CITY OF TEMPE

PUBLIC WORKS DEPARTMENT

ENGINEERING DESIGN CRITERIA

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October 2014

Table of Contents
Engineering Design Criteria

Page #

INTRODUCTION 1

SINGLE-FAMILY RESIDENTIAL IMPROVEMENTS 2

FIGURE 1: STANDARD DETAIL FOR SINGLE-FAMILY HOMES 6

FIGURE 2: DECLARATION OF MINOR MODIFICATION 7

ENGINEERING SUBMITTAL, PLAN REVIEW 8

CITY OF TEMPE ENGINEERING FEE SCHEDULE 12

TYPICAL PLAN CRITERIA FOR ALL ENGINEERING SUBMITTALS 12

ESTIMATED QUANTITIES 17

GENERAL PLAT REQUIREMENTS 18

ADDITIONAL PRELIMINARY PLAT REQUIREMENTS 21

ADDITIONAL FINAL PLAT REQUIREMENTS 22

PAVING & STREET DESIGN CRITERIA 26

STREET NAME SIGN REQUIREMENTS 31

SEWER DESIGN CRITERIA 32

WATER DESIGN CRITERIA 37
TABLE 1 42
CITY OF TEMPE PREFERRED NUMBER AND DISTRIBUTION OF FIRE HYDRANTS 42

TABLE 1 continued – 2006 INTERNATIONAL FIRE CODE, APPENDIX C, PAGE 395 44

Page #

TABLE 2 - 2006 INTERNATIONAL FIRE CODE, APPENDIX B, PAGE 394 45

MARICOPA COUNTY ENVIRONMENTAL SERVICES DEPT (MCESD) REQUIREMENTS 46

WILL SERVE LETTERS 47

UTILITY EASEMENT ENCROACHMENT GUIDELINES 47

PEDESTRIAN, BICYCLE, TRANSIT DESIGN CRITERIA 48

DRAINAGE DESIGN CRITERIA AND REQUIREMENTS 51

FIGURE 3: TIME OF CONCENTRATION FOR OVERLAND FLOW, SEELYE CHART 66

FIGURE 4: ARCA MAP 67

STREET LIGHTING REQUIREMENTS 68

RIO SALADO OVERLAY DISTRICT MAP 74

SOUTHWEST TEMPE OVERLAY DISTRICT MAP 74

TRANSPORTATION OVERLAY DISTRICT MAP 75

VARIANCE / INTERPRETATIONS / APPEALS 76

VARIANCE / INTERPRETATIONS REQUEST FORM 77

FINAL DECISION REGARDING EXACTIONS / DEDICATIONS 78

EXACTION POLICY: NOTICE OF APPEAL RIGHTS 79

MATRIX OF PROPORTIONATE DEVELOPMENT REQUIREMENTS 80

Table of Contents
Engineering Design Criteria

Page #

GENERAL AND SITE PLAN NOTES 80

PAVING PLAN NOTES 84

SEWER, WATER and UTILITY PLAN NOTES 85

ON-SITE DRAINAGE PLAN NOTES 87

STREET LIGHTING PLAN NOTES 88

PERMIT AND AS-BUILT INFORMATION BLOCK 89

UTILITY COMPANY SUBMITTALS 90

INTRODUCTION

The criterion in this document applies to all new and redevelopment projects that will affect the existing **lot grading or storm water retention,** projects where the original permitted floor area is cumulatively increased by at least 25% or when site/building improvements increase the valuation (excluding the land) by 50% or more. Single-Family Residential Improvement criteria is described on page 2 of this manual.

Valuation is determined by comparing the total construction cost estimate to the current appraised value of the property at time of application. For example, a $51,000 construction cost estimate compared to a $100,000 appraised value (not including land value) at time of application is an increase of 50% or more. Note that construction costs include any site modifications such as "remove and replace" items or any site improvements that affect grading and drainage features such as building, landscaping, utility, parking, resurfacing, site amenities, etc. Therefore, any existing vacant land submitted with proposed improvements will be required to meet all current City codes, standards and regulations; including but not limited to undergrounding of overhead utilities that are on or adjacent to the property.

The total construction cost estimate must be prepared, sealed, signed and submitted to the City by an Arizona licensed professional Engineer or Architect.

A permit issued by the Engineering Division shall be required for all work in the City of Tempe right-of-way. An investigation assessment, in the amount defined by section 29-19 Engineering Fees, Appendix A of Tempe City Code , will be charged for any work within the City of Tempe right-of-way in which a permit has not been issued prior to commencement of work.

The City Engineer, or designee, is authorized to interpret the criteria and grant variances where particular application would cause undue hardship to an applicant. Refer to "Interpretations/Variances/Appeals" section of this manual for procedure and appeals form.

This document adopts by reference the latest edition of the Maricopa Association of Governments "Uniform Standard Specifications and Details for Public Works Construction," the latest addition of the "Tempe Standard Details Supplement to the MAG Uniform Standard Details" and Chapter 29 of the Tempe City Code.

In addition to this manual, the latest edition of the "City of Tempe Utility Permit and Construction Manual" shall govern all utility and associated construction within the City right-of-way.

Additional information regarding storm water retention and storm water pollution control can be found in the Tempe City Code, Chapter 12, Drainage and Flood Control.

SINGLE-FAMILY RESIDENTIAL IMPROVEMENTS

The owner of a single-family residence may need to apply for a Single Family Residential (SFR) permit if improvements to the residence or lot affect existing drainage or volume of storage for storm water retention. There are various conditions, as explained in the next few paragraphs, that would affect the requirement for a SFR permit. The volume of storage for storm water retention would be based on the amount required for the lot when the subdivision was originally platted. The detail for typical grading for single family lots is shown in Figure 1. A SFR permit would also be issued for driveway or sidewalk modifications/ improvements.

The floor area of expansion to the residence and/or accessory structure(s) is less than or equal to twenty-five percent (25%) of the floor area of the original permitted building and accessory structure(s) and the area of expansion does not affect existing drainage retention areas. For this condition, the owner may apply for an exception to the SFR permit by submitting a Declaration of a Minor Modification. This declaration states that the modification will not reduce the existing onsite storm water retention capacity and will not alter the grading or drainage of the property. The declaration form is shown in Figure 2 and is available at the Development Services front counter.

The floor area of expansion to the residence and/or accessory structure(s) is less than or equal to twenty-five percent (25%) of the floor area of the original permitted building and accessory structure(s) and the area of expansion DOES affect existing drainage retention areas. For this condition, a SFR permit is required and the amount of storm water retention needed is the replacement of the retention volume lost.

The floor area of expansion to the residence and/or accessory structure(s) is greater than twenty-five percent (25%) of the floor area of the original permitted building and accessory structure(s). Existing single-family homeowners shall submit a Grading & Drainage plan for review/approval and obtain a SFR permit only when the original permitted floor area is cumulatively increased by at least 25%. When a Grading & Drainage plan is required it shall be prepared, sealed and signed by an Arizona licensed professional engineer; submitted and approved for a SFR permit. In addition, a signed and sealed as-built plan must be provided to the City by the design Engineer/Surveyor certifying the grades and finished floor elevation.

For installation of a swimming pool, a Declaration of Minor Modification may be required. For swimming pool construction, the declaration affirms that all excavated materials from the swimming pool will be removed from the property and all landscape features remaining after completion of the pool construction will not affect existing drainage retention. If the swimming pool construction alters or fills the surface of the lot for on-lot retention, then a SFR permit is required. For this condition, the amount of storm water retention needed is the replacement of the retention volume lost.

Submittal of a Grading and Drainage Plan: The **SFR Permit** is for on-lot grading, drainage, driveway and sidewalk improvements. The **SFR Permit** acts as a **Drainage**

Permit for single family improvements. A grading and drainage plan would need to comply with the requirements of the section 'Typical Plan Criteria for All Engineering Submittals'. For any work within the street or alley right-of-way (typically driveways, sidewalks, sewer services, water services), existing single-family homeowners are required to submit plans to the City's Engineering Division for review and approval and appropriate permits issued for such work.

Other Permits for Single Family Residential Improvements: If the proposed improvements affect the paving of the street, then a **Paving Permit** is required. If the proposed improvements are for a new water service to the home, upgrade of water service meter, hydrants, installation/ modification of water mains, or abandonment of water facilities, then a **Water Permit** is required. An associated **Water/ Sewer (WATSEW) Permit** may be required for upgrades to a water meter service. A **Sewer Permit** is required for all sewer service connections, repairs, or replacements for the portion of the sewer service that is in the street right of way or in the alley. A **Underground Fire Permit** is required for a new fireline connection to the water main.

Drainage Design Criteria and Requirements: The following is the Drainage Design Criteria and Requirements for improvements or renovations on Existing Single-Family Residential lots. New Residential Subdivisions, New Single Family Lot Development, Commercial Developments and Industrial Developments shall be designed in accordance with the "Drainage Design Criteria and Requirements" section of this manual.

There are two methods accepted by the Engineering Division for calculating required retention volume for improvements to single-family homes. Both methods use the following formula:

$$V = (P \div 12) * A * C$$

V = Volume required to retain (cubic feet)
P = Precipitation Depth (in inches) of storm water required to be retained
A = Total area of lot (in square feet) plus any additionally required areas. For some subdivisions, the additionally required areas include one-half of the street fronting onto the lot.
C = Coefficient of Non-Absorption

METHOD 1: Tempe's standard method of calculating onsite storm water retention uses the formula above with the following data:
Where,
P = 2.4 inches (based on the 100-year, 1-hour storm event)
C = 0.95

$$V = (2.4 \div 12) * A * (0.95)$$

METHOD 2: The City allows the usage of the **Drainage Design Manual, Volume I, for Flood Control District of Maricopa County** (Fourth Edition, Chapter 3, Rational Method) as an alternative method for determining required retention volume. This method determines the volume based on a 100-year 2-hour storm event, which has a precipitation depth (P) of **2.2 inches**. This method also has different Coefficient of Non-Absorption (C) values that vary by the size of the lot and the approximate percentage of the lot covered with improvements (house, decking, driveway, sidewalks, etc., i.e. anything other than undeveloped land). For single-family lots, Tables 3.2 and 3.3 of the County Drainage Design Manual for determining Coefficients of Non-Absorption will be interpreted as follows:

Coefficients Non-Absorption for Single-Family Lots			
Lot Size	20% or Less Lot Coverage Improvements	20% to 39% Lot Coverage Improvements	40% or More Lot Coverage Improvements
6,000 to 12,000 square feet	0.60	0.71	0.82
12,000 to 40,000 square feet	0.53	0.56	0.60
Over 40,000 square feet	0.41	0.47	0.53

$$V = (2.2 \div 12) * A * C$$

Retention of the 100-year 1-hour storm event (or 100-year 2-hour for Method 2) on property outside the public rights-of-way is required. The rare exception to the on-site retention requirement above includes only properties in the Alternative Retention Criteria Area (ARCA) where retention of the 2-year 1-hour storm event is required In this case the precipitation depth, P = 0.9 inch. In no event shall a drainage permit be issued unless the drainage plan has been approved by the City Engineer and establishes that storm water runoff from the lot, plot or parcel of land will not adversely impact other property or City infrastructure. Refer to Section 12-57 of the Tempe City Code for defined areas of ARCA or see Figure 3 of this manual for visual location of ARCA.

Method of Storage:

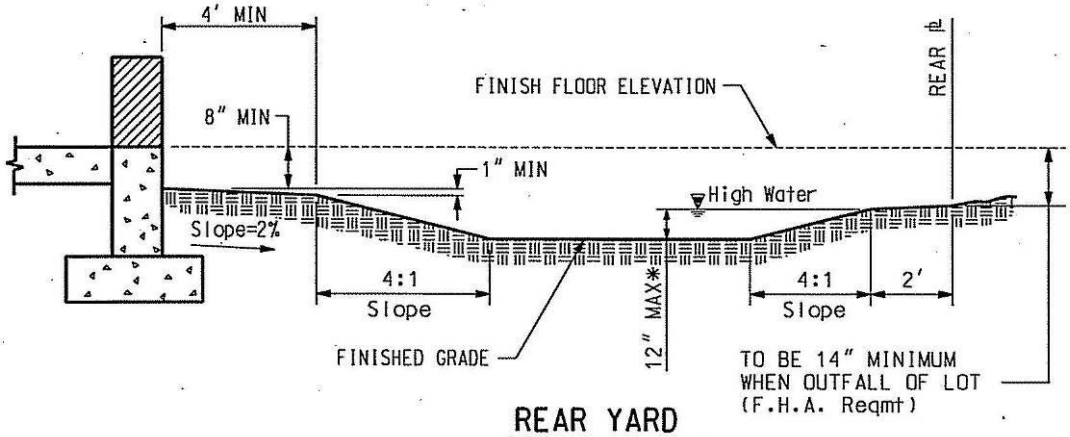
Individual lot storage shall consist of providing adequate surface storage volume for the lot, plot or parcel of land using either Method 1 or Method 2 as described above. Storage volume shall include adjacent alleys storm water run-off. A maximum depression of 1-foot is allowed for single-family lots; use maximum 4:1 side slopes. Finish floor elevations for single-family residences are to be a minimum of 14” above outfall of lot per Figure 1.

Design Requirements for the retention basin:

- Retention volume must be disposed of in 36 hours.
- Basins *greater* than 1.0’ in depth *will* require a dual-chamber drywell or other approved disposal mechanism.

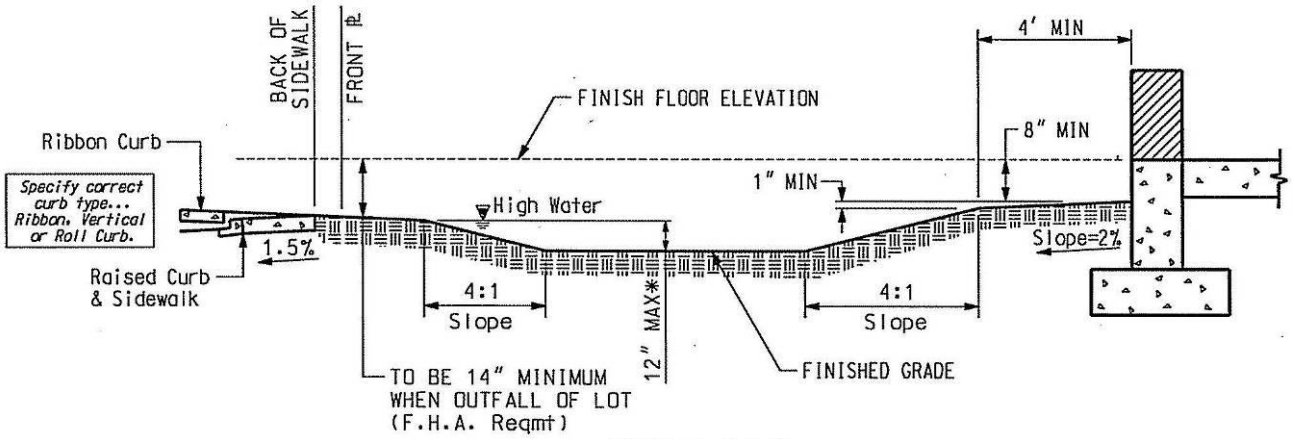
- Basins *less* than 1.0’ in depth *may* require a dual-chamber drywell or other approved disposal mechanism.
- Maximum allowable design dissipation rate for drywell is 0.10 cfs unless substantiated by percolation test then after applying a reduction factor of 50%, a maximum rate of 0.25 cfs may be used.

