

LANDSCAPE DESIGN OF RIGHTS-OF-WAY, MEDIANS AND RETENTION BASINS

Technical Design Manual #8



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1.0 INTRODUCTION

1.1 POLICY

Establish a standardized set of minimum requirements in accordance with the City of Chandler Zoning Code (35-1093 Landscaping), City of Chandler Standard Specifications and Details, and Maricopa Association of Governments (MAG) Standard Specifications and Details, for the use as guidelines for landscaping City-owned landscape, predominately retention basins, rights-of-way and medians.

Developers will be required to adhere to these guidelines with staff review and inspections as specified.

All development and installation must be completed and accepted by the City.

All improvements shall be in accordance with the current Federal regulations and requirements of the Americans with Disabilities Act. Coordinate all design to prevent conflicts or restrictions on routes and facilities providing access for the people with disabilities.

Consideration shall be given for utilization of reclaimed water. Reclaimed water may be available for projects south of Pecos Road.

The City encourages sustainable practices. Although subject to the approval of the Streets Superintendent, proactive proposals utilizing current advances are desirable. The City would rather not dictate solutions but would like to see them proposed utilizing state of the art, current, innovative strategies.

1.2 PURPOSE

These landscape standards have been assembled to establish minimum guidelines for the design and development of landscaped boulevard strips (the area between the back of the outside curb and the rights-of-way), medians, and retention basins within City of Chandler. These standards are not intended to provide design solutions or treatments for all landscape areas or address site specific conditions. The primary purpose for these guidelines is two-fold. First, they are provided to establish a framework of design criteria and parameters to ensure a comprehensive and unified approach to landscape enhancement. Their secondary purpose is to provide the design consultant with a recommended guideline and reference for standardization of materials, equipment selection and installation requirements that are in accordance with the standard of quality required by the Public Works & Utilities Department, Streets Division.

These landscape guidelines are not intended to specify any pedestrian or traffic safety requirements. The Design Professional shall rely on other current design manuals or documents for the proper guidance for all safety issues related to their design. The safety recommendations in other design manuals or documents shall take precedence over these landscape guidelines.

Designs shall consider the ability of landscape maintenance crews to access the landscape maintenance area in that the crews should not be endangered by extensive thorns or spikes on the plant material which may be preventative of staff to walk about the landscaped area safely.

Work covered by the above shall include, but not be limited to:

- Site Preparation
- Excavation
- Grading and Drainage
- Plant, Turf and other material Installation
- Water Supply and Irrigation
- Tree Planting and Staking
- Accessibility – Americans with Disabilities Act

1.3 SUBMITTAL PROCEDURES, REVIEW, AND SCHEDULING

A. Pre-Submittal Conference: The Developer shall also meet with the user department/division that will be assuming the operation and maintenance (User Department) to ascertain priorities, discuss intended improvements, and review City Standards and site development requirements.

B. Conceptual Landscape Plan: Conceptual Landscape Plan may also be required to be submitted for review by the User Department as part of the approval process.

C. Final Landscape Plan: A Final Landscape Plan, Irrigation Plan, cost estimate, and development schedule shall be submitted and approved by the City prior to the start of any on site improvements.

D. The contractor is to obtain an approved and current traffic control or barricade plan as may be required. All approvals are to be coordinated through the City’s Traffic Engineering Division.

E. Start Construction: The contractor shall notify the User Department, in writing, two weeks prior to the start of work indicating the date on which work is to commence.

F. Utilities: The contractor must coordinate with existing utilities. This includes, but is not limited to the electric utility to service pumps, controllers, and lighting, as may be required. Blue Staking shall be required at a minimum.

G. Plant Material: The material will be “tagged” and available for inspection and approval before planting. ”On-site” inspection will be conducted upon delivery. Notification of delivery shall be the responsibility of the contractor; substandard material will be rejected at that time. At the option of the City Streets Superintendent, nursery inspection and/or plant selection may be requested.

H. Inspection: The contractor shall notify the User Department at each pertinent stage of construction to allow for periodic inspection. Any workmanship or materials not meeting City standards will necessitate a correction of the deficiency before additional work may be done.

I. Preliminary Acceptance: The contractor shall make a written request to the User Department for preliminary acceptance of the improvements. Approval of this request shall begin the ninety-day maintenance period.

J. Final Acceptance: The contractor, upon completion of the ninety-day maintenance period, shall forward a written request for final acceptance of the improvements to the User Department. The maintenance period will be extended if necessary, until such time as the improvements are acceptable.

The contractor shall forward a mylar print, digital file, two irrigation manuals, one (1) operation and maintenance manual, and transfer the utilities to the proper User Department to finalize acceptance of the improvements.

K. Preliminary and Final Acceptance: Shall only apply when the City is to assume maintenance. In all other cases, the developer will simply request final approval.

1.4 LANDSCAPE PLAN REQUIREMENTS

A. All plans shall include most current Landscape Notes found on City Unified Development Manual website.

B. Provide separate offsite landscape, irrigation and hardscape plans. Minimum scale is 1"=30' and to be submitted on 24" X 36" plan sheets. Include a Vicinity Map and sheet index on the Cover Sheet. Digital plan submittal may also be required.

C. All medians shall be shown on Civil Plans.

D. Show the location of existing and proposed plant materials on Landscape Plan.

E. Include plant schedule specifying graphic symbol, botanical and common names, planting size, number of plants and on-center spacing within the Landscape Plan set.

All trees shall comply with the latest amended edition of the "*Arizona Nursery Association – Recommended Tree Specifications*".

F. Include location of overhead and underground utilities, streetlights, signage, valve boxes, etc. Contact the appropriate utility for acceptable plant material species and location.

1.5 AS-BUILT DRAWINGS

The Developer or Contractor shall be responsible for providing one mylar print and an approved format electronic file of the system with all changes in location marked. This shall be given to the City prior to final acceptance. No final payment will be made until the as-built drawings have been received by the City.

2.0 GENERAL LANDSCAPE STANDARDS

2.1 GENERAL DESIGN CONSIDERATIONS

Landscaping of public right-of-way and retention areas is important to the overall image, character and visual quality of the primary circulation corridors throughout the City of Chandler. The landscape design should attempt to provide year round aesthetic appeal and interest; improve space and scale relationship of the roadway for the users; accent or improve awareness of community features; provide visual screening; micro-climate enhancement; provide a model for conservation and sensitivity to our natural environment, and water consumption; and minimizing maintenance requirements.

Minimizing and ease of maintenance shall be a primary consideration in the selection, location, and installation of all landscape plant material, irrigation materials, and equipment.

Plant material selection and layout must consider the mature growth potential and natural growth habit of each plant species.

Careful consideration must be given to the selection and placement of all plant materials with regards to frost/heat sensitivity, solar or shade exposure, and susceptibility to pests and diseases.

It is strongly recommended that the designer utilize a multiple plant species palette and multiple plant massing combinations to increase visual diversity, enhance seasonal interest and avoid potential large scale plant losses. Designers should avoid over-use of a particular plant species due to the potential for single species die-out or maintenance problems resulting from horticultural conditions, climate hardiness or diseases impacting a monoculture plant type.

2.2 MATERIALS – GENERAL

Once the City has approved the plans, no substitutions shall be allowed, except when unavailable from the supplier and another approved product is locally available. The User Department must approve all such substitutions in writing. All materials shall be new and the best of their class and kind. All materials and workmanship shall be guaranteed for a period of one year from the time of User Department acceptance against material defects and workmanship.

Landscape materials for use within the public right-of-way shall consist of the following:

A. Plants

Plant materials shall consist of ground cover plants, succulents, cacti, shrubs, and trees. All plant material shall be selected from the Arizona Department of Water Resources (ADWR) approved list of low water use plants for use within the public right-of-way. Although allowed by the ADWR approved list, not all plant materials are appropriate for use within the public right-of-way. Palm trees and yellow and purple lantana is prohibited unless approved by a City Representative.

