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1.0 INTRODUCTION

The purpose of these standards is to aid developers, homebuilders and their designers in the planning and designing of public and private infrastructures. Design concepts and specific technical data are outlined, however, they are not intended to supersede sound engineering judgment. All plans are to be prepared with these concepts in mind and will be reviewed accordingly.

Chapter 28 of the Code of the City of Glendale authorizes the City Engineer to publish and amend standards for infrastructure construction within the City. These standards are published and periodically amended in accordance with that authority. This 2002 edition of the *Design Guidelines for Site Development and Infrastructure Construction* has been renamed *Engineering Design and Construction Standards*.

City Council adopted Section 2-3 of the City Code of Glendale by Ordinance No. 2260 and a fee schedule by Resolution No. 3582 on June 11, 2002. This ordinance establishes Community Development fees of the City of Glendale and further provides for an annual automatic adjustment in accordance with the CPIUU (Consumer Price Index Urban Users) Inflationary Index. A copy of the current fee schedule may be obtained from the Engineering Department on request or may be downloaded from the Engineering Department website.

This book is divided into individual Chapters, which cover specific elements of the design and development review process. It begins with general information, followed by specific technical details. Updates will be published and made available periodically.

These standards are intended to be used in conjunction with the specifications of the Zoning, Subdivision, Floodplain Management, Grading and Drainage, Landscape Ordinances, and other appropriate ordinances of the City of Glendale, and the laws and regulations of such other agencies as may have jurisdiction.

1.1 GENERAL INFORMATION

1.11 Codes and Standards: All development within the City of Glendale shall comply with all requirements of the City of Glendale Code and Ordinances. Copies of these documents, with revisions, are on file in the Office of the Clerk of the City of Glendale. Preliminary and final design plans shall be prepared in accordance with these standards unless specific variances have been approved by the City. All construction shall be in accordance with the Uniform Standard Details and Specifications published by the Maricopa Association of Governments (MAG), utilizing the English units of measurement, as may be amended by the City herein. Private on-site water and sewer lines shall be constructed in accordance with the Uniform Plumbing Code as adopted by the City.

1.12 Plans Review: Once the plans for a development have been prepared, they shall be submitted to the City's Development Services Center. From there they will be distributed to the appropriate City departments for review and comment. These comments will be compiled and consolidated by the Development Services Center and returned to the developer. All such comments shall be incorporated into the plans and reports by the developer prior to resubmittal.

1.13 Right-of-Way: When required, the acquisition and dedication of new street right-of-way and/or utility easements shall be coordinated through the City's Property Manager. Deeds for these rights-of-way, easements and/or parcels shall be prepared by the developer and submitted to the City for approval, recordation and formal council acceptance.

1.14 Street Lights: Street lights are required on all public streets within or adjacent to any proposed development. Plans for these facilities must be included in the overall submittal and plans should be prepared in accordance with the City's Street Light Manual.

1.15 Construction: Construction permits are required for all construction within the City. Any contractor found working on a project without an official set of approved plans and a current permit shall discontinue work. Prior to the issuance of a permit, the contractor shall provide a current Arizona State Contractor's License, proof of commercial general liability insurance and an appropriate letter of assurance or other guarantee for the completion of all off-site improvements as required by the City's Subdivision Ordinance Sections 31-91 to 31-97. All construction shall be in accordance with the approved plans and the Uniform Standard Details and Specifications published by the Maricopa Association of Governments (MAG) as amended herein by the City.

1.2 GENERAL IMPROVEMENT POLICIES: The following sections outline the City's policies related to various improvements associated with the development process. They are by nature general in scope. Reference should be made to the appropriate Chapters within the balance of these standards for specific details.

1.21 Street Improvement Policy (See Chapters 3 and 4): All developments within the City shall provide an interior street system adequate to insure that all parcels and/or facilities within the development shall have reasonable access to the balance of the public street system. Further, they shall provide access into the development for public service and/or emergency operations. Such facilities, be they public or private streets, shall be of such width and structural strength as to provide safe and unrestricted access. Private streets shall not normally be permitted and must be specifically approved by the City Council. If approved, private streets must be improved to City standards to include an easement for

utility and public safety access at least equal to the City standard right-of-way for local, residential streets. Where private streets are authorized, the developer will be responsible for providing guards or other means of denying access by the general public. Private streets shall not be maintained by City forces. In single-family developments it is the intent of the City of Glendale that the street system be designed in conformance with the classifications outlined in Paragraphs 3.11 and 4.1. There shall be minimal direct access to the collectors, and extremely limited access to major arterials and arterials. When the development occurs adjacent to a boundary street, it is the City's policy that it shall be the responsibility of the developer to install improvements along their frontage to the ultimate grade and alignment for the said boundary street. If the existing pavement does not meet current City design standards, the developer will be required to remove and replace the pavement to street centerline..

1.22 Storm Drainage Policy (See Chapter 5): It is the City's policy that all developments within the City shall provide sufficient stormwater retention or detention so as to minimize the adverse impact of that development on its downstream neighbors. To that end, all development shall provide sufficient on-site retention or detention to contain, at the least, the runoff generated by a 100-year, two-hour storm falling on that property. Such facilities shall be separate and distinct parcels within the development and shall be planned for accordingly. In single-family developments this facility may be deeded to the City for operation and maintenance, presuming it meets those requirements as indicated in the Subdivision and Grading and Drainage Ordinances and in the appropriate sections of these standards. Further, it is the City's policy that all developments shall provide adequate drainage facilities so as to convey runoff generated both on and off the project, around or through the project in such a manner as to insure that the structures will be free from flooding and that there is reasonable access for emergency and public service vehicles. The developer shall install storm sewers, channels and/or other physical improvements necessary to achieve this result.

1.23 Water Line Extension Policy (See Chapter 6): It is the City's policy that all development within the City shall have an adequate and secure source of potable water. To that end the City has developed a comprehensive program for supplying municipal water. Therefore, unless specifically excepted, all developments within the City shall be serviced by the City's potable water system. Further, the developer shall extend said system to and through the development as necessary to insure adequate supply to the development. If deemed necessary and appropriate, the developer shall extend the water distribution system to the extremities of the project so as to insure that more distant potential users shall have reasonable access to the City's water system.

1.24 Sewer Line Extension Policy (See Chapter 7): It is the City's policy that, unless specifically excepted, all development within the City shall provide for the discharge of domestic and other liquid waste into the municipal sewerage system. All developers shall be required to extend to and through their project a sewage collection system of a size, depth and slope sufficient to dispose of these wastes to the public system. When deemed appropriate and necessary, the developer shall extend the main trunk and/or collector lines to the upstream extremities of the project so as to provide reasonable access for potential upstream users to the City system.

1.25 Site Development Policy (See Chapter 9): It is the City's policy that all development within the City shall be designed and constructed in such a manner as to provide a safe and pleasant environment for the citizens of Glendale. To that end, the appropriate standards have been established for site development to include: public and/or private access for general and special uses; public water and sewerage systems; on-site and off-site drainage; undergrounding of utilities; landscaping; stormwater retention; street lighting; and public utilities as may be required. The structures themselves are to be constructed in accordance with the Zoning Ordinance, the Subdivision Ordinance, the current adopted Uniform Building Code, Standard Specifications, and these standards, as appropriate.

1.3 ORDER OF PRECEDENCE: It is not intended by these standards to repeal, abrogate, annul, or in any way impair or interfere with existing provisions of other laws or ordinances except those specifically repealed with private agreement, or with restrictive covenants running with the land to which the City is a party. Where these standards impose a greater restriction on land, buildings, or structures than is imposed or required by such existing provisions of law, ordinance, contract, or deed, the provisions of these standards shall prevail.

1.4 DEFINITIONS AND ABBREVIATIONS: The words, abbreviations, or phrases used in these standards may be found in the Uniform Standard Specifications and Details for Public Works Construction Manual. All other words or phrases shall be according to the generally accepted meaning in the English language.

2.0 CONSTRUCTION PLAN PREPARATION

2.1 GENERAL INFORMATION

2.11 All construction plans for Grading and Drainage, Streets, Water, Sewer, and storm Drains shall be prepared per the standards set forth in these standards. Chapter 11 contains standard City details which augment or replace some MAG standards.

2.12 Plan sheets shall not be smaller than 22 in. x 34 in. or larger than 24 in. x 36 in.

2.13 Plans shall be drawn with the drafting symbols presented in Detail G-210.

2.14 Plans shall be of a quality to allow microfilming, i.e. line weight and letter size shall be easily read when reduced by 50%.

2.2 COVER SHEET

2.21 An individual cover sheet with the following information is required for each type of improvement plan:

A. Project name, address, description, and total net and gross project acreage.
B. Developer's name, address, and telephone number.
C. Consultant's name, address, and telephone number.
D. Engineer's seal and signature is to be affixed on each sheet.
E. Vicinity map showing the project's location within the City limits (see Detail G-201).
F. Key map showing the project's location within a section and a graphic sheet index. This may be shown on a Detail Sheet instead of the Cover Sheet.
G. Project Benchmark: Approved City benchmarks shall be used. In areas that have been Master Planned and partially developed using a different elevation datum, the City Engineer may approve a project datum. If a project datum is approved, an equation to City datum shall be provided on each sheet of the plans.
H. Estimate of Quantities with construction items shown in units as required in the right-of-way permit fee schedule. (See Detail G-207) If the project is to be developed in phases, the estimate of quantities shall indicate quantities for each phase.
I. Specific reference should be made to soils investigation reports and /or pavement designs, if any.
J. Approval blocks (See Detail G-202).

K. Certification:

"I hereby certify that this design is based on accurate field data which has been checked in the field within 180 days prior to submission for City approval."

By:_____Date:_____

L. Utility undergrounding statement:

"PURSUANT TO CHAPTER 32.5 OF THE GLENDALE CITY CODE, ALL NEW AND EXISTING UTILITIES WITHIN OR CONTIGUOUS TO THIS SITE SHALL BE PLACED UNDERGROUND IN CONDUIT UNLESS A WAIVER OR DEFERMENT OF UNDERGROUNDING IS APPROVED BY THE CITY ENGINEER. WAIVER OR DEFERMENT OF UNDERGROUNDING MUST BE ACTED UPON BY THE CITY ENGINEER PRIOR TO APPROVAL OF CONSTRUCTION DOCUMENTS OR IMPROVEMENT PLANS."

M. Completed permit fee schedules as shown in Detail G-203.

2.3 DETAIL SHEET

2.31 A separate detail sheet may be provided at the discretion of the Consultant or when required by the City.

2.32 The following information is required:

A. General Notes as detailed in Section 2.6 shall be shown on this sheet.

B. A typical cross section shall be shown for each street on street construction plans. The data required on a typical section are:
   1. Dimensions
   2. Street centerline and right-of-way lines
   3. MAG Standard Details and Specifications
   4. Pavement structural design (See para. 2.21.I., above)
   5. Trim and match to existing street
   6. Existing and proposed utilities
   7. Landscaped areas

C. Special construction details required shall be provided. Typically this would include:
   1. Modification or relocation detail for existing irrigation structures.
   2. Special construction required where utility locations conflict.
   3. Others determined by the Consultant and/or the City as needed to clarify construction.

2.4 PLAN VIEW ONLY SHEETS:

2.41 Plan view only is allowed for construction plans for:

A. Minor collector and interior streets in undeveloped areas (1 in.=20 ft. only)

B. Grading and Drainage Plans with supplemental cross sections as needed to explain drainage (minimum scale - 1 in.= 40 ft.)

C. Water line plans for new subdivisions 12 inches and under (minimum scale - 1 in. = 40 ft.)

D. Street light plans (minimum scale - 1 in.= 40 ft.)

2.42 The following information is required:

A. Plan view shall be oriented such that north is either at the top or the right side of the sheet. North shall be clearly indicated for each plan view.

B. The drawing scale shall be clearly indicated for each plan view, and a graphic scale at least 2 inches long, or 100 scale feet, shall be placed adjacent to each north arrow.

C. All existing topography shall be shown. Typically this will include:

1. Existing contours with adequate spot elevations to show drainage (including a minimum 100 feet beyond project limits)
2. Existing utilities - aerial and underground
3. Existing irrigation facilities
4. Adjacent land uses (within 100 feet)
5. City limits where applicable
6. 100-year floodplain limits where applicable
7. 100-year floodway limits where applicable

D. Existing and proposed right-of-way, easements, view-easements (see Detail G-447) and property lines. Dimensions of these shall be clearly indicated.

E. Drafting and lettering of new construction shall be sufficiently heavier (darker) than existing topography so as to allow it to be quickly and clearly identified.

F. New construction notes SHALL BE BOXED so that they contrast with general information notes.

G. New drainage slopes may be shown as a percentage of slope or in foot per foot change of grade.

H. Grade breaks shall be clearly shown.

I. "Blue Stake" notes shall be provided on each sheet.

J. Benchmark Information.

2.5 PLAN/PROFILE AND CROSS-SECTION SHEETS:

2.51 Plan and Profile are required for construction plans for:

A. All major arterial, arterial, collector and residential streets, plus other streets when longitudinally matching existing streets
(Horizontal - 1 in.= 20 ft. or 1 in. = 40 ft.);

(Vertical - 1 in.= 2 ft. or 1 in.= 4 ft.)

B. Water line plans for construction within existing streets (same scales as 2.51A)
C. All sewer line plans (same scales as 2.51A)
D. All storm drain plans for main lines (same scales as 2.5.1 A). Connector pipes shall be at 1" = 5' horizontal and vertical.

2.52 The following information is required:
A. Plan view shall be prepared in accordance with Section 2.4.
B. Profile view shall show the following:
1. Elevation and stationing grid clearly indicated.
2. Profile of existing surface over proposed construction.
3. Existing utility crossings.
4. Proposed construction (i.e. elevations, slopes, grade breaks).
C. New construction notes SHALL BE BOXED so as to contrast with general information notes.
D. Where the sanitary sewer is approved to be less than five feet deep, the proposed water line shall be indicated in profile by a "ghost" line, and the building sewers shall be plotted at the locations and inverts where they cross the water line. The MAG Std. Detail 404 shall be called out, when needed, on both plan and profile.

2.53 Cross section sheets are required for construction plans for all streets when longitudinally matching existing streets.
A. Maximum distance between cross sections shall be 100 feet and shall include cross sections at the ends of curb returns. Cross sections shall extend the full width of the right-of-way.
B. Existing ground shall be shown with dashed lines with break points indicated by elevation and distance from monument line. New construction shall be shown with solid lines with break points indicated by elevation and distance from monument line.
C. Minimum scale: Horizontal - 1" = 10'-0"
Vertical - 1" = 1'-0"

2.6 GENERAL NOTES: The following Notes shall be placed on the Detail Sheet or Cover Sheet for all private development construction plans.

2.61 All plans for construction within City right-of-way or easements shall have the following shown on either the Cover Sheet or the Detail Sheet:

GENERAL NOTES FOR CONSTRUCTION

A. All construction shall conform with the latest MAG Standard Details and Specifications and the City's current *Engineering Design and Construction Standards***.**

B. **This set of plans has been reviewed for compliance with City requirements prior to issuance of construction permits. However, such review shall not prevent the City from requiring correction of errors in plans found to be in violation of any law or ordinance. Review and approval of plans does not release any developer or engineer from responsibility for errors or omissions on said plans.**

C. **The City does not warrant any quantities shown on these plans.**

D. **The City approval is for general layout in the right-of-way only. This approval is valid for a period of six months. Construction permits shall be obtained during this period or the plans shall be resubmitted for review and approval. The City's review of all NPDES submittals including NOI, NOT & SWPPP is intended as Review Only and does not constitute approval of the methods or plans for cleaning the storm water and protecting the waters of the United States. The Contractor is solely responsible for insuring that all requirements of the Clean Water Act are strictly enforced.**

E. **An approved set of plans shall be available on the job site at all times.**

F. **The City shall be notified 24 hours prior to any construction work. Construction work concealed without inspection by the City shall be subject to exposure at the contractor's expense.**

G. **A Right-of-Way Construction Permit is required for all work within the public right-of-way. A 100% Performance Bond or equivalent form of financial surety is required for all work within the right-of-way prior to the issuance of any right-of-way construction permit(s). All contractors working within the right-of-way shall provide the City with a proof of insurance form and with limits of coverage acceptable to the City. The City shall be named as additional insured. All work within the right-of-way shall be inspected and approved by the Engineering Department of the City.**

H. **Improvements shall not be accepted until "As-Built" plans have been submitted and approved by the City.**

I. **The developer is responsible for the removal or relocation of all obstructions within the right-of-way prior to starting new construction.**

J. **The developer is responsible for arranging the relocation and associated costs of all utilities. A utility relocation schedule shall be submitted prior to the issuance of permits.**

K. **The developer is responsible for obtaining or dedicating all required rights-of-way and easements to the City prior to issuance of permits.**

L. **The contractor shall contact BLUE STAKE (602-263-1100) 48 hours prior to construction.**

M. **The contractor shall barricade construction sites at all times per the City of Phoenix Traffic Barricade Manual. When required by the City a traffic control plan shall be submitted for approval a minimum of 72 hours in advance of construction.**

N. **The contractor may obtain a fire hydrant meter for construction water from the Utilities department. This meter should be ordered two working days prior to the start of construction. The unlawful removal of water from a fire hydrant is a violation of the municipal code, punishable by fine and/or imprisonment.**

O. Private on-site water and sewer lines shall be constructed in accordance with the Uniform Plumbing Code as adopted by the City.

2.62 All plans for street construction within right-of-way or easements shall have the following shown on either the Cover Sheet or the Detail Sheet:

GENERAL NOTES FOR STREET CONSTRUCTION

A. The developer is responsible for making proper application and paying the prevailing fees prior to any street construction.

B. The paving contractor is responsible for obtaining water and sewer "As-Built" plans before start of construction to determine the location of all utility rims and covers that must be adjusted to finish grade.

C. The paving contractor shall not start construction until conflicting underground utility construction is completed and all service stubs have been extended to all platted lots.

D. If the existing pavement does not meet City requirements, the developer will be required to remove and replace the pavement to street centerline. The City shall determine the exact point of pavement matching termination and overlay in the field as necessary.

E. All existing street monuments must be preserved. Prior to construction, monuments will be referenced horizontally and vertically. After construction, monuments shall be reset and field notes, including new elevation, shall be filed with the City.

F. The maximum stake interval for grades of 0.2% or less shall be 25 feet for concrete work and 50 feet for asphalt roadway section, except on horizontal or vertical curves where a maximum stake interval of 20 feet for concrete work shall be required. All curb returns shall be staked at the P.C. and the midpoint of the return. No grade stake interval shall exceed 50 feet.

G. The paving contractor is responsible for the installation of all new pavement markings and the removal of all existing pavement markings that are in conflict with the new pavement markings.

H. Asphalt mix designs shall be prepared and submitted for approval in accordance with the City of Glendale *Engineering Design and Construction Standards***.**

2.63 All plans for water main construction within right-of-way or easements shall have the following shown on either the Cover Sheet or the Detail Sheet:

GENERAL NOTES FOR WATER MAIN CONSTRUCTION

A. The developer is responsible for making proper application and paying the prevailing fees prior to construction of all services.
B. Butterfly valves are not allowed in lines 12 inch and smaller.
C. Gate valves shall be resilient seated, solid wedge gate, fully encapsulated and open left.
D. Tapping valves shall be flange by mechanical joint to allow tapping by Contractor.
E. Taps to existing mains shall be done by a City approved contractor. No tap shall be made until the City inspector has approved the installation of the tapping sleeve, thrust block and valve placement. No tap shall be made without a City Utilities Department representative present.
F. Construction survey stakes shall be in place and cut sheets shall be provided to the City Construction Engineering Inspector prior to starting construction.
G. Conflicts with existing utilities discovered during construction shall be called to the attention of the City and resolved prior to proceeding.
H. It shall be the responsibility of the contractor/developer to have the service line visible and accessible when requesting the installation of a water meter or a pre-final inspection.
I. Only City forces are authorized to open and close existing water valves.
J. All asbestos cement pipe fittings shall be ringtite.
K. All water lines shall be staked prior to trenching at a maximum staking interval of 50 feet, except when the City Engineer approves the use of laser.
L. Location of all water valves must be referenced at all times during construction and made available to the Utilities Department.
M. All materials which may come in contact with drinking water shall conform to the National Sanitation Foundation Standards 60 and 61.
N. Thrust blocks shall be installed at all valves, fire hydrants and fittings where there is a change in size or direction unless approval is obtained from the City.

2.64 All plans for sewer main construction within right-of-way or easements shall have the following shown on either the Cover Sheet or the Detail Sheet:

GENERAL NOTES FOR SEWER MAIN CONSTRUCTION

A. The developer is responsible for making proper application and paying the prevailing fees prior to construction of all services.
B. MAG Standard Detail 404 shall apply.
C. Construction survey stakes shall be in place and cut sheets shall be provided to the City's Construction Engineering Inspector prior to starting construction.
D. Conflicts with the existing utilities discovered during construction shall be called to the attention of the City and resolved prior to proceeding.

E. All sewer lines shall be staked prior to trenching at a maximum staking interval of 50 feet, except when the City Engineer approves the use of laser.

F. Location of all manholes and cleanouts must be referenced at all times during construction and made available to the Utilities Department.

G. All new sewer mains shall be inspected by closed circuit television methods acceptable to the City. Any defects discovered during televised inspection shall be corrected and re-televised at no cost to the City. Video tapes or CDs of all televised inspections shall be provided to the City prior to final acceptance of the sewer main.

2.65 All plans for On-site Grading and Drainage construction shall have the following shown on either the Cover Sheet or the Detail Sheet:

GENERAL NOTES FOR GRADING AND DRAINAGE CONSTRUCTION

A. An on-site grading permit is required.

B. A separate permit is necessary for any off-site construction.

C. An NPDES permit is required for all construction that disturbs land over one (1) acre in size. Prior to start of any construction, the Contractor shall submit a copy of the Notice of Intent (NOI) to the Environmental Protection Agency (EPA) and to the City of Glendale and have a copy of the SWPPP on site at all times.

D. Prior to the start of any on-site grading or paving operations, the contractor shall notify the City Grading and Drainage Inspector at least 24 hours prior to commencing work by calling 623-930-3622. Additional instructions concerning grading and paving inspections will be provided at that time by the Grading and Drainage Inspector.

E. Staking pad and/or finished floor elevations are the responsibility of the developer or his engineer. In non-critical areas, the developer's engineer shall submit certifications of constructed building pad elevations prior to the City's acceptance of project. In a critical drainage area, certification of the finished building floor or stem wall elevation shall be submitted and approved prior to any vertical construction.

F. The grading contractor shall designate the location for wasting spoil materials and a letter from the owner giving permission for said disposal prior to starting on-site construction.

G. An approved grading and drainage plan shall be on the job site at all times. Deviations from the plan must be preceded by an approved plan revision.

H. Grading and drainage plan approval includes: construction of all surface improvements shown on the approved grading and drainage plan including, but not limited to, retention areas and/or other drainage facilities, surface grading, walls, curbs, asphalt pavement, and building floor elevations.

I. Drywells must be drilled a minimum of 10 feet into permeable porous strata.

J. The contractor shall provide all retention basins at elevations as shown on the plans. Retention basins side slope shall not exceed 4:1 on private property or 6:1 adjacent to

public right-of-way. Retention basin water depth shall not exceed 3 feet on private property or 1.5 foot depth within 10 feet of public right-of-way.

K. The contractor is responsible for locating and confirming depth of all the existing utility lines within proposed retention basin areas. If the basin cannot be constructed per plan as a result of conflict with underground utilities, the contractor should contact the City and designer and request modification of the basin design.

L. Reproducible "As-Built" plans, certified by the developer's registered engineer or registered land surveyor, shall be submitted to the City and approved prior to issuance of a building "Certificate of Occupancy".

M. This set of plans has been reviewed for compliance with City requirements prior to issuance of construction permits and shall be kept at the construction site. Such review shall not prevent the City from requiring correction of errors in plans which are found to be in violation of any law or ordinance.

N. You are hereby advised that no person shall use any mechanical equipment for land leveling or clearing, road construction, trenching, excavating, demolition or engage in any earthmoving activity without first obtaining a permit from Air Pollution Control, Maricopa County Department of Environmental Services, 1001 North Central Avenue, Phoenix, AZ 85004, Phone: 602-506-6010.