FIGURE 1: STANDARD DETAIL FOR SINGLE-FAMILY HOMES



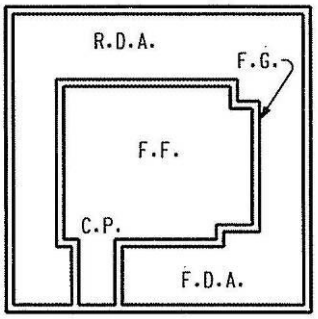
REAR YARD

* Drywell req'd when depth is over 12"



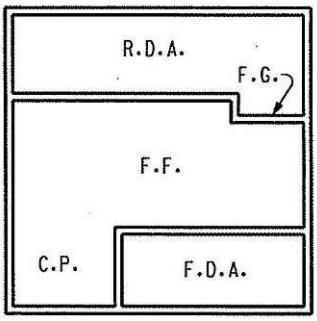
FRONT YARD

* Drywell req'd when depth is over 12"



PLAN "A"

LEGEND
C.P. = CARPORT
F.D.A. = FRONT DEPRESSED AREA
F.F. = FINISHED FLOOR
F.G. = FINISHED PAD GRADE
R.D.A. = REAR DEPRESSED AREA



PLAN "B"

NOTE:
Include the appropriate PLAN "A" or PLAN ""B" plus the following note on the recorded plat. "These lots are to be graded to retain storm water in accordance with ordinance ".

FIGURE 2: DECLARATION OF MINOR MODIFICATION

When recorded, return to: AFFIDAVIT and FEE EXEMPT
CITY OF TEMPE BASKET PURSUANT TO A.R.S. §11-1134.A-3

STATE OF ARIZONA)
) ss
County of Maricopa)

DECLARATION OF MINOR MODIFICATION

Quarter Section: _____Address: _____
Subdivision Name:_____ Lot No. _____
DS Number:_____Assessor Parcel Number (APNs):_____

I, _____, being first duly sworn, upon oath, declare the following:

1. I am the legal owner of the residential property located at _____ _____, in Tempe, Arizona.

2. That the only modifications that will be made at the above-referenced property shall be minor, and comply with this declaration.

3. Any and all minor modifications to the improvements including building(s), accessory structure(s), property and lot itself will not reduce the existing storm water retention capacity of the lot.

4. Any and all minor modifications to the property will not alter the grading or drainage of the property, and will at all times remain in compliance with Tempe City Code Section 12-73, as amended from time to time.

5. All excavated materials from construction, including swimming pool construction, will be removed from the property at my sole expense.

6. Any and all landscape features remaining post-construction will not affect on-lot retention.

7. Any and all fill or substantial alteration of the surface of the lot for on-lot retention will require a drainage permit from the City Engineer.

Signed by:_____

The foregoing instrument was acknowledged before me this _____ day of _____ _____, 2010, by _____.

_____

[Seal] Notary Public

ENGINEERING SUBMITTAL, PLAN REVIEW

PROCEDURES & FREQUENT COMMENTS

1. Obtain a copy of the City of Tempe Engineering Design Criteria manual, latest edition, for requirements for engineering plan submittals. Some comments frequently occurring on plan review are listed below to help avoid common errors.

2. Submit two sets of civil plans to Development Services counter located in the east wing garden level of City Hall, and notify the Development Services Specialist the submittal is for engineering plan review. The first review by the Engineering Plan Reviewer will normally take 15 working days to complete. The 2nd review will take 10 working days and then five working days for all subsequent reviews to be completed. Note that these are estimated turn-around times only and may change due to workload, staffing considerations, and size or complexity of project. Payment of the engineering plan review fee is required at or before the time of picking up initial review redlines. Additional plan review fees will be charged after the 2nd submittal of engineering plans or if additional sheets or reports were included after the first submittal. Appendix A of the City Code has the schedule of fees for engineering plan review and inspections.

3. General Notes & other discipline plan notes shown in the latest edition of the City's Engineering Design Criteria manual shall be listed on the engineering plans submitted for City review.

4. Engineering plans are to be submitted on 24" x 36" sheets. Submit water, sewer, onsite grading and drainage, underground fire lines, sidewalk/street/paving plans (including storm drains), and street lighting if not included with paving plans. All plans must be legible at 50% reduction. All plan sets submitted for City Engineer approval signature must be printed on front side of 3 mil minimum double matte black line reproducible mylar.

5. The maximum scale for engineering plans is 1" = 30'. Avoid overstrikes, tight hatch patterns, heavy shading, etc. All text & drawings *must* be clear, legible & scalable @ 50% reduction (half-size prints)

6. All overhead utilities on or adjacent to site must be placed underground, including street crossings, per City of Tempe Code, Section 25-120 thru 25-126 & Ord # 88.85 except for tansmission lines (greater than 12.5kv). Existing services will be required to be placed underground where the cumulative expansion is greater than 25% of the existing building floor area or the cumulative alteration is at a cost exceeding fifty percent 50% of the current appraised value of the structure.
   Single-family homes and duplexes are exempt from undergrounding overhead utilities that are adjacent to the site.

7. Refer to special overlay zoning districts (Southwest, Rio Salado, and Transportation) for special design and retention requirements. These districts are defined in Part 5 of the Zoning and Development Code. Maps of the overlay districts are shown in this manual.

8. On-site storm water retention is required for the 100-year, 1-hour storm per City of Tempe Drainage Criteria section unless the property is located within the Alternative Retention Criteria Area (ARCA). The ARCA map is shown in the Drainage Design Criteria and Requirements Section of this manual.

9. All onsite storm water for the design event is to remain on property.

10. Drainage report is required for all commercial and multi-family projects; add the following note to the Grading & Drainage sheets, "A FULL DRAINAGE REPORT EXISTS UNDER SEPARATE COVER." Always provide a summary table of storm water retention on the plans. Single-family homes and duplexes must meet drainage requirements but are exempt from providing a formal drainage report.

11. Dual-chamber drywell systems are required on all projects where a drywell is needed. No exceptions.

12. All storm water is required to dissipate within 36 hours. The City requires that surface retention be maximized (including use of paved areas up to one foot deep with positive means of dissipation) before sub-surface retention will be considered. Underground storm water retention storage is allowed only with specific approval of the City Engineer, or designee. When allowed, all underground storage tanks require means of disposal within 36hrs by use of a dual-chamber drywell system. Refer to the "Underground Retention Storage Tanks" section of the City of Tempe Engineering Design Criteria manual, latest edition. Fuel dispensing sites require special consideration and a multi-stage drywell system for storm water disposal.

13. All developments over one acre shall meet the National Pollution Discharge Elimination System (NPDES) requirements. Provide, with the engineering plan submittal, a copy of the "*NOI Certificate*" from ADEQ. The Storm Water Pollution Prevention Plan (SWPPP) is the responsibility of the property owner and will not be reviewed by the City.

14. After all comments have been successfully addressed, the design engineer will be notified by Development Services that permits are ready to be issued. After the permits have been issued the General Contractor shall contact the City's Engineering inspector for a pre-construction meeting with the general contractor and any sub-contractors. Engineering inspectors will then provide the inspections required for final acceptance of the engineering work as the construction proceeds.

15. Any new easement, dedication or agreement not shown on the plat or subsequent to plat recordation is required to be prepared via separate instrument. This

instrument/document shall be prepared by City staff *only* and shall be done after receiving proof of property ownership. Proof of property ownership shall be a copy of current Warranty Deed or Title Report, current to within six months. Preparation of the legal description and exhibits, complying with Maricopa County Recorder requirements, shall be done by the design engineer. The *original* instrument/document must be signed by the property owner and notarized prior to submitting to City for final review. After the entire packet has been reviewed by the City it will be returned to the design engineer who will have the packet recorded with the Maricopa County Recorder. The entire *original* recorded packet, with the County Recorder's label, shall be returned to the City *prior* to final project approval by the City Engineer, or designee. No permits will be issued until all required documents have been submitted, approved, and recorded with the County.

16. Sidewalks are required in all zoning categories, including all non-residential classifications. Sidewalks shall meet the provisions of the Americans with Disabilities Act. This includes sidewalks that are affected by existing driveways. Sidewalks and driveways shall be brought up to meet all current codes and standards.

17. Pavement cutting for utility installation, or any reason, is prohibited without prior approval of the City Engineer, or designee.

18. New sewer services shall be a minimum of 6" diameter for all commercial projects and be constructed according to Maricopa Association of Government (MAG) Standard Details 440-1 and 440-4. Construction of all other underground utilities that cannot be located using surface features (valve boxes, meter boxes, manholes, cleanouts, catch basins, etc.) shall include some type of metallic pull wire, locator strip, or other type of locating device in accordance with ARS 40-360.22.

19. Encroachment permit is required for any part of a building including but not limited to canopies, awnings, balconies which protrude into the City right-of-way and for any type of crossing of a public water or sewer easement.

20. Projects with water or sewer construction may require completion of an "Approval To Construct" (ATC) packet and Maricopa County Environmental Service Department (MCESD) approval. Visit MCESD office or website for additional information and current County forms. Documents needing 'City of Tempe' signature will be submitted to the Engineering Plan Reviewer and will be processed for signature when the Water/ Sewer plans reach an 'Approvable' status. Plans must be signed by MCESD prior to City's final plan approval when an ATC is required. An "Approval Of Construction" (AOC) packet is required to be completed by the design engineer at the end of any project for which an ATC was required.

21. Show, identify and dimension all topography in City right-of-way including pavement, driveways, curb, gutter, sidewalk, poles, medians, traffic signal equipment, street lights, etc. and how each will be handled.

22. Be sure to comply with all City comments from a preliminary Site Plan Review (SPR), when applicable, prior to formal engineering plan submittal.

23. Refer to the following sections of this manual for all Plan Criteria.

24. Full-size sheet:

    A 24” x 36” drawing showing site plans, various discipline plans and details. Maximum plan view scale is 1” = 30’.

25. Discipline:

    Type of work shown on engineering plans such as:

    - Water (including fire hydrants) *****
    - Sewer *****
    - Underground fire sprinkler lines
    - Onsite grading and drainage; storm water retention
    - Street/paving plans (including but not limited to: streets, signing, striping, sidewalks, driveways, storm drains, irrigation lines, etc) *
    - Street lighting when plan is not shown on paving plans*****

    (*) in City right-of-way or easement

CITY OF TEMPE ENGINEERING FEE SCHEDULE

Plan review fees are due at or before the time of picking up initial review redlines. Additional plan review fees will be charged after the 2nd submittal of engineering plans or if additional sheets or reports were included after the first submittal. Any additional review fees will be determined by the Plan Reviewer during the plan review process. Additional review fees beyond the third review will be based on an hourly review rate. The latest fee schedule for Engineering plan review, permits, purchase of engineering records, etc. can be found in Appendix A of the City Code or on the City's website at:

http://www.tempe.gov/citycode/APPENDIX.htm

TYPICAL PLAN CRITERIA FOR ALL ENGINEERING SUBMITTALS

Listed below are typical requirements for all engineering discipline submittals. Refer to the sections following for the specific criteria and requirements for each section.

A. GENERAL

1. Allow approximately 15 working days for review of the first submittal, ten (10) days for review of 2nd submittal, and five (5) days for all subsequent submittals. Note that these are target turn around times only.

2. Each submittal shall have two stapled sets of engineering plans and two copies of drainage report (commercial and multi-family projects). Each resubmittal shall have two complete stapled sets of corrected prints of engineering plans and two copies of reports plus the City's redlines of the previous submittal. All plans must be clear and legible at 50% reduction, i.e. half-size plans.

B. TYPICAL REQUIREMENTS

1. Include a complete legal description as it appears on the property's deed and the Assessor Parcel Number (APN) on the cover sheet.

2. Include a vicinity map showing the property in relation to that of the nearest major streets intersection on the cover sheet.

3. Include north arrow, pointing to right or top edge of sheet.

4. Include owner's name or names as appears on the deed (property, business, developer, etc.) and mailing addresses. Provide copy of warranty deed or other title document, which shall be dated within 90 days of initial submittal.

5. Include “Contact” name, address and phone number of person to whom plans should be returned.

6. Include legal address of property.

7. Include applicable City of Tempe notes (General, Site, Paving, Sewer and Water, On-site Drainage, Street Lighting). See the back of this manual for all notes.

8. Include completed Utility Company Submittals on cover sheet. See the back of this manual.

9. Include the Permit and “As-Built” information block on cover sheet. See the back of this manual for this block.

10. Include a sheet index on the cover sheet.

11. Show location of and distance to closest fire hydrant.

    a. Fire hydrants shall be provided to within 150’ of any point on the first floor of any building.

    b. A fire hydrant shall be provided within 150’ of any fire department connection.

12. Show size of all new, existing and proposed abandoned water service meters, including gpm needed, on the Civil plans and locate them using centerline station and offset or dimension from property line.

13. Show size of all sewer taps (new, existing and proposed abandoned) on the Civil plans and locate them using centerline station and offset or dimension from property line. New sewer services shall be a minimum of 6” diameter for all commercial projects and be constructed according to Maricopa Association of Government (MAG) Std Details 440-1 and 440-4.

14. Sidewalks are required adjacent to both sides of all city streets. Arterial streets require 8’ wide sidewalks, L-1 streets require 5’-6” wide sidewalks, and all other streets require 6’-0” wide sidewalks. No exceptions.

15. Include a benchmark on cover sheet, use and note City of Tempe datum.

16. Tie property to at least two official record survey control corners, preferably section and/or quarter corners.

17. Show all lot dimensions, widths of easements, and rights-of-way, including bearings and distances.

18. Show and dimension the parking lot layout, drainage pattern, proposed spot elevations and existing topography of site and adjacent areas.

19. Show finished floor elevations. Commercial: minimum of 8” above lot outfall and 12” above high water level. New residential: minimum 14” above lot outfall.

20. Show, identify and dimension all topography in City right-of-way including pavement, driveways, curb, gutter, sidewalk, poles, medians, traffic signal equipment, street lights, etc. and how each will be handled.

21. All overhead utilities on or adjacent to site must be placed underground, including street crossings, per City of Tempe Code, Section 25-120 thru 25-126 & Ord # 88.85 except for transmission lines (greater than 12.5kv). Existing services will be required to be placed underground where the cumulative expansion is greater than 25% of the existing building floor area or the cumulative alteration is at a cost exceeding fifty percent 50% of the current appraised value of the structure.

22. Detached, single-family dwellings are exempt from undergrounding overhead utilities adjacent to the site per Tempe City Code, Sec 25-122, Undergrounding of overhead utility lines.

23. Show and dimension all existing utilities (water, gas, power, irrigation, sewer, storm drain, etc.) and locate by tying to property line and/or street centerline.