B. Inert Ground Covers

Inert ground covers are defined as rock ground covers and decorative pavements. Rock ground covers include: decomposed or crushed granite, gravel, stone, and boulders. Boulders, stone or rock aggregate may be used within median landscape areas but the exposed surface height may not exceed 8 inches in height or placed within 6' to the face of curb. Faux boulders are acceptable – typically LR series random

sizes by Poolrock.com or approved equal. Decorative pavements may include: interlocking paving units for raised medians, , or patterned/textured concrete. Decorative pavements may have defined applications within right-of-way streetscape or may be used to accent or enhance streetscape features. All proposed paving treatments shall be subject to the City’s approval. Selected areas of raised medians require interlocking paving units – typically Acker Stone 60% Street Stone I, 6cm, Old Town Blend, 40% Street Stone II . 6 cm, Old Town Blend or approved equal is utilized. In some situations, the pavers may be required to be set in concrete.

C. Turf Grasses/Lawn

In accordance with the Arizona Department of Water Resources (ADWR), proposed turf area introductions are not allowed within the public right-of-way, unless such areas are designed to utilize reclaimed water or unless the area is associated with preexisting turf areas.

2.3 PLANT MATERIALS

- Unless otherwise indicated, all plant materials furnished shall be nursery-grown, well branched, and well proportioned. All plants are subject to inspection and approval before planting, whereupon all plants found unsuitable shall be removed and replaced.
- Substitutions: Plants of kinds other than those indicated on the plant list may be considered by the User Department of the City only upon submission of proof that any specified plant is not reasonably procurable in the local region. Substitution will require prior approval by the User Department based on the characteristics of the kind of plant specified in regards to appearance, ultimate height, shape, habit of growth, general soil, and other requirements. In no case, shall the average cost and value of the submitted plants be less than the cost and value of plants indicated.
- Protection After Delivery: Upon delivery to the site, all nursery stock shall be planted as soon as possible. Until planting, stock plants shall not be exposed to excessive sun or drying winds during planting operations.
- Reference and standards for all plant material shall be as per the “Arizona Nursery Association Standards for Nursery Stock”, most current edition.

2.3.1 QUALITY AND SIZE

All trees shall have sufficient roots to hold the earth together after removal from the containers, but shall not be root-bound. Plants shall have been grown in pots, cans, containers, or boxes for a minimum of three months and a maximum of one year.

All plants shall have a normal habit of growth and shall be sound, healthy, vigorous, and free from disease, insect infestations or weeds.

Trees shall have a straight trunk throughout their height and shall be in accordance with the Arizona Standard for Nursery Stock, most current addition. Multi-Trunk trees are not permitted in a median without authorization from a City Representative.

2.3.2 MATERIALS FOR PLANTING

- a) Manure (for mulch): Shall be well-rotted, unbleached stable or cattle manure, reasonably free from shavings, sawdust or refuse and shall contain no more than ten (10) percent straw by volume.

b) Humus (for prepared soil): Shall be sterile peat or peat-moss or decomposed stabilized and fortified, treated (nitrolized) wood mulch, with no more than one (1) percent nitrogen after treatment and shall be fir mulch, pine mulch, or redwood mulch type.

d) Prepared Soil (for backfilling tree pits): Mix three (3) cups soil sulfur per fifteen (15) gallon tree, five (5) cups per twenty-four (24) inch box tree. Mix sulfur with planting mix; which shall be one (1) part imported topsoil to one (1) part mulch and one (1) part sand. Topsoil shall be natural, fertile, friable soil which shall not be excessively acid or alkaline nor contain toxic substances harmful to plant growth and be reasonably free of noxious weeds, clay clumps, clods, stones, roots, stumps, and debris of any kind. All imported topsoil shall have soil analyses before it can be incorporated on the project.

e) Staking Materials:

- Stakes for supporting trees shall be placed outside of tree pit per City Detail C-801.
- Tie wire for fastening trunks to stakes shall be per City Detail C-801.
- Rubber Hose to protect trunk from wire shall be per City Detail C-801.
- Install Arbor Guards to all planted trees in turf.

2.3.3 SETTING PLANTS

Unless otherwise specified, all plants shall be planted in pits and shall be set so that the finish grade will be the same as that at which plants were grown. They shall be planted upright and faced to give the best appearance and relationship to adjacent plants or structures. All trees shall be set plumb and rigidly braced in position until the soil has been tamped solidly around the ball. Plants shall be backfilled with planting soil which shall be thoroughly settled by watering and tamping to fill all voids.

All slopes shall be contoured in such a manner not to exceed a 4:1 grade, especially, where trees are to be planted (refer to City Detail C-802).

2.3.4 TRANSPLANTING

a) Refer to City Detail C-801 and C-806. Prepare planting area per Plant Pit Schedule detail. (If you must amend the backfill, then increase size of area and amend the entire plant pit. If you must use fertilizer in backfill, then use no more than three pounds per inch of trunk diameter of a low nitrogen, slow release fertilizer).

b) Dig planting hole in center of area no deeper than root ball. Make sure root ball will rest on undisturbed, firm soil and that the top will be at or slightly above the soil surface. This is important to prevent the tree from sinking

c) Remove the tree from the container. Avoid lifting the tree by its trunk (better to sacrifice the container). Either disentangle and spread encircling roots or cut and remove them. Score the sides of the root ball to encourage lateral root growth.

d) Place tree in hole and backfill with unamended soil. Do not tamp backfill with your feet.

e) Remove nursery stakes. Stake tree as required.

- f) If irrigating by hose, then form a well just outside the original ball root. Irrigate tree. Water will settle the soil without compaction.
- g) Apply a CarbonizPN soil enhancer, Mirimichi Green, or approved equal to all new plantings in reclaimed water areas.

2.3.5 NOMENCLATURE – PLANT IDENTIFICATION

For inspection and identification, durable legible labels, stating in weather-resistant ink, the correct plant name and size, as specified in the plant list, shall be securely attached to a tree leader branch to all trees delivered and to an adequate representative amount of the shrubs to the site.

2.3.6 CLEAN UP

Any soil, manure, or other material dropped onto paved areas by hauling operations or otherwise, shall be removed promptly, keeping these areas clean at all times. Upon completion of planting, all excess soil, stones, and debris not heretofore disposed of under this scope of work, shall be removed from the site or disposed of as directed by the City Representative.

2.3.7 MAINTENANCE PERIOD

- a) The Developer or Contractor shall maintain all plants for a period of ninety (90) days beginning with the preliminary acceptance by the User Department, as specified above. If all plants are not healthy at the end of the maintenance period, the maintenance shall be continued until the plants meet the approval of the City, and/or are replaced.
- b) Plant Guarantee and Replacement: The Developer or Contractor shall guarantee all plant material to be in a vigorous, healthy condition for a period of one year from the date of final acceptance or replacement, and shall guarantee to replace any plant material which proves to be not true to name, regardless of the length of time it takes to make this determination. With consent of the City Streets Superintendent replacement planting may be delayed so the appropriate planting season may be utilized.

2.4 INERT MATERIALS

2.4.1 ROCK AND COVER

Rock ground covers are considered to be any boulder, rock, stone, or aggregate material used to cover landscape area soil surfaces. Decomposed or crushed granite is the recommended rock ground cover material for use within City of Chandler right-of-way landscape areas. Rock ground covers shall provide a minimum depth of twice the rock size specification or 2 ½“ whichever is greater uniform depth after settlement. Color, gradation, aggregate size and required installation depth of rock ground cover material shall be approved by the City Representative. Recommended color range is gold or tan. Other color selections will require prior approval and will be reviewed on a case-by-case basis. Typically utilized is 1 ¼” screened Desert Gold or approved equal.

2.4.2 INSTALLATION/MAINTENANCE

All rock ground cover areas shall be sprayed with pre-emergent herbicide, by a licensed applicator, as part of installation as follows (a minimum of three (3) applications are required):

1st - Prior to the application of the rock ground cover - one-half gallon per acre.

2nd - After rock ground cover has been applied - one-half gallon per acre.

3rd - Prior to final acceptance - one gallon per acre.

The City shall be furnished, for approval, written documentation of applicators license, all materials used, application rates, and the scheduled dates for application prior to the start of any applications (Spray Logs).

