circle heads four (4) inches from curbs and two (2) inches from walks.

Stake each shrub head with #6 reinforcing steel bar and secure with adjustable stainless steel geared clamp to ensure stability.

### **Backflow Preventer**

Install backflow preventers where indicated on the plans and in accordance with all pertinent codes, regulations and the manufacturer's recommendations as approved by the City's Water Utilities Department.

Backflow preventers are to be plumbed with unions to facilitate removal in winter. The Contractor shall provide a quick-coupler with purple (non-potable) lid for blow out. Install fittings between the water meter

and the backflow preventer risers and 24" past the 90 degree ell on the inlet and discharge. The backflow preventer shall be type L copper. Backflow preventers are to be housed in an adequately sized cover, insulated to resist freezing, and mounted on a concrete base as recommended by the manufacturer and the dimensions shall accommodate the specified cover. The base thickness shall be a minimum of four inches (4"). Concrete bases shall not be in contact with piping.

### **Automatic Controller**

The automatic controller shall be installed at the location approved by the City's Department of Park and Recreation. The controller shall be wall mounted in a locking box.

All regulatory authorities having jurisdiction and other applicable codes shall take precedence in connecting the 110 volt electrical service to the controller.

Install the controller per regulatory authority having code jurisdiction, the manufacturer's latest printed instructions, and as detailed.

Connect remote control valves to the controller in sequence to correspond with station setting beginning with 1, 2, 3, etc.

Affix a non-fading copy of the irrigation diagram to the cabinet door below the controller name. The irrigation diagram shall be sealed between two sheets of 20 mil (minimum) plastic. The irrigation diagram shall be a reduced copy of the as-built drawing and shall show clearly all valves operated by the controller, showing station number, valve size and type of planting irrigated.

### **Control Wiring**

All electrical equipment and wiring shall comply with regulatory authorities having jurisdiction and be installed by those skilled and licensed in the trade.

Wiring shall occupy the same trench and shall be installed along the same route as pressure supply or lateral lines wherever possible. Control wires shall be installed to the side of the main line whenever possible. Placement over pipes is not permitted. Control wire splices at remote control valves shall be crimped and sealed with specified splicing materials. Line splices will be allowed only on runs of more than 500 feet and they must be located in ten (10) inch round splice boxes, which are green in color. The connector shall be 3M DBY splice kit by 3M Corporation, or 314 IR connector by 3M. The wiring will include two (2) spare conductors installed in its entire length and to the automatic controller. The Contractor shall label spare conductors in the timer "spare wire".

### **Closing of Pipe and Flushing of Lines**

All testing shall be done under the supervision of the City or the Engineer. The Contractor shall submit written requests for inspections to the City's Department of Park and Recreation at least three (3) days prior to the anticipated inspection date.

- a) The Contractor shall thoroughly flush out all water lines under a full head of water before installing heads, valves, quick coupler assemblies, etc. The flushing shall be maintained for a minimum of three minutes at the valve located furthest from the water supply.
- b) After flushing, the Contractor shall cap or plug all openings to prevent entrance of materials that would obstruct the pipe or clog heads. The plugs shall be left in place until removal is necessary for completion of installation.
- c) The Contractor shall conduct the test as specified below.
- d) Upon completion of testing, the Contractor shall complete assembly and adjust sprinkler heads for proper distribution.
- e) All sprinkler heads and quick coupling valves shall be set perpendicular to finished grades unless otherwise designated on the drawings, or otherwise specified. Sprinkler heads adjacent to existing walls, curbs and other paved areas, shall be set to grade. Sprinkler heads, which are to be installed in lawn areas where the turf has not yet been established, shall be set one (1) inch above the proposed finish grade. Heads installed in that manner will be lowered to grade when the turf is sufficiently established to allow walking on it without appreciable damage. Such

lowering of heads shall be done by this Contractor as part of the original contract with no additional cost to the City.

### **Testing**

The Contractor shall make hydrostatic tests as below on pressurized mains when welded PVC joints have cured per the manufacturer's instructions.

- a) Completely install mains, isolation valves and control valves. Do not install laterals.
- b) Open all isolation valves.
- c) Fill all lines with water and shut off at the meter.
- d) Pressurize the main to 100 psi. Monitor gauge for pressure loss for 2 hours.
- e) Leave lines and fittings exposed throughout the testing period.
- f) Leaks resulting from tests shall be repaired and tests shall be repeated until acceptance by the City's Department of Park and Recreation.
- g) Test all isolation valves for leakage.
- h) Air testing is prohibited.

### **Inspection**

The Contractor shall maintain proper facilities and provide safe access for inspection to all parts of the work.

Irrigation inspection shall consist of a minimum of:

- a) Mainline pressure test.
- b) Coverage test.
- c) Final irrigation inspection.

The Contractor shall be solely responsible for notifying the City where and when such work is in readiness for testing.

If any work should be covered up without approval of the City it must be uncovered, if required, for examination at the Contractor's expense.

No inspection shall commence without "Record" drawings and without completing previously noted corrections, or without preparing the system for inspection.

For final inspection, the Contractor shall clean, adjust and balance all systems.

- a) The Contractor shall verify that remote control valves are properly balanced.
- b) Verify that heads are properly adjusted for radius and arc of coverage.
- c) Verify that the installed system is workable, clean and efficient.

### **Backfill and Compacting**

The Contractor shall backfill excavations and trenches after the system is operating and required tests and inspections have been made.

Backfill for all trenches, regardless of the type of pipe covered, shall be returned to the state of grade and 90% compaction at that location before excavation began.

Within all planting and lawn areas the existing 4 inch layer of topsoil shall be restored to its original condition and finish grade. After backfilling, the Contractor shall dispose of surplus earth offsite.

### **Warranty**

The irrigation system and all its components shall have a full one-year warranty from the installing Contractor. This shall include winterization the first year and spring start-up (including backflow preventer testing) the following year.

## **906.5 OPERATING INSTRUCTIONS**

The Contractor shall furnish operating instructions and materials as follows:

Attach a typewritten legend inside each controller door, stating the areas covered by each remote control valve.

The Contractor shall instruct the City's maintenance personnel in the operation and maintenance of the system after the system has been completed, inspected and approved.

The Contractor shall provide the City with two (2) keys to each controller, and may require these match existing key system(s).

The Contractor shall provide the City with reproducible "as-built" drawings, in Auto CAD compatible format, of equal quality to the original plans of the irrigation layout including:

- a)** Any variance from the original plan.
- b)** Measurements to all valves, quick couplers and wire splices.
- c)** Clear identification of the wire routes.
- d)** Expanded drawings and measurements of details not clearly visible.

END OF SECTION