24. Distinguish between all existing and proposed construction and clearly show any planned phasing.

25. Show and dimension all existing and proposed curb cuts for driveways per Tempe Standard Detail T-320. Driveway entrances may not be required on roll curb streets for single-family residential. Driveway curb cuts shall not be located within 100’ of the point of intersection of property lines at arterial/arterial or arterial/collector street intersections.

26. Vertical curb required at all street frontages with the exception of single-family homes where the existing curb is other than vertical curb.

27. Show, dimension and locate all existing streets, sidewalks, driveways, medians and median openings within 125’ of the project boundaries on both sides of the street.

28. Clearly indicate drive aisle widths & turning radii. 45' min turn radius, 20' minimum width, 23' minimum when parking on both sides. Refer to the City of Tempe Zoning & Development Code manual, Chapter 5, Figure 4-502 G, for

the maneuvering diagrams.

29. Show and dimension proposed and existing perimeter walls, wall heights, spot grades on both sides of walls, and adjacent building faces near property line.

30. Signature block as follows (lower right-hand corner of cover/first sheet):

APPROVAL FOR OFFSITES AND DRAINAGE ONLY

_____ _____

CITY ENGINEER **DATE**

31. Include the most current local Arizona Blue Stake block on all construction plan sheets.

32. Use 1" = 30' maximum engineering scale and show a bar scale.

33. Show net area of site in square feet and acres.

34. On-site storm water retention is required for the 100-year, 1-hour storm per City of Tempe Drainage Criteria section unless the property is located within the Alternative Retention Criteria Area (ARCA).

35. Underground retention may be permitted with the specific approval of the City Engineer, or designee.

36. Show on plans the retention volume required and provided, top and bottom elevations for retention areas, rim elevations for drywells and catch basins, invert elevations for catch basins and drainage pipes. 4:1 maximum side slopes for landscaped retention areas. Maximum depth of 3' in landscaped areas and 1' maximum depth in paved areas. Show the high water levels (HWL) at all basins and at grates or manholes for catch basins and underground storage tanks. Include cross-sections at all property lines and frontages, basins, swales, ditches, means of storm water conveyance and retention. Figure 1 in the Single-Family Residential Improvements section of this manual can be used for single-family residential projects.

37. Show positive grade breaks at all property and right-of-way lines.

38. Show existing and proposed landscaping in water, sewer, and storm drain easements. Add the following note to plans that have a public water line or sewer line easement. "No deep-rooted shrubs, trees, lights, poles, structures, etc. are allowed in easements."

39. Include the Arizona Registered Professional Civil Engineer's seal, signature, date signed, and expiration date on each sheet.

40. Call out all applicable standard specifications and standard details (City of Tempe, MAG, etc.) on the plans.

41. A boundary survey and/or a title report less than three months old may be required.

42. Show all underground electric circuits, conduit, traffic signal poles, pole foundations, pull boxes, and other traffic furniture approved by the Transportation Division. Show locations of any required street lights to be installed with project. Call out the correct type of street lights per the City's requirement. Locate all street lights from the center line of roadway and/or the nearest property line.

43. Show the Development Services (DS) Number and Engineering Private Development (EN) Number (assigned during the first review) and Project Address in right hand bottom margin on the right edge of each sheet. Use 36 pt. Helvetica Kroy or 350 CL Leroy Lettering.

44. Provide title block on each sheet showing project name, type of drawing (water, sewer, paving, grading and drainage, etc.) sheet number and Township range and quarter section.

45. Plan check approval is valid for one year from application date. One 6 month extension is allowed if requested prior to the expiration of the one year period at an additional cost of 25% of the total plan review fee. The approval expires if permits have not been picked up and paid for or extended within the six (6) month period. An additional 100% of the plan review fees will be charged for all renewals after the expiration date and all expired permits will be issued using the fee structure effective at the time of issue.

46. Show all proposed utilities (electric, telecommunications, television, gas, data/communication, etc.) on civil plans or on separate plans. Profiles are required for bores. A miscellaneous trenching permit is required for utility construction. And shall be obtained directly through the Engineering Dept.

47. Provide copies of private cross-access & cross-drainage easements/agreements, where applicable.

48. Comply with all applicable Site Plan Review comments/requirements.

49. Provide an estimate of quantities of construction items may be required. See following sheet for list.

ESTIMATED QUANTITIES

The following is a list of quantities currently used by the City. Select all applicable items and show on the first sheet of the plans showing actual quantities for your project (complete the following table, selecting only the items applicable to your project.)

Item	Unit	Quantity
Water Main	LF	
Water Services	EA	
Fire Hydrant	EA	
Driveway or Alley Entrance	EA	
Concrete Curb and Gutter	LF	
Sidewalk or Bike Path	LF	
Valley Gutter and Apron	EA	
Paving	SY	
Alley Surfacing	SY	
Irrigation	LF	
Storm Drains	LF	
Drywells	EA	
Headwalls	EA	
Catch Basin	EA	
Manholes	EA	
Sewer Lines-Testing-Inspection	LF	
Sewer Services-Testing-Inspection	EA	
Manhole/Cleanout-Testing-Inspection	EA	
6” Machine-Drilled Tap	EA	
Underground Fire Sprinkler Line	EA	
Energization (overhead)	EA	
Energization (underground)	EA	
Trench Inspection	LF	
Street Light Pole Inspection	EA	

GENERAL PLAT REQUIREMENTS

A. GENERAL

1. Show the proposed subdivision name on the plat.

2. Provide a Tract Table describing intended use for each Tract.

3. Locate the plat by section, township, range and county.

4. The plan shall have mathematical ties to a minimum of two record survey control corners, preferably section corners and/or quarter corners as shown on the City of Tempe horizontal control map.

5. Show and note City of Tempe elevation benchmark used for vertical datum if needed (example: Condo Plats.)

6. Include the names, addresses, and phone numbers of the subdivider and the Engineer who prepared the plat.

7. Show the scale, north arrow, date of preparation, and any revision dates.

8. Show the subdivision on a location map of the area.

9. The plat is required to be signed by an Arizona Registered Land Surveyor.

10. Maximum scale shall be 1" = 50' except for Tract Maps which shall be 1"= 100' maximum; show a bar scale on each plan sheet.

11. All plans must be submitted on 24" x 36" sheets only and be legible at 50% reduction.
    Font sizes shall be as follows:
    Plat Title, 48pt and subsequent information 24pt.
    All other categories shall be 24pt for the Heading and all subsequent information shall be 16pt.

12. Include a key map if two or more sheets are required for the drafting of the final plat.

13. On each sheet show the Engineering Private Development (EN) Number and the Development Services (DS) number (assigned during the first review) in the lower right hand corner in the bottom margin. Use 36 pt. Helvetica Kroy or 350 CL Leroy Lettering.

14. Provide title block on each sheet showing project name, type of drawing (preliminary plat, final plat, etc.), sheet number, and quarter section.

15. Provide a Utilities Block.

16. Provide an H.O.A. Ratification Block (if needed).

17. Provide a Lien Holder's Block (if needed).

18. Show access to the Plat site and provide a recorded document number if it is by easement only.

B. EXISTING CONDITIONS

1. Identify and dimension all existing rights-of-way and easements.

2. Show existing structures, site amenities, and municipal corporation lines.

3. Show the name, book, and page number of adjacent recorded tracts.

C. PROPOSED DEVELOPMENT

1. Show the proposed street and alley layout and centerline dimensions of streets.

2. Show proposed street names. They shall conform to the City of Tempe grid.

3. Show street connections to adjoining platted tracts.

4. All cul-de-sac streets shall terminate in a circular right-of-way with a minimum radius of 55' and shall have an improved traffic turning circle with a minimum radius of 45'. The maximum length of any cul-de-sac street shall be 400' measured from the intersecting right-of-way lines to the face of curb at the back of the cul-de-sac.

5. If the tangent centerlines deflect more than 10° and less than 90°, they shall be connected by a 600' minimum radius curve for collector streets or a 200' minimum radius curve for local streets.

6. There shall be a tangent of at least 100' between reverse curves for collector and local streets.

7. All streets intersecting an arterial route shall do so at a 90° angle.

8. All local streets shall intersect at an angle between 75° and 105°.

9. Right-of-way widths shall match the City's standard street and alley cross sections as shown in the Tempe Public Works Dept-Uniform Standard Details-300 Series & 400 Series.

10. Paved alleys shall be 20' wide.

11. A.B.C. surfaced alleys shall be at least 16' wide.

12. Partial alleys shall be 12' wide.

13. Alleys shall have corners cut off a minimum of 15' on each side of the corner at all changes of alignment.

14. Dead-end alleys are prohibited.

15. Local streets that intersect collector or arterial streets shall have a tangent centerline length of at least 150'.

16. If a local street curve intersects a collector or arterial street, it shall have a centerline radius greater than 400'.

17. All street corners shall have minimum right of way triangular cutoffs as follows:

    a. 15' x 15' cutoff where local streets intersect
    b. 15' x 15' cutoff where local street intersects collector street
    c. 20' x 20' cutoff where collector streets intersect.
    d. 20' x 20' cutoff where local and collector streets intersect arterial streets.
    e. 30' x 30' cutoff where arterial streets intersect

18. For non-residential lots less than 100' in width, common access easements shall be provided for Refuse and Fire Department circulation.

19. Show dimensions and bearings for all lots.

20. Where two streets intersect a common local or collector street and those streets are offset from each other, the minimum offset shall be 125'. Where the common street is an arterial street the minimum offset shall be 330'.

21. Show the location, width dimensions and use of all existing or proposed easements.

ADDITIONAL PRELIMINARY PLAT REQUIREMENTS

A. EXISTING CONDITIONS

1. Show and dimension the existing drainage by the use of contour lines.

2. Show and note City of Tempe elevation benchmark used for vertical datum.

3. Show and dimension existing irrigation features and the direction of flow. Indicate any modifications.

4. Show existing water, sewer, storm drain, irrigation pipelines, pipeline size, material, and associated facilities.

5. Show the existing zoning and that of adjacent tracts.

6. Fully dimension the boundary and show any encroachments.

7. Show the gross and net acreage of the tract.

8. Include legal description.

B. PROPOSED DEVELOPMENT

1. If there will be vehicular access to lots from the alley, the alley shall be 20' wide and paved to the nearest street or to both end streets depending on use.

2. Show street and drive widths.

3. Lengths of blocks measured along the centerline shall be no longer than 1200' except in the case of 1/2-acre lots where the maximum block length is 1700'.

4. Clearly show all land dedicated for public use.

5. If the zoning of this area is to be changed, indicate the proposed change.

ADDITIONAL FINAL PLAT REQUIREMENTS

A. GENERAL

1. Engineering plans shall be approved by the City Engineer prior to recordation of the final plat.

2. Fully dimension the map and submit a copy of the coordinate point map and a disk containing coordinate list from the land surveyor with all project coordinates in ASCII format.

3. Fully dimension each parcel, lot, and tract and show its area on the plat.

4. Fully dimension and clearly identify all excepted parcels and label them or "exception" them as "not part of this plat."

5. The plat shall have mathematical ties to a minimum of two record survey control corners preferably section corners and/or quarter corners as shown on the City of Tempe horizontal control map.

6. Locate and identify existing monuments.

7. Identify survey monuments to be set.

8. For all curvilinear streets, show points of tangency, centerline radius, tangent distance, central angle, and length.

9. Show drainage easements for areas where retention is required for street run-off.

10. Show flood hazard boundary from FEMA Maps and cite restrictions in declaration.

11. Comply with all of the conditions of approval as evidenced by the minutes of the following meetings.

    a. City Council
    b. Board of Adjustment
    c. Design Review Board
    d. Planning Commission

12. Where on-site storm water retention occurs, a typical lot grading plan shall be included on the plat.

13. Any property with a drywell and/or an underground retention tank/system shall add the following note to the plat plan sheet: "The underground retention system and/or drywell as shown on the approved grading and drainage plans shall be the sole responsibility of the property owner to: (1) regularly inspect the system (at least annually), and (2) maintain the system in a condition that will allow the system to store and dissipate the volume of storm water within 36 hours, as shown on the design plans. The foregoing restriction cannot be changed without the prior written consent of the City of Tempe Engineer."

14. Provide current title report (less than three months old) of land being platted.

15. Any new easement or dedication not shown on the plat or subsequent to plat recordation is required to be prepared via separate instrument. This instrument/document shall be prepared by City staff only and shall be done after receiving proof of property ownership. Proof of property ownership shall be a copy of current Warranty Deed or Title Report, current to within 90 days from date of initial engineering submittal. Preparation of the legal description and exhibits, complying with Maricopa County Recorder requirements, shall be done by the design engineer. The original instrument/document must be signed by the property owner and notarized prior to submitting to City for final review. After the entire packet has been reviewed by the City it will be returned to the design engineer who will have the packet recorded with the Maricopa County Recorder. The entire original recorded packet, with the County Recorder's label, shall be returned to the City prior to final project approval by the City Engineer.

B. DEDICATION AND ACKNOWLEDGMENT

1. Include all necessary dedications on the plat.

2. Include the location by section, township, range, and county in the dedication.

3. The execution of the dedication shall be acknowledged.

4. The acknowledgment shall be certified by a notary public.

C. STREET DESIGN

1. Where the subdivision abuts an arterial street, use reverse frontage lots with a 1' wide vehicular non-access easement along the arterial street.

2. Collector streets may be extended to the subdivision boundary for future connection with adjacent land that is not subdivided, but not necessarily as a straight line street (e.g. can be curved or offset appropriately.)

3. Where the subdivision abuts or contains a railroad right-of-way, limited access highway, irrigation canal, or abuts Industrial zoned land, the streets parallel and on each side of such right-of-way for a suitable distance may be required.

4. Half streets shall be used where necessary to comply with the approved street pattern. Where such half street furnishes the only access to the subdivision, the remaining half shall be constructed or a portion thereof to make the necessary transition as determined by the Traffic Engineering Division.

D. CERTIFICATIONS

1. Certification by an Arizona Registered Land Surveyor.

2. Certificate of plat approval by the Planning Division.

3. Certificate of plat approval by the City Engineer.

4. Certificate of plat approval by the City Council.

5. Certificate of assured water supply.

C. CHANGES TO A RECORDED PLAT:

1. Any material change to a recorded subdivision plat requires that the plat be amended. Material change includes, but is not limited to:
   - Any change in location or dimensions of a property line, tract, dedicated easement, or right of way.
   - Any change in acreage due to listed item above.
   - Any change in the legal description which alters the dimensions of the plat or its area.
   - Any change, except for obvious spelling errors, in the dedicatory statement.
   - Other matters as determined by the City Engineer or representatives thereof.

2. Minor typographical errors in dimensioning or annotation shall be corrected by a Certificate of Correction.

   Procedure:
   The Certificate of Correction shall include the following:
   - The corrections and/or changes requested.
   - The date that the plat was recorded.
   - The Maricopa County recorders instrument number of the plat which is to be modified.
   - A signature line for approval by the City Engineer or representatives thereof.
   - An imprint of the seal and signature of a Registered Land Surveyor in Arizona.