2.5 TURF GRASSES/LAWN

2.5.1 PREPERATION OF SEED BED

Although sod is preferred, where soil analyses show that existing topsoil is satisfactory, a seedbed shall be prepared by scarifying to a depth of at least three inches and dragging to a smooth surface. Where existing soil is caliche type, it shall be excavated to a depth of six-inches, removed from the site and replaced with acceptable topsoil. Irregularities in the surface shall be leveled before seeding operations begin.

After raking, roll the entire area in two directions at approximate right angles with a water ballast roller weighing one-hundred to three-hundred pounds. Any irregularities that develop shall be re-raked, scarified for bond, and again rolled until the area is true and uniform and free from lumps or depressions. Water shall be applied to surface whenever necessary to insure proper working of soil. No heavy objects except lawn rollers shall be taken over these areas. Grade and compaction must be approved by the City prior to planting.

2.5.2 PLANTING

A. Just prior to broadcasting the seed, apply and lightly rake into the surface the following:

1. 5 pounds Ammonium Sulfate (21-0-0) per 1,000 square feet
2. 15 pounds Superphosphate (0-20-0) per 1,000 square feet

B. After approval of the User Department of the areas to be seeded, the seed will be broadcasted at the rate of three and one-half pounds Bermuda per 1,000 square feet. One-half of the seed will be sown with the sower moving at right angles to the first sowing. Broadcasting shall not be done in windy weather.

C. Hydro seed and sodding are approved methods of turf planting. Preparation of the turf area must follow the above guidelines.

2.5.3 TURF MULCHING

Top dress all seeded areas with an approved organic mulch as specified. Spread mulch evenly over all areas at a rate of one cubic yard per 1,000 square feet or as recommended by the manufacturer, whichever is greater.

Lightly roll all areas and thoroughly water with a fine spray. Turf shall be kept continually moist by watering as often as required without creating runoff.

Any areas that do not root properly shall be replanted at ten-day intervals until an acceptable stand of grass is obtained.

2.5.4 MAINTENANCE PERIOD

A. The Developer or Contractor shall maintain all turf areas for a period of ninety days, beginning immediately after preliminary acceptance by the City.

B. If all plantings are not acceptable at the end of the maintenance period, the maintenance period shall be continued until the work meets approval by the User Department of the City.

C. Fertilizing: During the maintenance period, two applications of complete fertilizer (6:10:4) shall be made (at 30 days and 60 days) at the rate of twenty-pounds per 1,000 square feet with each application. The User Department of the City shall be furnished with written documentation of the schedule of applications.

D. Maintenance shall include continuous operations of watering, weeding, mowing, rolling, trimming, edging, cultivating, fertilizing, spraying, insect and pest control, re-seeding, replacement, and/or other operations necessary to assure good normal growth. The Developer or Contractor shall be responsible for applying lawn with control sprays or other materials, as often as may be required to protect turfs during the entire contract.

E. When the turf has established sufficient root structure and an approximate height of three inches, mowing should begin immediately to a two-inch height and shall be mowed thereafter and reduced in safe increments to a height as specified by the City.

F. During the installation period and during the maintenance period, the Developer or Contractor shall be responsible for maintaining adequate protection for all areas. Any damaged planting shall be repaired and/or replaced at the Developer's or Contractor's expense.

G. At termination of each maintenance period all turf shall be alive, healthy, undamaged, and free of infestations. All areas shall be completely covered at the time of acceptance, leaving no bare spots larger than three inches by three inches. Inferior plantings shall be replaced and brought to a satisfactory condition before final acceptance of work will be made.

H. Replacement: The Developer or Contractor shall immediately replace any and all turf that dies or is damaged. Replacements shall be made to same specifications as required for original plantings.

I. Two inspections shall be made that affect each maintenance period: The first, after all planting have been completely installed, in order to approve the beginning of the maintenance period of not less than ninety calendar days; and the second, at the end of the ninety-day period. Should there be defective maintenance during the maintenance period, the maintenance period shall be continued by the Developer or Contractor until all work meets the specifications and can be approved.

J. The Developer or Contractor shall operate and maintain the irrigation system during the maintenance period. Repairing broken mainlines, pumps, laterals, sprinkler heads, emitter systems, valves and timers, and/or other malfunctions that may occur.

K The Developer or Contractor must notify the City three weeks in advance of the end of his maintenance period and must also transfer title to the City prior to the City's assuming the maintenance.

2.6 SOIL TESTING

All areas in which planting is to be done shall have soil analyses performed to determine the soil deficiency and the nutrients needed to sustain and insure healthy plant growth. Any landscape areas suspected of having been exposed to or treated with soil sterilants or materials detrimental to plant health shall be tested for the presence of toxic substances. If found, all soil with the toxic substances shall be removed prior to the start of any landscape planting or irrigation system installations.

All soil testing shall be completed and approved by a State of Arizona certified soils testing laboratory to meet the requirements for topsoil or fill and be free of any toxic, hazardous, or undesirable substances. The Public Works & Utilities, Streets Division shall receive a copy of all tests prior to final acceptance.

2.7 MOISTURE CONTENT

The soils shall not be worked when the moisture content is so great that excess compaction will occur; nor when it is so dry that a dust will form in the air or that clods will not break readily. Water shall be applied if necessary, to provide optimum moisture content for tilling and for planting.

2.8 TOPSOIL

All areas to be graded (cuts or fills) shall be stripped of the topsoil, which shall be stockpiled in an approved area. The Developer or Contractor shall be responsible for making arrangements for storage and/or moving of this topsoil prior to its replacement on the site.

2.9 FINISH GRADING

Upon acceptance of the subgrades by the User Department of the City, the stockpiled topsoil shall be evenly spread over the entire graded area and dragged to uniform planes at proper grades. Sprinkler and utility trenches must be dug, completed, and backfilled prior to the next segment of work. All grades shall be within a tolerance of 0.10 feet; and 0.25 feet in sloping or mounded areas.

All areas to be sodded or seeded shall be fine graded and topsoiled. All turf areas shall be dragged and raked, removing all clods or rock, one-inch or larger in any dimension. All soil shall be thoroughly water settled.

Finish grade landscape areas (top of turf or decomposed granite) must be graded to 1 ½" below top of concrete or other paved surfaces.

Positive drainage from curb cut-outs, backs of scuppers and transitions from ends of spillways to landscape or turf area must adequately convey drainage following finish grade and landscape installation.

2.10 UTILITIES AND IRRIGATIONS SYSTEMS

Utilities (underground or above ground) shall be located in accordance with the above referenced City of Chandler Standard Specifications and Details. However, all new utility installations or modifications to

existing utility locations should be assessed and reviewed with the Public Works & Utilities Department to determine if adjustments to the above standards may provide more appropriate placement of utilities that may otherwise restrict, prohibit, or be in conflict with desired landscape improvements. Utilities should not be located directly in the center of medians. Utilities, if required within median areas, should be offset to avoid conflicts with tree planting pit excavations and root growth. Early identification and coordination of engineering and landscape design requirements will provide a greater opportunity to initiate modifications and adjustments to allow both to be successfully integrated into the design.

Irrigation sleeves shall be required under roadway, sidewalk, pavement, and pavers.

Both reclaimed and potable irrigation system water main connections, booster pumps, and backflow prevention units for the median landscape shall be located within the landscape median when possible. Center each unit equal distance between the curbs. This equipment should be no closer than two feet from the back of curb, and should be located in an area of the median or boulevard strip that is the least noticeable by the traveling public. Backflow preventors are not required when associated with reclaimed water.

Some utilities require the electrical meter to be located in the rights of way (not in the median).

If backflow prevention units and irrigation controllers cannot be located within the median landscape areas, each unit shall be located as far back of curb and walkway as possible while remaining within the right-of-way. Minimum setback distance for above ground irrigation installations from any walkway or curb edge shall be two feet.

The location and position of irrigation system backflow prevention units, controllers, meter pedestals, and related enclosures shall not conflict with vehicular sight visibility.

Landscape plant material and irrigation system components shall be selected and located to maintain all required access, clearances and setbacks adjacent to utility installations. This shall be coordinated by the designer and verified by the developer and/or contractor with the utility companies prior to any installation.

No trees should be installed adjacent to or beneath overhead utility lines if the mature growth habit of the plant will conflict with the overhead lines or restrict utility service access. Plant material must comply with approved planting lists of the associated utility if required.