O. For each project which includes drywells, the following is required:

1. **An engineer's (or drilling company) certification that the drywells have been registered with the Arizona Department of Environmental Quality (ADEQ), and that the installation will conform with ADEQ requirements.**
2. **A copy of each drywell drilling log and an engineer's "As-Built Certification" that each drywell was installed in accordance with the plans, specifications and ADEQ requirements shall be provided to the City of Glendale Development Services Center.**

NOTES FOR STORM WATER POLLUTION PREVENTION PLAN
(to appear on SWPPP cover sheet)

1. **A copy of the grading and drainage plan for this project, together with a copy of the Notice of Intent (NOI) and the Storm Water Pollution Prevention Plan (SWPPP), shall be maintained on the site and available for review. Those elements of the grading and drainage plan pertinent to or referenced on the SWPPP shall be considered a part of the SWPPP.**
2. **The Construction Engineering Department shall be notified 48 hours before any on-site and/or off-site construction begins, Phone: 623-930-3622.**
3. **The operator shall obtain a Dust Control Permit from Maricopa County Health Department and perform measures as required by the permit to prevent excess dust.**
4. **The operator shall perform, at a minimum, a visual inspection of the construction site once every month and within 24 hours of rainfall greater than or equal to half of inch or more. The operator shall prepare a report documenting his/her findings on the conditions of the SWPPP controls and note any erosion problem areas. The**

operator's report is to be submitted to the City's Construction Engineering Department Inspector for review. Facilities shall be maintained as necessary to ensure their continued functioning. In addition, all temporary siltation controls shall be maintained in a satisfactory condition until such time that clearing and/or construction is completed, permanent drainage facilities are operational, and the potential for erosion has passed.

5. **The operator shall amend this plan as necessary during the course of construction to resolve any problem areas, which become evident during the construction and/or during rainfalls. All changes to the SWPPP must conform to the Drainage Design Manual for Maricopa County- Volume III Erosion Control.**
6. **The permittee shall file a Notice of Termination (NOT) after completion of construction and placement of final landscape materials. A copy of the NOT is to be submitted to the Construction Engineering Department to final the SWPPP permit.**
7. **The permittee shall save all records, including the NOI, SWPPP, NOT, and inspection reports, on file for minimum of three years from the date of filing the NOT.**
8. **The implementation of these plans and the construction, maintenance, replacement, and upgrading of these facilities is the responsibility of the permittee/contractor until all construction is approved and the NOT is submitted to the Construction Engineering Department.**
9. **The facilities shown on this plan must be constructed in conjunction with all clearing and grading activities in such a manner as to insure that sediment-laden water does not enter the drainage system or violate applicable water standards. The facilities must be installed and in operation prior to any grading or land clearing. Wherever possible, maintain natural vegetation for silt control.**
10. **A copy of the contractor's NOI and five (5) copies of the reviewed and signed SWPPP must be received prior to any Grading and Drainage permit being issued.**
11. **All Storm Water Pollution Prevention Plans shall follow the Drainage Design Manual for Maricopa County, Arizona, Volume III, Erosion Control.**

3.0 STREET DESIGN AND CONSTRUCTION

3.1 GENERAL INFORMATION

3.11 Streets System and Classifications: The City street system is based on a grid layout to provide access to all land parcels. There are four (4) basic classifications of streets. These classifications are based on street development policies and are determined by location and/or intended use. For additional information see Section 4.1 of these standards.

A. Major Arterial - Major arterials move large volumes of moderate speed traffic to and from freeways and serve some metropolitan-wide trips. They connect areas that are major traffic generators. There is controlled access for commercial uses along major arterials, and residential areas are served from side streets.

B. Arterial - Arterial streets move large volumes of traffic from one part of Glendale to another. Spacing of arterials is a function of land use density, not distance. Direct property access is a secondary concern to the movement of through traffic. Arterials are used to primarily connect neighborhoods to local commercial uses.

C. Collector - A collector street allows neighborhood traffic to travel from local to arterial streets. Direct property access is a secondary concern to the movement of neighborhood traffic. Collectors serve internal neighborhood traffic movements, but not as connections for non-neighborhood through traffic movements.

D. Local - Local streets provide direct property access. They bring local neighborhood traffic to collectors which then feed into arterials. Local streets are designed to preserve privacy and encourage liveable residential neighborhoods.

E. Alleys - the creation of new alleys is not acceptable. The design of all re-development of parcels in areas with existing alleys shall provide for primary access by public streets. Secondary access to alleys is allowed, but the alley must be improved to City Standards by the developer.

3.12 Street Names: Street names shall be consistent with the natural alignment and extension of existing streets and the "M.A.G. Address and Street Assignment Policy". New street names shall not duplicate in whole or in part, or be confusing with existing street names. The City reserves the right to modify street names to conform to City standards.

3.13 Intersections to Major Arterial or Arterial Streets: Interior streets shall not intersect major arterial or arterial streets other than at the 1/4 and 1/2mile points of the arterial.

3.14 "Half-Street" Minimum Requirements: In cases where no adjacent street improvements exist, a developer is responsible for installing half of the full

street improvements, but the minimum paving width for residential "half streets" shall be 24 feet. Minimum pavement widths for other types of streets shall be established on a case-by-case basis. In most cases, the developer shall be required to install full improvements on the half street and a thickened edge on the unfinished side, within the required right-of-way for the half street. If these minimum improvements will require additional right-of-way, it will be the developer's responsibility to obtain the required right-of-way. Parking shall not be allowed on the finished side of half-streets. "No Parking" signs shall be installed by the Developer per City standards.

3.2 GENERAL TECHNICAL INFORMATION

3.21 Irrigation Facilities: All new developments shall provide for continued and undiminished service of affected irrigation systems. The developer is responsible for coordinating with S.R.P. the design and construction of S.R.P. facilities. New S.R.P. irrigation tile shall be located within the right-of-way per Details G-313 through G-316. Private irrigation facilities shall be located on private property and sized to carry at least the same flow as the existing ditch, or as may otherwise be directed by the City. The Engineer shall submit appropriate data to support the design. Where there is a need to cross the public right-of-way, it shall be done at approximately 90 degrees and must be tiled with R.G.R.C.P. Class III (minimum) in accordance with the criteria outlined in A.S.T.M. Specifications Section C 76. It is not intended that the above material requirements be applied to existing tiled irrigation facilities where minor roadway improvements (as determined by the City Engineer), such as a driveway, are proposed and investigation by the owner of the irrigation facilities shows the existing tile to be functionally and structurally adequate. The City will not accept the liability of pipe failure for systems which are not constructed with R.G.R.C.P.

3.22 Curb returns and ramps: All street intersections shall be constructed with concrete vertical curb returns and a single sidewalk ramp. For back of curb radius 30' and over, use MAG Std. Det. 231. For back of curb radius less than 30' and a curb height more than 4", use MAG Std. Det. 232. For back of curb radius less than 30' and a 4" curb height, use MAG Std. Det. 234. The radius to back of curb for the return shall be:

Table 3.1

Street Classification	Major Arterial	Arterial	Collector	Residential Interior
Major Arterial	35'*	35'*	30'	20'
Arterial	35'*	35'*	30'	20'
Collector	30'	30'	30'	20'
Residential Interior	20'	20'	20'	20'

* For intersections with bus pullouts, see Standard Detail G-406.

3.23 Valley Gutters: Concrete valley gutters (MAG Std. Det. 240) shall be constructed at all intersections where the drainage pattern requires them. However, valley gutters are not allowed to cross major arterial and arterial streets. Valley gutters crossing collector or residential street intersections with major arterial or arterial streets shall be six feet wide. Valley gutters not at intersections shall be six feet wide (minimum). Asphalt valley gutters are not allowed on public streets.

3.24 Paving Blocks: All paving blocks used within the public streets for crosswalks or to enhance the visual quality of the entry way to a development shall conform to the requirements of Detail G-328. Size, shape, design and colors shall be approved by the City's Community Development Group.

A. Interlocking Paving Stones:
   1. All interlocking concrete paving stones shall be sound and free of defects that would interfere with the proper placing of the unit or impair the strength or permanence of the construction.
   2. Size, shape, design and colors shall be approved by the City's Community Development Group.

B. Dry Set Mortar Bed: The thickness of the dry set mortar bed course shall be uniform to insure an even surface and shall be provided and installed by the paving stone installer.

C. Installation:
   1. Paving work should be plumb, level and true to line and grade to properly coincide and align with adjacent work and elevations. All edges must be retained to secure the perimeter stones and the dry set mortar bed.
   2. Cutting of paving stones shall be done with a masonry saw.

3. The completed paving stone installation shall be washed down and cleaned to provide a clean finished workmanlike installation.

3.26 Sidewalk Areas: Sidewalks shall be detached a minimum of 7 feet from the back of curb on all arterial and major arterial streets. Detached sidewalks enhance pedestrian safety and the visual quality of the roadway by creating a boulevard landscaped area between the street and the detached sidewalk. Sidewalks shall remain within the City's right-of-way or within an easement dedicated for that purpose.

3.27 Concrete placement and curing: All concrete shall be mixed, placed and cured as required by MAG Specifications. For curb, gutter and sidewalk, subgrade densities shall be 90% of a Standard Proctor, (ASTM D-698). These specifications require that white-pigmented curing compound be used on all concrete paving items such as streets, curbs, gutter and sidewalks. The particular white-pigmented curing compound selected by the contractor must meet the requirements of either AASHTO M-148, Type 2, Class A, or that of ASTM C 309, Type 2, Class A. It is important to begin the application of curing compound immediately after the surface water has disappeared from the concrete and the surface will support walking workmen. The coverage should be uniform, not spotty or with missed areas. The curing compound should be applied at a rate of 200 square feet per gallon.

3.3 TECHNICAL REPORTS

3.31 General Information: Developers are responsible for submitting a Design Study Report to validate the design shown on the construction plans. The Design Study Report Should not be excessively long or complex. Rather it is to briefly: describe the basis of the design and the assumptions made; explain "special" solutions to problems encountered; etc. All reports must be sealed by an Arizona registered engineer. The following sections shall be contained in the report:

A. Soils Report: A "Soils Report" shall be submitted with new street construction plans indicating "R" value, sieve analysis, and plasticity index of the subgrade.

B. Drainage Report: A "Drainage Report" shall be submitted with new street construction plans and/or the grading plans. This report shall be prepared per Chapter 5 herein and the "Grading and Drainage Ordinance".

C. Pavement Evaluation Report: A "Pavement Evaluation Report" shall be submitted with new street construction plans when it is proposed to match existing pavement. The design engineer is responsible for investigating and evaluating the existing pavement structure. If the existing pavement does meet the structural requirements, it may be matched by trimming a minimum of one (1) foot for a longitudinal match, or two (2) feet for a perpendicular match.

Exact point of matching and method of trimming (sawcut or wheelcut) shall be determined in the field by the City.

D. Details: Supplemental sketches, details, calculations, design rational and cross sections as required in paragraph 2.53.

E. Reports: A "Pavement Structure Design Report" shall be submitted with new street construction plans utilizing the design procedures in the "AASHTO GUIDE FOR DESIGN OF PAVEMENT STRUCTURES 1993". The report shall document the values used in determining the design 18 kips E.S.A.L. Traffic Loading. Current ADOT load equivalency factors for each of the various vehicle classifications shall be used for the traffic loading calculations. The structural layer coefficients used for each layer in the pavement structure shall be the current values utilized by ADOT. The following values shall be utilized in the pavement structure design analysis for the various street classifications:

Table 3.2

CLASSIFICATION	ANALYSIS PERIOD	RELIABILITY*	SERVICEABILITY	
			INITIAL	TERMINAL
Major Arterial & Arterial	20	95	4.5	2.5
Industrial & Commercial	20	95	4.5	2.5
Collector	20	90	4.4	2.3
Residential & Parking Lots	20	80	4.2	2.0

* The overall standard of deviation shall be 0.35 and 0.45 for rigid and flexible pavements, respectively.

3.4 TECHNICAL DESIGN REQUIREMENTS BY STREET CLASSIFICATION:

Technical design requirements for all street classifications are shown in Table 3.4 at the end of this chapter.

3.5 CONSTRUCTION:

3.51 All construction shall conform to the latest MAG Standard Details and Specifications subject to City of Glendale modifications. Plans shall be prepared per the standards in Chapter 2.0, Construction Plans Preparation.

3.52 A. Asphalt mix designs: Asphalt mix designs shall be prepared and submitted for approval in accordance with the City of Glendale requirements detailed in "*Asphaltic Concrete Mix Designs*" which is at the end of this chapter. Highlights are as follow:

1) Design methodology shall be by either the Marshall Method or Level One Superpave Method.
2) Annual mix design submittals are acceptable, however, they must be verified every six months. Mix designs and verifications must be prepared under the supervision of, and sealed by a Registered Engineer.

B. Conformance: Asphalt mixtures placed within the existing and proposed right of way of the City of Glendale shall conform to the approved mix design, subject to normal production tolerances defined in the above referenced document. Any material placed which does not conform to the approved mix design will be subject to removal and replacement at the expense of the Contractor.

C. Placement: All courses of asphaltic concrete shall be placed and finished by means of a self-propelled paving machine equipped with a screed and automatic controls. Spreader boxes will not be permitted to place asphalt material on city streets.

D. Lift thicknesses: Completed pavement which is deficient in either thickness or density shall be subject to removal and replacement at the expense of the Contractor. The choice of asphaltic concrete mix designation shall be governed by the following target lift thicknesses:

Table 3.3

Target Lift Thickness	Nominal Maximum Size Asphalt Mixture
1" (25 mm)	3/8" (9.5 mm)
1-1/2" (37.5 mm)	1/2" (12.5 mm)
2" (50 mm)	3/4" (19 mm)
3" (75 mm)	1" (25 mm)
4" (100 mm)	1-1/2" (37.5 mm)

NOTE: 19mm and larger sizes shall not be used for a surface course. Pavement replacement in trenches shall use either 9.5mm or 12.5mm mixtures placed in lifts not to exceed 2 -1/2 inches.

3.53 Permit: A Right-of-Way Construction Permit is required for all work within the City's right-of-way.

3.54 Bond: A 100% Performance Bond or equivalent is required for all work within the right-of-way prior to the issuance of any right-of-way construction permit(s).

3.55 Insurance: All contractors working within the right-of-way shall provide the City with proof of insurance in a form and with limits of coverage acceptable to the City.

3.56 Inspection: All work within the right-of-way shall be inspected and approved by the Construction Engineering Department.

3.57 Public access: All newly constructed public ways shall be kept barricaded and access denied to the public until such public way is accepted by the City and all traffic control devices are installed to the approval of the City.

3.58 Pavement matching: Pavement matching and surfacing replacement shall conform to MAG Standard Specifications, Section 336. Sidewalk removal may be required prior to final acceptance and will be made to either the nearest joint score line, or five foot interval.

3.59 Pavement cuts: All trenches and pavement cuts shall be 4' minimum in width in order to mechanically compact the aggregate base course and lower lifts of asphaltic concrete.

3.60 Subgrade: Subgrade preparation shall be performed in accordance to MAG Section 301 for all Right-of-Way Projects. The City shall also require that subgrade moisture content be maintained between the limits of +2 and –4 percent of optimum moisture content as determined by AASHTO T-99 or ASTM D-968.

3.61 Compaction: Relative Compaction requirements will adhere to MAG Section 301.3 with the following exceptions:

Curb, gutters and sidewalks	90 Percent
Driveways, Aprons and Valley Gutters	95 percent

TABLE 3.4
TECHNICAL DESIGN REQUIREMENTS

CLASSIFICATION / ITEM		MAJOR ARTERIAL	ARTERIAL	COLLECTOR (8)	RESIDENTIAL	RESIDENTIAL CUL-DE-SAC (3)
MINIMUM RIGHT OF WAY (FULL WIDTH)		130' TO 110' (4)	110' (4)	70' TO 60'	50'	50' THROAT 50' RADIUS
MINIMUM STREET WIDTH (BACK OF CURB TO BACK OF CURB)		69'to 95'	69' to 95'	36' TO 48' (8)	36'	45' RADIUS TO BACK OF CURB
CURBING (MAG STD DET 220)		VERTICAL CURB & GUTTER			SINGLE FAMILY RESIDENTIAL – ROLL CURB & GUTTER. ALL OTHER INCLUDING MULTI-FAMILY-VERTICAL CURB & GUTTER	
SIDEWALK (MAG STD DET 230)		6' WIDE (DETACH)		4' WIDE	4' WIDE	
PAVEMENT STRUCTURE	ASPHALTIC CONCRETE (COG SPECS)	DEVELOPER SHALL DETERMINE THE STREET CROSS-SECTION DESIGN BASED ON "SOIL REPORT" AND THE CURRENT TRAFFIC VOLUME MASTER PLAN, TO BE APPROVED BY CITY ENGINEER			3" MINIMUM	
	BASE DEPTH				8" MINIMUM	
LONGITUDAL SLOPE (0.4% PREFERRED MIN. ALL STREETS)		0.2% MINIMUM 8% MAXIMUM-600' MAXIMUM LENGTH		0.2% MINIMUM 12% MAXIMUM-800' MAXIMUM LENGTH		0.4% MINIMUM 12% MAXIMUM
CROSS SLOPE (STRAIGHT CROWN)		2% MINIMUM – 3% MAXIMUM				
VERTICAL CURVES (6)	REQUIRED WHEN:	GRADE CHANGE EXCEEDS 1.0%		GRADE CHANGE EXCEEDS 2.0%		
	CREST CURVE (2) MINIMUM	LENGTH = 160 X A	LENGTH = 85 X A	LENGTH = 55 X A	LENGTH = 28 X A	
	SAG CURVE (2) (MINIMUM)	LENGTH = 160 X A	LENGTH = 75 X A	LENGTH = 55 X A	LENGTH = 35 X A	
HORIZONTAL CURVES	REQUIRED WHEN:	TANGENT $^{C}_{L}$ DEFLECT MORE THAN 7°DEGREES		TANGENT $^{C}_{L}$ DEFLECT MORE THAN 10°DEGREES		
	MINIMUM RADIUS	500'		100'		
	MINIMUM TANGENT $^{C}_{L}$ BETWEEN REVERSE CURVES	150'		100'		
TAPERS	LENGTH	SPEED LIMIT X WIDTH (7)			$\frac{\text{SPEED LIMIT X WIDTH (7)}}{60}$	
	PAVEMENT STRUCTURE	(1) REMOVE EXISTING TAPER, AND MATCH TO FULL WIDTH AND STRUCTURAL STRENGTH (2) WHEN REQUIRED, A NEW TAPER = 3" A.C. OVER AN 8" BASE AND RECONSTRUCTED WITH FUTURE IMPROVEMENTS				

BY STREET CLASSIFICATION

INDUSTRIAL/ COMMERCIAL CUL-DE-SAC (3)	EXISTING ALLEY (5)
60’ THROAT 50’ RADIUS	VARIES
45’ RADIUS TO BACK OF CURB	PAVEMENT FULL WIDTH OF ALLEY UP TO 24’
VERTICAL CURB & GUTTER	N/A
4’ WIDE	
DEVELOPER SHALL DETERMINE THE STREET CROSS-SECTIONDESIGN BASED ON THE “SOIL REPORT” AND THE CURRENT TRAFFIC VOLUME MASTER PLAN, TO BE APPROVED BY THE CITY ENGINEER	3” MINIMUM
	8” MINIMUM (1)
0.4% MINIMUM 12% MAXIMUM	0.2% W/CONCRETE VALLEY GUTTER 0.4% W/ASPHALT VALLEY GUTTER
2% MINIMUM 3% MAXIMUM	INVERTED CROWN 2% MINIMUM 3% MAXIMUM
GRADE CHANGE EXCEEDS 2.0%	N/A
LENGTH = 28 X A	
LENGTH = 35 X A	
TANGENT $^{C}_{L}$ DEFLECT MORE THAN 10 DEGREES	N/A
150’	
100’	
$\frac{\text{SPEED LIMIT}^2 \text{ X WIDTH (7)}}{60}$	N/A
(SEE LEFT SHEET)	

NOTES

(1) OTHER STRUCTURAL SECTIONS MAY BE REQUIRED IF SO INDICATED BY THE SOILS REPORT AND APPROVED BY THE CITY.

(2) A = ALEGEBRAIC DIFFERENCE OF THE TWO SLOPES.

(3) IN ALL CUL-DE-SACS: THE MAXIMUM LENGTH FROM THE INTERSECTING STREET CENTER LINES TO THE RADIUS POINT SHALL BE 400’

(4) SEE STANDARD DETAIL G-302 AND G-303.

(5) ALLEY ENTRANCES TO PUBLIC STREETS SHALL BE RECONSTRUCTED PER MAG STD. DETAIL 250 MODIFIED TO 9’ THICK CLASS “A” CONCRETE PER MAG SECT. 725.

(6) LENGTH OF VERTICAL CURVE SHALL BE ADJUSTED TO UP TO AN EVEN ONE-HALF STATION (I.E. 160X A = 532’ – USE 550’).

(7) WIDTH = DISTANCE FROM LIP OF GUTTER TO EDGE OF EXISTING PAVEMENT.

(8) MAY VARY DEPENDING ON TRAFFIC DESIGN (SEE STD. DET. G-304 AND G-305)

ASPHALTIC CONCRETE MIX DESIGNS

ASPHALTIC CONCRETE: Mix designs shall meet the following requirements when tested with the applicable test methods.

I. General Information

All producers of hot asphalt concrete whose mixes may be placed within the rights-of-way of the City of Glendale will be required to submit complete asphaltic concrete mix designs for all such material.

Where to submit: Three (3) copies of the reports shall be submitted to the City of Glendale, Assistant City Engineer - Construction, 5850 W. Glendale Ave., 3rd Floor, Engineering Department, Glendale, Arizona 85301-2599. Faxed copies are unacceptable and will not be reviewed.

When to submit: A new mix design will be required each January for each product code to be supplied. Verification tests for each product code shall be provided each July. A complete mix design will be required of any new product code at the time of its initial submittal. Laboratory certifications will be required on an annual basis. Mix submittals must be made at least seven working days prior to the paving date, in order to allow time for review and revision if necessary. No exceptions will be permitted.

II. Laboratory Requirements:

The mix designs must be performed by a laboratory knowledgeable in asphalt mix design. The laboratory can be the producers laboratory or a commercial geotechnical/materials laboratory provided they comply with the following:

A. The laboratory, at the time of testing and submittal, remains certified by the AASHTO Accreditation Program in the field of Bituminous Materials. Further subfields of Hot-Mix Asphalt and Hot-Mix Asphalt Aggregate are additionally required. A copy of the certifications will be required with each submittal as described.

B. The laboratory is under direct supervision of an experienced, registered professional engineer. This will require the Engineer be physically present on a routine basis while the mix design testing is being done and be the responsible person in charge of the work.

C. The Engineer in charge of the laboratory shall submit a resume which details the Engineer's knowledge and experience in the field of asphalt concrete and the design of the same. The resume will be submitted with the suppliers mix design. New resumes will be required whenever a

change occurs with the Engineer. If the laboratory is approved by the Arizona Department of Transportation (ADOT) to perform asphalt concrete mixture designs, a copy of the personnel resource data that is supplied to ADOT, along with a copy of their approved letter will suffice.

D. The Engineer shall seal (stamp), sign and date each mix design or verification.

III. Mix Designs

A. Mix designs or verifications will be required as indicated in Part I above for all asphalt mixes. The seal date must be current to within six months. Mix designs, without current verification, older than six months will be rejected. If, in the opinion of the Assistant City Engineer, the production test data from the mix is not meeting the approved design or if conditions at the plant change, quality control charts and/or additional submittals will be required. The scope of the additional submittals may vary depending on the degree of proof required to establish or reestablish a workable design. The following conditions are to be considered sufficient grounds justifiable for reevaluation of the mix designs.

1. A change in the producers pit.
2. When material is taken from a different or new source.
3. A change in the producers method of aggregate production.
4. Any other change that would require an adjustment in the asphaltic concrete mix design, in the opinion of the Engineer.

B. Design of the asphalt paving mixtures shall be accomplished by either the Marshall Method of Mix Design as described in the latest edition of the MS-2 manual published by the Asphalt Institute, or SHRP criteria as described in the *SUPERPAVE Mix Design Manual for New Construction and Overlays, SHRP-A-407 or Level One Mix Design; Materials Selection, Compaction and Conditioning, SHRP-A-408*, or current SHRP Design Manual when approved by the Engineer. ($N_{initial}$, N_{design}, $N_{maximum}$ to be determined by the Engineer)

A minimum of four (4) points will be used to establish the mix design results. Optimum asphalt content will be selected at an air void content of 4.0 plus or minus 0.2%. The proposed mix design must further comply with all requirements of Section III E of this document.