3. The developer or his representative shall have the certificate recorded in the Office of the Maricopa County Recorder. A copy of the recorded certificate shall be filed in the Office of the City Clerk and a copy shall be returned to the City Engineer, or designee.

PAVING & STREET DESIGN CRITERIA

A. GENERAL

1. In addition to this section refer to the section labeled “TYPICAL PLAN CRITERIA FOR ALL ENGINEERING SUBMITTALS”, in this manual.

2. Street design should also be consistent with and comply with the guidelines in the current issue of AASHTO’s “A Policy on Geometric Design of Highways and Streets”.

3. Include all applicable standard specifications and standard details on the plan.

4. Include a vicinity map showing the property in relation to that of the nearest major streets intersection on the cover sheet.

5. Benchmark shall be on City of Tempe datum. Horizontal control will be the same as the subdivision plat datum.

6. Include an index map showing sheet numbers on the title sheet.

7. If any streets are located within the jurisdiction of the State or County, a permit from that jurisdiction is required.

8. All plans must be submitted on 24” x 36” sheets and be legible at 50% reduction. All final plan sets submitted for City Engineer approval signature must be printed on front side of 3 mil minimum double matte black line reproducible mylar.

B. LAYOUT OF STREETS & ALLEYS

1. New streets and alleys require platting. Show street names, locations, widths, and easements; they shall agree with the final plat.

2. The alley and street drainage shall agree with the accepted drainage plan.

3. All cross-sections and dimensions of streets and alleys shall meet City Standards.

4. Valley gutters are not permitted across collector or arterial streets.

5. Curb returns shall have:

   a. A 25’ radius where a local or residential collector street turns 90°.

   b. A 30’ radius where two arterials intersect.

   c. All others 20’ radius.

6. For cul-de-sac dimensions, the minimum radius to the face of curb is 45’ and the radius for the right-of-way is 55'.

7. All dead-end streets serving more than four lots shall be provided with temporary connections or turn-arounds. (Refer to the City of Tempe, Zoning & Development Code, Chapter 5, Access and Circulation).

8. Location of driveways and dimensions shall be shown. Use street alignment stationing to locate driveway centerlines or locate from nearest property line. Include driveways width dimensions consistent with the C.O.T. Details.

9. Dead end alleys are prohibited.

10. All new and existing survey monuments shall be shown on the plans and are required at all street intersections, P.C.’s, P.T.’s, P.I.’s, section corners, quarter corners, sixteenth corners, and subdivision corners if applicable. After all improvements have been installed, an Arizona Registered Land Surveyor shall check the location of monuments and certify their accuracy and compliance.

11. Street names shall conform to the existing City grid.

12. Local streets shall be designed to minimize through traffic use.

13. Maximum block length shall be 1200’ except that in the case of 1/2-acre lots the maximum block length shall be 1700’.

14. Minimum 15’ X 15’ property line cutoffs are required at all angles and intersections of alleys.

15. 15’ X 15’ property line corner cutoffs are required at local street intersections and where local and collector streets intersect. 20’ x 20’ cutoffs are required at collector street intersections and where local and collector streets intersect arterial streets. 30’ x 30’ cutoffs are required at all arterial intersections.

16. Where two streets intersect, a common local or collector street and those streets are offset from each other, the minimum offset shall be 125'. Where the common street is an arterial street, the minimum offset shall be 330'.

17. All intersections with arterial streets shall be at 90°.

18. Local street intersections shall vary no more than 15° from a 90° angle.

19. Intersecting street center lines with an angle between them at more than 10° but less than 90° shall be connected by a minimum centerline radius of 600' for collector streets or 200' minimum radius for local streets.

20. Where a local street intersects a collector or arterial street, provide minimum tangent approach distance of 150' (measured from the right-of-way line of the major street) or a minimum radius of 400'.

21. Provide 100' minimum tangent distance between reverse curves on local and collector streets.

22. Right of way shall be dedicated in accordance with Tempe's Standard Details.

C. DESIGN OF CURB, GUTTER, SIDEWALK, & PAVING

1. The engineer shall provide sufficient cross-sections and profiles of existing and proposed improvements. Include typical sections and pavement structural sections.

2. Single-family residential development shall have 4" roll curb and gutter, arterial streets shall have 7" vertical curb and gutter and all other streets shall have 6" vertical curb and gutter.

3. Provide sufficient information showing existing upstream and downstream construction to justify the design.

4. The proposed paving grades shall match existing or proposed improvements both upstream and downstream.

5. The design grades shall match the existing or proposed improvements on the opposite side of the street.

6. Wing type driveway entrances shall be located on all streets except for local residential streets with roll curb in front of single-family homes and where approved by the Engineering Division.

7. Sidewalks are required adjacent to both sides of all city streets and shall be 8' wide along arterial streets, 5'-6" wide on L-1 local streets, and 6'-0" wide for all other streets.

8. Select material used in accordance with City Details for base course shall be verified by soil tests.

9. A soil report shall be submitted to verify the designed pavement section.

10. All irrigation ditches shall be tiled with rubber gasket reinforced concrete pipe (RGRCP.)

11. The engineer shall furnish satisfactory information to permit abandonment or relocation of existing irrigation facilities.

12. If the existing irrigation is proposed to be altered in any way, the engineer shall submit a letter, which verifies that provision for both delivery and tailwater will be adequate.

13. All pavement termination or extent of overlay shall be determined in the field by the City Engineer, or designee.

14. Excessive downhill gradient from an existing or proposed street intersection to a point where minimum gradient is used along the remainder of the street length will not be permitted. A straight grade must be used unless it will create a difficult problem in terms of grading or drainage.

15. Minimum street grade shall be S=0.0020 ft/ft. Where practicable street gradients shall exceed minimums (S=0.004 ft./ft. is desirable). Maximum street grade for collector streets is 0.07 ft./ft. and for local streets it is 0.09 ft./ft.

16. The minimum length for a vertical curve is 100'.

17. Minimum cross slope shall be 0.025 ft/ft. for all streets and alleys.

18. Minimum longitudinal slope across valley gutter shall be S=0.0020 ft/ft.

19. Minimum elevation difference from radius point of cul-de-sac to highest gutter shall be 0.5'.

20. Minimum slope on paved alley shall be S=0.0020 ft/ft.

21. Minimum slope on A.B.C. surfaced alleys shall be S=0.0015 ft/ft.

22. Show all proposed valley gutters, aprons, catch basins, scuppers, and other drainage structures.

23. Handicap sidewalk ramps are required at all intersections.

24. Show all curb transitions.

25. Show taper lengths and locations in both plan and profile.

26. Show invert elevations, pipe size, slope, hydraulic grade line, stationing, and material for all proposed storm drains.

27. All catch basins are to be curb opening type (5.5' minimum length.) No grate type catch basins shall be used. Slotted drain with angled slots may be used in combination with catch basins.

28. Scuppers are not preferred. Replacement of existing scuppers with catch basins is encouraged.

29. Call out all M.A.G. and Tempe Details in the construction notes or show "special" detail on plan.

30. Show all underground electric circuits, conduit, traffic signal poles, pole foundations, pull boxes, and other traffic furniture approved by the Transportation Division.

31. Saw cuts of existing pavement when approved by the City Engineer, or designee, shall be a neat straight edge.

32. Within the Southwest Overlay Zoning District, show the sidewalk in the right of way to be constructed per Tempe Standard Detail T-351. When the sidewalk is joined with the street curb, show the curb and gutter detail, MAG Standard Detail 220-1, Type A, to have contraction joint and expansion joint spacing of 12 feet in order to align with the sidewalk contraction and expansion joints.

STREET NAME SIGN REQUIREMENTS

Procedure for street name sign installation on public streets for new subdivisions:

1. During the development review process, the Engineering Division assigns new addresses to the subdivision.

2. Once addresses are assigned, Traffic Engineering prepares the bill for materials and installation that is sent to the developer.

3. After receiving payment, Traffic Engineering prepares the work order to initiate sign preparation and installation.

4. The City maintains street name signs installed on public streets.

5. Condition of subdivision plat approval is for the developer to pay for new street name signs.

Procedure for street name sign installation on private streets for new subdivisions:

1. The developer shall install private street name signs in accordance with City of Tempe Detail T-655.

2. The developer is responsible for sign preparation and installation.

3. The neighborhood association maintains street name signs installed on private streets.

4. Prior to clearance for occupancy, street name signs shall be installed per City requirements.

SEWER DESIGN CRITERIA

A. GENERAL

1. Include all applicable standard specifications and standard details on the plan.

2. Include the current general notes on the plan.

3. Include the completed utility approval block on the plan.

4. Include the permit and as-built information block.

5. Benchmark shall be on City of Tempe datum. Horizontal control will be the same as the subdivision plat datum. Each project shall have two mathematical ties to an approved City of Tempe datum.

6. Show a north arrow on each sheet of plans pointing up or to the right.

7. Include an index map showing the sheet numbers, pipe sizes, pipe type, manholes, and cleanouts on the cover sheet if more than two sheets are used.

8. Include a site plan/location map showing pipe sizes, pipe type, manholes, direction of flow, and cleanouts (see Engineering Submittal, Plan Review Procedures and Frequent Comments section, pages 8-11, for additional requirements).

9. Based upon centerline stationing and offsets show, locate, and dimension all existing and proposed utilities on the plan.

10. Show dimensions of rights-of-way features and all easements.

11. Public sewers shall be located in either the right-of-way or a minimum 12 foot wide exclusive sewer easement. When located in an easement, the sewer line shall be centered in the easement. Wider easements may be required based upon pipe diameter, depth of cover or location of adjacent utilities.

12. If any lines are located within the jurisdiction of the State or County their permit is required.

13. Plan and profiles are required for all public sewers showing existing and proposed surface grades, all other utilities, and other appropriate information (buildings, hardscape, landscape, drainage, etc.)..

14. Provide a service stub for each lot in the subdivision and extend it to property line or easement line. Show centerline station, offset location, and elevation

for each service.

15. Access to all sewer mains for maintenance purposes shall be provided.

16. All plans must be submitted on 24” x 36” sheets and be legible and scalable at 50% reduction. All final plan sets submitted for City Engineer approval signature must be printed on front side of 3 mil minimum double matte black line reproducible mylar.

17. All sheets shall be stamped, signed, and dated by an Arizona Registered Professional Engineer.

18. Provide an estimate of quantities of construction items.

19. Provide an estimate of the sanitary sewer average discharge rate in gal/day.

20. The maximum scale for sewer plans is 1” = 30’; show a bar scale on each plan sheet.

21. On each sheet show the Engineering Private Development Project Number (EN - assigned during the first review), the Development Services (DS) Number, and address in the lower right hand corner in the bottom margin. Use 36 pt lettering.

22. Provide title block on each sheet showing project name, type of drawing, sheet number, and quarter section.

23. Provide the applicable legend and notes on each sheet.

24. Provide a key map on each sheet showing page location within the overall plan.

25. The following requirement must be met when an existing sewer tap, which is not currently in use, is to be utilized in design. A sealed/signed statement from the design engineer <u>must</u> be submitted with the plans indicating that the existing sewer tap has been physically located and has been flow tested, TV’d, etc. to ensure the sewer tap’s serviceability. This must be received prior to City plan approval and prior to any permit issuance.

B. PIPES

1. The minimum design velocity shall be 2'/sec. (flowing full) with n = 0.013 for all pipe materials, unless otherwise approved by the City Engineer.

    a. The minimum grade for 8" sewers is 0.33%.

    b. The minimum grade for 10" sewers is 0.24%.

    c. The minimum grade for 12" sewers is 0.20%.

2. The sewer system shall be extended to serve adjacent property.

3. All abandoned sewer services shall be capped at the sewer main.

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

5. Include sewer line station at centerline of each manhole.

6. Include distance between manhole/centerlines.

7. Include calculated slope between manholes.

8. Include sewer line stationing and elevation at property line at centerline of each service tap at 90° to main; if not installed 90° to main, station, and offset to end of each service tap.

9. The maximum sewer velocity is 7'/sec unless specifically approved by the City Engineer.

10. Sewer lines shall be deep enough to have a minimum of 5' of cover at the property line.

11. All parallel <u>water</u> and <u>sewer lines</u> shall be separated by a minimum horizontal distance of 10' and contained in an exclusive water/sewer easement. The minimum easement width for this configuration is 20'. A wider easement may be required depending on pipe size and depth of bury.

12. Pipe crossing separation/protection shall be provided per M.A.G. Standard Detail 404.

13. All pipes shall be V.C.P. extra strength for pipe diameters of 8, 10, 12, 15 inches.

14. All taps shall be machine drilled only. Individual single-family residential taps

may be 4 inch. All others shall be a minimum of 6 inch diameter.

15. Any taps larger than 6 inch will require individual design of the tie-in.

16. Profiles for services may be required (based on the additional underground infrastructure in the area) from the site to the sewer.

17. No individual direct service taps to lines larger than 15 inch diameter will be allowed.

18. Determination will be made on a project specific basis whether public sewer in lieu of private sewer will be allowed onsite.

19. Public sewer lines should be a minimum of 20 ft. away from any trees.

20. Public sewer lines should be a minimum of 16 ft. away from any foundations.

21. Additional appurtenances are required based on use to satisfy the Fats, Oils and Grease (FOG) Ordinance. These appurtenances shall be installed on private property only. Contact City of Tempe Environmental Services Section at (480) 350-2674 for further information and requirements.

22. All bored street crossings shall be encased per Tempe Standard Detail T-215.

23. Trench, backfill, and pavement replacement shall conform to Tempe Standard Detail T-450 for all street cuts approved by the City Engineer.

24. Dry/private utility separation distance shall be a minimum of 2' both horizontally and vertically from all City of Tempe utilities; parallel separation from water lines shall be minimum of 6'.

25. New sewer line crossing of existing water, sewer or storm drain lines shall have a minimum vertical separation of two (2) feet. Protection of the water line and/or the line serving a fire hydrant shall be provided in accordance with MAG Standard Detail 404.

26. Electronic marker shall be installed at all services per MAG Standard Detail 440.

C. MANHOLES

1. The maximum distance between manholes is 400 ft. for 8" to 12" sewer and 500' for sizes larger than 12".

2. Show all rim elevations and pipe invert elevations at manholes.

3. Maintain an invert drop of 0.1’, minimum for angle deviations 45° or larger across each manhole.

4. All changes of gradient or direction shall occur with a manhole at the point of change.

5. A manhole shall be provided for all sewer intersections 8” or larger.

6. Use drop manholes only when absolutely necessary and conform to M.A.G. Standard Detail No. 426.

7. All other manholes shall conform to M.A.G. Standard Detail Nos. 420, 421 and 422.

8. No service taps are allowed into manholes or cleanouts.

9. The maximum distance from a cleanout to the nearest manhole is 150’.

10. Use a 30” manhole cover where the sewer is larger than 24”.

11. Use a 30” manhole cover where the sewer is more than 10’ deep.

12. Use a 30” manhole cover on all lift stations.

13. All manholes shall be 5’ diameter with no steps.

D. SYSTEM ANALYSIS

1. The peaking factor shall be per Section R18-9-E301 of the Arizona Administrative Code Title 18-Chapter 9-Part E.

2. Manning’s friction factor shall be 0.013 regardless of material of pipe construction.

3. d/D shall be 0.50 for diameters up to 15” per the US EPA's Capacity, Management, Operations, and Maintenance (CMOM) regulations. If the pipe diameter is greater than 15”, then d/D shall be 0.70.