2.11 IRRIGATION SYSTEMS

Flood irrigation is not permitted. An automatic sprinkler irrigation system must be used for all developed areas. However, there are certain areas which should be considered ‘grandfathered’ and flood irrigation may be utilized with permission.

The User Department of the City will review and approve all irrigation systems prior to any installation. All sprinkler systems shall be automatic, and shall utilize a reduced pressure backflow preventor (per City Detail C-311) before the electric control valves. All applicable codes shall be adhered to and a permit will be required. All plans submitted for approval must specify the brand, model, and nozzle size(s) of the heads. The brand, model, and size of all electric valves; and also the brand and model number of the

electric controller, the brand, model, and size of the backflow preventor. Also to be submitted are all the pertinent data on such miscellaneous items as valve boxes, covers, size and type of pipe. In addition to all the necessary details, and friction pressure loss calculation for the longest run in the system for both full circle circuits and part circle circuits (see City Detail C-816). The City will furnish the Developer or Contractor with City water pressure data on request.

All mainlines, valves, and wire shall be located as close as possible to the back of the right-of-way. or optionally behind the sidewalk. Irrigation within medians shall be located at the center line.

A. IRRIGATION AND DESIGN CONSIDERATIONS

All irrigation equipment and installations shall be in accordance with types, materials and standard details approved by the City of Chandler.

B. IRRIGATION SYSTEM LAYOUT AND LOCATION

All irrigation system mainlines, valves, wire and other primary system components or equipment shall be located within the right-of-way median landscape area or as close as possible to the outer edge of the right-of-way.

Landscape irrigation systems shall be designed so that irrigation to trees and palms operate on a separate valve from shrubs and ground cover varieties.

C. IRRIGATION SYSTEM TYPE/MATERIALS/EQUIPMENT

The City shall review and approve the irrigation system and materials prior to installation. All irrigation shall comply with the requirements of this Section with the following inclusions:

Irrigation system power sources shall be approved by the City User Department and the utility company having jurisdiction. Irrigation controllers with lockable enclosures for the median landscape shall be necessary located in the median near the backflow preventor or booster pump system.

All controllers shall be equipped with a plug-type harness for a remote control attachment. Wiring shall correspond to the geographic location of the valve and station controlled. The coordination of wiring systems shall be approved by the City, prior to the final acceptance.

For right-of-way and median irrigation systems only rigid type P.V.C materials shall be used, with bubbler or drip emitter heads. Hard pipe to riser-maximum length of drip tubing is six feet.

For right-of-way and median irrigation systems only rigid type P.V.C. or schedule 80 flex hose riser materials shall be used, with bubbler, drip or spray type heads. Use of poly pipe is prohibited. Poly or vinyl emitter (“spaghetti”) tubing in conjunction with multi-outlet emitters is prohibited. Poly tubing shall have limited use in the initial and temporary distribution of water at tree installations and shall be used only in conjunction with single-outlet emitters. All horizontal installations of poly tubing must be installed and anchored a minimum of four inches below the finished landscape area surface.

All irrigation heads (emitters, bubblers, sprays) must be rigid “hard” plastic, one half inch diameter threaded/screw on type installation unless otherwise approved by the City Landscape Maint & Design Coord.

Driplines shall be virgin vinyl, 7510 polyethylene material as manufactured by Landscape Products or approved equal.

2.11.1 EXCAVATION, BACKFILLING, AND COMPACTION

Irrigation trenching shall be per City Detail C-811 and in accordance with MAG Sections 440 and 601.

2.11.2 EXISTING UTILITIES AND STRUCTURES

The Contractor shall protect existing structures and utility services and be made responsible for their replacement. Minor adjustments in the system will be permitted to clear existing obstructions subject to the approval of the City.

2.11.3 WATERING CYCLE

- A. Complete watering cycle for turf areas and shrub emitters, shall be completed within 8 hours. Any drip system must be completed within four hours after the turf areas are completed.
- B. Minimum water application rate per week, for Bermuda shall not be less than 0.75 inches and not more than 2.75 inches per week.
- C. Length of watering cycle and application rate per week shall be noted on sprinkler irrigation plans.

2.11.4 WATER FOR TREES

All trees shall receive water from one of the following systems. Trees must be on separate valve:

- A. An emitter system with electric solenoid valve, Y-strainer and pressure regulating valve.
- B. For palms, a bubbler system with electric solenoid valve, PVC pipe with bubbler installed (see City Detail C-812 & C-817).

2.11.5 SPRINKLER HEADS

- A. The following manufacturers and models are acceptable:
 - 1. Rainbird model: 4" pop-ups
 - 2. Hunter: Institutional Series
 - 3. Bowsmith Multiport Emitters
- B. All heads of a particular type of function in the system shall be of the same manufacturer and shall be marked with the manufacturer's name and identification in such a position that they can be identified without being removed from the system. All sprinkler heads, which are to be installed in lawn areas where the turf has not yet been established, shall use a rotor dam or be set one inch above the proposed finished grade. Heads installed in this manner will be lowered to grade when the turf is sufficiently established to allow walking on it without appreciable destruction. All nozzles on rotary pop-up sprinklers shall be tightened after installation. All sprinklers having an adjustment stem shall be

adjusted on a lateral line for the proper radius, diameter, and/or gallons. Two vandal resistant screwdrivers shall be supplied to the City (see City Detail C-813).

C. SWING JOINTS

All sprinklers and quick coupler valves shall be installed on swing joints, consisting of two lengths of PVC schedule 80 nipples (6 inch long) attached with two PVC street ells (mipt by fipt) and one PVC ell (fipt by fipt) with a minimum of 30 degrees and a maximum arc of 60 degrees (see City Details C-813 through C-815). Pre-manufactured swing joints can also be used. Swing riser shall be Dow 7510 material per Landscape Products Inc. or approved equal.

2.11.6 PIPE

A. All pipe (PVC and Copper) shall be properly sized on the drawings.

B. No galvanized pipe shall be used. Schedule 80 PVC nipples shall be used for sprinkler swing joints and Type K hard copper shall be used for all main line piping above grade, and extending a minimum of eighteen (18) inches and a maximum of twenty-four (24) inches below finished grade.

C. Plastic PVC lines below street, street pavers, or sidewalk paving shall be installed within separate Schedule 40 sleeves. For PVC lines 1" to 2 1/2" the sleeve shall be two nominal sizes larger. For PVC lines 3" and larger the sleeve shall be one nominal size larger. Sleeves for water lines shall not exceed manufacturers recommended deflection for encased water line.

D. All pipe (PVC or Copper) installed in rocky or caliche soils shall be thoroughly embedded and completely covered in sand or approved imported topsoil.

E. Plastic pipe shall be as described on the drawings. It shall be unplasticized PVC extruded from virgin parent materials of the type specified on the plans. The pipe shall be homogeneous throughout and free from visible cracks, holes, foreign materials, blisters, deleterious wrinkles, and dents.

All pipe shall be continuously and permanently marked with the following information: Manufacturers name, size, schedule, type of pipe, working pressure at 73 degrees Fahrenheit, and N.I.S.F. approval.

2.11.7 PLASTIC PIPE, FITTINGS, AND CONNECTIONS ON MAINS

All pipe and fittings shall be approved type 1, grade 1, PVC, PR 200 pipe conforming to A.S.T.M. D1784-65T and D2241-L65T, and shall be either solvent weld pipe or rubber ring joint pipe. When a connection is plastic to copper either a PVC Schedule 80 nipple or male adapters shall be used. The male adapter shall be hand tightened, plus one turn with a strap wrench. Joint compound shall be virgin teflon paste or tape.

2.11.8 PLASTIC PIPE, FITTINGS, AND CONNECTIONS ON LATERALS

All pipe shall be as follows:

1/2 inch - PR 315, PVC

3/4 inch and 1 inch - PR 200, SDR 21, PVC

1 1/4 inch and up - PR 160, SDR 26, PVC

All fittings shall be molded fittings manufactured of the same materials as the pipe and shall be suitable for either solvent weld or screwed connections. Use male adapters as described above. Only Schedule 80 PVC pipe may be threaded.