C. If the Marshall Method of mix design is chosen, the mix properties shall be verified with two compacted specimens using a gyratory compactor in accordance with AASHTO Provisional Method TP-4. The verification shall meet the criteria in the following table:

Number of Gyrations	Percent of Maximum Theoretical Density
^{N}Initial	Maximum 89.0%
^{N}Design	95.0% to 97.5%
^{N}Maximum	Maximum 98.0%

D. All mix submittals must include the following information:

1. A mix design or verification will be stamped, signed, and dated by the Engineer responsible for the mix design. Date must be current to within most recent six months.
2. Product code for each mix design.
3. Recommended bitumen content with charts as noted below.
4. Aggregate proportions (including mineral filler) based on bin percentages and composite graduation. The composite plotted on a graph raised to 0.45 power.
5. Statement as to method used to introduce mineral admixture with aggregate (wet or dry process).
6. Bulk density, stability, flow, % effective air voids.
7. Percent Tensile Strength Ratio
8. Mixing and compaction temperatures
9. Source of asphalt, with supplier certificates
10. Source of mineral filler with certificates
11. Fractured face count.
12. Specific gravity of aggregates (bulk, bulk SSD, apparent and effective).
13. Specific gravity of mineral admix and asphalt cement.
14. Film thickness in microns.
15. SUPERPAVE mix designs will require a volumetric analysis of the compacted hot mix asphalt per the *SUPERPAVE Mix Design Manual for New Construction and Overlays*, SHRP-A-407, National Research Council, Washington D.C. May 1994. (Three trial blends are required).

E. Mix Design Criteria:

	ITEM	LIMITS/STANDARDS	REFERENCE
1.	Asphalt Mixes	3/8", ½", ¾", 1", and 1-½" Nominal Maximum Size*	This document and attached gradations.
2.	Mineral Admixture (Lime or Portland Cement, Type I or II) Liquid Anti-strip	Min. 1%, Max. 2% by wt. for all mixes. Per manufacturer	ASTM C150 or C977 AASHTO R15-89
3.	Asphalt Grade	AC-40 or PG grade per SUPERPAVE design at 98% reliability limits.	MAG 710.2.1 & 711.3 SHRP Mix Design

		(PAV @ 110º C)	Manual AASHTO-MP1
4.	Marshall Mix Design Method (or 5 below)	(75 blows)	MS-2 Manual
	a. Stability	Per Table 5.3 (MS-2)	ASTM D 1559
	b. Flow	0.08" to 0.16"	ASTM D 1559 AASHTO T245-94
	c. Air Voids	Design: 4.0% " 0.2% Production: 3.0% - 5.0%	ASTM D 3203 AASHTO T269 SHRP Mix Design
5.	SUPERPAVE Method	Level 1 Mix Design	Manual
6.	Tensile Strength Ratio (TSR)	Minimum of 75%	AASHTO T283-89
7.	Asphalt Binder Content	**	**
8.	Gradation	Between SHRP control points. Outside the Power 45 restricted zone. Arterial streets must be below restricted zone.***	SHRP-A-407, Appendix A, Table A-1 thru A-5
9.	Sand Equivalent	Natural sand limited to a maximum of 15%. Composite fines to meet a minimum uncompacted void content of 40% for residential or 45% for all others. SE 50 Minimum.	ARIZ Method 247 AASHTO T176
10.	Fractured Faces	85% min. 1 or more 80% min. 2 or more	ARIZ Method 212
11.	Plastic Index	Non-plastic	AASHTO T-90
12.	% Voids in Mineral Aggregate (VMA)	Per Table 5.3 (MS-2)	MS-2 Manual
13.	% Voids Filled (VFA)	Per Table 5.2 (MS-2)	MS-2 Manual
14.	Film Thickness	8-14 Microns	****
15.	Dust to AC Ratio (P_{200}/P_{be}) (incl admix)	0.6 to 1.2	MS-2 Manual

* Nominal Maximum Size is defined as one sieve size larger than the first sieve to retain more than ten percent. Maximum Size is defined as one size larger than the Nominal Maximum Size.

** The asphalt content shall be selected to provide a mix consistent with the above specified properties. The permissible production tolerance for asphalt content, so determined, will be within the limits of "0.40%. Curves shall be provided which plot each of the four trial binder contents against Air Voids, VMA, and VFA, Unit Weight, Stability and Flow. If the SUPERPAVE design method is used, the Densification Data and Curves developed shall be provided for review.

*** Once target values have been established by the mix design, the mineral aggregate gradation tolerances shall be as specified under ADOT 406-9.03(a). Samples may be taken at random locations by the Engineer in accordance with Arizona Test Method 104. In no case shall the gradations exceed the range in the SHRP Control Point Charts (See Gradations and Lift Thickness Tables below).

**** The asphalt film thickness should be calculated using the following formula:

$$T_f = \frac{(4876.8)\ (P_{be})}{(SA)(P_s)(G_b)}$$

Where,

T_f = Asphalt Film Thickness, Microns
P_{be} = Effective Asphalt Content, Percent by Total Weight of Mixture
SA = Surface Area of Aggregate (square feet per pound)
P_s = Aggregate Content, Percent by Total Weight of Mixture
G_b = Specific Gravity of Asphalt Cement

Surface Area (SA) calculations should follow procedures outlined in Chapter 6 of the Asphalt Institute Manual Series No. 2 (MS-2), Sixth Edition.

IV. Hot Mix Facilities

The following information regarding the hot mix facilities will need to be submitted for review with the annual laboratory certifications, whenever a new facility is placed in operation or whenever a facility is moved.

A. Listing of all hot mix facility numbers, their physical locations, and the mix product codes that the producer intends to supply.

B. Annual certificates on all weights and metering devices used in the production and weighing of the asphalt mix, for each such facility that the supplier intends to use to manufacture material for use within the City.

C. Each supplier must submit annually the Arizona Rock Products Association (ARPA) “Certification of Hot Mix Asphalt Production Facilities”.

V. Compaction Acceptance

Acceptance testing for asphalt mixtures which have been designed using Marshall methods will continue to be as specified under MAG 321.5.4 The target density for

asphalt mixtures designed using Superpave criteria will be 92 percent of Maximum Theoretical Specific Gravity. Remediation or other required measures will be per applicable MAG specification, unless specifically superceded by this document.

SUPERPAVE™ GRADATION LIMITS

GRADATION PLOT FOR 1-½ INCH (37.5 mm) NOMINAL MAXIMUM SIZE

Sieve	mm	Fm	0.45	ASTM Max	ASTM Min	0.45 Chart Max Dens	Min. Boundary	Max. Boundary
2	50.0	50000	130	***100.0***	***100.0***	100.0		
1-2	37.5	37500	114	***100.0***	***90.0***	87.9		
1	25.4	25000	95	88.0	68.0	73.2		
¾	19.00	19000	84	80.0	56.0	64.7		
½	12.50	12500	70	70.0	44.0	53.6		
3/8	9.50	9500	62	64.0	37.0	47.4		
4	4.75	4750	45	53.0	23.0	34.7	34.7	34.7
8	2.36	2360	33	***41.0***	***15.0***	25.3	25.3	27.3
16	1.18	1180	24	30.0	10.0	18.5	15.5	21.5
30	0.60	600	18	22.0	7.0	13.7	11.7	15.7
50	0.30	300	13	16.0	4.0	10.0	10.0	10.0
100	0.15	150	10	12.0	2.0	7.3		
200	0.08	75	7	***6.0***	***0.0***			

Control Point in ***BOLD ITALICS***

GRADATION PLOT FOR 1 INCH (25 mm) NOMINAL MAXIMUM SIZE

Sieve	mm	Fm	0.45	ASTM Max	ASTM Min	0.45 Chart Max Dens	Min. Boundary	Max. Boundary
1-2	37.5	37500	114		***100.0***	100.0		
1	25.4	25000	95	***100.0***	***90.0***	83.3		
¾	19.00	19000	84	91.0	74.0	73.6		
½	12.50	12500	70	80.0	56.0	61.0		
3/8	9.50	9500	62	73.0	46.0	53.9		
4	4.75	4750	45	59.0	29.0	39.5	39.5	39.5
8	2.36	2360	33	***45.0***	***19.0***	28.8	26.8	30.8
16	1.18	1180	24	33.0	13.0	21.1	18.1	24.1
30	0.60	600	18	24.0	8.0	15.6	13.6	17.6
50	0.30	300	13	17.0	5.0	11.4	11.4	11.4
100	0.15	150	10	12.0	3.0	8.3		
200	0.08	75	7	***7.0***	***0.0***	6.1		

Control Point in ***BOLD ITALICS***

GRADATION PLOT FOR ¾ INCH (19 mm) NOMINAL MAXIMUM SIZE

Sieve	mm	Fm	0.45	ASTM Max	ASTM Min	0.45 Chart Max Dens	Min. Boundary	Max. Boundary
1	25.4	25000	95	***100.0***	100.0	100.0		
¾	19.00	19000	84	***100.0***	***90.0***	88.4		
½	12.50	12500	70	88.0	68.0	73.2		
3/8	9.50	9500	62	80.0	56.0	64.7		
4	4.75	4750	45	65.0	35.0	47.4		
8	2.36	2360	33	***49.0***	***23.0***	34.6	34.6	34.6
16	1.18	1180	24	35.0	15.0	25.3	22.3	28.3
30	0.60	600	18	25.0	9.0	18.7	16.7	20.7
50	0.30	300	13	19.0	5.0	13.7	13.7	13.7
100	0.15	150	10	13.0	3.0	10.0		
200	0.08	75	7	***8.0***	***2.0***	7.3		

Control Point in ***BOLD ITALICS***

GRADATION PLOT FOR ½ INCH (12.5 mm) NOMINAL MAXIMUM SIZE

Sieve	mm	Fm	0.45	ASTM Max	ASTM Min	0.45 Chart Max Dens	Min. Boundary	Max. Boundary
¾	19.00	19000	84	***100.0***	***100.0***	100.0		
½	12.50	12500	70	***100.0***	***90.0***	82.8		
3/8	9.50	9500	62	91.0	74.0	73.2		
4	4.75	4750	45	74.0	44.0	53.6		
8	2.36	2360	33	***58.0***	***28.0***	39.1	39.1	39.1
16	1.18	1180	24	42.0	18.0	28.6	25.6	31.6
30	0.60	600	18	30.0	11.0	21.1	19.1	23.1
50	0.30	300	13	21.1	5.0	15.5	15.5	15.5
100	0.15	150	10	15.0	3.0	11.3		
200	0.08	75	7	***10.0***	***2.0***	8.3		

Control Point in ***BOLD ITALICS***

GRADATION PLOT FOR 3/8 INCH (9.5 mm) NOMINAL MAXIMUM SIZE

Sieve	mm	Fm	0.45	ASTM Max	ASTM Min	0.45 Chart Max Dens	Min. Boundary	Max. Boundary
½	12.50	12500	70	***100.0***	***100.0***	100.0		

3/8 4	9.50 4.75	9500 4750	62 45	***100.0*** 85.0	***90.0*** 55.0	88.4 64.7		
8	2.36	2360	33	***67.0***	***32.0***	47.2	47.2	47.2
16	1.18	1180	24	42.0	46.0	34.6	31.6	37.6
30	0.60	600	18	33.0	12.0	25.5	23.5	27.5
50	0.30	300	13	23.0	7.0	18.7	18.7	18.7
100	0.15	150	10	15.0	3.0	13.7		
200	0.08	75	7	***10.0***	***2.0***	10.0		

Control Point in ***BOLD ITALICS***

Lift Thickness Table

The choice of asphaltic concrete mix designation shall be governed by the following target lift thickness':

Target Lift Thickness	Nominal Maximum Size Asphalt Mixture
1" (25 mm)	3/8" (9.5 mm)
1 ½" (37.5 mm)	½" (12.5 mm)
2" (50 mm)	¾" (19 mm)
3" (75 mm)	1" (25 mm)
4" (100 mm)	1 ½" (37.5 mm)

4.0 TRAFFIC ENGINEERING

4.1 STREET STANDARDS/GEOMETRICS

4.11 Arterial Streets: Arterial streets are the backbone of the City of Glendale's transportation infrastructure. Arterials handle high traffic volumes at moderate traffic speeds. The City of Glendale classifies arterials as "major arterials" or "arterials". Major arterials are intended to carry traffic volumes in excess of 40,000 vehicles per day. Arterials are intended to carry traffic volumes between 30,000 and 40,000 vehicles per day. Arterial classifications are established in the Circulation Element of the General Plan, and are based upon projected future traffic demands. Right of Way and Street Section requirements for each arterial street and each arterial intersection are specified on the Arterial Streets Standards map (Detail G-300) issued by the Transportation Director. Copies of this map and corresponding Standard Arterial Street Sections are available in the Traffic Engineering Division of the Transportation Department and are included in the Standard Details Chapter (Chapter 11) of this publication.

4.12 Arterial and Major Arterial Sections:

A. Section A-1 (Detail G-302) is intended for use on arterial streets (not major arterials) with standard lane configuration (2/1/2). Section A-1 includes wide curb lanes. The basic section is a 69 foot roadway (measured to back of curb) on a 110 foot right of way.

B. Section A-2 (Detail G-302) is intended for use on arterial and major arterial streets where unbalanced lanes (3/1/2) are specified. Curb lanes are 12 feet wide. The basic section is a 69 foot roadway (measured to back of curb) on a 110 foot right of way.

C. Section A-3 (Detail G-303) is intended for use on arterial and major arterial streets where unbalanced lanes (3/1/2) and wide curb lanes are specified. The basic section is a 79 foot roadway (measured to back of curb) on a 120 foot right of way.

D. Section A-4 (Detail G-303) is intended for use on major arterial streets where six through lanes and wide curb lanes are specified. The basic section is a 95 foot wide roadway (measured to back of curb) on a 130 foot right of way.

E. Additional standards with respect to arterial and major arterial street sections include the following:

1. Intersection approach widening and additional right of way are required on most arterial to arterial intersections. Refer to the Arterial Street Standards Map (Detail G-300) for specific information on these requirements.
2. Far side bus bays (turnouts) are required on all arterial streets at arterial street intersections.

3. Continuous raised medians are required on all streets designated as "major arterials". Intersection approach medians are required on all other arterial streets at arterial intersections.
4. Raised median and median break locations must be in accordance with the approved Median Break Policy of the City of Glendale.
5. All proposed street and intersection designs are subject to review by the Transportation Director for applicability, capacity and safety.
6. The location of obstructions in the median and roadside must be in accordance with current Obstruction Policy of the City of Glendale.
7. EXCEPTIONS: Several arterial streets have existing or approved sections which do not satisfy any of the preceding standards. These are identified on the Arterial Street Standards Map as "Special Sections".

4.13 Collector Streets: Collector streets serve to connect local street to arterials or other collectors. Glendale normally requires one north-south and one east-west collector street with bike routes on both sides for each mile square section. This collector is normally located on the half mile section line, but the location may vary in accordance with current subdivision street layout practices, planned unit developments or the approved bikeway plan. Additional collector streets are also needed to provide good traffic circulation and traffic access within proposed subdivisions and other developments. These collectors normally would not have bike route requirements, unless otherwise specified by the Transportation Director. The City of Glendale uses four collector street standards. Selection of the standard to be used in a given situation shall be in accordance with the following guidelines:

4.14 Collector Street Sections:

A. Section C-1 (Detail G-304) is the preferred section for single family developments. The section shall only be used where houses do not front the street and no access to proposed single family lots is intended. The basic section is a 36 foot roadway (measured to the back-of-curb) on a 70 foot right-of-way with detached sidewalks. Section C-4 or C-2 shall be used as alternates to C-1 only when this requirement is not satisfied.

B. Section C-2 (Detail G-304) is intended for use in single family developments with houses fronting the street and where BIKE ROUTES ARE NOT REQUIRED. The basic section is a 40 foot roadway (measured to the back of curb) on a 60 foot right of way with attached sidewalks.

C. Section C-3 (Detail G-305) is intended for use in commercial/industrial and multifamily developments where BIKE ROUTES ARE NOT REQUIRED. Section C-3 MAY NOT be used for single family developments. The basic section is a 44 foot roadway (measured to the back of curb) on a 70 foot right of way with attached sidewalks.

D. Section C-4 (Detail G-305) is intended for use in commercial, industrial, multifamily and single family developments where BIKE ROUTES ARE

REQUIRED on both sides of the street. The basic section is a 48 foot roadway (measured to the back of curb) on a 70 foot right of way with attached sidewalks.

E. Additional standards with respect to all collector street sections include the following:
   1. Entry medians to new subdivisions and commercial developments are permitted. See intersection design standards for collector street approaches.
   2. Intersection throat widening is required at all collector/arterial intersections. See intersection design standards for collector street approaches.
   3. In mixed use subdivisions and developments, the widest collector street section required shall take precedence over a narrower section.
   4. The minimum length of collector street to be constructed to a given standard is 1/4 mile.
   5. All collector street sections require six foot sidewalks adjacent to schools.
   6. All proposed collector and local streets are subject to review by the Transportation Director for applicability, safety and circulation needs.
   7. The minimum width of paving for half streets is 24 feet for all street sections.
   8. Bicycle facilities are required on many collector streets as shown on the City's approved bicycle plan.

4.15 Local Streets: Local streets primarily serve to provide access to abutting properties. Local streets connect to the collector street system. They normally do not connect directly to the arterial street system.

4.16 Local Street Section: Section L (Detail G-306) is intended for use in single family detached developments. The basic section is a 36 foot wide street on a 50 foot right of way with attached sidewalks. Narrower streets may be considered under special circumstances and must be approved during design review by the City Engineer, Planning Director and Transportation Director. Roll curb and gutter is normally used with this section.

4.17 Bus Bays: At major intersections and at arterial intersections, bus bays are required on the far side of the intersection (see Detail G-406). At high volume mid-block locations, bus bays may be required, as determined by the Transportation Director.

4.18 Deceleration Lanes and Left Turn Lanes:
   A. At major intersections and major driveways, a deceleration right turn lane may be required, as determined by the Transportation Director.
   B. At major intersections, dual left turn lanes may be required, as determined by the Transportation Director.

4.19 Raised Median Policy:

A. General Policy: In the interest of public safety and street aesthetics, it is the policy of the City of Glendale to have raised medians installed on its major arterial and arterial street system, as identified in the Glendale General Plan. Medians shall be installed as required under the Guidelines and Standards section of this policy.

B. Guidelines and Standards:

1. Major Arterials: Continuous raised medians are required.
2. Arterials: Raised medians are required only within 500 feet of an arterial or major arterial intersection. Medians between mile intersections are optional, as determined by the City.
3. Collector and Residential Streets: At the option of the City, raised medians may be provided on collector and residential streets at arterial and major arterial intersections. These "entry statement" medians shall be installed and maintained at a developer's expense and are subject to prior approval of the Transportation Director.
4. Median Breaks: Median breaks in new or existing medians on arterials and major arterials normally will be provided at mile, half mile and quarter mile points. Other median breaks, for either streets or driveways, no closer than 500 feet to an arterial or major arterial intersection or 360 feet to another existing or potential median break may be considered for approval. For streets with posted speed limits under 35 miles per hour, the 360 foot minimum spacing required between median breaks may be reduced to 240 feet at the discretion of the Transportation Director.
5. Driveways: Median breaks for driveways on major arterial streets shall normally be restricted to left turn in only. Full median breaks may be permitted on arterial streets. Minimum design standards for driveways with full median breaks shall be as follows:
    a) An entering exclusive right turn deceleration lane on the arterial street.
    b) A minimum driveway width of one entering and two exiting lanes.

C. The spacing and design standards stated in this section are to be considered minimums, and are not automatic. In determining if a median break request should be approved, the following issues will be considered:

1. The proposed median break is necessary for adequate access to an abutting property and must improve access and circulation without increasing accidents or accident rates.
2. The proposed median break will not cause a significant problem elsewhere (e.g. increased traffic in neighborhoods, increased accidents at another location, etc.)
3. If requested for development access, full consideration must be given to adjacent and opposite properties. Median break locations for individual developments must be coordinated with other affected property owners.

4. The location and design of any proposed median break meets acceptable engineering design standards for expected traffic speeds and volumes.
5. The proposed median break will not interfere with the continuity of traffic flow at or between intersections.
6. Before approving any median break request, the City may require a traffic engineering analysis by a professional traffic engineer. Such an analysis shall address the issues stated in 1 through 5, and shall be at the sole expense of the requestor.

D. Median Construction:
1. The construction of optional or required medians as described by this median policy shall normally be accomplished when a street is constructed or improved to current City street standards. The cost of the median or of any break in the median shall be the responsibility of the benefiting property owners, and shall include any necessary traffic control devices.
2. In instances where immediate construction of a median is impractical, the City, at its option, may require the developer or property owner to pay the City for estimated cost of his share of the median. The median will then be constructed by the City at a future date.

E. Approval and Appeal Process:
1. Requests for new medians, median breaks or median removals shall be submitted to the Transportation Director for review and approval. The Transportation Director, subject to the guidelines and standards stated, may approve or disapprove the request. He may also request submission of a traffic analysis before a decision is made.
2. The requestor may appeal the Transportation Director's decision to the appropriate Deputy City Manager.

F. Public Notice Requirement:
1. The construction of raised medians may alter existing or future access patterns to properties abutting an arterial street. For this reason, it shall be the policy of the City to provide for adequate public notice and discussion prior to the installation or modification of raised medians on any arterial street.
2. Public notice shall consist of written notification to all property owners or tenants whose existing or future access could be altered by the construction of raised medians. An alteration in access could include the elimination of existing or potential left or right turns into or out of a public street or private driveway that currently exists or is planned.
3. After giving public notice, the City will hold a public meeting. The purpose of the meeting will be to present, discuss and resolve to the extent possible, access issues related to the construction of raised medians and the location of median breaks.

4.2 TRAFFIC CONTROL DEVICES

4.21 Traffic Signs: All new developments shall provide the necessary funding for required traffic control signs, street name signs and sign posts on all streets and intersections. The City will install these signs and posts at the developer's expense upon payment of all applicable charges. These charges will be billed by the City Traffic Engineer as a separate item, apart from applicable fees for other portions of the development. Construction bonds will not be released and streets will not be opened to traffic until these charges have been paid and the signs have been installed.

4.22 Traffic Signals:

A. Signal pole bases, signal conduit with pull boxes, interconnect conduit and vehicle loop detectors shall be provided at all major arterial, arterial and collector street intersections as shown in Details G-403 and G-404 (also, refer to the C.O.G. Traffic Signal Standards Manual).

B. Signal interconnect conduit and pull boxes shall be provided between existing and/or future traffic signals on major arterial, arterial and collector streets.

C. The cost of providing traffic signal poles and related signal equipment, along with installing new traffic signals, or modifying and relocating existing traffic signals shall be at the sole expense of the developer. The City does not loan signal equipment to developments for any reason. Deviation from these standards shall be approved by the Transportation Director.

D. All traffic loops shall be installed prior to the placing of the final lift of asphalt concrete pavement.

4.23 Barricades:

A. All new developments shall provide for barricades at all dead ends and incomplete streets per Detail G-460, except when waived by the Transportation Director.

B. New barricades shall be constructed per MAG Detail 130-B.

C. If an existing barricade is removed, it shall be delivered by the contractor to the City Traffic Sign Shop at 6210 West Myrtle Avenue.

D. Barricades installed with phased construction may be relocated within the same development.

E. Barricades shall be set one foot inside the subdivision being developed. The pavement should stop short of the barricade.

4.24 Street and Lane Closure Permits: A street/lane closure permit is required from the City before any work can be done within the street right of way. It is the responsibility of the developer's contractor to request the permit at least 24 hours in advance for a lane closure and 48 hours in advance for a street closure. The City may also require that a traffic control plan be submitted a minimum of 72 hours prior to the issuance of a permit. All construction zone signing shall be installed and maintained per the

Phoenix Barricade Manual and the Federal Manual of Uniform Traffic Control Devices, at the developer's expense.

4.25 Pavement Markings: All new developments are responsible for the cost, design and installation of pavement markings on the City streets adjacent to the development project. This includes the removal of all existing pavements markings that are in conflict with the pavement markings.

4.3 LIGHTING/VISIBILITY STANDARDS

4.31 Street Lighting: The developer is responsible for the design and installation of street lights on the public streets within and adjacent to the development. All street lights will be installed at the developer's expense, based on plans prepared and sealed by a licensed electrical engineer registered in the State of Arizona. The street lighting design shall be reviewed and approved by the Transportation Department. Street light poles shall be numbered at the developer's expense. (For additional standards, refer to the C.O.G. Street Light Manual.)

4.32 Sight Distance: As a minimum, the sight distance requirements of Detail G-448 shall be followed to provide adequate visibility on arterial and collector streets. The construction plans shall have the sight lines drawn on the plan sheets, along with a statement that the design meets the requirements of Detail G-448.

4.33 Obstruction Policy "Obstructions" are defined as items which are not a part of the traffic control or safety system and which are very likely to cause a severe injury or fatality if struck by an automobile traveling at the posted speed limit. Included are monuments, boulders, or trees more than six inches in diameter.