4. Sewage Flow Factors and Assumptions shall be per the Arizona Administrative Code Title 18-Chapter 9-Part E, Type 4 General Permits, Table 1 - Unit Design Flows.

WATER DESIGN CRITERIA

A. GENERAL

1. Call out or show all applicable standard specifications and standard details on the plan.

2. Include the current general and site plan notes on the plan.

3. Include the completed utility approval block on the plan.

4. Include the permit and as-built information block.

5. Include approval blocks for the Maricopa County Environmental Services Department (if required) and the City Engineer. Note that the signature from the Maricopa County Environmental Services Department is required prior to City Engineer signing.

6. Include a site plan/location map showing valves, hydrants, meters, back flow preventers, easements, and pipe sizes (see Engineering Submittal, Plan Review Procedures and Frequent Comments section, pgs. 8-11, for additional requirements).

7. If any lines are located within the jurisdiction of the State or County, a permit is required.

8. Benchmark shall be on an official City of Tempe datum. Horizontal control will be the same as the subdivision plat datum. Each project shall include two mathematical ties to an approved City of Tempe datum.

9. Show a north arrow on each sheet pointing up or to the right.

10. Include an index map.

11. Based upon centerline stationing and offsets, show, locate, and dimension all existing and proposed utilities on the plans.

12. Show dimensions of rights-of-way features and all easements, existing and proposed.

13. For public water lines not located within the Public right of way, exclusive public water easements are required and shall be a minimum of 12 ft. wide centered on the pipe. (Wider easements may be required based on pipe diameter and depth of cover)

14. For water services not located within the Public right of way, exclusive public water easements are required for the service lines from the main up to and including the water meter.

15. The maximum scale for water plans is 1” = 30’; show a bar scale on each plan sheet.

16. Each lot in a subdivision shall be supplied with water in sufficient volume and pressure for domestic use and fire protection. Locations of all taps shall be dimensioned on the plans.

17. All plans must be submitted on 24” x 36” sheets and be legible at 50% reduction. All final plan sets submitted for City Engineer approval signature must be printed on front side of 3 mil minimum double matte black line reproducible mylar.

18. All sheets shall be stamped, signed, and dated by an Arizona Registered Professional Engineer in compliance with the latest Arizona Board of Technical Registration requirements.

19. Provide an estimate of quantities of construction items.

20. For new water services, provide an estimate of flowrate in gallons per minute for average day water demand.

21. Provide the applicable legend and notes on each sheet.

22. On each sheet show the Engineering Private Development (EN) Number, the Development Services (DS) number (assigned during the first review), and the address in the lower right hand corner in the bottom margin. Use 36 pt lettering.

23. Provide title block on each sheet showing project name, type of drawing (water), sheet number, and quarter section.

24. Provide a key map on each sheet showing page location within the overall plan.

25. Water meters and fire hydrants shall be located within a recorded exclusive waterline easement contiguous with the water main system. Backflow preventers shall be located on private property & outside of the public right-of-way or outside of public easements.

26. Isolation valves at branch connections in the looped water line system shall be provided. The number of valve as required in order to provide means for isolating every branch by closing one or more valves. Typically this will

require one valve less than the number of branches.

B. PIPE

1. All public waterline pipes shall be ductile iron Pressure Class 350 and shall be wrapped in high-density polyethylene in accordance with MAG Standard Specification 610.

2. All section and mid-section water lines shall be 12”.
   All sixteenth section lines shall have 8” waterlines.

3. Water lines smaller than 12” shall have a minimum cover of 36”. Water lines 12” and larger shall have a minimum cover of 48”.

4. Provide a minimum of 2 feet vertical clearance to all other utilities; except sewer shall be per MAG Standard Detail 404. Encasement MAG Standard Detail 404 shall be specified on the plans for water line and sewer line encasement when a sewer line that is located less than 10’ horizontally and 2’ vertically under a water line. Storm drain shall be considered as sewer when crossing potable waterlines, thereby, referencing MAG Std Det 404.

5. Fire protection water flows may increase line sizes and require line looping.

6. All fire hydrant valves shall be flanged to the tee or 90° elbow.

7. Main line valves shall be spaced every 500’ to 600’ and placed in locations, which allow appropriate water main isolation.

8. All valve boxes shall be per MAG Standard Detail 391-1, Type “C”. Deep shouldered non-locking valve box covers are preferred except in heavy traffic areas where pentagonal bolted lids are required.

9. Main line valves at line intersections shall be flanged to fittings.

   a. Show coordinates (C.O.T. datum), bearings, and distances, or street centerline station and offset dimensions to:

      - All fire hydrants and fittings (i.e. valves, tees, ells)
      - Main at all changes in alignment.
      - All horizontal control points (i.e. centerline intersects, pc, pt).

   b. Show centerline station and offset to each service tap; size of tap; water meter and meter size; and dimension to nearest side property line.

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

12. Electronic ball marker (3M Model 1423XR/iD Blue) shall be installed at all horizontal and vertical changes in pipe direction without a valve. Marker shall be installed no greater than five feet (5') deep and installed per manufacturer's directions, cinch tied to pipe or above pipe if greater than five feet (5') deep.

13. Install a fire hydrant on all dead-end lines unless otherwise approved by the City Engineer, in which case use a M.A.G. Standard Detail 390, Type "B" curb stop with flushing pipe.

14. All single-family residential water service taps and meters shall be installed by the City of Tempe.

15. Commercial water service taps will be installed by the contractor/developer. The contractor/developer shall install the water meter box/vault and shall extend the pipe through the box/vault in preparation of the meter installation. The City of Tempe shall provide water meters for contractor installation. Duplex and multi-family residential units are considered to be commercial. Townhome and condominium complexes are considered to be commercial.

16. No water services are permitted on dead-end fire lines.

17. All bored street crossings require City Engineer approval and shall be encased per Tempe Standard Detail T-215.

18. Trench, backfill, and pavement replacement shall conform to Tempe Standard Detail T-450 for all street cuts approved by the City Engineer.

19. Service taps shall not be closer than 5' on any line.

20. Potable water service lines, meters and back flow devices shall be the same size, unless approved by City Engineer.

21. Meter size will be based on the design flowrate, latest meter technology and capability.

22. Valves shall have a flanged (FL) connection directly to fittings (Tees, Crosses). Valves may have flange (FL) or mechanical joint (MJ) connections to pipe. Flanged fittings shall be rated at 250 psi (minimum).

23. Separation of public water and sewer lines shall be 10 ft. center-center.

(Wider separation may be required based on pipe diameter and depth of cover.)

24. Public water lines should be 16 ft. minimum away from any foundations or 20 ft. minimum away from any trees.

25. In all cases the public water line shall be above any crossing (other public utility, onsite private utilities, and other non-structural appurtenances).

26. Water lines should be centered in paved drive aisles when located on private property.

27. Permanent overhead structures will not be allowed above public water or sewer easements unless the vertical clearance is greater than 30 ft.

28. Appropriate backflow prevention devices are required based on onsite use (Landscape, domestic midrise, high-rise, internally boosted, etc.)

29. Public water easements are required for service lines from the main up to and including the water meter.

30. Dry/private utility separation distance shall be a minimum of 2' both horizontally and vertically from all City of Tempe utilities; parallel separation from water lines shall be minimum of 6'.

31. New water line crossing of existing water, sewer or storm drain lines shall have a minimum vertical separation of two (2) feet. This separation criteria also applies to a line serving a fire hydrant. Protection of the water line and/or the line serving a fire hydrant shall be provided in accordance with MAG Standard Detail 404.

C. FIRE HYDRANTS AND SPRINKLER LINES

1. Fire hydrant spacing for one and two family dwellings shall not be over 500' measured along street lines with a minimum fire flow of 1000 GPM and a residual pressure of 20 psi for the most remote location.

2. Fire hydrant spacing for multi-family developments shall not be over 375' apart, or 150' to any opening in the building.

3. Fire hydrant spacing for commercial and industrial areas shall not be spaced over 375' apart, or 150' to any opening in the building.

4. Fire Department connections (FDC's) for sprinkler systems should be located at or near the main entry of the building and shall be located within 150' of a

fire hydrant. FDC's are to be shown on Fire Sprinkler Plans and are shown on Civil Plans for reference only. Remote FDC's are not allowed.

5. Along arterial streets, hydrants shall be spaced 500' (maximum) apart on both sides of the street and arranged in an alternating pattern.

6. The number of hydrants available to a building complex or subdivision (other than one and two family subdivisions) shall not be less than that determined by the spacing requirements of Table 1.

7. The minimum fire flow for buildings other than one and two family dwellings shall be not less than that specified in Table 2.

8. For fire sprinkler lines and new fire hydrants off of existing mains, three-valve clusters will be required for hospitals, high rise buildings, schools, and other high density areas as determined during plan review.

9. Fire sprinkler lines off new looped mains will be required to be properly isolated, which may require a three-valve cluster if there is not an adjacent valve in the loop.

10. Fire suppression system connections must be isolatable at the main from supporting fire hydrants. (This may require cut in tees with three valve clusters and/or INSTA Valves.)

11. A fire hydrant must maintain a minimum clear distance of 2' from back of sidewalks and curbs.

TABLE 1

CITY OF TEMPE PREFERRED NUMBER AND DISTRIBUTION OF FIRE HYDRANTS

Fire Flow Requirement (GPM)	Minimum No. of Hydrants	Maximum Spacing Between Hydrants (in feet) [1,2,3]
500 – 1000	1	375
1250 - 2225	2	375
2500 - 2750	3	375
3000	3	375
3250 - 4250	4	350
4500 – 5000	5	300
5250 - 5750	6	300
6000 - 6250	6	250
6500 - 7000	8	250

over 8000	1/1000 GPM	250

[1]Reduce spacing by 100’ for dead end fire apparatus access roadways.

[2]Where streets are provided with median dividers which can be crossed by fire fighters pulling hose lines, or arterial streets are provided with four or more traffic lanes and have a traffic count of more than 30,000 vehicles per day, hydrant spacing shall average 500’ on each side of the street and be arranged on an alternating basis up to a fire flow requirement of 7000 GPM and 400’ for higher fire flow requirements.

[3]Where new water mains are extended along a street where hydrants are not needed for protection of structures or similar fire problems, fire hydrants shall be provided at intervals of not less than 1200’ spacing to provide for transportation hazards.

FIRE HYDRANT LOCATIONS AND DISTRIBUTION

The provisions contained in this appendix are not mandatory unless specifically referenced in the adopting ordinance.

SECTION C101
GENERAL

C101.1 Scope. Fire hydrants shall be provided in accordance with this appendix for the protection of buildings, or portions of buildings, hereafter constructed.

SECTION C102
LOCATION

C102.1 Fire hydrant locations. Fire hydrants shall be provided along required fire apparatus access roads and adjacent public streets.

SECTION C103
NUMBER OF FIRE HYDRANTS

C103.1 Fire hydrants available. The minimum number of fire hydrants available to a building shall not be less than that listed in Table C105.1. The number of fire hydrants available to a complex or subdivision shall not be less than that determined by spacing requirements listed in Table C105.1 when applied to fire apparatus access roads and perimeter public streets from which fire operations could be conducted.

SECTION C104
CONSIDERATION OF EXISTING FIRE HYDRANTS

C104.1 Existing fire hydrants. Existing fire hydrants on public streets are allowed to be considered as available. Existing fire hydrants on adjacent properties shall not be considered available unless fire apparatus access roads extend between properties and easements are established to prevent obstruction of such roads.

SECTION C105
DISTRIBUTION OF FIRE HYDRANTS

C105.1 Hydrant spacing. The average spacing between fire hydrants shall not exceed that listed in Table C105.1.

Exception: The fire chief is authorized to accept a deficiency of up to 10 percent where existing fire hydrants provide all or a portion of the required fire hydrant service.

Regardless of the average spacing, fire hydrants shall be located such that all points on streets and access roads adjacent to a building are within the distances listed in Table C105.1.

TABLE C105.1
NUMBER AND DISTRIBUTION OF FIRE HYDRANTS

FIRE-FLOW REQUIREMENT (gpm)	MINIMUM NUMBER OF HYDRANTS	AVERAGE SPACING BETWEEN HYDRANTS[a, b, c] (feet)	MAXIMUM DISTANCE FROM ANY POINT ON STREET OR ROAD FRONTAGE TO A HYDRANT[d]
1,750 or less	1	500	250
2,000-2,250	2	450	225
2,500	3	450	225
3,000	3	400	225
3,500-4,000	4	350	210
4,500-5,000	5	300	180
5,500	6	300	180
6,000	6	250	150
6,500-7,000	7	250	150
7,500 or more	8 or more[e]	200	120

For SI: 1 foot = 304.8 mm, 1 gallon per minute = 3.785 L/m.

a. Reduce by 100 feet for dead-end streets or roads.

b. Where streets are provided with median dividers which can be crossed by fire fighters pulling hose lines, or where arterial streets are provided with four or more traffic lanes and have a traffic count of more than 30,000 vehicles per day, hydrant spacing shall average 500 feet on each side of the street and be arranged on an alternating basis up to a fire-flow requirement of 7,000 gallons per minute and 400 feet for higher fire-flow requirements.

c. Where new water mains are extended along streets where hydrants are not needed for protection of structures or similar fire problems, fire hydrants shall be provided at spacing not to exceed 1,000 feet to provide for transportation hazards.

d. Reduce by 50 feet for dead-end streets or roads.

e. One hydrant for each 1,000 gallons per minute or fraction thereof.