2.11.9 INSTALLATION OF PLASTIC PIPE

Plastic pipe shall be installed in a manner so as to provide for expansion and contraction as recommended by the manufacturer. Plastic pipe shall be cut with a hack saw or approved cutting device or in such a manner so as to ensure a square cut. Burrs at cut ends shall be removed prior to installation so that a smooth, unprotected flow will be obtained. A PVC primer shall be used on all main lines (according to manufacturer's recommendations). Pipe for use with rubber gaskets shall use a gasket lube, Weld On 787 or approved equal and shall be tapered as recommended by the manufacturer.

2.11.10 DRIP SYSTEMS

A drip system shall be installed in such a manner that the emitters and smaller tubing are to be below grade and vandal resistant. Maximum tubing length shall be 5 ft. Tubing shall be buried 4 in below finish grade.

For installation, type and number of drip emitters required, refer to City Details C-808 and C-817.

Tubing shall be 100% Dow Chemical 7510 polyethylene material as manufactured by Landscape Products, Inc or approved equal.

2.11.11 INSPECTIONS

The User Department will inspect and approve the work at the following stages of completion. Any work completed without these inspections must be removed prior to acceptance of that phase of work. These stages are:

- A. Completion of all trenching and installation of all main lines prior to back-filling, including the backflow preventor, quick couplers, electric valves and any isolation valves. The main line shall be pressure tested for 30 minutes at this inspection.
- B. Completion of installation of all control wires prior to back filling.
- C. Installation of all lateral valves, lines, and heads prior to back filling.

Prior to any construction or utility work starting within a City right-of-way, which will affect existing City-owned and maintained landscaping or irrigation systems, there will be a meeting on site to show that the existing systems or landscaped areas are in proper repair and functioning. At the completion of the construction work there will be another meeting and inspection on site. The same areas and systems will again be reviewed.

Any damage to the landscaping or to the irrigation system will be the responsibility of the general contractor or utility company and must be repaired to the satisfaction of the City within five (5) working days. If this work is not completed within the allotted time, the City will make the repairs or corrections and money will be deducted or billed to the general contractor on the project. The individuals who should be represented at these on-site meetings shall be: a representative from the contractor, a representative from the engineering firm and a representative from the City Streets Division.

2.11.12 FLUSHING AND TESTING

After all new sprinkler piping and risers are in place and connected and all necessary division work has been completed and prior to the installation of sprinkler heads, control valves shall be opened and a full head of water used to flush out the system. After the system is thoroughly flushed, risers shall be capped off and the system pressure tested prior to backfilling the laterals.

2.11.13 IRRIGATION SYSTEM MAINTENANCE

The Developer or Contractor shall maintain irrigation system for a period of ninety days, beginning immediately after preliminary acceptance by the City.

2.11.14 BACKFLOW PREVENTION

Backflow prevention assembly shall be per City Detail C-311 for potable water irrigation systems and C-404 for reclaimed water irrigation systems.

Upstream piping from the backflow prevention assembly shall be flushed in a manner that will not lodge dirt, rocks, and debris in the assembly itself.

Prior to final acceptance of the irrigation systems, each backflow prevention assembly shall be tested by a certified and approved backflow prevention assembly tester, to ensure the device is operating correctly within manufacturers recommendations. A list of approved testers may be obtained from the City. Test reports shall be sent to the City's Water Quality Division, Public Works & Utilities Department. An approved test report form may be obtained from the City.

Those devices not meeting test requirements shall be repaired and re-tested prior to final acceptance. In the case where reduced pressure principle assemblies are used, a splash pad shall be used under the relief part for discharge water. An acceptable method of handling discharge water from the device must also be approved prior to the installation of such a device.

2.11.15 ELECTRIC CONTROLLERS

The sprinkler controller shall be capable of operating on 117 volts, 60 cycle A.C. current and shall provide output current of 24-26.5 volts at 1.1 amps for electric solenoid valves. Controller shall be mounted on a stainless steel pedestal. Controller shall be sized to perform the sprinkling efficiently and adequately. All controllers shall be installed with rechargeable batteries.

The following manufacturers and models are acceptable: Irritrol, Hunter. The Irritrol IBOC Plus series battery operated clock is to be used if no booster pump is required i.e. where no electricity is required.

Wiring shall correspond to the geographic location of the valve and station controlled and shall be identified.

2.11.16 CONTROL CABLE

All wiring to be used for connection of the automatic controller to the electric solenoid actuated remote control valves shall be equivalent to Type UF-600V, 7 strand or solid copper, PVC insulation, single conductor, UL approved underground feeder cable. All pilot or hot wires are to be one color and all "common" wires are to be white. Wiring shall conform to local codes and shall be installed according to the manufacturer's recommendations. Minimum wire size shall be No. 14. All wire connections must be made with an epoxy filled cylinder type wire connector.

2.11.17 REMOTE CONTROL VALVES AND VALVE BOXES

Remote control valves shall be normally closed 24 volt a.c. 60 cycle solenoid actuated globe/angle pattern diaphragm type. The valve body and bonnet shall be constructed of heavy duty glass-filled nylon. Solenoid coil shall be encapsulated in molded epoxy. The valve shall have a flow control stem with wheel handle for regulation or shutting off the flow of water and a bleed screw for manual operation without electronically energizing the solenoid. The valve construction and installation shall be such as to provide for all internal parts to be removable from the top of the valve. The valve shall be either Rainbird, Hunter, or approved equal and shall be installed per manufacturer's recommendations (see City Details C-809 and C-810). Ball valve isolation valve, the same size as electric valve should be installed before each electric valve.

Valve boxes shall be vandal and water proof with locking bolt lid.

2.11.18 VALVE REQUIREMENTS

Brass Ball Valve

Shall have forged brass body, threaded cap, blowout proof stem, reinforced glass fiber filled PTFE seats, quarter turn handle, NPT threaded or soldier joint ends.

Every electric remote control valve shall have one ball valve on the pressure side as an isolation valve. Ball valve to be the same size as the electric remote control valve (see City Details C-809 and C-810).

Check Valves

A. Check valves two inch and smaller shall be swing type, bronze bodied with threaded connections and replaceable composition disc, rated at 150 pounds S.W.P.

B. Check valves 2 1/2 inch and larger shall be swing type, iron body, bronze mounted with flanged or threaded connections and replaceable rubber disc, rated at 125 pounds S.W.P.

Master Valve – Flow Sensor

Each facility will have a master valve and flow sensor located directly after backflow device. Master valve can be same product as stated in Section 2.11.17, above. Flow meter shall consist of data industrial 220 or 250 model transmitter along with 600-10 converter module. Bermad 910-P hydrometer can also be used.

2.11.19 BOOSTER PUMPS

Booster pumps may be required, refer to City Technical Design Manual No. 1&2, Reclaimed Water Distribution System regarding pressure considerations.

Booster pumps shall be located in the median if possible, if not, the booster pumps should be located near the back of the right of way in an area approved by the User Department. Electric service will be required to be supplied to the pump location. The booster pump shall be installed in a marine grade aluminum enclosure. Refer to City Detail C-404. The User Department will assist in the selection of an acceptable booster pump; currently the recommended pump is manufactured by Barrett Engineered Pumps. The

color of the enclosure shall be acceptable to the City Landscape Maint & Design Coord. The enclosure and irrigation controller cabinet shall not be located within sight visibility triangles.

2.12 OPERATION AND MAINTENANCE MANUAL

An Operation and Maintenance Manual shall be provided when the City is to assume maintenance. The Manual shall include, but is not limited to the following:

- A. One Cover Page with the projects name, address, phone number, contractor, and the consultant.
- B. A Table of Contents.
- C. Information on the make, model(s), and operation of all controllers, valves, pumps, backflow preventors, sprinkler heads, bubblers, emitters, etc.
- D. Meter serial number, street addresses and account numbers.
- E. Information on the location of each station.
- F. A facility information form specifying the following information for each turf station:
 - 1. Station Number
 - 2. Type of Sprinkler Heads
 - 3. Nozzle Size(s)
 - 4. GPM per Sprinkler Head(s)
 - 5. Spacing between Sprinkler Head(s)
 - 6. Numbers of Heads
 - 7. Is the station located on a slope and what is the exposure?
- G. Information and delivery on any extra stock to be given to the City.
- H. Information and documentation on all warranties of parts and accessories.
- I. A list of all plant materials which shall include the following:
 - 1. Botanical Name
 - 2. Common Name
 - 3. Tree standard (Single Stem, Multi-Trunk, etc.)
 - 3. Plant Size/Container type
 - 4. Quantity
 - 5. Type of irrigation to the plant (bubbler, emitter, etc.)
 - 6. How many cycles per week to water for both winter and summer?
 - 7. Length of watering per cycle
- J. Square footage of all granite areas.
- K. Square footage of all turf areas.