A. Medians:
   1. Lateral clearances from the median edge should be a minimum of four feet unless the obstruction is protected by traffic attenuators, guard rails, raised berms, or other acceptable measures. Seven feet of clearance is required for large massive obstructions.
   2. Minimum setbacks from any median nose should be 120 feet.
   3. Sight distance standards must be satisfied.

B. Roadside:
   1. Lateral clearances from the curbed edge of roadway should be a minimum of four feet; seven feet is required for large massive obstructions.
   2. Sight distance standards must be satisfied.
   3. A minimum vertical clearance of eight feet six inches must be maintained over sidewalks and roadways.

C. Any proposed obstruction which does not meet these criteria should be submitted to the Transportation Director for review.

4.4 PARKING AND ACCESS:

4.41 Requirements: For parking lot requirements, refer to Section 9.3 and Detail G-450 of these standards. For driveway requirements, refer to Section 4.5 below.

4.5 DRIVEWAYS:

4.51 All driveways serving property abutting public streets in the City shall conform with the following standards (See Detail G-454):

Driveway Design:

A. Width: The width of a driveway shall be the width at the throat of the driveway exclusive of wings or return radii.

B. Distance between driveways: The distance between the near edges of the throats of the two driveways. See Detail G-454 for specific distance requirements.

C. Construction:

1. Residential Driveways: With vertical curb, replace the curb per MAG Detail 250.

2. Commercial Driveways and Private Streets: With either roll or vertical curb, replace curb per Detail G-456 or G-458.

4.52 Notwithstanding the provision of these standards, where ample justification exists, the City may approve driveways up to a maximum width of 46 feet.

4.6 BICYCLE/MULTI-USE/EQUESTRIAN TRAILS

4.61 Bicycle Facilities: The use of bicycles as an alternate mode of transportation shall be considered in all new developments. This includes bicycle paths and routes, bicycle access to the development, bike racks and other amenities. Bicycle racks (Detail G-462) are required in parks and at other publicly accessible areas as determined by the Transportation Director. See the City's approved Bicycle Plan for additional information.

4.62 Multi-use Paths: Multi-use paths are required in large parks, along the banks of creeks, rivers and canals, in recreation areas and at other locations as determined by the city. Since these paths serve multiple uses for bicyclists, joggers, walkers, and skaters, the path shall be a minimum of 10-feet wide with 2 feet of shoulder clearance on either side of the pavement and constructed with either an asphaltic concrete or portland cement concrete surface. Decomposed granite or other soft surfaces are not allowed.

4.63 Equestrian Trail Design Standards:

A. Locations: Equestrian trails shall be located and developed in accordance with the locations identified on the "Trails and Bikeways" map contained in the adopted City of Glendale General Plan.

B. Dedication: All equestrian trails shall be dedicated in fee title to the City or located within a recorded easement granted for the purpose of equestrian use.

C. Width: A minimum width of fifteen feet is required in urban areas for equestrian use for the safety of horses and riders. For rural, undeveloped areas void of manmade improvements, the minimum width shall be four feet with 2 feet of shoulder clearance on either side of the pavement.

D. Drainage: All equestrian trails should be designed and constructed to provide adequate drainage. Surface material for trails in urban, developed areas shall be a minimum of four inches of one-quarter-inch minus decomposed granite. Trails in rural, unimproved areas may be constructed of natural, native materials.

E. Landscaping: Any landscaping, other than natural vegetation or ground cover, adjacent to the trail shall have a minimum height clearance of eight feet above the adjacent trail. No plant material shall be placed within the areas defined by widths in Paragraph C above. Plants should not include anything poisonous or with sharp edges or thorns.

F. Structures: Above grade utility structures to include, but not necessarily limited to; electrical transformers, utility poles, traffic signal controllers, fire hydrants, telephone switch gear, natural gas pressure regulators, etc., shall not be placed anywhere within the widths specified in Paragraph C above. Underground utilities may be placed in equestrian trails provided they will not present a hazard to horses or riders or create a potential for damage to the utility due to equestrian traffic.

G. Clearances: Any overhead obstacles such as street overpasses, tunnels, cables, etc., shall have a minimum vertical clearance of ten feet.

H. Grade: The maximum average longitudinal grade for any equestrian trail in urban areas, over a minimum horizontal distance of 300 feet, shall be twenty percent (20%). In rural, undeveloped areas, trails may follow natural existing grades.

I. Concrete surface: Where concrete driveways or parking lot entrances intersect equestrian trails, the concrete shall have a coarse broom finish to provide a surface which is not slippery when wet.

J. Detours: During construction operations, where construction activities may cross existing equestrian trails, developers shall be responsible for providing safe, well defined equestrian trail detours.

K. Signs: Equestrian trail identification signs shall be in accordance with ADOT. Sign Code W11-7 and shall be placed at all locations where trails intersect

streets or alleys. Signs shall be placed on both sides of the trial at a height of five feet above adjacent grade.

M. Exceptions: The above standards will be adhered to whenever practicable. In situations where the application of any of these standards may be impractical, requests for exceptions shall be made in writing to the City Engineer. The City Engineer will have the authority to grant exceptions to these standards after receiving advice from the City's Park and Recreation Director.

4.7 TRAFFIC IMPACT REPORTS

It is the responsibility of the developer to provide a Traffic Impact Report if a proposed development project will generate 100 or more vehicle trips during the project's peak traffic hour. A report may also be required if the project generates significant additional traffic on the surrounding street network, even though the 100 vehicle peak hour threshold is not met.

5.0 STORM DRAINAGE FACILITIES - DESIGN AND CONSTRUCTION

5.1 GENERAL INFORMATION

5.11 The standards contained in this section are intended to expand upon and supplement information contained in legally adopted Chapters of the Code of the City of Glendale. All designers should familiarize themselves with the provisions of Chapter 17, "FLOODPLAIN MANAGEMENT", and Chapter 18.5, "GRADING AND DRAINAGE", of the City Code prior to undertaking projects within the City. In case of conflict between these provisions and those of the Code, the more restrictive shall govern.

5.12 All developments within the City shall provide such storm drainage facilities as are necessary to insure that all structures and properties, both within the development and those located up and downstream of the development, shall be protected from the adverse impact of stormwaters due to the proposed development.

5.13 The City's storm drainage system shall be developed within two broad classifications as follows:

A. The "MINOR SYSTEM" (10-year) shall consist of those collection and/or retention/detention facilities necessary to collect, convey, retain and/or detain stormwater runoff from the more frequent rainfalls. (This is generally considered as the "formal" drainage system). The "Minor System" shall be designed to accommodate storms up to and including a "ten year storm"as defined in Chapter 18.5 of the City Code.

B. The "MAJOR SYSTEM" (100-year) shall consist of those facilities necessary to convey stormwater runoff from storms up to and including a "one-hundred year storm". The design of the "Major System" is somewhat less formal than that of the "Minor System". It consists primarily of the planning and/or analysis of the overall drainage system to insure: that there is always positive drainage from all areas, that the "one-hundred year" flows, as defined in Chapter 18.5 of the City Code, can safely pass through the project, and that all structures are above the high water elevation in areas where temporary and/or long duration ponding may occur.

5.14 Drainage facilities shall consist of the following components:

A. Collection System - This portion of the system is intended to collect and convey runoff to either retention/detention facilities and/or outfall points. In general this system consists of the following:

1. Surface Drainage Facilities

a. Streets

b. Open channels
(1) natural
(2) manmade
(a) grass lined
(b) gunite/concrete (smooth lined)
(c) riprap
(d) gabions
(e) covered gabions

2. Sub-surface Drainage Facilities - Sub-surface drainage facilities are required whenever the capacity of the surface system is exceeded. It is comprised of the following:
a. Pipes (plastic pipes in the right-of-way may be allowed upon written approval of the City Engineer)
b. Manholes/junction boxes
c. Catch basin and inlets

B. Retention/Detention Facilities: This portion of the system is intended to retain/detain sufficient volumes of runoff to minimize the adverse impact of the new developments on downstream areas. Projects with a gross land area of one-half acre or less will not normally be required to provide stormwater retention/detenion basins. All other developments must provide retention/detention facilities, which consist of one or both of the following:
1. "On-Site" basins on private property to be maintained by the property owner are required for the following types of developments:
a. Apartment complexes (Rental)
b. Townhomes, Condos, Patio Homes where a Homeowners Association will maintain the common area
c. Large lot Single Family Subdivisions, where each lot is at least one acre or larger. (Note: this is an option in lieu of a "public" facility)
d. Industrial Subdivisions (Note: this is an option in lieu of "public facilities")
e. Commercial Developments
f. Separate Tract of Land to be maintained by a Homeowners Association.
2. "Off-Site" facilities for projects in a separate tract are typically required of the following types of development:
a. Single-Family development when the lots are less than one acre in area.
b. Planned Unit Developments or other large (80 acres or more) master planned developments.

3. Retention/detention basins shall be protected from further development by a recorded drainage easement and must be fully improved with landscaping, irrigation systems, lighting and such other aesthetic improvements as may be required by the City. Any changes to a recorded drainage easement must be approved by the City Engineer. Any basin which is accepted by the City for maintenance shall be deemed public property and shall be dedicated to the City in fee simple title. If a basin is not accepted for maintenance by the City, the developer shall be responsible for establishing some satisfactory means to maintain the area in perpetuity.

5.15 Reports:

A. A preliminary Drainage Report must be submitted at the time of the preliminary plat review. The preliminary plat review will not be scheduled without this report.

B. A Final Drainage Report must be submitted as part of the Design Review. The final review of the detailed plans will not proceed without this report. No Grading and Drainage permit will be issued until the final drainage report is approved.

5.16 Hydrology, General:

A. Study Requirements: A hydrology study shall be performed for each development within the City over ten (10) acres in size unless waived by the City Engineer. The study shall define the overall and sub-drainage areas. It shall also determine appropriate hydrologic data for the following:

1. Off-Project Areas: The peak flows, times of concentration, and other hydrologic data, for each off-project drainage area tributary to the project shall be computed and submitted in summary form.
2. Project Sub-Basins: The project shall be divided into sub-basins tributary to appropriate design points. The pertinent hydrologic data shall be computed for each and submitted in summary form.
3. "Appropriate Design Points" are those points wherein the peak flow rates, or other pertinent data, is needed to determine flow capacity requirements, inflow-outflow relationships, etc. These "points" would include, but not necessarily be limited to, the following: inflow-outflow points of retention/detention basins; up and/or downstream ends of culverts; intake points for storm drains (i.e. inlets, catch basins, scuppers, etc.); points immediately upstream and downstream of channel junctions and/or street intersections; others as may be necessary to give a complete hydrologic picture and allow a thorough hydraulic evaluation and/or design of the drainage system.

B. Basis of Design: The basis of design shall be the "Hydrologic Design Manual" as prepared and published by the Flood Control District of Maricopa County. The Rational Method shall be used for all studies where the drainage area is less than 80 acres. Studies for drainage areas over 160 acres shall use the HEC-1 hydrologic model as detailed in the Manual. TR-20 or TR-55 hydrologic models may be used in undeveloped areas with permission of the City Engineer. For studies involving drainage areas between 80 and 160 acres in size, either the Rational Method or HEC-1 model may be used.

5.17 Hydraulics, General:

A. Basis of Design:

1. Storm drainage pipes and open channels shall be designed using "Manning's Formula".
2. Values of "n" for "non-typical" materials shall be noted in the report.
3. The Single-Step Method is the preferred method for hydraulic calculations on open channels.
4. Street capacity may be computed using the following formula:

$$Q = \frac{0.56\,(z)\,S^{2}\,d^{8/3}}{n}$$

where:

Q = flow capacity of the street section in cfs.
z = reciprocal of the cross slope
n = Manning's "n" for the surface type
S = Longitudinal slope of the street
d = depth of flow at the gutter line

5. Inlet capacity shall be computed for each inlet of the system. The design method or technical reference used for these calculations shall be cited.

B. Calculations Format:

1. All hydraulic calculations submitted for review shall be submitted in tabular summary form only. Voluminous reports containing page after page of routine detailed calculations may be returned unreviewed and the review of the construction plans will be delayed until these calculations are resubmitted in summary form. (Remember most hydrologic and hydraulic analyses consist of a repetitious series of standard routine calculations. The City does not intend to check the designer's arithmetic.) Summary forms for

hydrologic or hydraulic calculations as published by the City of Phoenix or by the City of Mesa or as found in various technical publications (such as the ASCE Manual Number 77), or comparable format may be used.

2. Occasionally circumstances will warrant or require special solutions which do not fall within the routine forms and formula prescribed above. In such cases the design engineer shall of course use these formula appropriate for the solution. The report should reference the formulas used and their source. If necessary, a single typical calculation may be shown in detail to clarify the logic of the solution. The balance of similar calculations are to be presented in tabular summary form.
3. Summary forms should provide space for each of the critical variables used in the set of calculations. For example, a hydrologic summary table for a study based on the "Rational Method" would include spaces to itemize the variables such as: A, C, cA, EcA, t_c, I, etc., providing the information necessary to check the summary table.

C. Retention/Detention Areas:

1. The design engineer shall determine and present calculations on each retention or detention facility required for their project. The retention/detention volume shall be provided.
2. Each retention/detention basin is required to provide sufficient volume to retain one hundred per cent of a one hundred year, two hour storm plus one-foot of freeboard and a safe overflow.
3. A drainage easement shall be recorded over each retention/detention area within the project for both "public" and "private" basins. The area to be encompassed within the easement includes an area within four feet of the "freeboard" line.

5.2 TECHNICAL DESIGN REQUIREMENTS - STORM DRAINS

5.21 Drainage:

A. Street Drainage:

1. The basis of design for local streets shall be the ten-year storm.
2. Streets shall be designed to carry the following minimum flows:
   a. Major arterial and arterial to carry a ten-year flow between the curbs and maintain a twelve-foot dry lane in each direction, and carry the one hundred year flow within the right-of-way.
   b. Collectors and local streets to carry ten year flows between the curbs, the fifty year flows within the right-of-way. All

habitable structures shall be placed above the 100-year flood elevation.

3. Underground or open channel storm drains are required when the street capacity is exceeded.
4. In general, dip crossings of open channels shall be avoided. Low water crossings passing a ten year storm shall be provided.
5. All storm drains and channels shall be constructed in public rights-of-way or dedicated drainage easements.

B. Drainage Between Lots:

1. Routing of drainage ways between lots or buildings is discouraged and will be allowed only with written approval of the City Engineer.
2. The channel shall be designed to convey the one hundred year flow without flooding adjacent properties.
3. When allowed, the channel shall be constructed in a dedicated drainage right-of-way or easement leading to a positive outfall point. The minimum width of the right-of-way shall be the top width of the channel plus twelve feet for a maintenance roadway. The ends of the right-of-way shall be treated in such a manner as to prevent non-maintenance vehicular access without diminishing the hydraulic capacity of the channel. A minimum of 25% of the up-stream opening shall be assumed to be clogged with debris.

C. Underground Storm Drains:

1. Underground storm drains shall be provided whenever the capacity of the streets is exceeded by the design storm event.
2. Pipes shall be sized using "Manning's Formula". Values of Manning's "n" shall be from appropriate technical literature and shall be referenced.
3. Velocities shall range from 3 fps to 9 fps.
4. The minimum pipe size shall be 15-inch ID.
5. The hydraulic grade line for the design storm may be above the pipe, provided that it remains at least one foot below the ground elevation at all manholes, catch basins, inlets, etc.
6. When the pipe changes direction more than 30 degrees there shall be a drop, between match points, of at least 0.1 feet. In no case shall the deflection angle be greater than 90 degrees.

D. Pipe Bedding Requirements: All construction projects within the City of Glendale shall adhere to the following bedding, backfill and compaction requirements. Specific sections of MAG are to be replaced with those published herein, in their entirety. All other specification sections of MAG Section 601 shall remain the same:

1. MAG 601.2.3, Trench Grade: For Capital Improvement Projects where the City will perform the surveying, alignment and elevation

stakes shall be furnished to the contractor at set intervals and agreed upon offsets. On water main projects, elevation stakes will be furnished only when deemed necessary by the Engineer. In all cases where elevation stakes are furnished, the Engineer will also furnish the Contractor with cut sheets.

The Contractor shall excavate for and provide for an initial granular bedding at least 4 inches thick or one twelfth (1/12) the O.D. of the pipe, whichever is greater. This bedding material shall be placed at a uniform density to the required compaction and fine graded as specified below. (See Standard Detail G-690.)

Bell or coupling holes shall be dug after the trench bottom has been graded. Such holes shall be of sufficient width to provide ample room for caulking, banding, or bolting. Holes shall be excavated only as necessary to permit accurate work in the making of the joints and to insure that the pipe will rest upon the prepared bottom of the trench and not be supported by any portion of the joint.

Depressions for joints, other than bell-and-spigot, shall be made in accordance with the recommendations of the joint manufacturer for the particular joint used.

2. MAG 601.4.1 Foundation: The material upon which the conduit or structure is to be placed shall be accurately finished to the grade or dimensions shown on the plans or as directed by the Engineer. The bottom portion of the trench shall be shaped so as to conform to the bottom of the conduit or structure, in order to provide continuous contact between the conduit and the material upon which it is being placed. In rock trench, the contractor is to excavate at least six inches below bottom of bell.

3. MAG 601.4.2 - Bedding: Pipes and conduits installed in the City of Glendale easements and rights-of-way shall be bedded from bottom of excavation to one foot above the top of pipe with granular material meeting the requirements of MAG Section 601.4.6. Bedding shall be constructed so as to conform to a Class B, as defined by the American Society of Civil Engineers, Practice No. 60, except that the top of bedding shall extend to one foot above the top of pipe. Pipe bedding shall be required for all pipe having an inside diameter of 8 inches or larger, and shall be required for pipe of any size diameter whenever rock larger than 1- ½ inches is encountered in the trench bottom.

Bedding shall consist of either granular material containing no pieces larger than 1 inch and free of any deleterious material. Chips or open graded rock will not be permitted without the express written permission of the Engineer.

Water consolidation shall be permitted for bedding material only with the written permission of the Engineer. Bedding material for all sizes of pipe or conduit shall be placed in lifts, with the maximum loose thickness not to exceed 8 inches. In no case shall the depth of the first lift exceed the springline of the pipe. (See Detail G-690).

4. MAG 601.4.3 Backfill: Backfill material shall be clean sound earthen material free from broken concrete, broken pavement, wood or other deleterious material. Unless otherwise specified, backfill may be screened native material with no piece larger than four (4) inches, select material or aggregate base course, a slurry mixture consisting of aggregate base course and not more than one-half sack of cement per cubic yard, or ½ sack CLSM that meets the requirements of MAG Section 604.

   Water consolidation shall not be permitted under any circumstance. Mechanical compaction shall be required except when ABC Slurry or CLSM is chosen as the backfill material. The maximum uncompacted lift thickness for mechanically compacted backfill shall be one (1) foot for any trench width. Nothing contained in these specifications shall be construed to violate or reduce any trench shoring requirements normally required by O.S.H.A.

   The moisture content of backfill materials shall be carefully maintained between the limits of +2 and -4 percent of optimum moisture content as determined by AASHTO T-180 or ASTM D-1557.

5. MAG 601.4.4 Compaction Densities: Unless otherwise noted , the backfill compaction densities listed in Table 5.1 below, shall be determined using the Modified Proctor Method, ASTM D-1557.

TABLE 5.1

MINIMUM DENSITY REQUIRED				
Backfill Type	Location	From Surface To 2' Below Surface	From 2' Below Surface To 1' Above Top of Pipe	From 1' Above Top of Pipe to Bottom of Trench
I	Under any existing or proposed pavement, curb, gutter, sidewalk, or such construction included in the contract, or when any part of the trench excavation is within 2' of the above.	90% Modified Proctor	90% Modified Proctor	95% Standard Proctor
II	On any utility easement, street or alley right-of-way outside limits of (I).	90% Modified	90% Modified	95% Standard
III	Around any structures or exposed utilities	90% in all cases Modified		

6. MAG 601.4.5 Compaction Methods: Water consolidation for backfill will not be permitted within the City of Glendale. The backfill compaction shall be accomplished by mechanical methods using equipment such as rollers, pneumatic tamps, hydro hammers, or other approved devices which secure uniform and required density without injury to the pipe or related structures.

5.22 Materials:

A. Pipes:

1. Standard material for storm drain pipes in the public rights-of-way shall be rubber gasket, reinforced concrete pipe (RGRCP) per ASTM C76. Generally the minimum rating shall be Class III.

When the cover is less than two feet the minimum rating shall be Class IV, or concrete backfill used subject to City approval.

2. The Design Engineer shall be prepared to justify the pipe class specified.
3. Cast-in-place concrete pipe, slotted drain or HDPE pipe shall not be used in the City right-of-way unless approved by the City Engineer.

B. Manholes/Junction Boxes:
   1. Materials - all manholes shall be per MAG Standard Details and Specifications.
   2. Locations - manholes and/or junction boxes are required at the following locations unless otherwise approved:
      a. Junctions of two or more pipes (except connector pipes)
      b. Changes in grade
      c. Changes in alignment
      d. Changes in pipe sizes
      e. PC's and PT's
   3. Spacing - the maximum spacing for manholes shall be:
      a. 400 feet on lines 12" to 36" in diameter
      b. 660 feet on lines 36" to 72" in diameter
      c. 1320 feet for lines over 72" in diameter

C. Open Channels:
   1. Natural Channels: Whenever possible and appropriate it is the City's preference that existing drainage channels be left in a natural state. When this is the case a drainage easement or right-of-way shall be dedicated over the 100-year flood plain of the natural drainage way.
   2. Man-made Channels: When man-made channels are required the emphasis would be placed on a "natural" appearance. Grass lining with side slopes 6:1 or flatter are preferred.
   3. Maximum Velocities/Erosion Protection: In general the maximum velocity for the 100-year event or other less frequent event, whichever creates the worse scour potential, shall not exceed the scouring velocity of the soil (with natural cover). When the scour velocity is exceeded additional erosion protection shall be provided. The protection may consist of one or more of the following:
      a. Concrete/gunite lining (reinforced with 4 x 4 WWF - 12GA).
      b. Natural stone grouted riprap 4" to 12" diameter stones - leave a minimum 1/4 diameter exposed.
      c. Gabions.

D. Catch Basins: Catch basins are to be curb opening inlets. Drywells and catch basins with grates shall be heavy duty H-20 loading, bicycle safe, meet ASTM A536 and are subject to the approval of the City Engineer. All new catch basins and scuppers shall be identified by the contractor placing a storm drain marker on the top of the curb above the inlet. Storm drain markers shall be properly epoxied on the structure. Markers may be obtained from the City's Construction Engineering Department. The contractor shall provide an acceptable 2-part epoxy for adhering the marker to the concrete.

5.3 TECHNICAL DESIGN REQUIREMENTS- RETENTION/DETENTION FACILITIES

5.31 Sizing:

A. Basis of Design:

1. All retention/detention facilities shall be sized to retain 100% of the one hundred year, two hour storm falling over the entire project (gross area including streets). For purpose of determining the volume required, the project shall be considered to extend to the centerline of all existing and/or future streets on the exterior boundaries and to include all interior streets and other rights-of-way within the project.
2. Freeboard: There shall be a one-foot freeboard from the high water surface elevation to the lowest building elevation and/or the gutter of the downstream streets.

B. Volume: The following data shall be provided for each retention/detention basin:

1. Volume Required - the volume required in cubic feet can be computed using the following formula:

*$Vr = 7200C (I) (A_a)$ where
C = coefficient of runoff
I = rainfall intensity (Use 1.45 in/hr)
A_a= area in acres

*See 5.31.A.2. for "freeboard" requirements

The "Effective Drainage Area" is defined as that portion of the project that is tributary to the retention/detention basin.

2. Volume Provided - The volume provided shall be submitted in a table noting the stage-capacity relationships.

C. Retention/Detention Basins: Basins shall be located such that they can intercept the flows from the entire site. If the basin is located other than at

the lowest point of the project, the Design Engineer shall denote on the master drainage map the actual or effective drainage area. If portions of the project cannot drain to the primary basin, additional basins shall be added to retain runoff from these areas. Credit will not be given for providing volume in excess of that needed to retain the one hundred year, two hour storm from a basin's effective drainage area.

D. Outfall: A positive outlet from the basin must be provided for events in excess of the 100-year event.

5.32 Grading:

A. Depths:

1. The basins shall not exceed 1.5 feet of water depth within 10 feet of the right-of-way.
2. While it is the City's intent that the basin depth not exceed 3 feet, it is also the City's intent that the basins be contoured to present an aesthetically pleasing appearance. To that end up to 25% of the bottom area may be up to 4 feet deep.
3. In no case shall the depth exceed 1.0 foot without a positive means of disposing of accumulated runoff.