TABLE 2 - 2006 INTERNATIONAL FIRE CODE, APPENDIX B, PAGE 394

MINIMUM REQUIRED FIRE-FLOW AND FLOW DURATION FOR BUILDINGS[a]

FIRE-FLOW CALCULATION AREA (square feet)					FIRE-FLOW (gallons per minute)[c]	FLOW DURATION (hours)
Type IA and IB[b]	Type IIA and IIIA[b]	Type IV and V-A[b]	Type IIB and IIIB[b]	Type V-B[b]		
0-22,700	0-12,700	0-8,200	0-5,900	0-3,600	1,500	2
22,701-30,200	12,701-17,000	8,201-10,900	5,901-7,900	3,601-4,800	1,750	
30,201-38,700	17,001-21,800	10,901-12,900	7,901-9,800	4,801-6,200	2,000	
38,701-48,300	21,801-24,200	12,901-17,400	9,801-12,600	6,201-7,700	2,250	
48,301-59,000	24,201-33,200	17,401-21,300	12,601-15,400	7,701-9,400	2,500	
59,001-70,900	33,201-39,700	21,301-25,500	15,401-18,400	9,401-11,300	2,750	
70,901-83,700	39,701-47,100	25,501-30,100	18,401-21,800	11,301-13,400	3,000	3
83,701-97,700	47,101-54,900	30,101-35,200	21,801-25,900	13,401-15,600	3,250	
97,701-112,700	54,901-63,400	35,201-40,600	25,901-29,300	15,601-18,000	3,500	
112,701-128,700	63,401-72,400	40,601-46,400	29,301-33,500	18,001-20,600	3,750	
128,701-145,900	72,401-82,100	46,401-52,500	33,501-37,900	20,601-23,300	4,000	4
145,901-164,200	82,101-92,400	52,501-59,100	37,901-42,700	23,301-26,300	4,250	
164,201-183,400	92,401-103,100	59,101-66,000	42,701-47,700	26,301-29,300	4,500	
183,401-203,700	103,101-114,600	66,001-73,300	47,701-53,000	29,301-32,600	4,750	
203,701-225,200	114,601-126,700	73,301-81,100	53,001-58,600	32,601-36,000	5,000	
225,201-247,700	126,701-139,400	81,101-89,200	58,601-65,400	36,001-39,600	5,250	
247,701-271,200	139,401-152,600	89,201-97,700	65,401-70,600	39,601-43,400	5,500	
271,201-295,900	152,601-166,500	97,701-106,500	70,601-77,000	43,401-47,400	5,750	
295,901-Greater	166,501-Greater	106,501-115,800	77,001-83,700	47,401-51,500	6,000	
—	—	115,801-125,500	83,701-90,600	51,501-55,700	6,250	
—	—	125,501-135,500	90,601-97,900	55,701-60,200	6,500	
—	—	135,501-145,800	97,901-106,800	60,201-64,800	6,750	
—	—	145,801-156,700	106,801-113,200	64,801-69,600	7,000	
—	—	156,701-167,900	113,201-121,300	69,601-74,600	7,250	
—	—	167,901-179,400	121,301-129,600	74,601-79,800	7,500	
—	—	179,401-191,400	129,601-138,300	79,801-85,100	7,750	
—	—	191,401-Greater	138,301-Greater	85,101-Greater	8,000	

For SI: 1 square foot = 0.0929 m^2, 1 gallon per minute = 3.785 L/m, 1 pound per square inch = 6.895 kPa.

a. The minimum required fire flow shall be allowed to be reduced by 25 percent for Group R.

b. Types of construction are based on the *International Building Code.*

c. Measured at 20 psi.

2006 INTERNATIONAL FIRE CODE

MARICOPA COUNTY ENVIRONMENTAL SERVICES DEPT (MCESD) REQUIREMENTS

Include approval blocks for both the Maricopa County Environmental Services Department (if required) and the City Engineer. Sewer and Water plans shall be reviewed by the City of Tempe but approved by the MCESD prior to final approval by the City Engineer. Tempe Water Utilities Division (WUD) may require MCESD processing. The design engineer is to contact MCESD regarding their current requirements for Approval to Construct (ATC), Approval of Construction (AOC) and Health Certificate Packets.

PROCESSING REQUIREMENTS:

1. Approval to Construct (ATC)

   An appropriately completed application is to be submitted to Development Services Department (DSD) along with the Engineering plan review set. This occurs after the plans are complete and acceptable to WUD.

   When WUD has determined that the plans are complete and approvable, the ATC documents will be signed and WUD will generate a Sewer Capacity Letter.

2. Approval of Construction (AOC)

   AOC documents are generated post-construction and testing. The AOC documents and testing data are submitted by the design engineer along with as-built documents to MCESD to fulfill the ATC process.

3. “Health Cert.” Packet (Approval of Sanitary Facilities for Subdivisions)

   The “Health Certs.” are agreements by the providers of water, sanitary sewer and refuse collection & disposal relative to for-sale residential or non-residential projects. WUD will process the water and sewer portion of the “Certs.” upon completion, testing and as-builting of the proposed public infrastructure improvements as documented by the appropriately completed “Health Cert.” packet and MCESD processed AOC document.

   The appropriately completed “Health Cert.” packets need to be submitted by the engineer to DSD (Engineering review) to be forwarded to the applicable City of Tempe provider of the specific service category (water, sanitary sewer, refuse) for final signature. Please note that the City of Tempe signs the collection portion of the refuse agreement only. Waste Management, Inc. signs the disposal site portion. This required a separate submittal to Waste Management, Inc.

WILL SERVE LETTERS

A Will Serve letter is a generic form letter that states if a proposed development meets all the reviews, approvals and payment of the appropriate fees that the WUD will provide water and sewer service.

Will serve letters may be directly requested of WUD by the owner once a Development Services (DS) project number, project name and project address have been identified and recognized by DS. The following information is required to complete a Will Serve Letter.

Project Name
Project Address
Owner's information (name, address, fax number)
Or if not an individual owner then a Company name and contact person and title (this person needs to have fiduciary authority)
Company name and address
Fax number

UTILITY EASEMENT ENCROACHMENT GUIDELINES

A. GENERAL REQUIREMENTS

1. The need for an encroachment permit or license agreement for use of the Public right of way will be determined at the time of submittal based upon specific use.

2. Any underground facility may only traverse a public water or sewer easement via an encroachment permit.

3. Only perpendicular encroachments are allowed.

4. The encroachment exhibit will be formalized during the encroachment permit process.

PEDESTRIAN, BICYCLE, TRANSIT DESIGN CRITERIA

A. GENERAL REQUIREMENTS

1. Plans submitted for review shall show all existing bus bays, bus stops, shelters, furniture, and easements within 250' of the site.

2. Plans submitted for review shall show all existing bicycle and pedestrian paths, easements, and facilities within 250' of the site.

3. Plans submitted for review shall include a pedestrian plan indicating proposed circulation within the site and access from the streets abutting the site. Pedestrian plans must conform to Americans with Disabilities Act (ADA) requirements.

B. GUIDELINES FOR DEDICATIONS AND IMPROVEMENTS

1. Development of parcels located at the far side of arterial to arterial and arterial to collector intersections shall be required to dedicate minimum easements of 9' by 27' for transit shelters and 11' by 175' for bus bays per the City's exaction policy.

2. Development of parcels located along multi-use paths designated by the most recent adopted Tempe Bicycle Plan and Updates may be required to dedicate a 25' easement per the City's exaction policy.

3. Bus shelter and bus bay improvements shall conform to City of Tempe Standard Detail T-654 specifications.

4. Multi-use path improvements shall conform to City of Tempe Standard Detail T-656 specifications.

C. TRANSIT RELATED DESIGN CRITERIA

1. Building frontages and location of main buildings should be oriented towards arterial streets or streets with existing or planned transit service (all arterial and collector streets).

2. Bus stops shall be integrated into the overall pedestrian plan of any project. Pedestrian walkways shall be designed to provide a direct connection between the main building entrance to public sidewalks and transit stops. Landscaping plans shall be designed to provide shading to the pedestrian walkways.

3. Pedestrian and transit user access to buildings is encouraged by locating buildings at the minimum setback at arterial to arterial intersections and arterial to collector intersections**,** or where transit service is provided or planned (all arterial and collector streets).

4. Distance of pedestrian access from bus stops to building entrances shall be minimized by using minimum setback requirements for locations of buildings on the site.

5. Pedestrian and bicycle access to the main building entrances from all sides of the site by providing more links to street frontages. At a minimum**,** it is suggested that pedestrian and bicycle ingress and egress pathways into the site shall be equal to the number of proposed driveways.

6. It is desirable that buildings locate closer to the street intersection by minimizing parking at street frontages or locating all parking behind or to the side of the building.

7. Bus stops shall be located between 60' and 110' from point of tangency of the intersection curb return.

8. Furniture installed at bus stops shall be located so as to provide minimum 36” clearance for access and maintenance between components and switch boxes, mailboxes, and utility boxes. All bus stops shall meet current ADA requirements for transit.

9. Bus stops shall be provided with convenient and safe pedestrian access to and from building entrances to streets. It is recommended that driveways not be located within a bus stop and/or pullout area.

10. The landscape plan shall incorporate shade trees for bus stops, maximizing shading for summer morning and afternoon hours. All landscaping shall be located so as not to obstruct the shelter canopy or visibility of the bus stop.

11. Mixed-use development is encouraged, allowing people to work and play where they live.

12. New and existing cul-de-sac and dead end streets, especially those abutting arterial and collector streets, should provide connecting pedestrian and bike paths to the major streets. Cul-de-sacs and dead-end streets are not encouraged for new or re-development.

13. Pedestrian and bicycle access to alleys shall be encouraged. Pedestrian and bicycle access to alleys may provide additional means for those users to access arterial streets.

D. BIKE FACILITIES

1. Bike racks shall be installed near main building entrances and located to take advantage of available building shade.

2. Provide direct access to the site from designated multi-use paths and other bike facilities abutting the site.

3. Bicycle rack design and installation shall conform to the City of Tempe Standard Detail T-578.

E. AMERICANS WITH DISABILITIES ACT (ADA) ACCESS

1. Sidewalks shall be required on all streets surrounding the property, including industrial, commercial and residential developments.

2. Sidewalks and pedestrian paths shall be built in compliance with the requirements of the Americans with Disabilities Act.

3. Ramps shall be provided at all street corners abutting the property.

4. A minimum 8’ X 8' concrete clear area adjacent to the curb shall be required at all bus stops. Bus stops in areas with sidewalks less than 8' wide or with sidewalks separated from the curb shall be upgraded to meet the minimum clear area per the City's exaction policy.

DRAINAGE DESIGN CRITERIA AND REQUIREMENTS

In accordance with Ordinance No. 819.1 adopted by the Tempe City Council on April 21, 1977, Ordinance No. 93.03, adopted February 11, 1993 and Ordinance 2012.45, adopted September 20, 2012, the following criteria are established to provide proper measures for handling and disposal of storm water runoff. Requirements for specific development (new subdivision, commercial, industrial) will be determined by the applicable criteria.

Drainage reports are required for all developments except for single-family and duplex homes unless part of a new master planned subdivision.

In addition to this section refer to the section labeled “TYPICAL PLAN CRITERIA FOR ALL ENGINEERING SUBMITTALS”, in this manual.

A. HYDROLOGY REPORTS

Flows (Q’s) should be calculated for the 100-year storm according to the methods outlined in the Drainage Design Manual for Maricopa County, Arizona, Volume I, Hydrology published by the Flood Control District of Maricopa County. The rational method may be used for areas of 160 acres or less. At the option of the Engineer, the Drainage Design Manual for Maricopa County, Arizona, Volume II, Hydraulics published by the Flood Control District of Maricopa County may be used to determine required retention volumes.

1. Subdivisions

A **preliminary hydrology report** must be submitted with the preliminary subdivision plat. This report shall include:

a. A contour map showing the existing drainage of the property (channels, ditches, structures, overland flow, etc.), including any drainage crossing the property from upstream areas.

b. A map that shows the proposed subdivisions runoff flows, points of concentration, limits of each drainage area, and location and size of storm sewers and catch basins. For retention, show volume of water required to be stored, location of storage, and method of disposal.

A **final hydrology report** must be provided before construction plans will be reviewed. The report will show:

a. A complete runoff analysis in tabular form.

b. Points of concentration with peak street flows and drainage areas.

c. Calculation for sizing catch basins and pipes and locations of catch basins.

d. Retention basin characteristics:

- Inlet structure
- Detailed calculation of volume required and actual holding volume
- Calculation and verification for disposing of water within thirty-six (36) hours

e. Calculations of 100-year runoff at critical points of subdivisions, such as low points and constrictions to overland relief.

f. Maximum elevation difference shall be 1' between adjacent residential finished floors not separated by a street.

2. Commercial and Industrial

For developments not requiring a subdivision map, the hydrology, hydraulics and retention volume calculations shall be included in a formal Drainage Report and also tabularized on the "Grading & Drainage Plan." The report must contain the following:

a. Cover Sheet, Table of Contents, Introduction, Location, Site Description & Proposed Development, Existing Drainage Conditions & Characteristics inclusive of Offsite Drainage, Proposed Drainage Plan, Data Analysis & Methods Used, References, Tables, Figures. Appendices.

b. Hydrology, hydraulics and retention calculations for a 100-year storm event including the "Volume Required" and the "Volume Provided".

c. A plan sheet with delineated drainage areas that easily identifies the retention areas, fully dimensioned with high water elevation noted. The lot outfall shall be a minimum of 4" above high water elevation. Include section views if needed for clarity.

d. Finish floor elevation is to be a minimum of 12" above the high water design and 8" above the lot outfall.

e. When paved areas are incorporated into lot retention, water depth is not to exceed 1.0' and must provide means of dissipation.

f. Retention Basin Volume calculations that can be <u>easily</u> verified and shown by basin.

g. An acceptable method of dissipating storm water within a 36-hour period. If a drywell is to be used, the drywell volume can be included in the calculations for volume provided. A dual-chamber drywell such as the Maxwell Plus drywell or an approved equal is required for dissipation whenever any basins or paved areas greater than 1.0' in depth are incorporated into retention. No allowances for volume due to percolation rate will be given. See Sections C.3 and C.4 for drywell limitations. Any projects at locations involved in fuel dispensing shall use a multi-stage drywell system such the Envibro System drywell or an approved equal; be aware that these drywells have limiting flow capacities which will govern the dissipation rate of the basin.

- Drywells must penetrate a minimum of 10' into suitable permeable strata.
- Drywells and Drywell system interceptor chamber grates shall be 0.5' above basin bottoms.
- Drywells must be registered with the Arizona State Department of Environmental Quality. An Aquifer Protection Permit (APP) may also be required.

B. STREET AND STORM DRAIN DESIGN

1. Peak runoff for subdivisions shall be determined by using The Drainage Design Manual for Maricopa County, Arizona, Volume II, Hydraulics published by the Flood Control District of Maricopa County or the Rational Method using this section and chart/nomograph of Figure 3.

   Note: A composite C-value may be used in the Rational Equation when determining flows for storm drain design purposes only. Required retention volume is calculated in accordance with Section C, Retention Design Criteria.

2. Streets, catch basins, and storm sewers shall be designed for a 10-year storm. When the computed runoff exceeds the capacity of a street (where the depth of flow is at the top of curb) subsurface drainage will be required, i.e. storm drain piping system. Each sub-basin contributing to an inlet structure is to be delineated and flows calculated at point locations; longitudinal slopes, cross slopes and superelevations must be considered when designing roadway drainage. Peak flows from a 100-year storm must be carried within the cross section between buildings (front yards and streets).

3. Rainfall intensity is related to time of concentration. Time of concentration is the summation of Overland Flow Time, Street Time, and Pipe Time.

   a. Overland Flow Time is the time required for a drop of water falling on an open area (lawn, field, etc.) to reach an outlet point (street, ditch, pipe, etc.) Smaller lots, larger building footprints, and increasing non-pervious services (roots, driveway, patio, etc.) require overland travel time of 10 minutes maximum.

   b. Street Time is the time required for the runoff to travel from entrance onto the street to entrance into a catch basin, drainage channel (or to some other point along the street where the runoff exits from the street).

   c. Pipe Time is the time required for the runoff to travel in the pipe from the entrance catch basin to another point along the storm drain - usually an entrance structure for another drainage area, retention basin, drainage channel, etc.