- L. Linear footage of header and specification
- M. Spray Logs
- N. Material Safety Data Sheets (MSDS), if requested.
- O. Irrigation Logs meeting the City requirements shall be completed and be within every City controller.
- P. Information on the utilization or reclaimed or potable water.

2.13 STREET LIGHTING AND ACCENT LIGHTING

Coordinate landscaping to avoid conflicts with street and pedestrian light poles, wiring, conduit and illumination patterns.

The designer shall coordinate the location of the street light conduit/cable as necessary to provide adequate clearance for required tree installations.

Up lighting of palms and trees in certain situations may be required.

Electrical outlets for seasonal lighting or other uses shall be provided near up-light trees and at other selected locations as determined by the City Streets Superintendent.

Decorative and accent lighting shall not be designed or installed within the right-of-way without approval from the City Streets Superintendent.

2.14 FENCES/WALLS OR OTHER STRUCTURES

Unless approved by the City Streets Superintendent, walls, fences, signs or other screening or decorative type structures will not be installed within the limits of right-of-way.

Landscape areas within a City maintained area are to have a separate irrigation system meeting City standards. Note that in some cases, for example, the opposite side of the wall is to have a separate irrigation system if it is to be maintained by any other entity besides a City department.

3.0 ADDITIONAL SPECIFICATIONS FOR CITY OWNED RETENTION BASINS

3.1 DESIGN CONSIDERATIONS

- A. Turf coverage or seed mix coverage will be reviewed on an individual basis with the major determinants being aesthetics, reclaimed water availability, and use. Authorization must be obtained from the City when planting of any kind is to be utilized in areas to be maintained by the City.
- B. Paved Pedestrian and Bicycle Ways: Shall be included when applicable to provide easy access to schools, parks, shopping, and places where people congregate. The walkways shall be six-foot minimal width.
- C. Although the required storage volume is the primary design consideration, the contour of the basin may be irregular in nature allowing the embankment areas to become integral components of the design. A vacillating contour at areas immediately adjacent to long runs of masonry wall will be encouraged as a design detail for added depth and variety of perspective.
- D. Basins that are landscaped are to be so designed to permit vehicular access for maintenance. Non-vehicular access shall only be permitted with the City's approval. Vehicles must be able to reach the basin bottom and all basin structures. Temporary basins do not require vehicular access.
- E. Embankments shall not exceed a 4:1 ratio at lawn areas. Specific approval may be given for increased sloping in cases where the increase results in a more pleasing design and does not hamper the maintenance or the functional use of the basin. All instances of increased sloping shall include the following considerations:
 - a. Public Safety
 - b. Low Maintenance and Maintenance Access
 - c. Erosion Control
 - d. Transitional Control (walls, bollards, timbers)
 - e. Irrigation Runoff into ROW
 - f. Environmental Regulations
 - g. Elimination of Standing Water
 - h. Ease of mowing and scalping prevention
 - i. Safety and accessibility
- F. Low maintenance should be an essential consideration to all design schemes, including the following:
 - 1. Plant material shall not be placed at areas where it will encroach onto sidewalks or adjacent planting beds.
 - 2. Areas of varying composition within the basin, such as where ground cover or planting beds are adjacent to lawn, shall be separated through the use of durable, reinforced concrete or masonry mow strips.
 - 3. Areas where "nuisance" water enters and/or accumulates in the basin will have design features to eliminate perpetual soggy condition and littered appearance. A dry well or French drain shall be required under certain conditions as deemed necessary by the City to reduce the nuisance water problems.
 - 4. Positive drainage from curb cut-outs backs of scuppers and transitions from ends of spillways to landscape or turf areas must be included in design. The design should assure positive flows to inlets, drywells, etc.

5. Generally, consideration must be given for the longer-term look of the basin in association with maintenance. For example, riprap tends to be unsightly and is a maintenance issue, so its use should be kept to a minimum.
 6. All basins shall be sloped to drain.
- G. All basins are required to provide a dust-controlling cover. All permanent basins are required to provide vegetated and mulched landscaped areas
- H. Vehicular ramps for maintenance activities must be provided where basin slopes exceed 4:1. All vegetated landscaped basins to be maintained by the City are to provide for maintenance vehicle access.

3.2 GRADING AND MOUNDING

- A. All finished grades shall be in accordance with approved Grading Plans. All slopes shall be in accordance with the approved Grading Plan and the top and bottom of all slopes shall be rounded for a distance of not less than ten feet.
- B. All fills shall be compacted to 85% density in eight-inch lifts and brought to optimum moisture content and thoroughly compacted. All rock one-inch or larger in any dimension, debris, rubbish, concrete, or asphalt paving shall be removed from the site prior to preparing the finished subgrade.
- C. All cuts shall be made in accordance with the plans. All cut areas shall be over-excavated to guarantee the replacement of a six-inch thick layer of topsoil when turf is specified, or the required mulch depth if required.
- D. Positive drainage from curb cut-outs backs of scuppers and transitions from ends of spillways to landscape or turf areas must be graded to convey drainage. Grading shall convey runoff away from the roadway, or existing hardscape, including walls.

3.3 DRYWELLS

Drywells shall be registered with the Arizona Department of Environmental Quality in the name of the underlying property owner at the completion of construction. Percolation testing, drilling logs, and Arizona Department of Environmental Quality (ADEQ) registration numbers shall be delivered to City at the time of project acceptance.

3.4 PLANT MATERIAL

- A. General: Quantities stated here are not intended to be absolute numbers, but rather “rule of thumb” for the designer and reviewer.

Basin designs shall be evaluated on an individual basis, considering quality of design and environmental contribution to the community. Strong considerations must be given to ease of maintenance; all designs for permanent basins require the use of low water use landscape material.

- B. Tree Material: The minimum allowable number of trees in a basin shall be established at the rate of 20 per acre, or at a rate otherwise approved by the Public Works & Utilities Department.

One species will account for about 40 percent of the tree material. The nature of the basin and design concept will dictate a mix of tree species. A mix of acceptable, larger species is encouraged. The Mix

of tree sizes shall be about 50 percent 36 inch box or larger, 40 percent 24 inch box, and 10 percent 15 gallon, or at a mix of tree sizes otherwise approved by the Public Works & Utilities Department.

- C. Consideration shall be given to each landscaped area to provide a site feature to that area. The feature, to be approved by the City may include; specimen plant material, hardscape elements (bench, protective rails, boulders) or other features.
- D. When specifying plant material, be cognizant of the space available in contrast to the mature size of the plant species to reduce both hazards and maintenance issues.
- E. Be selective where grafted trees are utilized due to seasonal wind issues.

3.5 LAWN CONSTRUCTION MATERIALS

- A. Lawn construction shall be one of the following:

- 1. Winter Lawns (are not permitted unless authorized by the City Streets Superintendent)

Shall be sodded with a (insert sod spec)_____ sod. At the Developer's or Contractor's option, they may wait until April 15 and seed Bermuda grass.

- 2. Summer Lawns

Shall be sodded blend of predominately Bermuda Primayera (Cynondon Dactylon) planted from April 15 through October 15; or with permission from the City Streets Superintendent shall be fancy hulled seed having minimum percentage of purity and germination of 94 percent and 88 percent respectively and a weed seed content not exceeding 0.35 percent. The Bermuda seed shall comply with requirements noted in this manual. The amount of seed shall be based on the application rate specified in subsection 8-B. The seed must be sown prior to final acceptance.