B. Slopes, side and bottom:

1. Bottom: The bottom of all basins shall be sloped towards the discharge points. The minimum bottom slope shall be 0.5 %.
2. Side Slopes:
   a. Side slopes adjacent to public or private sidewalks, or when there is pedestrian type access within ten feet to that portion of the basin, shall have a side slope of 6:1 or flatter.
   b. Side slopes adjacent to walls, fences, hedges, etc. (i.e., limited or no pedestrian type access in that area) may have side slopes up to 4:1.
   c. Retaining walls (i.e., vertical slopes) may be used in areas adjacent to permanent walls, fences, etc.
   d. Concrete or grouted riprap slope erosion protection shall be provided when street runoff is collected and conveyed to the basin(s) via a scupper or weir.

C. Grading and Landscaping:

1. It is the intent of the City that retention and detention basins present an aesthetically pleasing appearance. The Design Engineer shall endeavor to "contour" the sides and bottoms of the basins to enhance appearance through varied slopes.
2. It is not the intent of these guidelines to dictate the specific details of the configuration to the designers - however, the following concepts will be used as the basis of reviewing the plans:

a. Curvilinear sides should be used in lieu of long stretches of straight lines.

b. Side slopes should be varied (i.e., start with 6:1 then change to 7-8 or more. With appropriate use of landscaping, side slopes can even be reduced to 4:1 - see Section 5.32.B.2.

c. Bottom areas should contour to varying depths in lieu of uniform depth/slope (see Section 5.32.A.2).

3. The tops and bottoms of side slopes shall be rounded off - generally over a distance five (5) feet each way of the "PI".

4. Landscaping - Chapter 10 defines the basic landscaping requirements for retention and detention basins. As with the grading, the landscape plans shall be reviewed in regard to aesthetic effect of the proposed design.

5. No more than fifty (50) percent of the required streetscape landscape area may be used for storm water retention purposes.

D. Retention/Detention in Parking Lots:

1. Retention/detention in parking lots of multi-family developments is not allowed. All retention/detention of such developments shall be in landscaped areas.

2. Retention/detention of runoff in parking lots of industrial/commercial developments is allowed subject to the following standards:

a. No more than 75% of the volume required may be retained/detained in parking lots. The balance shall be provided in landscaped areas. The tributary areas to each "basin" shall be noted on the master drainage map.

b. Depth in parking lots shall not exceed 0.67 feet, nor shall it exceed 0.15 feet at the midpoint of any parking space. If paved areas are designed to store water at a depth greater than 0.67 feet, the developer shall post conspicuous warning signs in these areas advising that flooding may occur and vehicles may be subject to inundation.

c. A continuous emergency vehicle access lane shall be provided throughout the development, and it shall be free of ponded water from the retention areas.

E. Overflow/Outfall:

1. Outfall: Each project shall be designed such that the "ultimate" outfall for all drainage is a public street, storm drain, drainage channel or natural watercourse. The outfall shall be accessible without draining over private property unless specific, recorded drainage easements are provided over the private property. Design engineers must evaluate cases where overflow conditions occur and take necessary actions to prevent flooding or damage to

properties located downstream of the outfall. In all cases, the engineer must insure that the "post development flow" does not exceed flow that would result had no development taken place.

2. If such an outfall does not exist the project must provide an outfall.
3. Overflow/Conveyance:
    a. Off-project flows which historically flowed through the project may be routed through the retention or detention facilities.
    b. Runoff volumes in excess of those required to be retained/detained (currently the one hundred year - two hour storm) may be routed directly through the outfall, although they must be routed via the retention/detention facilities.

F. Location/Conflicts With Existing Utilities:

1. Retention/detention facilities shall not encroach into existing easements for private utilities without written approval of the encroachment from all utilities using the easement.
2. Retention/detention facilities shall not encroach into public rights-of-way nor into public easements. If necessary the developer shall relocate conflicting utilities into a new dedicated easement.
3. The top of the retention/detention facilities (i.e., freeboard elevation) shall be at least four horizontal feet from any building or public roadway.
4. Retention/detention facilities shall not be located within 20 feet of an active septic system nor within 100 feet of an active water well.
5. A minimum three feet of cover (from the bottom of the basin to the top of the pipe) shall be maintained over water and sewer service lines.

G. Disposal/Discharge:

1. All retention/detention facilities shall have a positive method of disposing of retained or detained runoff waters. All water so retained or detained shall be disposed of within 36 hours. Public streets are not considered an acceptable outlet for disposal of retained or detained runoff, however, are considered an acceptable outlet for overflow.
2. Acceptable methods of disposal of accumulated storm water runoff are:
    a. Discharge to an existing storm drain or drainage channel of sufficient capacity to convey the anticipated flows from the tributary drainage area after the storm via a valve or slide gate.

b. Percolation wells are considered an acceptable method of disposing of the retained runoff, subject to the following:

1) Drywells shall penetrate a minimum of 10 feet into permeable soil defined as mostly cobbles and gravel with no material passing a No. 40 sieve. Soil shall not form a cast when air dried and squeezed in the hand, and shall fall apart when pressure is released. When hand squeezed moist, the soil may form a cast which shall crumble when lightly touched, and cannot be ribboned between thumb and fingers.

2) The maximum disposal rate shall not exceed 0.1 cfs per disposal well unless a higher rate is supported by a certified test of an actual well and approved by the City. No other percolation test will be allowed. If an actual well test is performed, the resultant design disposal rate shall not exceed 50% of the rate determined by the test, in order to compensate for deterioration of percolation rates over time.

3) The minimum number of wells per retention/detention basin shall be computed, and noted in the drainage report, per the following:

$N = (V_p/36R_I)$, where:

N = minimum number of injection wells required

V_p = volume provided in the retention/detention basin

R_I = approved discharge rate per well in "cfs" or "cfm" or other rate unit

36 = maximum number of hours required to drain the retention/detention basin

4) Drywell drilling log(s), along with an engineer's certification that the drywell(s) has been installed in accordance with plans, specifications and Arizona Department of Environmental Quality requirements shall be submitted to the City of Glendale Engineering Department upon completion of drywell installation.

5) All drywells are to be equipped with a secured grate to prevent unauthorized removal.

H. Nuisance Water: such that there is one or more "sump" areas wherein runoff from the more "frequent" storms and nuisance runoff may be

retained/detained without flooding the balance of the basin. Positive methods of disposal shall be provided for each sump.

5.4 CONSTRUCTION DETAILS:

5.41 All construction shall be per MAG Standard Details and Specifications subject to City of Glendale modifications. Plans shall be prepared per the standards in Chapter 2.0, Construction Plans Preparation.

STORM WATER POLLUTION PREVENTION PLAN
Checklist

City of Glendale
Development Services Center

DSC No: _____ **Project Name:** _____

Reviewed by: _____ **Phone:** _____ **Date:** _____

Engineer: _____ **Phone:** _____

This project is subject to the National Pollution Discharge Elimination System (NPDES) requirements for construction sites under the Environmental Protection Agency (EPA) general permit for Arizona. Owners, developers, engineers, and/or contractors are required to prepare all documents required by this regulation, including but not limited to Storm Water Pollution Prevention Plan (SWPPP), Notice of Intent (NOI) and Notice of Termination (NOT). Copies of all requirements, forms and guidelines are available in the Drainage Design Manual for Maricopa County Volume III Erosion Control available at the Flood Control District, 2801 West Durango, Phoenix, Arizona 85009, Phone No (602) 506-1501.

This checklist serves to minimize redline comments on the check prints and to maintain consistency among plan reviewers on plans for storm water management. Plan approval, issuing permits, and certain grading clearances depend on compliance with the comments made on the check prints and this checklist. The engineer of record shall satisfy themselves of the completeness and accuracy of the design.

Please return this checklist and the check prints with your next submittal. Discussion of redline comments on plans or this checklist should be directed to the plan reviewer.

GENERAL REQUIREMENTS:

- [ ] Sheets to be 24" X 36"; submit two (2) sets of plans.
- [ ] Separate storm water pollution prevention plans shall be submitted with grading and drainage plans at time of first review.
- [ ] Plans shall be prepared on vellum, linen, or Mylar.
- [ ] Cover sheet is required on plans of more than one sheet.
- [ ] Include appropriate processing numbers from Development Services Center.
- [ ] Original plan sheets shall be sufficiently clear to allow legible prints to be reproduced from microfilm. The size of lettering and symbols shall be 1/8-inch minimum.
- [ ] All sheets shall have the Civil Engineer's Arizona registration seal and original signature prior to plan submittal
- [ ] Show Best Management Practices (BMP) details on plan sheets.

COVER SHEET REQUIREMENTS:

- [ ] Project title block with name and address of project.
- [ ] Vicinity map with north arrow.
- [ ] Index of plan sheets if more than one plan sheet.
- [ ] Owner's/Developer's name, address, and telephone number.
- [ ] Engineer's name, address, and telephone number.
- [ ] Contractor's name, address and telephone number (if Contractor already selected).
- [ ] Legend identifying grades, symbols, lines, etc.

NOTES FOR STORM WATER POLLUTION PREVENTION PLAN
(to appear on SWPPP cover sheet)

1. A copy of the grading and drainage plan for this project, together with a copy of the Notice of Intent (NOI) and the Storm Water Pollution Prevention Plan (SWPPP), shall be maintained on the site and available for review. Those elements of the grading and drainage plan pertinent to or referenced on the SWPPP shall be considered a part of the SWPPP.
2. The Construction Engineering Department shall be notified 48 hours before any on-site and/or off-site construction begins, Phone: 623-930-3622.
3. The operator shall obtain a Dust Control Permit from Maricopa County Health Department and perform measures as required by the permit to prevent excess dust.
4. The operator shall perform, at a minimum, a visual inspection of the construction site once every month and within 24 hours of rainfall greater than or equal to half of inch or more. The operator shall prepare a report documenting his/her findings on the conditions of the SWPPP controls and note any erosion problem areas. The operator's report is to be submitted to the Construction Engineering Department Inspector for review. Facilities shall be maintained as necessary to ensure their continued functioning. In addition, all temporary siltation controls shall be maintained in a satisfactory condition until such time that clearing and/or construction is completed, permanent drainage facilities are operational, and the potential for erosion has passed.
5. The operator shall amend this plan as necessary during the course of construction to resolve any problem areas, which become evident during the construction and/or during rainfalls. All changes to the SWPPP must conform to the Drainage Design Manual for Maricopa County- Volume III Erosion Control.
6. The permittee shall file a Notice of Termination (NOT) after completion of construction and placement of final landscape materials. A copy of the NOT is to be submitted to the Construction Engineering Department to final the SWPPP permit.
7. The permittee shall save all records, including the NOI, SWPPP, NOT, and inspection reports, on file for minimum of three years from the date of filing the NOT.
8. The implementation of these plans and the construction, maintenance, replacement, and upgrading of these facilities is the responsibility of the permittee/contractor until all construction is approved and the NOT is submitted to the Construction Engineering Department.
9. The facilities shown on this plan must be constructed in conjunction with all clearing and grading activities in such a manner as to insure that sediment-laden water does not enter the drainage system or violate applicable water standards. The facilities must be installed and in operation prior to any grading or land clearing. Wherever possible, maintain natural vegetation for silt control.
10. A copy of the contractor's NOI and five (5) copies of the reviewed and signed SWPPP must be received prior to any Grading and Drainage permit being issued.
11. All Storm Water Pollution Prevention Plans shall follow the Drainage Design Manual for Maricopa County, Arizona, Volume III, Erosion Control.

6.0 WATER MAIN DESIGN AND CONSTRUCTION

6.1 GENERAL INFORMATION

6.11 Water Main System:

A. The City of Glendale water main system is based on a grid system with three (3) basic classifications of water lines which are determined by use. These classifications are:
   1. Services
   2. Distribution
   3. Transmission

B. All development shall provide for water distribution and service lines of appropriate sizes, with normal locations as follows:
   1. Distribution water lines:
      a. In major arterial, arterial and collector street alignments, 12-in. minimum diameter lines.
      b. All other locations, 8-in. minimum diameter lines.
      c. These are minimum standards and the City may require larger sizes in unusual circumstances.
   2. Service water lines:
      a. Metered taps for single-family residences shall be located per Detail G-642 and G-643. The minimum service size shall be 1".
      b. The service line shall be constructed with Type K roll copper.
      c. For all other types of development, metered taps shall be located outside of street improvements but within the right-of-way or an easement.
      d. Service taps are prohibited on any line which is primarily designed to service either fire sprinkler systems and/or fire hydrants.
   3. Fire sprinkler line locations shall be such that maintenance activity will not disrupt normal access to the development. The owner will be responsible for the sprinkler line/main up to and including the tap and sleeve coming off the City main. (Optional backflow prevention assembly is shown on Detail G-668 or G-670).
   4. Fire hydrants shall be located outside of street improvements but within the right-of-way or easement. General spacing for fire hydrants shall be:
      a. 500 feet maximum in a single-family residential development.
      b. 300 feet maximum in a multi-family residential development.
      c. 300 feet maximum in commercial/industrial areas with at least one hydrant per 100,000 square feet of coverage.

d. Fire hydrants shall not be installed on any portion of a dead end line that is more than 400 feet from its source of supply (point of connection on 8-in. water lines).

e. Fire hydrants shall be located between 1 foot and 6 feet off the back of curb on all streets. (See Detail G-662).

5. ADHS Bulletin 10 shall apply to all City of Glendale water lines.

6.2 TECHNICAL DESIGN REQUIREMENTS

6.21 Water Lines:

A. Materials and Details:

1. Standard materials and details for pipe 12-in. diameter and smaller shall be per Maricopa Association of Governments, Uniform Standard Specifications and Details for Public Works Construction (ductile iron or asbestos cement pipe only). Materials and details for pipe larger than 12-in. diameter shall be considered individually.
2. Where ductile iron pipe is used, all pipe and fittings shall be encased in a polyethylene tube and installed in accordance with AWWA C105 and C600 unless directed otherwise by the City.
3. Pavement replacement type and compaction type shall be indicated on each sheet.
4. All "dead-end" lines, e.g. at the end of a cul-de-sac, will be terminated with a fire hydrant installed per standard detail G-660, G-661 or G-665, as applicable.
5. Private waterlines or firelines shall be DIP or ACP in City right-of-way. Once outside the right-of-way, the pipe material may be C900 PVC **Class 200** pipe.

B. Location within Right-of-Way:

1. Right-of-way shall be dedicated prior to any construction.
2. Major arterial streets - water main alignment shall be reviewed individually.
3. Arterial streets - water mains shall offset from street centerline 16 feet north or east.
4. Collector and residential-interior streets - water mains shall be offset from street centerline 12 feet north or east.

C. Easements:

1. Easements shall be dedicated prior to any construction.
2. The minimum width of the easement for all water lines shall be 20 feet.
3. Water lines shall be centered in easements, unless otherwise approved by the City.

D. Depth:

1. Minimum cover from finish grade to the top of the pipe shall be:
   a. Forty-eight inches for water lines 12-in. and larger, and all lines in major arterial and arterial streets.

b. Thirty-six inches for water lines smaller than 12-in., and all lines in collector streets, interior streets, and other locations.

2. The proposed depth shall be clearly noted in each plan sheet. Any changes in depth required to avoid conflicting utilities, etc., shall be noted.

E. Air Release: Air release valves, vacuum release valves, fire hydrants, or other suitable means of air control shall be installed at high points in a line, or where a long line changes slope.

F. Pipe Bedding Requirements: All construction projects within the City of Glendale shall adhere to the following bedding, backfill and compaction requirements. Specific sections of MAG are to be replaced with those published herein,in their entirety. All other specification sections of MAG Section 601 shall remain the same:

1. MAG 601.2.3, Trench Grade: For Capital Improvement Projects where the City will perform the surveying, alignment and elevation stakes shall be furnished to the contractor at set intervals and agreed upon offsets. On water main projects, elevation stakes will be furnished only when deemed necessary by the Engineer. In all cases where elevation stakes are furnished, the Engineer will also furnish the Contractor with cut sheets.

   The Contractor shall excavate for and provide for an initial granular bedding at least 4 inches thick or one twelfth (1/12) the O.D. of the pipe, whichever is greater. This bedding material shall be placed at a uniform density to the required compaction and fine graded as specified below. (See Standard Detail G-690.)

   Bell or coupling holes shall be dug after the trench bottom has been graded. Such holes shall be of sufficient width to provide ample room for caulking, banding, or bolting. Holes shall be excavated only as necessary to permit accurate work in the making of the joints and to insure that the pipe will rest upon the prepared bottom of the trench and not be supported by any portion of the joint.

   Depressions for joints, other than bell-and-spigot, shall be made in accordance with the recommendations of the joint manufacturer for the particular joint used.

2. MAG 601.4.1 Foundation: The material upon which the conduit or structure is to be placed shall be accurately finished to the grade or dimensions shown on the plans or as directed by the Engineer. The bottom portion of the trench shall be shaped so as to conform to the bottom of the conduit or structure, in order to provide continuous contact between the conduit and the material upon which it is being placed. In rock trench, the contractor is to excavate at least six inches below bottom of bell.

3. MAG 601.4.2 - Bedding: Pipes and conduits installed in the City of Glendale easements and rights-of-way shall be bedded from bottom of excavation to one foot above the top of pipe with granular material meeting the requirements of MAG Section 601.4.6. Bedding shall be constructed so as to conform to a Class B, as defined by the American Society of Civil Engineers, Practice No. 60, except that the top of bedding shall extend to one foot above the top of pipe. Pipe bedding shall be required for all pipe having an inside diameter of 8 inches or larger, and shall be required for pipe of any size diameter whenever rock larger than 1- ½ inch is encountered in the trench bottom.

   Bedding shall consist of either granular material containing no pieces larger than 1 inch and free of any deleterious material. Chips or open graded rock will not be permitted without the express written permission of the Engineer.

   Water consolidation shall be permitted for bedding material only with the written permission of the Engineer. Bedding material for all sizes of pipe or conduit shall be placed in lifts, with the maximum loose thickness not to exceed 8 inches. In no case shall the depth of the first lift exceed the springline of the pipe. (See Detail G-690).

4. MAG 601.4.3 Backfill: Backfill material shall be clean sound earthen material free from broken concrete, broken pavement, wood or other deleterious material. Unless otherwise specified, backfill may be screened native material with no piece larger than four (4) inches, select material or aggregate base course, or a slurry mixture consisting of aggregate base course or CLSM and not more than one-half sack of cement per cubic yard.

   Water consolidation shall not be permitted under any circumstance. Mechanical compaction shall be required except when ABC Slurry or CLSM is chosen as the backfill material. The maximum uncompacted lift thickness for mechanically compacted backfill shall be one (1) foot for any trench width. Nothing contained in these specifications shall be construed to violate or reduce any trench shoring requirements normally required by O.S.H.A.

   The moisture content of backfill materials shall be carefully maintained between the limits of +2 and -4 percent of optimum moisture content as determined by AASHTO T-180 or ASTM D-1557.

5. MAG 601.4.4 Compaction Densities: Unless otherwise noted, the backfill compaction densities listed below, shall be determined using the Modified Proctor Method, ASTM D-1557.

TABLE 6.1

MINIMUM DENSITY REQUIRED				
Back-fill Type	Location	From Surface to 2' below Surface	From 2' Below Surface to 1' above Top of Pipe	From 1' above Top of Pipe to Bottom of Trench
I	Under any existing or proposed pavement, curb, gutter, sidewalk, or such construction included in the contract, or when any part of the trench excavation is within 2' of the above.	90% Modified Proctor	90% Modified Proctor	95% Standard Proctor
II	On any utility easement street or alley right-of-way outside limits of (I).	90% Modified	90% Modified	95% Standard
III	Around any structures or exposed utilities	90% in all cases Modified		

6. MAG 601.4.5 Compaction Methods: Water consolidation for backfill will not be permitted within the City of Glendale. The backfill compaction shall be accomplished by mechanical methods using equipment such as rollers, pneumatic tamps, hydro hammers, or other approved devices which secure uniform and required density without injury to the pipe or related structures.

The moisture content of backfill materials shall be placed at +2/-4% of optimum moisture content as determined by AASHTO T-180 or ASTM D-1557.

6.22 Fire Hydrants:

A. Materials and Details:

1. Fire hydrants shall be installed per City of Glendale Detail G-660, G-661, G-662 or G-665 as applicable.

2. The Contractor shall tap all energized mains after placing the tapping sleeve and valve. The installation must be approved by the Construction Engineering Inspector prior to tapping.
3. The developer shall provide the fire hydrant, other necessary materials, and all labor for installation.
4. The only acceptable fire hydrant models and manufacturers are: Kennedy Guardian, Mueller Centurian, Clow 2500, and Waterous Pacer.

B. Locations: (see 6.11.B.4 for spacing requirements)
1. Fire hydrants at intersections shall be placed a minimum of 1 foot and a maximum of 6 foot from back of curb. Fire hydrants in mid-block shall be placed in line with side property extension. When sidewalk is not attached to curb, hydrant shall not exceed 6 feet back of curb. Care shall be taken to minimize conflicts with future driveways.
2. Location of the fire hydrant shall be such that the pipe leading to the hydrant will be under the least amount of pavement.
3. On private property, the fire hydrant shall be contained within a dedicated easement (3 foot clearance minimum). Hydrants not in a dedicated easement or right-of-way are considered private and shall be painted red.
4. A finished grade elevation shall be shown for the "break-away" flange on each fire hydrant. This shall be such that there is at least 18 inches but no more than 30 inches clearance from finished grade to the lowest nozzle. Vertical extension is to be no longer than 18 inches.
5. Hydrants shall be installed in such a way that the depth of bury including extensions does not exceed 5 feet (see Detail G-660).

C. Hydrant Marker Locations: (See Detail G-650)
1. Blue retro-reflective pavement markers shall be used as a method of identifying fire hydrant locations. Retro-reflective pavement markers shall be 911A-blue, Fire Lite, Amerace Corporation, Signal Products Division or equal.
2. Two-Way Streets or Roads - Markers should be placed 6 inches from edge of painted centerline on the side nearest the fire hydrant. If the street has no centerline, the marker should be placed 6 inches from the approximate center of the roadway on the side nearest the hydrant.
3. Streets with Left Turn Lane at Intersection - Markers should be placed 6 inches from edge of painted white channelizing line on the side nearest the hydrant.
4. Streets with Continuous Two-Way Turn Lane - Markers should be placed 6 inches from the edge of the painted yellow barrier line on the side nearest the fire hydrant.
5. Freeways and Expressways - Because of higher maintenance at these locations if placed on the roadway, markers should be placed on shoulder 1 foot to the right of the painted edge line opposite the off-right-of-way fire hydrant location.

6. Private drives in apartments, condos, etc., same as in paragraph 6.22.C.2., above.
7. On cul-de-sacs, marker shall be placed off the center monument of the cul-de-sac in the direction of the hydrant.

6.23 Valves:

A. Materials and Details:
1. All gate valves shall be resilient seated, solid wedge gate and shall open left. The following are the only acceptable manufacturers of valves to be used on public water mains: Clow, Mueller, Kennedy and Waterous.
2. Butterfly valves shall not be permitted on mains less than 18-inch diameter. On 18-inch diameter and larger pipe the written approval of the City Engineer is required. Manholes are to be installed at all butterfly valve locations (See Detail G-605).
3. Blocking will be concrete only per MAG Standard Detail 340 and City of Glendale Detail G-601.
4. Valve boxes shall be 8-inch slip joint concrete pipe with 8" lids. Lids shall have the word "water" clearly marked on them (see Detail G-660).

B. Spacing:
1. The maximum spacing of valves in industrial, commercial and multi-family districts shall be 300 feet. In single-family residential, the maximum spacing shall be 500 feet. At every tee and cross in the mainline, a valve shall be placed at each pipe run.
2. One fire hydrant is the preferred number to be out of service and twenty (20) homes shall be the maximum number to be without water per closure.
3. Any main unit that will be extended in the future shall have a valve, along with a 13 feet minimum stub at the end.
4. For distribution lines 12-inches and smaller, one valve shall be placed on each side of major canals, railroads, etc.
5. One gate valve shall be placed between each fire hydrant and the main, except for hydrants on fire lines of 100 feet or more, then a second gate valve is required 20 feet from hydrant. (See Details G-660 and G-661.)

C. Location:
1. In arterials, a valve shall be located in line with curb returns at the intersections. In mid-block they shall be in line with property line extensions. In local streets, the valves shall be located within 3 feet of the tee or cross (see Detail G-607).
2. Valves for fire hydrant connections shall be flanged to the tee, except when a second valve is required, then it shall be 20 feet from the hydrant.

D. Operation:
1. All valves that control the City's energized water lines shall only be operated by a Valve System Operator from the City's Utilities Department.
2. City personnel of the Utilities Department will be responsible for opening and closing of all existing water valves where a contractor must tie into an existing water main stub that does not have a valve.