      The time of concentration shall be arrived at in the following sequence:

      I. Determine Overland Flow Time by referring to above paragraph (B.3.a) and Figure 3, Seelye Chart, in this manual.

      II. Compute Street Time by dividing the length of street flow by the runoff velocity when flowing at top of curb. Velocity shall be computed using Manning's equation with "n" value of 0.015.

      III. Compute Pipe Time by using the velocity occurring at design flow in a pipe or channel of given size and material. Velocity shall be computed using Manning's equation with the "n" value for pipe of 0.012. Refer to any published table for "n" values of channels.

4. Storm sewers shall be designed with a velocity of at least 3 feet per second. Minimum pipe diameter is 18".

5. New storm drain line crossing of existing public water, sewer or storm drain lines shall have a minimum vertical separation of two (2) feet. Protection of the water line and/or the line serving a fire hydrant shall be provided in accordance with MAG Standard Detail 404.

6. When a pipe size has been established, it shall not be reduced, unless for a metered situation. The upstream effects of this size reduction must be analyzed.

7. Maximum manhole spacing for 36" pipe or less is 400' and above 36" is 800'.

Manholes will be required at a change of grade, pipe size, or alignment.

8. Curved pipe will not be permitted for pipe of 36” in diameter or less.

9. Catch basins shall be designed to intercept a minimum of 80% of the total runoff delivered to the point in the street where depth of street flow reaches curb height or a storm water spread limitation restricted to one 12-foot lane of traffic in each direction. Only curb-opening inlets will be allowed on City of Tempe streets unless prior specific written approval has been attained from the City’s Engineering Division. Bicycle-safe grates shall be used where grated inlets or trench drains have been approved.

10. Sump catch basins shall be designed to receive all of the runoff at the catch basin. In situations where catch basins are in sump condition, the Engineer will verify that overland relief for the 100-year storm is available without damage to buildings. Catch basin capacities shall be determined from Hydraulic Engineering Circular No. 12 published by the Federal Highway Administration or the Fflood Control District of Maricopa County Drainage Design Manual, Volume II, Hydraulics. No grate type catch basins are permitted in streets.

11. Length of curb opening shall be 5.5’ minimum. Slotted drain with angled slots (minimum length - 10’) may be used in combination with catch basins.

12. Inlet clogging factors shall be applied as follows:

Inlet Type	Clogging Factor
Grate Inlets	
On grade	0.50
Sump	0.50
Curb-opening Inlets	
On grade	0.20
Sump	0.20
Combined Curb and Slotted	
On grade	
Curb inlet	0.20
Slotted inlet	0.33
Sump	
Curb inlet	0.20
Slotted inlet	0.33
Combined Grate and Slotted	
On grade	
Grate inlet	0.50
Slotted inlet	0.33
Sump	
Grate inlet	0.50
Slotted inlet	0.50

13. Storm drains shall be designed to provide the required capacity without surcharging the line. Storm drain outlets shall be designed to function as a part of the ultimate drainage system.

14. Valley gutters will not be permitted across midsection collector streets or arterial streets. Valley gutters will be discouraged on other collector streets.

15. Pipe outlets 12” or larger require an access barrier gate unless a backflow preventer is used at the outlet; provide a detail on the plans. Pipe inlets 12” or larger require a trash rack or an access barrier gate. Trash racks per MAG Std Detail 502 or provide a special detail on plans.

C. RETENTION DESIGN CRITERIA

There are two methods accepted by the Engineering Division for calculating required retention volume for improvements to single-family homes. Both methods use the following formula:

V = (P ÷ 12) * A * C

V = Volume required to retain (cubic feet)
P = Precipitation Depth (in inches) of storm water required to be retained
A = Total area of lot (in square feet) plus any additionally required areas
C = Coefficient of Non-Absorption

METHOD 1:

Tempe's standard method of calculating onsite storm water retention uses the formula above with the following data:

Where,
P = 2.4 inches (based on the 100-year, 1-hour storm event)
C = 0.95

V = (2.4 ÷ 12) * A * (0.95)

METHOD 2:

The City allows the usage of the **Drainage Design Manual, Volume I for the Flood Control District of Maricopa County** (Fourth Edition, Chapter 3, Rational Method) as an alternative method for determining required retention volume. This method determines the volume based on a 100-year 2-hour storm event, which has a precipitation depth (P) of **2.2 inches**. This method also has different Coefficient of Non-Absorption (C) values that vary by the size of the lot and the approximate percentage of the lot covered with improvements (house, decking, driveway, sidewalks, etc., i.e. anything other than undeveloped land). For single-family lots, Tables 3.2 and 3.3 of the County Drainage Design Manual for determining Coefficients of Non-Absorption will be interpreted as follows:

Coefficients Non-Absorption for Single-Family Lots			
Lot Size	20% or Less Lot Coverage Improvements	20% to 39% Lot Coverage Improvements	40% or More Lot Coverage Improvements
6,000 to 12,000 square feet	0.60	0.71	0.82
12,000 to 40,000 square feet	0.53	0.56	0.60
Over 40,000 square feet	0.41	0.47	0.53

V = (2.2 ÷ 12) * A * C

1. Retention of the 100-year 1-hour storm event (or 100-year 2-hour for Method 2) on property outside the public rights-of-way is required. The rare exception to the on-site retention requirement above includes only properties in the Alternative Retention Criteria Area (ARCA) where retention of the 2-year 1-hour storm event is required. In this case the precipitation depth, P = 0.9 inch. In no event shall a drainage permit be issued unless the drainage plan has been approved by the City Engineer and establishes that storm water runoff from the lot, plot or parcel of land will not adversely impact other property or City infrastructure. Refer to Section 12-57 of the Tempe City Code for defined areas of ARCA or see Figure 3 of this manual for visual location of ARCA.

2. Methods of Storage

   a. Individual lot storage shall consist of providing adequate storage volume for the lot, plot or parcel of land using either Method 1 or Method as described above. Storage volume shall include adjacent streets and alleys run-off except for arterial streets. A maximum depression of 1-foot is allowed for single-family lots with 4:1 side slopes.

      The maximum allowable depth of storm water for <u>calculation</u> of retention volume provided for new single-family residential lots as part of a new subdivision project shall be 10”, even though the plans specify depth of 1.0’, due to slope rounding, etc.

   b. Central retention storage shall provide adequate volume to handle runoff from the property being developed. If the central retention basin will be privately owned, maintained and operated by the subdivision or similar entity, the property shall be dedicated to the City for drainage purposes by easement, and all maintenance and operation shall be the responsibility of the owner of the property. If the central retention basin will be dedicated to the City for public use, an easement for the drainage area will be required, and all maintenance and operation shall be the responsibility of the City.

      The City may require the owner to comply with the following conditions:

      - Construction of drywells as necessary to dispose of nuisance water.
      - Seeding to provide ground cover.
      - Construction of flood irrigation and/or sprinkler systems.

- Other construction as the City may deem necessary to the proper public use of the property.

Upon acceptance of the easement dedication and the completion of the required construction, the City will assume responsibility for operation and maintenance when dedicated for public use. Design of such storage is outlined in the following section (C.3).

c. Combination storage consists of providing retention on individual lots and the balance of the volume within a central storage area. The "C" factor is the Coefficient of Non-Absorption of (0.95) for the onsite lot area and the run-off factor for the right-of-way water contributing to the central storage.

New subdivisions with lots of less than 18,000 sq.ft. (single-family zoning) will be required to utilize combination storage. The perimeter and house-footing berm configurations shall be submitted with the final hydrology to substantiate the retention volume provided, see Figure 1. Individual storage over 1.0' in depth will require a disposal mechanism to meet the 36 hour dissipation criteria.

- Where a residential subdivision is designed using combination storage, the entire volume of water generated minus the amount held by the depressed lots is the amount of central storage required.

- For newly constructed homes, rear yard retention will only be allowed on lots of 6500 square feet or greater. Rear yard retention surveillance is difficult after occupancy and experience has shown that spas, pools, patios, gazebos, garages, storage buildings and other amenities regularly usurp original depressed on lot storage. A "coefficient of build-out" will be applied to all newly constructed homes, including tear-down & rebuild; proposed retention volume is to be reduced by 40% of the original rear yard retention volume. Therefore, only 60% of the proposed retention volume can be considered as actual retention volume for compliance purposes.

- Finish floor elevations for new single-family residences to be a minimum of 14" above outfall of lot per Figure 1.

3. Design Requirements

a. All central storage basins must be graded to drain towards the outlet where applicable.

b. The typical maximum side slope is 4:1; City parks require flat bottoms (irrigation) & 10:1 side slopes. Private retention basins utilized for recreation require maximum 5:1 side slopes. Minimum bottom grade is 1%, except at City parks.

c. Maximum depth of water in central storage basins shall be 3'.

d. When special exceptions are granted for storm water retention basins greater than 3' in depth the basins must be secured. An acceptable means of securing is to provide a locking 8.0' high architecturally pleasing fence (no chain link will be allowed).

e. Above-grade retention areas shall not occupy more than 67% of the onsite landscaped street frontage areas.

f. Provide a minimum of 1' freeboard above the high water design elevation on all sides of a central retention area, including lowest development gutter flow line.

g. Wherever possible, overland relief must be provided.

h. Discharge requirements:

- Retention volume must be disposed of in 36 hours.
- Basins *greater* than 1.0' in depth *will* require a dual-chamber drywell or other approved disposal mechanism.
- Basins *less* than 1.0' in depth *may* require a dual-chamber drywell or other approved disposal mechanism.
- Maximum allowable design dissipation rate for drywell is 0.10 cfs unless substantiated by percolation test then after applying a reduction factor of 50%, a maximum rate of 0.25 cfs may be used.
- Multi-stage drywell systems such as the Envibro Drywell System or equivalent are restricted by flow capacity; therefore the flow capacity shall govern the dissipation rate and time.

i. Drywells will be permitted pending the approval by the Arizona Department of Environmental Quality for disposal of water.

j. No percolation rate will be considered for reduction of retention volume.

k. Invert of inlet pipe shall not be lower than bottom of retention facility at point of entrance unless otherwise approved.

l. Any outlet inverts and the top of grate for drywells and interceptor chambers shall be set at 6” above the bottom of the basin.

m. Inlet and outlet structures shall have a minimum 6’ wide concrete apron at the opening and shall be constructed to prevent easy access, particularly by children.

4. Underground Storm Water Retention Tanks may be acceptable requiring specific approval by the City Engineer and at a minimum must meet the following requirements. Note that these requirements may change without notice.

a. The installation of corrugated metal pipe with aluminum coating for underground retention tank system shall be in accordance with MAG Specification No.621. Excavation, bedding, and backfill shall be in accordance with MAG Specification No.601 and the material per MAG Specification No. 760. Corrugated high density polyethylene (CHDPE) pipe may be used provided supporting documents are submitted with design plans and the following requirements are met.

b. Required is a report prepared by a soils engineer registered in Arizona, showing the following information at each proposed location of the underground tank system(s). The report must include:
(1). Soil boring results to a depth of at least 10 feet below the bottom of the proposed retention tank(s), at each location, showing the depth of the proposed installation and the depth to groundwater.
(2). Soil conditions at each location of underground retention tank system(s). Include in the report and also show on the plans the following data:
(a) Soil pH
(b) Resistivity in ohm-cm
(c) Chloride concentration in ppm
(d) Sulfate concentration in ppm
(e) Moisture content

c. Submit documentation demonstrating that the design life of the lining and coating of the underground retention tank system will be greater than 50 years. Design life of tank is also to be noted on plan sheet. The methodology for determining the soil side service life of the corrugated steel pipe must conform to the Soil Side Durability of Corrugated Steel Pipe, Final Report 1991, prepared for the National Corrugated Steel Pipe Association.
(1). Show details for the lining and coating of the corrugated metal pipe retention tank(s) on the plans.
(2). Submit a letter from the soils engineer stating that the pipe material, lining, and coating are suitable for the soil conditions at the site and the pipe will last at least 50 years based on the soils conditions

encountered; also when using CHDPE pipe.

d. Submit calculations showing traffic and load bearing capacity of the underground retention tank system.
(1). Show the pipe gauge and corrugation size for CMP on the plans.
(2). Show the D-Load for RCP on the plans.
(3). Meet the manufacturer's minimum cover requirements for CHDPE pipe. These minimum cover requirements may have to be exceeded in order to install the required access manholes.

e. Provide a minimum of two access points for each underground retention tank.
(1). The access shall consist of 48-inch manhole shafts with 30-inch manhole frames and covers at grade labeled "RETENTION TANK", refer to MAG Std Details 424 & 522. Grated covers to allow for the inlet of surface storm water run-off may also be used in lieu of the solid covers.
(2). The access may include a fixed ladder, anchored to the wall of the retention tank. A structural engineer or the manufacturer must certify the structural integrity of the ladder installation.
(3). Provide concrete collars, per City of Tempe Standard Detail T-446, for all manholes located in pavement areas or subject to wheel loads.

f. Show a backfill detail on the plans. The detail shall include the material and compaction requirements and must address backfill and compaction under the pipe haunches, to the springline of the pipe.

g. Include a note on the plans specifying that all joints in the underground retention tank system(s) will be water-tight, manufactured joints.

h. Provide a minimum of 3 feet of cover, to the bottom of the base of the pavement structure, over the underground retention tank system(s) located in traffic areas. Provide a minimum of 3 feet of cover over the retention tank(s) in non-pavement areas.

i. Provide a detail on the plans showing the connection of the retention tank drain pipe into the interceptor chamber of the dry well. The invert of the drain pipe must be at or above the elevation of the inlet to the 4-inch cross-over pipe to the dry well chamber.

j. The drain pipe from the retention tank to the drywell interceptor chamber cannot be used to convey water from a retention basin into the underground retention tanks. Any water conveyed from a retention basin, road or parking surface is to be conveyed via storm drain pipe tied independently into the underground retention tank. Surface run-off water may also be directly discharged into underground retention tanks

when grated lids are substituted for the solid covers at any of the manhole access points noted in e.(1) above, however, this is not a preferred inlet.

k. Underground Storm Water Retention Tank location and proximity to any structure is also to be clearly shown on the Architectural site plan.

l. Contact the City of Tempe Engineering Division for all current requirements.

5. Subsurface Storm Water Management may be acceptable requiring specific approval by the City Engineer and at a minimum must meet the following requirements. Note that these requirements may change without notice.

a. Acceptable systems may include *StormTech Chamber System*, *CONTECH CHAMBERMaxx* or an approved equal.

b. Not for use at a fuel dispensing or fuel storage sites.

c. A manifold is required in multi-chamber systems.

d. A drywell is required in any case and shall be located downstream of a manifold.

e. Multi-stage pollutant/sediment treatment required upstream of chambers. Include an “isolation” chamber to trap sands/silts/fines.

f. Inspection/cleaning ports are required at each end of each chamber.

g. Cleanouts are required at each end of manifold.

h. Subsurface Storm Water Management system location and proximity to any structure is also to be clearly shown on the Architectural site plan.

i. Contact the City Engineering Division for all current requirements.