- B. Mulch

This is typically 2.5" minimum depth screened 1 ¼" Desert Gold decomposed granite or approved equal on all areas of medians, permanent basins and on basin tops and banks with the bottom being compacted earth decomposed granite or approved equal on Temporary basins. Variations may occur with the permission of the City Streets Superintendent.

- C. Header

Unless already separated by a hardscape feature or edge (ie, sidewalk, driveway, structure) all turf areas are to be separated from other areas, typically granite mulch, by a header. Prior approval may be granted for other types of headers, but typically they should be 6" wide, reinforced concrete.

A minimum 6' separation (buffer) is required from walls and turf edged by a reinforced concrete header. The buffer typically consists of decomposed granite mulch, shrubs and ground cover as specified. The intent is to keep spray heads away from walls.

4.0 ADDITIONAL SPECIFICATIONS FOR RIGHTS-OF-WAY AND MEDIANS

4.1 GENERAL

When the Design Professional is designing a right-of-way landscaping system that is adjacent to an existing or previously approved plan, the proposed plan must be compatible with the existing landscaping plan yet meeting current Code requirements and standards. If the Engineer does not desire to continue the existing plan or the City does not desire it to be continued, the Landscape Architect or Engineer shall design a transitional area to change from the existing to the new type of landscaping.

The Design Professional, in designing the right-of-way landscaping, shall take into consideration any potential conflict between the trees the Designer proposes and existing or planned utility lines. This shall be coordinated by the Developer or Contractor with the utility companies.

Community or commercial development gateways and entry features are important to the image and awareness of the particular development and should be considered an integral part of the overall design of the streetscape. Right-of-way designs should be coordinated to insure compatibility and a unified appearance between gateway/entry features and the streetscape.

All right-of-way landscape and irrigation system installations to be maintained by the City shall be located entirely within the limits of the right-of-way. There shall be no overlap between public and privately maintained systems without prior approval and written authorization from the Public Works & Utilities Department.

Generally, the landscape maintenance of the boulevard strip, the area between the back of curb (or edge of paved roadway) and the right-of-way shall be maintained by the adjacent development, property owner or homeowners association.

Where publicly maintained and privately maintained landscape areas abut each other, a method of separation shall be provided to establish clear limits of maintenance responsibility. Acceptable methods for providing separation between public and private landscape areas shall be as follows: walls, fences, walkways or reinforced concrete headers (plastic or wood headers are typically not allowed). Metal or plastic headers (only if required by a utility) may be utilized if approved by the City representative.

A. STREETSCAPE

In general, the term streetscape refers to the many visible surface elements that make up a typical roadway environment. However, due to the fact that many of the visible elements are directly affected by the requirements of their below grade portion or the requirements of other elements located below ground, the designer must consider both the surface and sub-surface elements as part of the total streetscape. Typical streetscape elements include: vehicular and pedestrian pavements, surface and sub-surface utilities, grading and drainage, lighting, walls, signage, and landscaping.

B. STREETSCAPE CHARACTER/IMAGE

Streetscapes are the signature feature of various developments throughout the City of Chandler. From the major highways to residential streets, the visible streetscape establishes an image or character of the community for both residents and visitors. A well-coordinated and unified streetscape will not

only enhance the visual quality of the community, but will also provide a continuity and help to improve the image and character of the overall City. Although not always aware of it, the general public is influenced by the aesthetic appeal provided by streetscape design as well as how it supports or fits the vision of their City.

Streetscape design should consider the local context of the roadway as well as unique features and focal points of the community areas. Streetscape design can be beneficial toward the enhancement of the positive aspects of the City.

Streetscape design within public right-of-ways should consider views of the immediate streetscape from the perspective of the vehicle and pedestrian users as well as views between the roadway and the adjacent development. Distant views of scenic or significant features should be maintained or enhanced whenever possible.

4.2 DESIGN GUIDELINES

A. TREE DENSITY FOR MEDIANS

Trees shall not be planted within median landscape areas that measure less than eight feet in width, from face-of-curb to face-of-curb without consent of the City Streets Superintendent and the City Traffic Engineer.

In general, the required tree density formula for median landscape areas shall be as follows:

- a. The minimum required tree density for all median landscape areas greater than eight feet wide and equal to or less than sixteen feet wide, face-of-curb to face-of-curb, shall be determined at a ratio of one tree per thirty feet of plantable median length. Medians greater than sixteen feet in width will require increased tree densities and evaluated on a case by case basis per the City of Chandler Landscape Maint & Design Coord.
- b. In addition to the minimum required tree density of one tree per thirty feet of plantable median length, an additional one-third of the required minimum total shall be added within the portion(s) of the median landscape area outside the vehicular sight distance/visibility clear zone.
- c. The desired location for increased median tree densities is within the permanent portion(s) of phased median landscape areas, outside vehicular sight distance/visibility clear zones. However, the City Landscape Maint & Design Coord may approve tree locations in the temporary portions of the phased medians outside of the vehicular sight distance/visibility clear zones.
- d. If any portion of the permanent and/or temporary portion(s) of phased median landscape areas are within vehicular sight distance/visibility clear zone the designer must show these areas on the plan(s) at the time of the first City of Chandler review submittal.
- e. At the time of the first submittal review, the City of Chandler may exercise the option to modify the tree density requirements, which may result in the addition or deletion of trees.

f. Trees within median may be uniformly spaced or planted in random groupings as long as the density ratio criteria indicated above is correct for the full length of the median improvements and as long as the maximum spacing between trees does not exceed 200'. The minimum spacing for trees shall not be less than one-half of the mature canopy spread of each of the two adjoining trees. Actual plant placement and planting patterns shall be determined by the designer and submitted to the City for review and approval.

2. 36" Box Tree Size Minimum

Tree sizes shall be as set forth by the Arizona Nursery Association Grower's Committee Recommended Average Tree Specifications, most current edition.

B. TREE DENSITY FOR BOULEVARD STRIP FRONTAGES

In general, the required tree density formula for the boulevard strip frontage (face of outside curb to the right-of-way) shall be as follows:

1. The required minimum density of trees for boulevard strip areas from ten feet up to twenty-five feet wide, shall be determined at ratio of one tree per 30 linear feet of curb frontage length. Boulevard strips greater than twenty-five feet in width will require increased tree densities and shall be evaluated on a case by case basis by the City Landscape Maint & Design Coord. Boulevard strips less than ten feet in width shall be evaluated on a case by case basis by the City Landscape Maint & Design Coord.

2. The required formula for increasing tree densities within the boulevard strip areas greater than twenty-five feet wide shall be one tree per 800 square feet.

3. Trees within the boulevard strip may be uniformly spaced or planted in random groupings as long as the density ratio criteria indicated above is correct for the full length of the improvements and as long as the maximum spacing between trees does not exceed 200'. The minimum spacing for trees shall not be less than one-half of the mature canopy spread of each of the two adjoining trees. Actual plant placement and planting patterns shall be determined by the designer and submitted to the City for review and approval.

C. GROUND COVER AND SHRUB DENSITY FOR MEDIAN AND RIGHT-OF-WAY FRONTAGES

Ground cover plants and shrubs at maturity shall provide 40% minimum coverage of the total available landscape surface area for permanent median and boulevard strip areas. Within certain City areas, which include but are not limited to: gateways, Downtown, and the Mall, minimum densities may be increased at the discretion of the City Streets Superintendent.

Ground cover plants and shrubs at maturity shall provide 30% minimum coverage of the total available landscape surface area for temporary median and boulevard strip areas unless otherwise approved by the City Streets Superintendent.

D. PLANT SPECIES VARIATIONS

There shall be a minimum of two and a maximum of five different tree species/varieties and a minimum of three and a maximum of twelve different shrub/ground cover species/varieties required per design area. The City prefers an abundance of seasonal color in its landscape plantings utilizing diverse species. Other plant species variations may be allowed pending review and approval of the City Landscape Maint & Design Coord.

4.3 PLANTING OF TREES, SHRUBS, AND GROUND COVER

All trees must be located so the center line of the tree trunk is at least eight feet behind the back of the curb, at least five feet from the nearest edge of sidewalk and at least two feet from the fence installed along the property line (for all right-of-way areas of sufficient size to allow trees). There shall be a minimum of one tree per 40 linear feet of right-of-way area. A minimum of two different varieties and a maximum of five different varieties will be required.