3. Only City personnel from the Utilities Department shall turn on the water that lies between the new system and the existing system for the purposes of chlorinating the water lines, flushing lines and pressure testing water lines.
4. Only City personnel from the Utilities Department shall operate valves that control the Water System Zone Split. These valves are normally designated by a welded "AZ" on the valve cover with a debris cap inside the valve box.

6.24 Water Services:

A. The developer shall install all 1-inch, 1-1/2-inch and 2-inch water services in new subdivisions. (See Details G-642 and G-643). The minimum service size shall be 1 inch.
B. The developer shall install all water meter boxes per City requirements.
C. The developer is responsible for application and payment of all applicable fees.
D. Water services installed outside of public right-of-way shall be contained within a dedicated easement.
E. Water meters shall not be located in parking lots, service driveways, residential driveways, or in areas of concrete or asphalt paving.
F. If 1-inch water meter services are located incorrectly by the developer and must be moved to avoid conflicts, the City will relocate services a maximum of 13 feet. Water services 1-½" and 2" will be relocated by the Contractor and inspected by the Utilities Department prior to backfill. If the service needs to be relocated farther than the above distance, a new service will be required and installed by the developer. The developer will be required to apply for a right-of-way permit and will be responsible for shutting off the abandoned service at the main (corporation stop) and severing the old service line. If the abandoned service has a steel strap saddle it will need to be removed and a full circle leak clamp will be installed. Both services shall be noted on "as-built" plans. All new services, relocations, and meter installations will be done only after the developer has paid the prevailing fees.
G. The size of the meter will be the same size as the service line, and there will be one meter per service line. A 3" meter shall require a 4" tap and a 4x3 reducer placed in a vault (See Details 674 and 676).
H. Meters will not be fenced in or enclosed and must be accessible at all times. If a meter is to be installed in a landscaped area, the meter service will be installed so that any runoff will flow away from the meter installation.
I. The use of alternative material for backfilling any trench with an exposed water service line shall require the installation of a PVC conduit around the service line prior to backfilling. The size of the conduit will be two (2) times greater than the service line diameter. If Controlled Low Strength Material (CLSM) is used, then the water service shall be backfilled in ABC to within 1 foot above service.
J. Cooling towers in excess of 250-tons capacity are required to be individually metered and must be designed to implement water recirculation.

K. Only soft K copper is to be used on water services. Brass compression fittings only shall be used when joining pipe and/or relocating water services. Sweated joints will not be allowed in the City right of way. Only double strap brass saddles are to be used.

6.25 Water Meters:

A. All water meters shall be sized and designed in accordance with the requirements of the Uniform Plumbing Code.

B. All water meters shall be installed in accordance with the acceptable practice and the MAG Specifications Section 631 shall be used as an acceptable guideline.

C. Water meters 3-inches and larger shall be installed in accordance with Details G-674 or G-676. Alternative water meter boxes will be considered.

D. The water meter to be used shall satisfy the following requirements:

1. Nutating Disc - Single and multi-family residential
2. Compound - Generally residential, this unit is designed for use where most of the flow is low, some intermittent and no more than occasionally high.
3. Turbo - This shall be used where a wide variety of flows can be expected but most are at the high end.
4. Propeller - This shall be used where low flows never occur, the flows shall be consistent within a limited range.

6.26 Taps:

A. Wet Taps - Tapping sleeves will not be installed on Machined Over All ACP.

1. The contractor shall make all wet taps into the City's energized water system. No tap shall be made without a City Utilities Department representative present. No tap shall be made until the City inspector has approved installation and testing of the tapping sleeve, valve and thrust block.
2. The developer is responsible for application and payment of all applicable fees prior to taps being made.

B. Dry Taps - The developer shall make all dry taps for 1-inch, 1-½inch, and 2-inch water service connections.

C. A 3-foot minimum separation is required between taps.

6.27 Flow Tests:

A. A permit to conduct a flow test shall be obtained from the Development Services Center on the second floor of City Hall at 5850 West Glendale Avenue.

B. The permittee shall identify, at the time of application, the fire hydrants to be used for the flow test. Fire hydrants may be identified by a hydrant number stamped on or near the operating nut. If there is no number, the hydrant shall be identified by distance to some permanent landmark such as cross streets, driveways, alleys, etc.

C. A water flow permit shall be valid for ONE flow test only. Should additional tests be required, an additional permit and fee will be required for EACH TEST.

D. Each flow test shall be observed by a Construction Engineering inspector. Instructions for scheduling an inspector are on the back of the permit. Twenty-four hour notice is required.

E. The inspector will observe only, and will NOT participate in any way in the test. The permittee is responsible for providing the required number of staff to conduct the test.

F. The inspector shall be provided with the results of the test.

G. The permittee shall include the water flow permit number on all plans, or communications that reference the water flow results. Failure to do so will delay processing.

6.28 Backflow Prevention: An approved backflow prevention method shall be used at every service connection to a customer's water system when the city determines that the city's potable water system may be subject to contamination, pollution or other deterioration in sanitary quality by conditions within the customer's water system.

A. The following types of backflow prevention methods are recognized in the City. For detailed descriptions of each type, see Section 33-89 of the Code of the City of Glendale.

1. Air Gap (AG)
2. Reduced Pressure (RP)
3. Double Check Valve (DC)
4. Pressure Vacuum Breaker (PVB)

B. A complete list of specific activities requiring backflow prevention is provided in section 33-90 of the Code of the City of Glendale. Questions on the requirement for a backflow prevention system should be directed to the City's Building Safety Department.

6.3 ZONE SPLITS

6.31 General: The City's water distribution system is divided into various pressure zones (see Detail G-600). Each zone operates as an independent water distribution system, and cross connections between zones are prohibited.

6.32 Valving: At selected locations between the zones special valves have been installed. Operation of these valves shall be by City Valve Systems Operator from the Utilities Department.

6.33 Special Requirements for Developments Bordering Zone Splits: In those situations wherein a proposed development borders on the zone split boundary, the developer shall install a redundant main on the development side of the zone split boundary in order to insure that the subject development has a closed loop distribution system. A redundant parallel main shall be required to close the loop within the development and shall be

extended as necessary to connect to other distribution mains within the zone. All plans for water distribution mains adjacent to these zone split boundaries shall be reviewed and approved by the City.

6.4 CONSTRUCTION

6.41 Pressure testing of new mains shall be by the contractor per MAG Specifications, except fire sprinkler lines. Fire sprinkler lines shall be tested per C.O.G. Fire Marshall's Office and Glendale Fire Code and Amendments as adopted by the City. Forty-eight hour notification is required for testing. A Glendale Fire Department underground fire line permit required.

6.42 Chlorination and flushing of new mains shall be performed by the contractor per MAG Specifications. Samples will be taken and tested by the City.

6.43 The developer is responsible for protecting construction survey stakes and property corner monuments for use by the City.

6.44 Existing Water System Facility Impacts:

A. Water Service Lowering and Extensions; Relocation of Meters; and Sewer Lateral Adjustment:
   1. Contractor, using qualified plumber, shall do all work including meter disconnects and reconnects.
   2. Service material to be copper and service to be placed "below subgrade."
   3. Contractor's representative to handle water customer notification.

B. Fire Hydrant Set-Backs and Water Main Relocations to Eliminate Conflicts: Work to be done by contractor. Only City Valve Systems Operator shall operate valves, and chlorination and testing requirements shall apply to this type of work.

C. Switchovers and Abandonments: Work will be done by Contractor after authorization by City Utilities Department.

6.5 PLAN PREPARATION: Plans shall be prepared per the standards in Chapter 2, Construction Plan Preparation.

7.0 SEWER MAIN DESIGN AND CONSTRUCTION

7.1 GENERAL INFORMATION

7.11 Sewerage System:

A. All developments are required to connect to the City's sewerage system. On-site disposal systems are not allowed. Exceptions are made only with the written approval of the City Engineer.

B. The City's sewerage system includes various classifications of sewer lines which are determined by use. A "building sewer" is a pipe conveying sewage from the plumbing system of a single building to a "lateral sewer." A "lateral sewer" collects discharges from individual buildings to a "branch sewer" and has no tributary lines other than building sewers. "Branch sewers" convey discharges to larger "main (also called 'trunk') sewers" which in turn convey flows from large areas to treatment facilities.

C. All developments shall provide for all categories of sewer lines required to provide sewer service for not only the individual development but for the ultimate service area, as deemed necessary by the City Engineer.

D. Sewer lines shall be sized to accommodate their ultimate service area. The minimum size line for the public mains is 8-inch diameter.

E. Public sewage lift stations are discouraged and are allowed only under unusual circumstances with the approval of the City Engineer. When a lift station is the only means of the property being sewered, the developer is responsible for building the lift station, bonding for twenty (20) years of operation and maintenance of the lift station and replacing the station after that initial twenty (20) year period.

F. A sewerage feasibility report shall be required to determine that the current line has the capacity for connection that the minimum slopes will allow for the installation of services.

G. All lateral sewers shall be a minimum of 8-inch diameter. Larger mains may be required dependent upon the maximum flows anticipated with full development of the ultimate service area. The following data may be used as a general guide for planning purposes. Additional engineering studies may be required in individual cases to verify validity of these general capacities:

1. A maximum of 120 acres of combined commercial and residential property may drain into any 8-inch line.
2. A maximum of 250 acres of combined commercial and residential property may drain into any 10-inch line. A 10-inch line may be used between 120 and 250 acres.
3. A maximum of one square mile may drain into a 12-inch line with the written approval of the City Engineer. A 12-inch line may be used for between 250 and 640 acres.

H. ADHS Bulletin 11 shall apply to all City sewer lines.

I. Public sewer mains at less than minimum slopes are not allowed unless approved by the City Engineer. A 20-year maintenance fee shall be paid by the developer as part of the development fees and put into the Utilities Wastewater Collection Fund.

7.2 WASTE CONTROL

7.21 All developments shall provide for waste control per the following standards:

A. Single-family developments (Swimming Pools):

1. Swimming pool waste water shall be allowed to be pumped to the sanitary sewer through an indirect drain. Maximum pumping rate shall not exceed one half of the calculated capacity of the receiving sanitary sewer nor 100 gallons per minute.
2. Indirect drain connections shall be designed, located and constructed to exclude surface or underground water from the sanitary sewer.
3. The indirect drain connection shall provide an air gap, equal to two times the diameter of the waste water discharge pipe, between the lowest opening of the waste water discharge pipe and the flood level rim of the receiving plumbing fixture.
4. Swimming pools having a pressure or gravity sand type filter shall be allowed to connect to the sanitary sewer only through an indirect drain.
5. Swimming pools having a diatomaceous earth type filter shall be allowed to connect to the sanitary sewer through an indirect drain, only if the diatomaceous earth type filter is equipped with a diatomaceous earth separation tank on the backwash waste water line. All diatomaceous earth or other type filter aids shall be removed from the backwash water before the backwash water may be discharged to the sanitary sewer.

B. Multi-family developments:

1. Swimming pool connections:

a. Swimming pool waste water shall be allowed to be pumped to the sanitary sewer through an indirect drain. Maximum pumping rate shall not exceed one half of the calculated capacity of the receiving sanitary sewer nor 100 gallons per minute.
b. Indirect drain connections shall be designed, located and constructed to exclude surface or underground water from the sanitary sewer.
c. The indirect drain connection shall provide an air gap, equal to two times the diameter of the waste water discharge pipe, between the lowest opening of the waste water discharge pipe and the flood level rim of the receiving plumbing fixture.
d. Swimming pools having a pressure or gravity sand type filter shall be allowed to connect to the sanitary sewer only through an indirect drain.
e. Swimming pools having a diatomaceous earth type filter shall be allowed to connect to the sanitary sewer through an indirect drain, only if the diatomaceous earth type filter is equipped with a

diatomaceous earth separation tank on the backwash waste water line. All diatomaceous earth or other type filter aids shall be removed from the backwash water before the backwash water may be discharged to the sanitary sewer.

2. Laundry room facilities:
   a. Laundry rooms with ten or more washing machines shall be equipped with a 350 gallon lint interceptor, Smith Pre-Cast or approved equal. See Detail G-710.
   b. No wastes other than those requiring treatment or separation shall be discharged into the lint interceptor.
   c. Each interceptor shall be properly vented and shall have a clean out on the discharge pipeline.
   d. For outside installations, the interceptor shall be elevated three (3) inches above existing grade to exclude surface water.
   e. The interceptor shall be located as to be readily and easily accessible for cleaning and inspection.

C. Commercial developments:
   1. Interceptors are required:
      a. Grease, oil, or sand interceptors shall be provided for laundries, restaurants, service stations, auto repair shops, car washes and other facilities when the City determines they are necessary for the proper handling of liquid wastes containing grease or oil in excessive amounts of any flammable wastes, sand, and other harmful ingredients. (See Details G-720 and G-725).
      b. All interceptors shall be of a type and capacity approved by the City and shall be located as to be readily and easily accessible for cleaning and inspection.
      c. Grease and oil interceptors shall be constructed of impervious materials capable of withstanding abrupt and extreme changes in temperature. They shall be of substantial construction, watertight, and equipped with easily removable covers. When bolted covers are required, they shall be gas tight and watertight.
      d. Where installed, all grease, oil, and sand interceptors shall be maintained by and at the expense of the owner in continuously efficient operation at all times.
   2. Cross-connections are prohibited: No person shall connect to the City water system any water operated equipment or mechanism, or any water treating chemical or substance, if it is determined by the City that such equipment, mechanism, chemical or substance may cause pollution of the domestic water supply. Such equipment or mechanism may be permitted only when equipped with a backflow prevention assembly approved by the City.

D. Industrial developments:

1. Preliminary treatment facilities: Where necessary, as determined by the City, any user of the sewer system shall provide at their expense, such preliminary treatment as may be necessary to reduce objectionable characteristics or constituents to within the maximum limits provided for in the Glendale City Code, Chapter 33. Plans, specifications, and any other pertinent information relating to proposed preliminary treatment facilities shall be submitted for the approval of the City's Pretreatment Officer. No construction of such facilities shall be commenced until the City's Pretreatment Officer's approval is obtained in writing. The completed facilities shall not be placed in service until they have been inspected for conformance to the approved plans and the final construction approved by the City's Pretreatment Officer. The approval of the plans and inspection of construction shall not relieve the owner from complying with discharge limitations set forth in the Glendale City Code, Chapter 33. The City shall enforce Federal pre-treatment requirements as set forth in the Code of Federal Regulations, Title 40, Part 403.
2. Cross-connections are prohibited: No person shall connect to the City water system any water operated equipment or mechanism, or any water treating chemical or substance, if it is determined by the City that such equipment, mechanism, chemical or substance may cause pollution of the domestic water supply. Such equipment or mechanism may be permitted only when equipped with a backflow prevention assembly approved by the City.
3. Control vaults are required:
    a. When required by the City, the owner of any property served by a building sewer carrying potentially harmful or other industrial wastes shall install an industrial waste control vault in the building sewer to facilitate observation, measurement and sampling of the wastes. Such control vault, when required, shall be accessible and safely located and shall be constructed in accordance with plans approved by the City Engineer. The control vault shall be installed by the owner at his expense and shall be maintained by him so as to be safe and accessible at all times. The sampling vault shall be installed on the owner's property as close to the public right of way as to allow reasonable access for City personnel and yet installed within the limits of the manufacturer's requirements. After the installation is complete the owner shall provide the City's Pretreatment Officer with necessary keys to access the vault. (See Detail G-740).
    b. Where required, vaults will be constructed to the following standards:
        1) All concrete for the floor, walls and top slab of the structure shall conform to MAG Standard Specification Section 725,

Class A, minimum compressive strength at 28 days to be 3,000 psi.

2) All concrete for the grout fillet inside the structure shall conform to MAG Standard Specification Section 725, Class C, minimum compressive strength at 28 days to be 2,000 psi.
3) All steel reinforcement shall be deformed bars, Grade 60, billet steel conforming to ASTM Specification No. A-615, latest edition.
4) Flume size should be based upon minimum and maximum flow rates and velocities to insure free-flow conditions. Maximum flow shall be 70-100% of maximum capacity of selected flume size. A minimum flow depth of 0.5 inches should exist at the minimum actual flow.
5) Flume floor elevation should be high enough, relative to the downstream conditions, to prevent submerged flow (50% submergence is acceptable at maximum flow). Install the flume level with the floor longitudinally and transversely in the converging section.
6) Upstream flow should be wave free, non-turbulent, symmetrical and have a uniform velocity (1 fps minimum to 3 fps maximum) at least 10 times flume throat in length in the approach channel. Bends in the outlet or inlet pipe will not be permitted for a distance of 25 pipe diameters up and down stream.
7) It shall be the owner's responsibility to properly maintain the flume in accordance with the manufacturer's recommendations to insure the accuracy of the measurement.

c. Industries included in, but not necessarily limited to, the following list shall install a control vault in the building sewer:

Adhesives manufacturing
Aluminum forming
Asbestos manufacturing
Battery manufacturing
Carbon black manufacturing
Coil coating
Copper forming
Electrical and electronic components manufacturing
Electroplating
Feedlots
Ferroalloy manufacturing
Fertilizer manufacturing
Foundries (metal molding and casting)
Glass manufacturing
Grain mills
Ink formulating
Inorganic chemicals manufacturing
Iron and steel manufacturing
Laundries
Leather tanning and finishing
Mechanical products manufacturing
Metal finishing
Metal molding and casting (foundries)
Nonferrous metals manufacturing

Paint formulating
Pesticides chemicals manufacturing
Petroleum refining
Pharmaceutical manufacturing
Porcelain enameling
Printing and publishing
Pulp, paper and paperboard manufacturing
Rubber manufacturing
Soap and detergent manufacturing
Steam electric power generating
Sugar processing
Tars and asphalt paving and roofing materials manufacturing
Textile mills
Timber products processing

d. Final interpretation in case of questions on the above will be made by the City's Industrial Waste Officer.

7.3 TECHNICAL DESIGN REQUIREMENTS

7.31 Sewer Lines:

A. Materials and Details:

1. Standard materials and details for collector and service lines, within the rights-of-way, shall be either vitrified clay pipe (V.C.P.) or solid wall, SDR35, polyvinyl chloride (PVC) pipe. Materials and details for sewer mains of 18-inch diameter or larger will be considered individually.
2. Pavement replacement type and compaction type shall be indicated per MAG Standard Details and Specifications on each sheet.
3. Private on-site sewer lines shall be constructed of materials and at slopes as specified in the Uniform Plumbing Code as adopted by the City.

B. Slopes: Slopes shall be sufficient to maintain velocity of 2.5 feet per second in the sewer at the design flow rate. The maximum velocity shall not exceed 9 feet per second. The following table indicates the minimum slopes generally considered necessary to obtain minimum 2.5 feet per second. Exceptions to these slopes and in cases where the minimum slope cannot be met, upsizing to the next pipe size will not be allowed without written approval from the City Engineer.

Minimum Slopes for Sanitary Sewers
(n = 0.013)

Size	Minimum Design Slope
4 in. Building Connection	0.0200 ft. per ft.
6 in. Building Connection	0.0100 ft. per ft.
8 in Sewer Main	0.0053 ft. per ft.
10 in. Sewer Main	0.0039 ft. per ft.
12 in. Sewer Main	0.0031 ft. per ft.
15 in. Sewer Main	0.0016 ft. per ft.
18 in. Sewer Main	0.0012 ft. per ft.

C. Location within the Right-of-way:
   1. Sewer lines shall be offset 6 feet south or west of centerline (except major arterials and arterials).
   2. All sewers shall be parallel to the property lines or centerlines, or as close to parallel as possible.
   3. Minimum horizontal distance from the sewer line to another underground utility shall be 6 feet.
   4. In some cases, public sewers may be authorized outside of public rights-of-way. In these cases, sewers shall be centered within a dedicated easement with a 20-foot minimum width.

D. Cover and Depth:
   1. All laterals shall have a minimum of 4 feet of cover measured from finished ground at the property line or easement line.
   2. All trunks, mains, or branches shall have a sufficient depth to serve the ultimate drainage area with a minimum cover of 6 feet.
   3. When a sewer line crosses an irrigation ditch, at least 4 feet of cover between the flow line of the ditch and the crown of the sewer shall be maintained. If this condition cannot be met, the crossing shall be made according to the directions of the Water Users' Inspectors. Permits shall be acquired in the name of the City.
   4. Where cover is less than 4 feet (due to topography such as canals, washes, etc.) ductile iron pipe (with an epoxy interior coating that is corrosion resistant) shall be used. The ductile iron pipe shall extend 5 feet beyond the limits of the canal, wash, etc.

E. Bedding Requirements: All contractors shall adhere to the following bedding, backfill and compaction requirements for all construction projects within the City of Glendale. Specific sections of MAG are to be replaced with those published herein, in their entirety. All other specification sections of MAG Section 601 shall remain the same:

   a. MAG 601.2.3, Trench Grade: For Capital Improvement Projects that the City of Glendale will perform the surveying, cut sheets shall be furnished the contractor at set intervals and agreed upon offsets. On water main projects, elevation stakes will be furnished only when deemed necessary by the Engineer. In all cases where elevation stakes are furnished, the Engineer will also furnish the Contractor with cut sheets.

      The Contractor shall excavate for and provide for an initial granular bedding at least 4 inches thick or one twelfth (1/12) the O.D. of the pipe, whichever is greater. This bedding material shall be placed at a uniform density to the required compaction and fine graded as specified below. (See Standard Detail G-690.)

Bell or coupling holes shall be dug after the trench bottom has been graded. Such holes shall be of sufficient width to provide ample room for caulking, banding, or bolting. Holes shall be excavated only as necessary to permit accurate work in the making of the joints and to insure that the pipe will rest upon the prepared bottom of the trench and not be supported by any portion of the joint.

Depressions for joints, other than bell-and-spigot, shall be made in accordance with the recommendations of the joint manufacturer for the particular joint used.

b. MAG 601.4.1 Foundation: The material upon which the conduit or structure is to be placed shall be accurately finished to the grade or dimensions shown on the plans or as directed by the Engineer. The bottom portion of the trench shall be shaped so as to conform to the bottom of the conduit or structure, in order to provide continuous contact between the conduit and the material upon which it is being placed. In rock trench, the contractor is to excavate at least six inches below bottom of bell.

c. MAG 601.4.2 - Bedding: Pipes and conduits installed in the City of Glendale easements and rights-of-way shall be bedded from bottom of excavation to one foot above the top of pipe with granular material meeting the requirements of MAG Section 601.4.6. Bedding shall be constructed so as to conform to a Class B, as defined by the American Society of Civil Engineers, Practice No. 60, except that the top of bedding shall extend to one foot above the top of pipe. Pipe bedding shall be required for all pipe having an inside diameter of 8 inches or larger, and shall be required for pipe of any size diameter whenever rock larger than 1-1/2 inch is encountered in the trench bottom.

Bedding shall consist of either granular material containing no pieces larger than 1 inch and free of any deleterious material. Chips or open graded rock will not be permitted without the express written permission of the Engineer.

Water consolidation shall be permitted for bedding material only with the written permission of the Engineer. Bedding material for all sizes of pipe or conduit shall be placed in lifts, with the maximum loose thickness not to exceed 8 inches. In no case shall the depth of the first lift exceed the springline of the pipe. See Detail G-690.

d. MAG 601.4.3 Backfill: Backfill material shall be clean sound earthen material free from broken concrete, broken pavement, wood or other deleterious material. Unless otherwise specified, backfill may be screened native material with no piece larger than four (4) inches, select material or aggregate base course, or a slurry mixture consisting of aggregate base course and not more than one-half sack of cement per cubic yard.

Water consolidation shall not be permitted under any circumstance. Mechanical compaction shall be required except when ABC Slurry is chosen as the backfill material. The maximum uncompacted lift thickness for mechanically compacted backfill shall be one (1) foot for any trench width. Nothing contained in these specifications shall be construed to violate or reduce any trench shoring requirements normally required by O.S.H.A.

The moisture content of backfill materials shall be carefully maintained between the limits of +2 and -4 percent of optimum moisture content as determined by AASHTO T-180 or ASTM D-1557.

e. MAG 601.4.4 Compaction Densities: Unless otherwise noted , the backfill compaction densities listed below, shall be determined using the Modified Proctor Method, ASTM D-1557.

MINIMUM DENSITY REQUIRED				
Back-fill Type	Location	From Surface to 2' below Surface	From 2' below Surface to 1' above Top of Pipe	From 1' above Top of Pipe to bottom of Trench
I	Under any existing or proposed pavement, curb, gutter, sidewalk, or such construction included in the contract, or when any part of the trench excavation is within 2' of the above.	90% Modified Proctor	90% Modified Proctor	95% Standard Proctor
II	On any utility easement street or alley right-of-way outside limits of (I).	90% Modified	90% Modified	95% Standard
III	Around any structures or exposed utilities	90% in all cases Modified		

f. MAG 601.4.5 Compaction Methods: Water consolidation for backfill will not be permitted within the City of Glendale. The backfill compaction shall be accomplished by mechanical methods using equipment such as rollers, pneumatic tamps, hydro hammers, or other approved devices which secure uniform and required density without injury to the pipe or related structures.

F. Intersecting Lines:
1. Lateral sewers may have a maximum of 12-inch drop (flow line to flow line) without a drop connection.
2. When the size of pipe changes, the spring lines or crowns shall match.
3. Manholes with the through line having a change of direction of more than 30 degrees shall have a minimum 0.10 foot drop through the manhole.
4. Manholes with a line intersecting the through line: the intersecting line invert shall be 0.10 foot above the flow line of the through line. The lines shall intersect at no more than a 90 degree angle.

G. Curved Sewers:
1. Curved sewers shall have a minimum 300 feet radius.
2. Only 8-inch and larger mains shall be curved and only with written approval of the City.

H. Tie-in to Existing System: Construction plans shall call for contractor to tie-in new work to the existing, active system only after completion of the new work and specific approval of the Construction Engineering to make the tie-in. An additional manhole may be required when tie-in to an existing line with odor problems.

7.32 Manholes:

A. Materials and Details: All manholes shall be 5 feet in diameter and per MAG Standard Details and Specifications. Manhole frames and covers shall be Class 35 and their weights and dimensions shall be in accordance with details shown in MAG Standard Detail 424. Manholes constructed within the City will not contain built-in steps. The interior of all manholes shall be coated with Sewer Shield 100, T-Loc lined, or other approved corrosion resistant coating or lining.

B. Spacing:
1. Manholes are required at all changes in grade, all changes in alignment, and at every P.C. or PT.
2. Maximum manhole spacing shall be:
a. 400 feet for 8-inch or 10-inch sewers
b. 500 feet for 12-inch to 21-inch sewers
c. no more than 600 feet, or as specified by the City Engineer, for 24-inch or larger sewers.

3. Cleanouts are not allowed in the City of Glendale. If there are services between the last manhole and the end of the line, a manhole shall be required at the end of the line.
4. Manholes on boundaries of the subdivision or improvement district shall have stubs with shaped inverts in appropriate directions for future connections.
5. A sewer manhole shall be required at the upstream end of a cul-de-sac. All manholes shall be located in such a manner as to provide easy access for the City's combination jetter and vacuum trucks.

7.33 Taps:

A. Materials and Details:

1. New sewer taps shall be per MAG Standard Details 440 and 441.
2. The maximum number of taps into manholes shall be three (3) into a manhole in a cul-de-sac and two (2) into a manhole in all other situations. However, no tap is allowed into a manhole against incoming flow through the manhole.
3. A 3-foot minimum separation between service taps is required.
4. All taps shall be stationed using the closest downstream manhole as Station 0 + 00.
5. All taps, when installed, may be perpendicular to the lateral or at an angle with the flow. Taps may also be at an angle if located into a manhole.
6. No taps will be made directly into 12-inch or larger sewers. Such taps must be into an existing manhole or the developer shall install a new manhole at his expense.
7. Plans shall be reviewed by the Design Engineer for backflow prevention valves which are required where finish floor elevations are below both upstream and downstream manhole rim elevations. When a backflow prevention valve is required, the owner of the property will be responsible for maintaining the backflow valve.
8. The owner will be responsible for the sewer service line from the main to service facility.
9. No sewer taps will be allowed between the sewer trunk and the odor control manhole.
10. An odor control device may be required when tapping in to an existing line with odor problems. The odor device shall be installed and maintained by the owner of the property.

B. Sizes:

1. Tap sizes for single family residential developments shall be 4-inch. A 4-inch diameter tap shall be provided for each platted lot.
2. Commercial lots with buildings shall have 6-inch minimum taps and provide service adequate for discharge. Commercial lots without buildings shall have no taps unless requested by owners, then only 6-inch minimum taps or larger shall be allowed.

3. Multi-family developments shall have a minimum 6-inch tap.
4. All taps larger than 6-inch require the installation of a manhole.

C. Location:
1. Taps shall be located as shown on Detail G-643.
2. Proposed tap locations shall be shown on all plans and shall be changed in the field by the City only.

D. Taps:
All taps, whether into a line or into a manhole, will be performed by a licensed contractor at the expense of the developer. Prior to all taps, the contractor will contact the city's Utilities Wastewater Collection Division for inspection services at 930-2700 not less than 24-hours prior to tapping.

7.4 CONSTRUCTION DETAILS:

All construction shall be per MAG Standard Details and Specifications subject to City of Glendale modifications.

7.5 TELEVISED INSPECTION

All newly installed sewer shall be inspected by closed circuit television methods acceptable to the City. Any defects discovered during televised inspection shall be corrected at no cost to the City. After correction of defects has been completed, affected sewer sections shall be re-televised, at no cost to the City. Video tapes or CDs of all televised inspections shall be provided to the City prior to final acceptance of the sewers.

7.6 PLANS PREPARATION

Plans shall be prepared according to the standards in Chapter 2, Construction Plan Preparation.

8.0 "AS-BUILT" REQUIREMENTS

NOTICE: RIGHT-OF-WAY CONSTRUCTION RELEASES AND BUILDING CERTIFICATES OF OCCUPANCY WILL NOT BE RELEASED NOR ANY TYPE OF CONSTRUCTION ACCEPTED UNTIL CERTIFIED "AS-BUILT" PLANS HAVE BEEN SUBMITTED TO AND APPROVED BY THE CITY.

8.1 SUBMITTALS

8.11 As-builts: "As-Built" plans shall be submitted in a digital file, "TIF" format and on a reproducible mylar (size 24" x 36", 4 mil. thickness) and be of a quality allowing microfilming. No vellum or paper copies will be accepted. Additionally all plats shall be submitted in a digital file "DWG" and "TIF" format and on a reproducible mylar.

8.12 Certification: An "As-built Certification" statement on the cover sheet of the "as-built" plans shall be signed and sealed by a Registered Professional Engineer or a Registered Land Surveyor. An "As-built Certification" statement is shown per Detail G-202.

8.2 MINIMUM TECHNICAL REQUIREMENTS

8.21 Paving Plans:

A. Station for all grade breaks.
B. Back of curb offset dimension at all changes in alignment.
C. Top of curb, gutter and pavement centerline elevations at all grade breaks, curb returns, valley gutters, plus any other location necessary to adequately show drainage.
D. Survey monuments - installation and accuracy certification.

8.22 Irrigation and Storm Drain Plans:

A. Street centerline station and offset dimension to the main at all changes in alignment and/or changes in grade.
B. Street centerline station and offset dimension to all structures and changes in alignment.
C. Top and invert elevations for all structures.

8.23 Grading and Drainage Plans:

A. Elevations at all drainage control points (i.e. retention overflow point, tops and bottoms retention basins, drywell rim, valley gutters, curbs).
B. Dimensions of all retention areas.
C. Retention calculations revised to as-built condition.
D. First floor or pad elevations.
E. Location of all structures (i.e. buildings).

8.24 Water Plans:

A. Street centerline station and offset dimension to:
   1. All fire hydrants and fittings (i.e. valves).
   2. Main at all changes in alignment.
   3. All horizontal control points (i.e. centerline intersects, PC, PT).

B. Station and elevations given at all vertical alignment changes.

C. Centerline station and offset to each service tap; size of tap and dimension to nearest side property line. (Note! At least 50% of the front property corners must be visible to verify information for approval.)

D. Note centerline station, offset and elevations to all changes in vertical alignment (i.e. dips, bends, etc. required to avoid conflicts with other utilities).

E. The water pipe material that was actually installed shall be shown on as-built plan and/or plan and profile sheets. Pipe material information shall also be shown on the cover sheet adjacent to material quantity lists.

8.25 Sewer Plans:

A. Street centerline station and offset dimension from street centerline to main at manholes and all changes in alignment.

B. Sewer line station at centerline of each manhole.

C. Rim and invert elevation for each manhole.

D. Calculated slope between manholes.

E. All taps shall be stationed using the closest downstream manhole as station 0+00 for taps at 90^{o} to main; if not installed 90^{o} to main, station and offset to end of each service tap. (Note! At least 50% of front property corners must be visible to verify information for approval).

F. All taps into manhole shall be dimensioned from a property line.

G. The sewer pipe material that was actually installed shall be shown on all plan and/or plan and profile sheets. Pipe material information shall also be shown on the cover sheet adjacent to material quantity lists.

8.26 **As-Built Records: The City of Glendale assumes no responsibility for the accuracy of as-built information provided as a public record**

9.0 SITE DEVELOPMENT - DESIGN AND CONSTRUCTION

9.1 GENERAL INFORMATION: All new developments shall provide for vehicle parking, refuse collection, Fire Department access, landscaping, waste control, on-site private water and sewer systems, and on-site storm water retention per the following standards:

9.2 REFUSE COLLECTION STATIONS - DESIGN AND CONSTRUCTION:

9.21 The City provides a wide variety of sanitation services for commercial business. The City requires that all refuse be collected and disposed of a minimum of twice a week. Private contractors are also permitted to service businesses within the City of Glendale, but must have a valid City permit to operate in Glendale. For information on schedules and collection fees, contact the Sanitation Division at 623-930-2660.

9.22 All service and construction of enclosures will be in accordance with Maricopa County Health codes. Health codes can be obtained by calling the Maricopa County Health Department. All container stations shall be constructed according the standards herein and shall be designed to accommodate front-loading sanitation collection vehicles.

9.23 All developments shall provide areas for refuse containers per the following standards:

A. Single-family subdivisions: Refuse shall be placed at the curb in approved containers provided by the developer and acquired through the City. Arrangements will be made for distribution of Rules and Regulations to citizens concerning container usage.

B. Multi-family developments:

1. Sanitation collection services will be provided by the City of Glendale. Refuse containers two (2), three (3), four (4), six (6), and (8) cubic yards will be provided by the City.
2. The developer shall construct a concrete pad for each required container or for each pair of containers. The concrete pad shall be 12-feet wide x 10-feet deep x 4-inches thick for a single container; 24-feet wide x 10-feet deep x 4-inches thick for a double container station and 36-feet wide x 10-feet deep x 4-inches thick for a triple container station. Measurements are all inside measurements. All stations will include an approach slab of 6-inch thick reinforced concrete extending 6 feet out from the front edge of the station.
3. The container station shall be located immediately adjacent to an interior driveway or private street improved to City standards. The City will not be responsible for repairing any damage to the pavement within the development during normal collection activities. The concrete pad shall be at an elevation matching the adjacent pavement and graded to provide positive drainage.

4. All multiple container enclosures shall be constructed on the same side of the driveway or private street so the collection truck may be routed through the site in one direction only. All side by side trash enclosures are to have horizontal fronts, not staggered fronts.
5. The driveway or private street, along which the container station is located, shall provide access through the site or a turn around with a turning radius of 55 feet (minimum) if it is a dead end.
6. Container stations shall be free of all obstructions, front, back, adjacent to and overhead, for a distance of 30 feet (in backing of truck a minimum of 60 feet.
7. Container stations may be enclosed (dimensions given in 2, are inside measurements) and shall be enclosed if visible from a public street. Gates shall be the same height as the enclosure walls. However, if gates are constructed for the front of the station, it shall be the owner's responsibility to insure that the gates are open when the City's collection truck arrives or the collection will not be made. Gates are to have cane bolts installed which in an open position lock at or past 90 degrees.

C. Business/Industrial Developments:
1. Refuse containers and compactors may be provided by the City. Size of the container and frequency of collection will be determined by the City in cooperation with the customer.
2. Sizes and facilities:
   a. There are five (5) different sized front loading containers available:
      1) two (2) cubic yard
      2) three (3) cubic yard
      3) four (4) cubic yard
      4) six (6) cubic yard (not available with casters)
      5) eight (8) cubic yard (not available with casters)
   b. The developer shall construct a concrete pad for each required container. The concrete pad shall be 12-feet wide x 10-feet deep x 4-inches thick for a single container; 24-feet wide x 10-feet deep x 4-inches thick for a double container station; and 36-feet wide x 10-feet deep x 4-inches thick for a triple container station; with 6-foot wall around outside of pad. Measurements are all inside measurements. A reinforced concrete approach pad of 6-inch thickness, extending 6 feet from the front of the station shall be provided across the entire frontage of the station.
   c. Restaurants only: Size of concrete pad for single enclosure will be increased to 20-feet wide x 12-feet deep x 4-inches thick if other items such as grease cans, soft drink cylinders or plastic trays will be placed inside enclosures with refuse containers.
   d. Location of enclosure/concrete pad. All container stations shall be located on the same side of the driveway or private street at an angle of 20 to 90 degrees to centerline to accommodate front loading

sanitation vehicles, so that collection truck may be routed through the site in one direction only. Facilities which are visible from any public street shall be walled and gated as specified in paragraph 9.23.B.7. above.

1) Containers will not be at a dead end street unless there is a turning radius of 55 feet.
2) Container stations shall be free of all obstructions, front, back adjacent to and overhead, for a distance of 30 feet.
3) The twenty, thirty and forty cubic yard containers shall be located such that the containers may be rolled on/off the transport truck. This requires a pad area (as shown on Detail G-936) 15 ft. wide x 28 ft. deep x 6 in. thick parallel with the driveway, with adequate area in the front for the transport truck to maneuver.

9.3 PARKING AND STORAGE YARD FACILITIES - DESIGN AND CONSTRUCTION

9.31 All developments shall provide for on-site vehicular parking according to the following standards.

9.32 Number of parking spaces required for each development shall be in accordance with the City's Zoning Ordinance.

9.33 Parking space and driveway dimensions (see Detail G-450):

A. All parking spaces shall be 10 ft. x 20 ft. for 90 degree angle parking (minimum). Of this, a minimum of 10-feet x 18.5-feet shall be pavement, except handicapped spaces (see Section 9.34.B.). For 60 degree angle parking or less, 9' wide stalls are acceptable.

B. All parking areas (except single-family residential) shall provide adequate area to maneuver in and out of parking spaces on-site without vehicle backing into or across public right-of-way, including alleys. The minimum driveway width for 90^{o} angle parking is 23 feet. Driveway width for other angles of parking vary, but 20-foot width is the minimum allowed where Fire Department access is required.

C. The front of a parking space is allowed to overhang 1.5 feet (maximum) onto on-site landscaped areas or on-site sidewalk if bumper curbs are provided. If the parking space overhangs an on-site sidewalk, the sidewalk shall be wide enough to maintain a 4-foot (minimum) clear walkway. Parking spaces shall not encroach into public right-of-way or roadway easements.

D. Parking spaces adjacent to walls shall be configured with sufficient space that vehicles cannot make contact with the wall.

9.34 Handicapped Parking Facilities: Federal and State legislation has created the "Americans With Disabilities Act" (ADA) which establishes strict requirements for

handicapped person accessibility. Where the provisions of this Chapter and Federal or State laws differ, the more stringent requirements will apply.

A. Number of spaces required:

1. Multi-family residential: The currently adopted edition of the Uniform Building Code establishes the number of handicapped accessible units required based on the total number of dwelling units in the development. The development shall provide one (minimum) handicapped parking space for each required handicap living unit. These parking spaces shall be located as near, in proximity, as possible to the living unit to which they are assigned.
2. Commercial/Industrial: All new developments shall provide for handicap parking spaces in the minimum quantities provided in the following chart:

Total number of parking spaces required in the lot.			Required minimum number of handicapped parking spaces.
1	to	25	1
26	to	50	2
51	to	75	3
76	to	100	4
101	to	150	5
151	to	200	6
201	to	300	7
301	to	400	8
401	to	500	9
500	to	1,000	2 percent of total spaces
Over 1,000			20 plus 1 for each 100 spaces over 1,000

3. These parking spaces shall be located so as to provide the most convenient access to the proposed facilities.

B. Space Dimensions (see Detail G-450): The minimum required depth shall be 20 feet. As a minimum, each handicapped space shall consist of a space 8 feet wide with a stripped adjacent access lane of 5-foot width. A.D.A. standards require that one in every eight (8) spaces, but not less than one, shall be "van accessible" which consists of an 8-ft parking space with an adjacent, striped, 8-foot wide access lane or an 11-foot parking space with an adjacent, striped, 5-foot wide access lane.

C. Marking Handicapped Spaces: Each such parking space for physically disabled persons shall be painted with a wheelchair symbol, an access aisle and posted

with a permanent sign located not less than three (3) feet nor more than six (6) feet above the grade and of a color and design approved by the State Department of Transportation bearing the internationally accepted wheelchair symbol, the caption "RESERVED PARKING" and C.O.G. Sec. 26-3. Van accessible spaces must have a "VAN ACCESSIBLE" sign below the normal handicapped sign.

D. Handicapped Access Ramps: All parking areas shall provide access ramps for the handicapped. Slopes of ramps will be the least possible and in no case shall any ramp be steeper than one vertical to twelve horizontal (1:12). The minimum clear width of any ramp shall be 36 inches.

9.35 Parking lots surfacing:

A. Multi-family residential:

1. All parking areas shall be constructed to a minimum thickness of either 5 inches of Portland Cement Concrete (P.C.C.) on compacted native, or 3 inches of asphaltic concrete over a minimum of 6 inches of aggregate base.
2. Where public utilities (i.e. water main) are located within the parking area, the 5 inch P.C.C. surface is not allowed, unless written approval is given by the City.

B. Commercial/Industrial:

1. All parking areas shall be constructed to a minimum thickness of either 5 inches of P.C.C., or 3 inches of asphaltic concrete over 6 inches of aggregate base.
2. Where public utilities (i.e. water main) are located within the parking area, the 5-inch P.C.C. surface is not allowed, unless written approval is given by the City.
3. Areas of minimal vehicular activity, such as storage yards, may be surfaced with 2" of washed, crushed granite (2 inch nominal size) over an aggregate base capable of supporting the City's Fire Department equipment (16 tons minimum). Design to be submitted for approval. Areas surfaced in this manner shall be maintained smooth and weed and dust free by the owner.

C. Parking lot drainage:

1. Slopes: 0.5% minimum - 12% maximum.
2. Valley gutters: A 3-foot wide concrete valley gutter is required if the drainage slope is less than 1.0%.

9.36 Parking lot curbing:

A. Multi-family residential, commercial, and industrial:

1. A 6-inch x 18-inch concrete curb with 6 inches exposed above finished grade (MAG Standard Detail 222) is required along the edge of driveways

and between parking areas and public right-of-way. Other barriers, such as concrete block screen walls, may be constructed in lieu of this curb, if they provide a substantial barrier and are approved by the City. Landscaped earthen berms do not meet this requirement.

2. Barriers to prohibit vehicular movement are required along side and rear property lines, not adjacent to public right-of-way. The minimum approved barriers are 6-inch high pre-cast concrete bumper curbs fixed in place with iron pins, or 6-inch high continuous extruded concrete curb. The owner shall maintain these curbs in place and replace when damaged.

9.4 FIRE DEPARTMENT ACCESS

9.41 General Information: All developments shall provide access for Fire Department vehicles and personnel per the following standards. The Fire Department has the right of final approval and may revise these standards as individual situations require.

9.42 Driveway width and turning radii:

A. A 20-foot (minimum) wide driveway is required for fire truck access.

B. Turning radii per Detail G-954 is required at all entrances and interior driveway intersections where access is required.

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9.43 Building Access:

A. Buildings shall be located so that Fire Department trucks may be parked within 150 feet of the farthest point on the ground floor of the building. This 150-foot dimension is measured along the route a person would follow from the truck to a given point on the building.

B. For buildings that cannot meet the 150-foot access requirement, a fire sprinkler system shall be installed throughout. Specifications for the sprinkler system vary with the type of development. It is the developer's responsibility to contact the Fire Marshall's Office to determine the specific requirements for the development.

C. Retention areas shall not be considered as part of the required access.

D. Provide a minimum of 13'-6" vertical clearance.

E. There shall be a minimum 10-foot setback from fire lanes.

F. Any roadway intended for Fire Department access shall not have a grade greater than 8%.

G. No parking signs shall be posted for fire lanes as directed by the Fire Department (see Detail G-434).

H. The Fire Department will allow speed bumps in fire lanes a maximum of 4 inches in height and a minimum of 18 inches width with a continuous slope to the existing grade.

9.5 LANDSCAPING

9.51 General Information: All developments shall provide for on-site and right-of-way landscaping per the Landscape Ordinance and in accordance with the specifications contained in Chapter 10 of these Standards.

9.52 The Landscape Ordinance: The provisions of the City's Landscape Ordinance and the Zoning Ordinance shall apply to all new developments or construction, all building remodeling, alterations, additions, or expansions; and to all changes of occupancy in the use or development of land which requires the approval of a development site plan or subdivision plat by the City of Glendale. Agricultural uses and single-family and two-family residences and their accessories shall be exempt from the requirements of these ordinances.

9.53 Sight Distances: Sight distance requirements pertaining to landscaping will be found in Details G-447 and G-448. Additional discussion on sight distance requirements can be found in paragraph 4.32.

10.0 LANDSCAPING AND IRRIGATION

10.1 IRRIGATION SYSTEMS

10.11 All irrigation systems installed in the City shall conform to the following:

A. A flood irrigation system may be used for flat level areas, if available. A sprinkler irrigation system must be used for all areas not covered by flood irrigation which will be developed as turf.

B. The City will review and approve all irrigation systems prior to any installation. All sprinkler systems shall be automatic, and shall utilize a pressure type vacuum breaker assembly or a reduced pressure principle backflow prevention assembly (as required) before the remote control valves. 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; the brand and model number of the electric controller; the brand, model and size of the backflow prevention assembly, and all pertinent data on such miscellaneous items as valve boxes and covers, size and type of pipe, all necessary details and friction pressure loss calculations for the longest run in the system for both full-circle and part-circle circuits. All subdivisions, industrial parks and large scale development projects shall provide an irrigation key map identifying the location of all controllers and the location, addresses and sizes of all water meters. All applicable codes shall be adhered to and plumbing and electrical permits will be required. Irrigation systems installed in conjunction with commercial entities, Home Owner's Associations, City of Glendale Right-of-Way and City of Glendale Parks are to have separate systems, clocks, meters (water and electric), vacuum breakers, etc. (stand alone systems). The irrigation plans shall also clearly state the areas that are maintained by the City and maintained by the Home Owner's Association.

C. Excavation, Backfilling and Compaction: Trenches for sprinkler lines and control wiring shall be excavated to a minimum depth of 18 inches for mains under constant pressure and 12 inches for laterals not under constant pressure. When in common trenches, all control wires shall be placed first, followed by a layer of fine backfill; then the main line followed by a minimum of 6 inches fine backfill; then the laterals, and final backfill and compaction, all in accordance with Section 601 of the Maricopa Association of Governments' Specifications.

D. Existing Utilities, Structures and Trees: The developer shall protect existing structures, utility services and trees and be responsible for their replacement. The location of existing trees and the requirements for performing work around them shall be shown on all irrigation plans. Minor adjustments to the system will be permitted to clear existing obstructions subject to the approval of the City.

E. Materials: Once the plans have been approved by the City, no substitutions shall be allowed, except when unavailable from the supplier, and another approved product is locally available. All such substitutions must be approved

in writing by the City. All materials shall be new and the best of their class and kind.

F. Screening: All irrigation control equipment shall be appropriately screened from view.

G. Control Cable: All wiring to be used for connection of the automatic controller to the electric solenoid actuated remote control valves shall be Type UF, , UL approved underground feeder cable. All pilot or "hot" wires are to be one color and all "common" wires are to be of another color. Wiring shall conform to local codes and shall be installed according to the manufacturer's recommendation. Minimum wire size shall be No. 14.

H. Pipe:

1. 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 18 inches below finished grade.
2. PVC lines below paving shall be installed within separate Schedule 40 sleeves (sized, as required). Piping shall be installed by jacking, boring, or hydraulic driving.
3. All pipe (PVC or copper) installed in rocky or caliche soils shall be thoroughly embedded and completely covered in sand or approved imported topsoil.
4. 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 cracks, holes, foreign materials, blisters, deleterious wrinkles and dents. All pipe shall be continuously and permanently marked with the following information: Manufacturer's name, size, schedule, and type of pipe, working pressure at 73^{o}F, and N.I.S.F. approval.
5. All mainlines that do not have valve wires run beside them should have a separate wire run, including main lines crossing streets, and labeled in clock for future locating purposes. Wire shall be of a different color than valve wires or common. If battery/solar clock installed, run wire with laterals. **All mainlines, laterals and wires which cross underneath roads and sidewalks must be sleeved.**

I. Plastic Pipe, Fittings and Connections on Mains: All pipe and fittings shall be approved Type 1, Grade 1, PVC, Schedule 40 pipe, conforming to ASTM D1784-L65T, and shall be either solvent weld pipe or rubber ring joint pipe. When a connection is plastic to metal, either a PVC Schedule 80 nipple, brass nipple, or male adapters shall be used. The male adapter shall be tightened as not to leak under pressure. Joint compound shall be Teflon tape or Teflon liquid joint compound. All PVC pipe to be cleaned with a PVC solvent primer before gluing.