Street Light conflicts

All planting of trees, shrubs, and ground cover shall comply with the requirements of Section 2 in this manual. All plant material used in right-of-way and median landscaping must be approved by the Director of Public Works & Utilities. Some materials appearing on the plant list will not be acceptable for the use in these areas.

A. GRADING AND DRAINAGE

Aesthetic grading and land form design (mounding and depressions) of boulevard strip areas and medians may be used to provide visual relief, and control surface drainage. Offset or meandering wall alignments in combination with contoured land-form design is also recommended.

Aesthetic grading or land-form surface variations greater than six inches within boulevard strip and median landscape areas less than eight feet in width is not recommended. For areas eight feet or greater in width, aesthetic grading and land-form design is recommended. Cut or depressed slopes and fill or elevated slopes shall be constructed in accordance with the engineering requirements. Slopes should be no steeper than 4:1 (H:V). Fill areas should be compacted between 85% and 90% in eight-inch maximum lifts.

Upon completion of site grading, underground utilities and landscape irrigation system installations, the entire site shall be fine graded by dragging and raking to remove all clods and rocks one-inch and larger. All landscape area soil shall be water settled and compacted to required densities. Prior to any planting, an inspection shall be requested and completed by the User Department. All grades shall be kept within a tolerance of one-tenth foot, plus or minus in landscape areas. Where installation of topsoil is specified or shown on the drawings, topsoil shall be installed at a minimum depth of eighteen inches (Refer to City Detail C-807).

All areas shall be sloped to drain. Ponding of water shall be prevented. Grades shall slope away from walls and other features which may be damaged by water.

Designers should attempt to balance earthwork requirements between cut and fill whenever possible to avoid importing and exporting requirements.

All imported soil shall be thoroughly tested and approved by a State of Arizona certified soils testing laboratory to meet the requirements for topsoil and be free of any toxic, hazardous, or undesirable substances.

B. SAFETY CONSIDERATIONS

Safety must be an integral part of all public right-of-way design, including streetscape improvements. Streetscape design must consider the safety of all right-of-way users from vehicular and bicycle to pedestrian and maintenance personnel. Because many of the landscape elements that make up the streetscape are not constant, the designer must be aware of how the various elements will change and how these changes will affect the relationship between the streetscape elements and the users.

C. VEHICULAR/PEDESTRIAN SIGHT DISTANCE, VISIBILITY CLEAR ZONES

The following referenced detail and sight distance regulations are with regard to vehicular visibility and safety. The sight distance standards provided herein may not be applicable to every intersection or vehicular sight distance condition. Each vehicular sight distance must be evaluated on an individual basis due to the multiple site specific conditions and roadway geometric factors that may vary at any location. The information contained herein is based on 90 degree intersections, flat (vertical alignment) and straight (horizontal alignment) roadway conditions. Variations in design speeds and posted speed limits, roadway elevation changes, alignment skews and curves or various other conditions are but a few of the factors that may significantly alter required sight distance criteria and visibility clear zones.

Sight distance criteria and visibility clear zones shall pertain to all classifications of roadway intersections and driveways with access onto any public roadway.

Refer to City of Chandler Standard Sight Distance Detail No. C-246, C-247 and C-248.

All trees within vehicular sight distance/visibility clear zones shall have a vertical canopy clearance/clear trunk to six (6') feet above the nearest top of curb or sidewalk elevation. Trees with growth characteristics such as low branching or multiple trunks may require larger size specimens to be installed to provide the required canopy clearance, or increased tree spacing distances will be necessary to insure adequate sight visibility is provided and maintained. Trees within vehicular sight distance visibility clear zones shall be horizontally spaced and/or offset to prevent creation of a "picket fence effect" based on the angle and position of the viewer from the origin point of the vehicular sight distance. Minimum or maximum tree spacing requirements previously indicated may require modifications as a result of actual roadway and sight distance/visibility clear zone conditions or tree size and growth characteristics.

Visibility obstruction by all other landscape elements, other than trees, within vehicular sight distance clear zones shall not exceed two feet in height. In other words, no single or combination of shrubs and ground cover plant material, inert ground cover materials or elevated land-form, within vehicular sight distance visibility clear zones, shall exceed two feet in height above the nearest vehicular pavement top of curb or sidewalk elevation (when fully matured).

The above limits of sight distance visibility obstruction must provide a minimum four (4') foot vertical visibility window between the two foot maximum visibility obstruction height and below the six foot minimum canopy clearance/obstruction height.

The sight distance visibility of any on-road vehicle, within the four foot vertical visibility window, may not be obstructed more than 25% at any time. In other words, within the four foot vertical visibility window, 75% of any moving vehicle profile must be visible at all times from the origin point of any sight distance position or potential conflicting intersection turning movement.

Irrigation equipment installations are required to be sized and located to avoid conflicting with sight distance visibility clear zones. Irrigation equipment or equipment enclosure installations, shall not exceed two foot maximum height above the nearest vehicular pavement curb unless located outside the sight visibility clear zone.

D. LANDSCAPE SETBACKS/CLEARANCES

Plant material setbacks as indicated below shall be adhered to for the safety of the public, maintenance personnel and maintenance operations.

All the trunks within median landscape areas should maintain a minimum six (6') foot horizontal setback from face-of-curb and in no cases be less than four (4') feet from the face of any permanent or future curb.

Within public right-of-ways, the use of plant materials that have thorns, rigid pointed blades or needles are not recommended. Use of plants with sharp protrusions shall be restricted to areas where the mature natural growth pattern of the plant (mature horizontal spread and/or vertical canopy clearance) will remain a minimum of three feet from any pedestrian surface or bicycle lane.

All plant material shall be located to prevent encroachment of normal growth patterns into pedestrian or vehicular circulation areas and sight distance clear zones.

All shrub and ground cover plantings shall maintain a minimum one-foot setback from walkways and back-of-curbs at maturity. For medians, maintain a minimum of two-foot setback from back-of-curb at maturity.

Trees shall be selected and located to provide adequate vertical canopy clearance above pedestrian or vehicular circulation areas as follows: eight feet minimum above pedestrian walkways and 13'-6" minimum clearance above vehicular traffic.

All trees must be located so the center line of the tree trunk is a minimum of five feet from walls or fences.

The location and position of any plant materials shall not obstruct visibility of or restrict maintenance access to any signage or traffic control devices.

All plant materials shall be selected and arranged to meet the above setback and clear zone requirements without maintenance. Some tree species may require occasional pruning to encourage strong growth and maintain the required sight distance clear zones and setbacks.

E. PHASED ROADWAY/TEMPORARY MEDIANS

Phased major arterial roadways in the City of Chandler will typically have an initial median width that includes twenty-four (24') feet of additional width (Refer to Standard Detail No. C-204). The additional width is considered to be the requirement for the expansion of two future 12' foot traffic lanes, one on each side of the permanent landscape median area. To avoid having the future lane areas, or temporary portion of the median, appear unattractive and void of landscaping, the design shall have temporary landscaping installed during the initial phase of the roadway development for the unknown interim period.

Because the landscape improvements for this area are considered temporary, the designer must consider the potential impacts associated with the future lane additions, from both a construction and cost conscious standpoint. The design and installation of both the planting and irrigation system must be sensitive to the permanent portion of the median as well as the temporary portion. The designer must provide an overall median design that will allow for the future removal of the outer edges while maintaining a complete and total design for the permanent portion of the median to remain. Both the planting and irrigation systems must be designed to allow for the removal of the temporary portion with little or no impact on the permanent portion. Major components of the irrigation system should not be installed in temporary median areas. The location and installation of both the temporary and permanent median landscape elements must also be designed to be in accordance with sight distance and clear zone setback requirements for both the interim and future roadway conditions.

4.4 DECORATIVE PAVERS

In median landscape design the Design Professional shall follow the dimensions and layout as shown on City Standard Detail C-225. This requirement is mandatory at all left turn bay locations and at all other median breaks to facilitate adequate visibility for motorized vehicles.

4.5 TRANSIT FACILITIES

Refer to the Regional Public Transportation Authority (RPTA) handbook and guidelines, most current edition, for landscaping transit facilities.