J. Plastic Pipe, Fittings and Connections on Laterals: All pipe shall be as follows:

1/2" - PR 315, PVC
3/4" and 1" - Class 200, SDR 21, PVC
1-1/2" and up - Class 200, SDR 21, 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.

K. Remote Control Valves and Valve Boxes: Remote control valves shall be electric and have brass or high strength plastic bodies and flow controls. Provide expansion coils at each wire connection in valve box. Irrigation valves are to be labeled on a sheet of paper placed in the controller(s), with stations corresponding to valve areas in the field.

L. Backflow Prevention Assemblies:

1. A reduced pressure principle backflow prevention assembly or a pressure vacuum breaker assembly shall be required. The requirement will be established by system design and service connection. Those systems served by a separate water meter used in elevated areas or with drip irrigation shall require a reduced pressure principle backflow prevention assembly. Those systems served by a water meter used for both domestic water service and landscape irrigation may use a pressure vacuum breaker if installation requirements can be met.
2. All assemblies shall comply with local and state codes and have current approval by the Foundation for Cross-Connection Control and Hydraulic Research, University of Southern California and current listing with the International Association of Plumbing and Mechanical Officials. All assemblies shall be equipped with resilient seated shutoff valves and test cocks.
3. All assemblies shall be rated at 150 psi working pressure and 160^{o}F water temperature.
4. All backflow assemblies shall be FEBCO 825YA or a City approved equal.
5. Assemblies shall be installed in compliance with City standards for reduced pressure principle assemblies or pressure vacuum breakers. Assemblies shall be enclosed in a lockable, expanded metal cage such as that manufactured by Wayne Vowell, Inc., B.P.D.I., or approved equal. All assemblies shall be tested by a certified tester prior to final inspection.

M. Sprinkler Heads:

1. Sprinkler heads shall be pop up, rotary pop-up or gear drive sprinklers, part circle, adjustable and full circle types.
2. 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 be identified without being removed from the system. All sprinkler heads shall be set perpendicular to finished grades unless otherwise designated on the plans. Sprinkler heads adjacent to existing walks, curbs or other

paved areas shall be set to grade. All nozzles on rotary pop-up sprinklers shall be tightened after installation. All 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 gallonage.

N. Electric Controller: The sprinkler controller shall be capable of operating on 117 volts, 60 cycle A.C. current, and shall provide output of 24-26.5 volts and 1.1 amps for electric solenoid valves, and 115 volts for a pump start circuit (if required). Controller shall be pedestal mount or wall mount with factory supplied hardware for either. Controller shall be sized to perform the sprinkling adequately. The electric solenoid valves do not have to be of the same manufacturer as the controller. The controller shall be enclosed in a lockable rounded metal cage per Detail G-673. Provide source of power where applicable.

O. Gate Valves:

1. Gate valves shall be bronze, in sizes of 2" through 2-1/2", and cast iron, in sizes of 3" through 12".
2. The body of bronze valves shall be of heavyduty bronze conforming to the requirements of ASTM B62 (85-5-5-5 alloy)., Valves shall have a service rating for non-shock, cold water, or 200 pounds per square inch. Valves shall be of the double disc, taper seat type with non-rising stem, union bonnet and handwheel. Identification of valves by trade name, manufacturer, etc., shall be stamped or cast on the valve. Valves shall be assembled as detailed on the plans or as specified in the special provisions.
3. The body of cast iron valves shall conform to the requirements of ASTM A126, Class B. Valves shall be of the double disc, parallel seat type, with non-rising stem and "O" ring seal. Valves shall conform to the requirements of A.W.W.A. C500 and shall be iron bodied, bronze mounted. Valves shall have a service rating for non-shock, cold water of 200 pounds per square inch.
4. The Y strainer attached to the Hardie 700 Series valve shall be an agricultural product type.

P. 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. Burrs at cut ends shall be removed prior to installation so that a smooth, unobstructed flow will be obtained. Pipe for use with rubber gaskets will be tapered as recommended by the manufacturer.

Q. Pipe Routing shall be as follows:

1. Meter to backflow prevention assembly shall be Type K soft copper.
2. Backflow prevention assembly risers - Type K hard copper.
3. All other exposed main line pipe - Type K hard copper.
4. All buried mains and laterals downstream of a backflow prevention assembly (or booster pump) - PVC pipe.

R. Water for Trees: All trees shall receive water from one of the following systems:

1. An emitter system with electric solenoid valves, Y-strainer and pressure regulating valve, or
2. A bubbler system with electric solenoid valves, surface bubblers and PVC pipe.

10.2 NON-PRIVATE SYSTEMS

In addition to the requirements of Section 10.11, the following irrigation system standards shall be considered as the minimum standard for the design and construction of projects which fall into either of the following categories: city-maintained properties; or landscape installations of residential common areas and private parks whose maintenance effort is collectively financed, e.g. maintained by a "homeowners association"

A. Materials: Once the plans have been approved by the City, no substitutions shall be allowed, except when unavailable from the supplier, and another approved product is locally available. All such substitutions must be approved in writing by the City. 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 (1) year against defective material and workmanship. Irrigation systems shall consist of PVC pipe (mainlines Schedule 40, laterals Schedule 20).

B. Remote Control Valves and Valve Boxes: Remote control valves shall be electric and have brass or high strength plastic bodies and flow controls, and shall be Hardie 700 Series, or an approved equal. Remote control valve boxes shall be Carson, Brooks or an approved equal with locking cover. Irrigation valves shall be labeled on a piece of paper placed in the controller. The stations shall correspond to valve areas in the field.

C. Sprinkler Heads:
   1. The following manufacturers and models or an approved equal shall be used:
      a. Hunter I-20, I-25 and I-40 series.
      b. Rainbird, pop-up 1800 series.
   2. Swing Joints: All sprinklers and quick coupler valves shall be installed on swing joints consisting of one PVC Schedule 80 nipple. Schedule 80 nipples shall be 8 inches to 12 inches in lengths attached with one Marlex Street ell at the bottom and two Marlex Street ells at the top end, so that the sprinkler can rise or fall without breaking the pipe.
   3. Emitters shall be Bowsmith multiport emitters, 6 port, 2 gallons per hour or single port, 2 gallons per hour.

D. Electric Controllers: The following manufacturers and models or an approved equal shall be used:
   1. Irri-Trol MC-Plus-B 4, 6, 8, 12, 18, and 24.
   2. Motorola MIR 5000.i.

E. Solar Controllers: The following manufacturers and models or an approved equal shall be used:
    1. Leit 8000
    2. Leit 4000

F. Fertilizer Injector System (5 gallons only): Shall be installed in a lockable metal cage on the down side of the vacuum breaker, prior to electric control valves. Fertilizer injector to be in same cage as the backflow preventor.

G. Calculations: Provide complete calculations for sizing irrigation systems.

H. Inspections: The City shall be required to 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 the work. These stages are:
    1. Completion of all trenching and installation of all control wires prior to backfilling.
    2. Installation of all main line piping prior to backfilling, including the vacuum breaker, quick coupler circuits, and any shut-off valves. The main line shall be pressure tested for 30 minutes at this inspection.
    3. Installation of all lateral valves, lines and heads.

I. Flushing and Testing: At the end of each run, flush caps in Telco boxes shall be installed. 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.

J. As-Built Drawings: The developer shall be responsible for providing a digital or photo mylar drawing system with all changes in location marked on the drawing. This shall be submitted to the City prior to final acceptance.

(See Section 8.0 "As-Built Requirements")

10.3 RECLAIMED WATER SYSTEMS

A. The use of reclaimed water (including but not limited to treated sanitary sewer effluent) for landscape irrigation is encouraged in those areas which have been approved by the City Council for such usage. All projects wishing to use reclaimed water for irrigation of landscaped areas may do so only if the particular type of usage area has been approved by the City Council. Certain areas of the city are designated areas where the use of reclaimed water for landscape irrigation is mandatory.

B. Reclaimed water systems shall be totally separate from all potable water systems and may not be placed in the same trench with potable water lines. Reclaimed water lines shall be placed on the opposite side of street

centerlines from any potable water lines. Other vertical and horizontal separations shall be in accordance with those outlined in the Arizona Department of Health Services Engineering Bulletin No. 10.

C. **Cross connections between potable water facilities and reclaimed water facilities are strictly forbidden.**

D. The safety and health of all persons is the primary consideration in the design and use of any reclaimed water system. All maintenance personnel, on a continuous basis, must be educated on the presence of reclaimed water. In view of the rapid turnover rate of employees in the landscape industry, it is important that this information is disseminated on an almost daily basis.

E. The following will not be allowed in reclaimed water systems:
   1. Hose bibs or other outlets accessible to the general public.
   2. Drinking fountains.
   3. Fire hydrants may be placed in areas served by reclaimed water but shall not be served by the reclaimed water system.

F. Overspray and runoff: The following shall be considered in the design of all systems to reduce or eliminate overspray and runoff:
   1. The use of drip systems or underground irrigation systems is encouraged.
   2. Reclaimed water irrigation facilities shall be designed to meet the peak moisture demand of all plant materials used within the area. The use of moisture sensors is encouraged but not mandatory.
   3. Reclaimed water facilities shall be designed to prevent discharge onto areas not intended for reclaimed water irrigation. Part circle sprinklers shall be used adjacent to roadways and property lines to confine the discharge from sprinklers to the design area.
   4. The design of reclaimed water irrigation systems shall provide for watering during periods of minimal use of the design area. This is typically between the hours of 10 p.m. and 5 a.m. Consideration should be given to allow a maximum dry out time before the design area will be used by the public.
   5. Reclaimed water shall be applied at a rate that does not exceed the infiltration rate of the soil. Where varying soil types are present, the design of the facilities shall be consistent with the lowest infiltration rate present. Copies of infiltration rate determinations may be required by the City.

G. Reclaimed water systems: The following materials shall be used for all reclaimed water systems:
   1. Purple-colored polyvinyl chloride (PVC) piping and fittings conforming to AWWA Guidelines for the Distribution of Non-potable Water. The pipe shall be identified as reclaimed

water pipe by continuous markings, which shall include the following, as a minimum:

"CAUTION: RECLAIMED WATER -DO NOT DRINK"

2. The minimum cover to the top of the pipe shall be 18 inches except under paved areas where the 18 inches shall be measured from the bottom of the subgrade.
3. Quick-coupling valves shall be used in reclaimed water systems and shall conform to the following:
   (a) Quick-coupling valves shall be constructed of brass with a purple rubber or vinyl cover.
   (b) The cover shall have a permanently stamped or molded warning with the following information:
      (1) "NON-POTABLE" or "RECLAIMED WATER".
      (2) "DO NOT DRINK" in English and Spanish.
      (3) The international "Do Not Drink" symbol such as an encircled glass of water with a diagonal slash through it.
   (c) In some installations, locking covers may be required.
4. Sprinklers used in reclaimed water systems shall have an exposed surface colored purple to identify them with a reclaimed water use. The exposed surface shall be colored purple through the use of: (1) dyed plastic or rubber or (2) weatherproof paint. Where possible, the exposed surface shall have the following warnings molded or stamped into the surface: "DO NOT DRINK" in English and Spanish. Sprinklers failing to meet these warning specifications shall be marked with purple, bilingual tags as described below for control valves.
5. Boxes used to house gate valves, manual control valves, electrical control valves, pressure relief valves, meters or other appurtenances to a reclaimed water system shall be constructed below grade and shall have a warning label permanently molded or affixed to the lid. This warning label shall be constructed of a purple weatherproof material with the warning permanently stamped or molded into the label. The label shall have the same information as stated in paragraph 10.13.G.3 above.
6. All control valves utilized in a reclaimed water system shall be tagged with a purple, weatherproof plastic tag, measuring not less than 3 inches by 4 inches with the words "WARNING - RECLAIMED WATER - DO NOT DRINK" imprinted on one side and "AVISA - AGUA IMPURA - NO TOMAR" printed

on the other side. Printing shall be black in colors with letters no less than one-half inch in height. Tags must be attached in a manner that will preclude accidental removal.

7. All systems shall be isolated from main lines by a backflow prevention device as outlined in Paragraph 10.11.L., "Backflow Prevention Assemblies." All systems shall also contain a meter for billing and for providing data to comply with ADWR reporting requirements. Meter types shall be the same as those outlined in Paragraph 6.25, "Water Meters," except that the meter box shall comply with paragraph 10.13.G.5., above.

H. Effluent Transmission Mains: The city operates the major, "wholesale" effluent transmission system. This system is designed to provide reclaimed water to storage areas (lakes) which form the reservoirs for individual irrigation systems. No individual irrigation systems shall be connected directly to any part of the city transmission system. All vaults, transmission lines, wells, mechanical and control equipment, etc. connected to City-owned effluent transmission systems are to be reviewed by the City's Utilities Department and approved by the City's Land Development Engineer. Vaults will be reviewed under the following criteria:

1. Access hatches shall be fully lockable, with automatic hold-open arm and cover release, safety chain and diamond plate covers. These shall be a minimum of 4-feet by 6-feet unless otherwise approved by the City. (See Detail G-1000).
2. Entry ladders shall include pull-up arms and will be designed to meet all OSHA standards.
3. Other items such as telemetry systems, controls, electronics, piping, valves, etc. shall be reviewed to insure compatibility with the site, other effluent reuse system components and city standards.
4. Private irrigation and lake quality control systems must be housed in separate vaults.

I. Marking tape: Reclaimed water systems located within the public right-of-way must use ductile iron pipe with marking tape indicating the pipeline as "Reclaimed Water."

10.4 LANDSCAPE STANDARDS

10.41 Private development projects: In addition to the landscape design standards included in Chapter 19, The Landscape Ordinance, of the

City Code, all private development projects shall conform to the following landscape installation standards:

A. Quality and Size:
   1. All trees shall be of a size and quantity to comply with applicable portions of the Landscape Ordinance; shall have a sufficient rootball that holds the earth together after the removal of the containers, but shall not be root-bound or girdled. Plants shall have been grown in pots, cans or boxes for a minimum of three (3) months, and a maximum of one year.
   2. All plants shall exhibit normal growth and shall be healthy, vigorous growth and disease, insect and weed free.
   3. Trees shall have a straight trunk throughout their height, and shall be in accordance with the American Standard for Nursery Stock.

B. Nomenclature: 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 all tree trunks delivered to the site.

C. Tree Staking:
   1. Stakes for supporting trees shall be 2-inches x 2-inches x 10-feet lodgepoles and shall be straight, sound, stout and free of knots and cracks which weaken the stake. Each tree shall receive two (2) stakes outside of the rootball.
   2. Wire for fastening trunks to stakes shall be No. 12 gauge, annealed galvanized steel (not iron). One wire shall be placed at the top of the stakes, and another halfway down the stakes. If necessary, nail wire to stakes to hold firm.
   3. Hose to protect trunk from wire rubbing shall be new 2-ply reinforced rubber or plastic garden hose.

D. Plant Material:
   1. Unless otherwise indicated, all plant materials furnished shall be nursery-grown in accordance with the American Standards for Nursery Stock, 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.
   2. Plant substitution for those indicated on the plant list will be considered by the City upon submission of proof that any plant is not reasonably available. Substitution of a plant shall have the same appearance, ultimate height, shape, growth habit , and same soil type . In no case shall the average cost and value of the substituted plants be less than the cost and value of plants indicated.

3. 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 and watered during planting operations.

E. Setting Plants: Unless otherwise specified, all plants shall be planted in pits and shall be set so that the finish grade level after settlement 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 but not compacting soil. A water basin shall be created at the base of each tree, and shall be a minimum of 4' in diameter. Side slopes shall be no greater than 3:1.

F. Cleanup: 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 developer.

10.42 City projects: Site preparation for all city-maintained landscape areas shall be in accordance with Sections 425 thru 430 and 795, MAG Uniform Standard Specifications. An exception to this shall be the exclusion of the requirement in section 430.4 for polyethylene film under decomposed granite. In addition to the requirements of the Landscape Ordinance and Section 10.12, all city-maintained properties shall conform to the following turf installation requirements:

A. Materials:

1. Seed: The kind of seed planted shall be appropriate for the planting season and conditions, and shall be one of the following:

a. Winter Lawn Seed: Shall be annual rye grass (Lotium Multiflorum) planted when the nighttime temperatures fall below 60 degrees; shall have a minimum percentage of purity and germination of 95% and 88% respectively. If rye is planted, the developer must provide the City bermuda grass seed to be used for reseeding the following summer. The Bermuda seed shall comply with requirements noted in this Section. The amount of seed shall be based on the application rate specified in Sub-section 6 b. The seed shall be delivered to the City prior to acceptance of the basin.

b. Summer Lawn Seed: Shall be common or hybrid bermuda (Cynondon Dactylon) planted when the nighttime temperatures rise above 60 degrees; shall be fancy hulled seed having minimum percentage of 98% (certified), and 95% purity respectively; and a weed seed content not exceeding 0.5%.

2. Mulch shall be one of the following decomposed, stabilized and fortified, treated (nitrolized) wood products with no more than 1% nitrogen after treatment: fir mulch, pine mulch, or redwood mulch.

B. Soil Test in Lieu of Removing and Replacing Topsoil: The developer may request to perform grading without replacing topsoil if a specific and compelling reason is provided.. If the City concurs, upon final grading of the site, soil samples will be taken by the developer for analysis to an independent soils lab. and recommendations will be made for improving the soil. Any recommendations must be implemented by the developer and inspected by the City prior to proceeding with lawn construction.

C. Soils 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 ideal moisture content for tilling and for planting herein specified.

D. Preparation of Seedbed: Where soil tests show that existing topsoil is satisfactory, a seedbed shall be prepared by scarifying to a depth of at least 3 inches and dragging to a smooth surface. Where existing soil is caliche type, it shall be excavated to a depth of 6 inches, removed from the site, and replaced with acceptable topsoil. Irregularities in the surface shall be leveled before seeding operations commence.

E. Surface Preparation: After raking, roll entire area in two directions at approximate right angles with a water ballast roller weighing 100 to 300 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 and draining 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.

F. Planting:

1. Immediately prior to broadcasting the seed, apply and lightly rake into the surface the following:
   a. 5 pounds ammonium sulfate (21-0-0) per 1,000 square feet.

b. 15 pounds Superphosphate (0-20-0) per 1,000 square feet.

2. After the City has approved the areas to be seeded, the seed will be broadcast at the rate of 3-1/2 pounds Bermuda or 10 pounds of Rye seed per 1,000 square feet. One half of the seed will be sown with the sower moving in one direction and the other half shall be sown with the sower moving at right angles to the first sowing. Broadcasting shall not be done in windy weather.

G. 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 then be kept continually moist by watering as often as required. Any areas that do not root properly shall be replanted at 10-day intervals until an acceptable stand of grass is obtained.

H. Maintenance Period:

1. The developer shall maintain all planted areas for a minimum period of 60 days, beginning immediately after preliminary City acceptance.
2. If all plantings are not acceptable at the end of the maintenance period, the maintenance shall be continued until the work meets City approval.
3. 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 20 pounds per 1,000 square feet with each application.
4. Maintenance shall include continuous operations of watering, weeding, mowing, edging, fertilizing, spraying, insecticide and pest control, reseeding, replacement, and/or any other operations necessary to assure good normal growth. The developer shall be responsible for applying lawn moth control sprays or other materials, as often as may be required, to protect turfs during the entire maintenance period.
5. When the turf has established sufficient root structure and an approximate height of 3 inches, mowing should begin immediately to a 2-inch height and shall be mowed thereafter and reduced in safe increments to a height of 1 inch.
6. During the installation period and during the maintenance period, the developer shall be responsible for maintaining adequate protection for all areas. Any damaged planting shall be repaired at the developer's expense.
7. At termination of each maintenance period all turf shall be live, healthy, undamaged and free of infestations. All areas shall be

completely covered at the time of acceptance, leaving no barren spots larger than 3 inches by 3 inches. Inferior plantings shall be replaced and brought to a satisfactory condition before final acceptance of work will be made. The developer shall immediately replace any and all turf that dies or is damaged.

8. Two (2) inspections shall be made that affect each maintenance period: The first shall be after all plantings have been completely installed in order to approve the beginning of the maintenance period of not less than 60 calendar days, and the second shall be at the end of the 60 day maintenance period. If there are differences due to improper or insufficient maintenance, then maintenance shall be continued by the developer until all work meets with the specifications and can be approved by the City.

10.43 Planting of trees, shrubs, and groundcover.

A. General: All retention basins shall receive a minimum average of fifteen (15) trees per acre, based on the net acreage.

B. Quality and Size:

1. All trees shall be of a size and quantity to satisfy applicable provisions of the Landscape Ordinance; shall have sufficient rootball to hold the soil together after removal from the containers, but shall not be root-bound or girdled. Plants shall have been grown in pots, cans or boxes for a minimum of three (3) months, and a maximum of one year.
2. All plants shall exhibit normal growth and shall be sound, healthy, vigorous and free from disease, insect infestations or weeds.
3. Trees shall have a straight trunk throughout their height, and shall be in accordance with the American Standard for Nursery Stock.

C. Nomenclature: 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 all tree trunks delivered to the site.

D. Materials for Planting:

1. Organic matter for prepared soil shall be decomposed stabilized and fortified, treated (nitrolized) organic mulch, with no more than 1% nitrogen after treatment, and shall be fir mulch, pine mulch or redwood mulch type.
2. Mulch in planting basins shall consist of 25 pounds of soil sulphur thoroughly mixed with one cubic yard of organic mulch. Mulch shall be evenly spread throughout the tree basin to a depth of 2 inches.

3. Prepared soil for backfilling tree pits shall be composed of three (3) parts of topsoil and one (1) part organic mulch by volume, and thoroughly mixed to insure uniformity. 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 lumps, clods, stones, roots, stumps and debris of any kind.
4. Staking materials:
    a. Stakes for supporting trees shall be 2-inches x 2-inches x 10-feet lodgepoles and shall be straight, sound, stout and free of knots and cracks which weaken the stake. Each tree shall receive two (2) stakes outside of the rootball on the side from which the prevailing winds come.
    b. Wire for fastening trunks to stakes shall be No. 12 gauge, annealed galvanized steel (not iron). One wire shall be placed at the top of the stakes, and another halfway down the stakes. If necessary, nail wire to stakes to hold firm.
    c. Hose to protect trunk from wire rubbing shall be new 2-ply reinforced rubber or plastic garden hose.

E. Plant Material:
1. Unless otherwise indicated, all plant materials furnished shall be nursery-grown in accordance with the American Standards for Nursery Stock, 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.
2. Plant substitution for those indicated on the plant list will be considered by the City upon submission of proof that any plant is not reasonably available. Substitution of a plant shall have the same appearance, ultimate height, shape, growth habit, and same soil type. In no case shall the average cost and value of the substituted plants be less than the cost and value of plants indicated.
3. 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 and watered during planting operations.

F. Setting Plants: Unless otherwise specified, all plants shall be planted in pits and shall be set so that the finish grade level after settlement 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 but not compacting

soil. A water basin shall be created at the base of each tree, and shall be a minimum of 4-feet in diameter. Side slopes shall be no greater than 3:1.

G. Cleanup: 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 developer.

H. Maintenance Period:

1. The developer shall maintain all trees for a minimum period of 60 days beginning with the preliminary acceptance by the City. If all trees are not healthy at the end of the maintenance period, the maintenance shall be continued until the trees meet the approval of the City, or replaced.
2. The contractor shall guarantee all plant material to be in a vigorous, healthy condition for a period of 60 days from the date of 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.

11.0 STANDARD DETAILS AND REFERENCES

11.1 GLENDALE STANDARD DETAILS

11.11 The construction details included herein are for design and construction purposes.

11.12 All contractors working in the City are responsible for obtaining and being familiar with these construction details.

11.2 DATA SOURCES

The Code of the City of Glendale

Uniform Standard Specifications and Details for Public Works Construction sponsored and distributed by the Maricopa Association of Governments.

Design of Urban Streets, Technology Sharing Report 80-204, January 1980. U.S. Department of Transportation.

Design and Construction of Sanitary and Storm Sewers, WPCF Manual of Practice No. 9, 1970, Water Pollution Control Federation.

Civil Engineering Handbook, Leonard Church Urquhart, C.E., Editor-in-Chief. McGraw-Hill Book Co., Inc.

Standard Details and Specifications, Public Works Department, City of Phoenix.

Storm Drain Design Manual, Subdivision Drainage Design, City of Phoenix, October 1972, Revised June 1974.

Hydrology Design Manual, Flood Control District of Maricopa County.

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