6. NPDES (National Pollutant Discharge Elimination System) regulations require the City of Tempe to promulgate a storm water management system that regulates quality as well as quantity. The statute is Section 402(p) of the Water Quality Act of 1987. In August 1998, the City Council adopted amendments to Chapter 12 of the Tempe City Code by adding Article VI.

ADEQ Notice of Intent (NOI) Certificate for developments 1 acre and larger shall be submitted prior to plan approval in order to show that the development is in compliance with the Storm Water Pollution Prevention Plan (SWPPP) requirements. The SWPPP is the responsibility of the owner and will be

reviewed as a part of the Drainage Plan review.

SWPPP plans shall implement the following design parameters.

a. All Best Management Practices (BMPs) shall be installed and maintained in accordance with the specifications of Volume III Erosion Control of the Drainage Design Manual issued by the Flood Control District of Maricopa County (2012). Best Management Practices mean schedules of activities, prohibition of practices, structural and non-structural controls, operational and maintenance procedures, control techniques or systems, design and engineering methods, and other management practices to prevent or reduce the discharge of pollutants.

b. The perimeter of the project site shall have BMPs for preventing discharges from the site. These BMPs would typically be Stabilized Construction Entrance (EC-5), Storm Waddles (SPC-1), and/ or Silt Fence (SPC-5). Storm Waddles shall be anchored by wooden stakes. Stakes shall penetrate soil a minimum of 12". Stakes shall have a maximum spacing of 5 feet on center. At Storm Waddle ends, stakes shall have a maximum spacing of 12-inches.

c. Designated Washdown Areas shall be onsite and follow the specifications of the General Housekeeping Best Management Practice GH-4.

d. Onsite stock piles shall have perimeter control BMPS installed around the stock pile. These BMPs would typically be Storm Waddles (SPC-1) and/ or Silt Fence (SPC-5).

e. Offsite storm drain inlets shall be protected by Gravel Bags (SPC-7) if upstream construction activities may result in stormwater discharges. Storm Waddles are not acceptable for offsite storm drain inlet protection.

f. BMPs for internal drainage and sediment control shall be indicated on the SWPPP. These BMPs would typically be Temporary Sediment Basins (SPC-8), Temporary Sediment Traps (SPC-9) and/ or internal drainage channels that directs storm water flows to onsite retention basins.

Drainage plans shall implement the following design parameters.

a. No drywells allowed in paved areas.

b. No direct connections from a catch basin or storm drain allowed to drywells.

c. On-site storm water retention is required for all lots and parcels within City limits and shall comply with this manual.

d. No drywells or other outlets allowed in truck wells.

e. Truck wells shall not be designed to accept flow from other areas of the site. Provide sump pump with manual switch for draining truck wells.

f. Generally, retention basins shall have grass bottoms, unless otherwise approved on plans. All basins greater than one foot in depth will require a dual-chamber drywell similar to the Maxwell Plus System or an approved equal. All developments require vehicular access to drywells for maintenance and repair.

g. Interceptors for commercial/industrial/multi-family developments may be required to filter and treat runoff.

h. Reduce water use where possible.

i. The above surface retention requirements avoids unnecessary “out of site-out of mind” maintenance/monitoring requirements to avoid groundwater contamination in the future.

j. Above-grade retention areas shall not occupy more than 67% of the on-site street frontage landscape area.

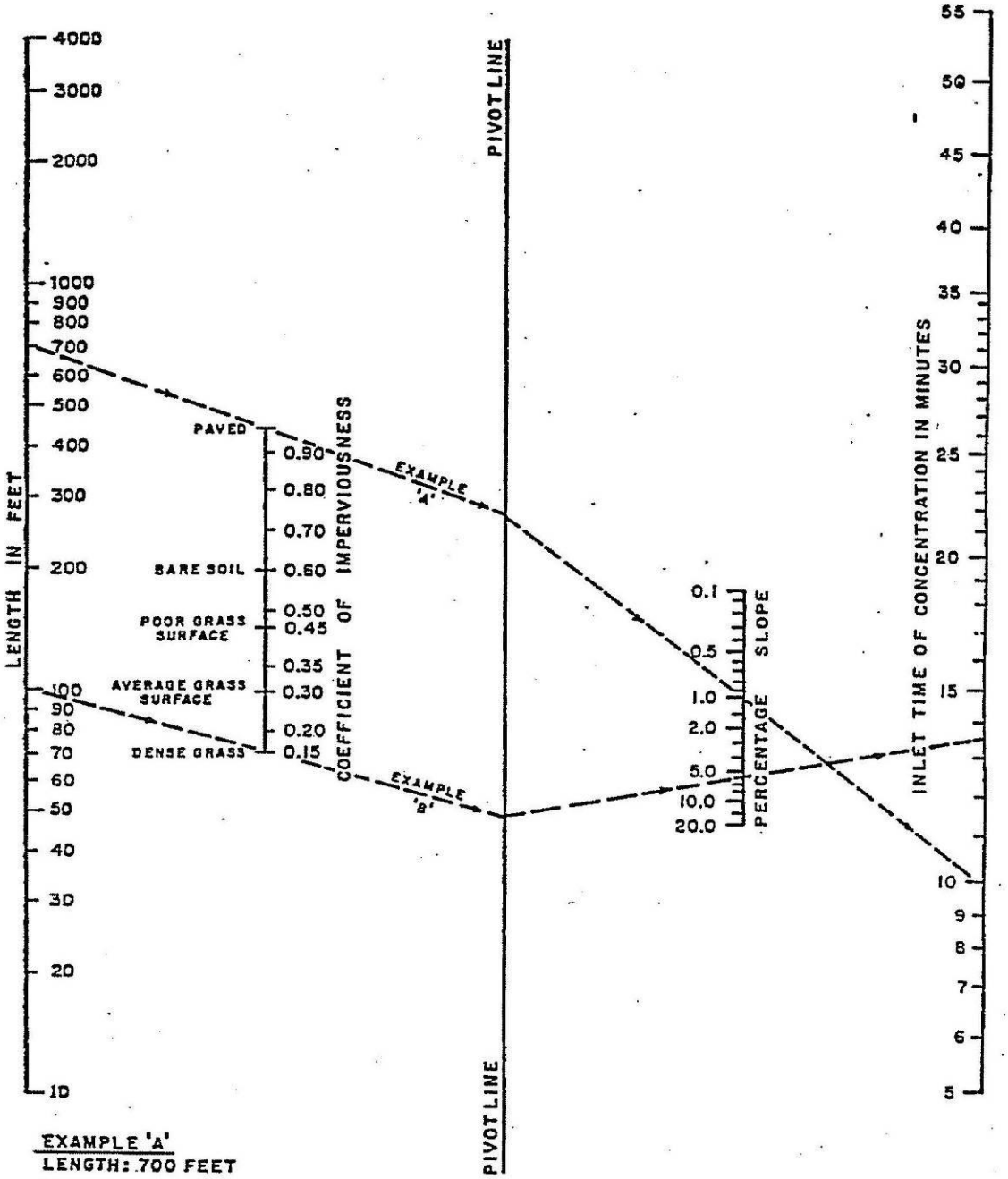
k. All above-grade retention areas shall maintain slopes no steeper than 4:1.

l. All on-site water retention areas, other than paved surfaces or piped systems shall be entirely landscaped.

m. The City requires that surface retention be maximized (including use of paved areas up to one foot deep with positive means of dissipation) before sub-surface retention will be considered. The City will allow underground storm water retention with specific approval from the Engineering Division. Refer to the “Underground Retention Storage Tanks” section of the City of Tempe Engineering Design Criteria manual, latest edition.

n. Existing basins or storm drain lines from properties other than City properties that bleed-off to the public storm drain system shall be eliminated.

FIGURE 3: TIME OF CONCENTRATION FOR OVERLAND FLOW, SEELYE CHART



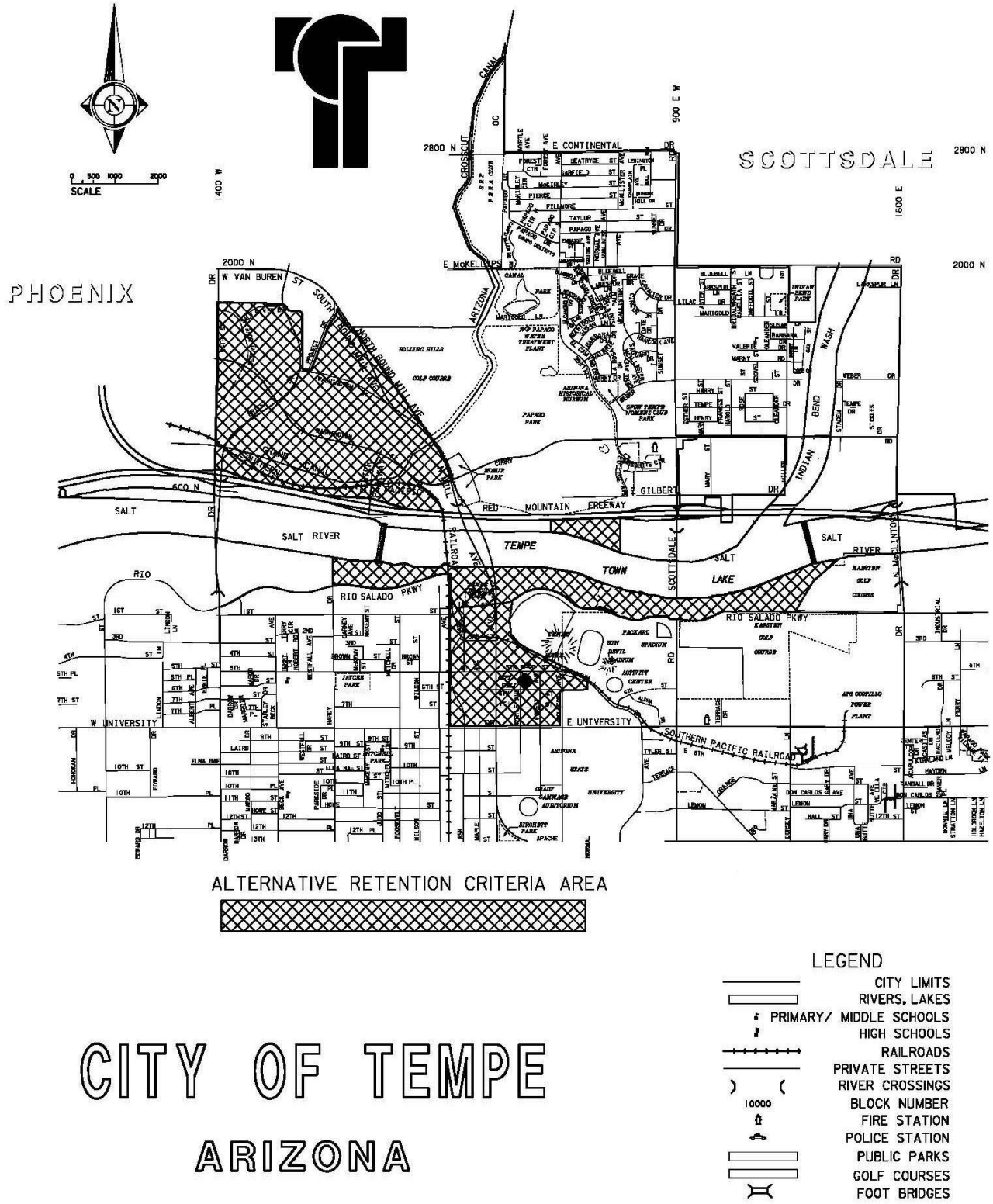
EXAMPLE 'A'
LENGTH: 700 FEET
PAVED
SLOPE: 1.0 %
TIME: 10 MINUTES

EXAMPLE 'B'
LENGTH: 100 FEET
DENSE GRASS
SLOPE: 6.0 %
TIME: 13 ½ MINUTES

SEELYE CHART

TIME OF CONCENTRATION

FIGURE 4: ARCA MAP



CITY OF TEMPE

ARIZONA

STREET LIGHTING REQUIREMENTS

A. GENERAL REQUIREMENTS

Developers of residential, commercial, and industrial properties are responsible for the design and installation of street lighting in accordance with the standards contained herein. As a part of normal plan processing through the Engineering Division, street lighting plans shall be forwarded to the Transportation Division for review and approval.

The plans shall include, but are not limited to, street lighting poles, pole foundations, mast arms, luminaries, receptacles, conduits, pull boxes (J-boxes), and all hardware associated with new or existing street lighting systems. The developer shall provide and install all required street lighting poles, foundations, mast arms, luminaries, receptacles, conduits, associated hardware and pull boxes (J-boxes) as specified. All necessary work shown on the approved plans shall be complete and all lighting systems functional; and all fees and connection charges shall be paid by the developer prior to the utility energizing the system.

1. DESIGN CRITERIA

a. Design wind speed – 80MPH; 1.3 gusts; 30 feet above ground.

b. Lighting Levels
Roadway width – variable
Two-sided – staggered opposite side or median (dual mast arm)
Minimal average foot candles – 1.2 f.c.
Uniformity ratio – 4.1

2. LOCATION

a. Subdivisions – average spacing of 175 feet. Poles to be located 2 feet back of curb or sidewalk on public right-of-way.

B. PROCEDURES

1. PLAN SUBMITTAL REQUIREMENTS

a. DEVELOPER

I. Submit two (2) sets of scaled site or subdivision plans to the Engineering Section of Development Services showing the proposed street lighting locations. The plans shall include street layout, lot lines, driveways, and all utilities.

II. Plans shall include the nearest adjacent street lights to the development and the distance to those lights will be noted on the plans, using standard M.A.G. symbols.

III. Upon receipt of preliminary approval of the street light locations from the Transportation Division, work with the appropriate utility and make payment to the utility for utility design fees for preparing circuit plans. (Utility to design the street lighting electrical circuits). Submit one utility circuit design plan set to the Engineering Division and distribute sufficient sets of plans to potential contractors for bid preparation.

IV. Pay the City, Development Services, all required energy connection, development and construction fees.

b. CITY

I. Upon initial receipt of the plans from the developer, the Engineering Division shall review the submittal for compliance with City codes and standards and provide for final approval.

II. Upon receipt of the plans from the utility, approval of the plans by the Engineering Division, and payment of all fees by the developer, Development Services shall issue appropriate permits.

c. UTILITY

I. Upon receipt of the approved street lighting plan, the utility shall design the street lighting circuits and assign street identification numbers for each proposed street lighting structure.

II. The utility shall then provide to the developer, 8 sets of the completed street lighting circuit designs for distribution.

2. UNDERGROUND REQUIREMENTS

a. DEVELOPER

I. The developer shall perform all the trenching, excavating, and backfilling per current utility company and Maricopa Association of Governments (M.A.G.) specifications.

II. The developer shall provide and install all conduit with pull wire per current utility company specifications for underground street lighting conductor systems; and bear the cost for the electrical conductor installation and design expenses.

III. The developer shall install a pull box (provided by the utility company) as near to the base of each pole as practical (not required in Old Towne Special District area).

IV. The developer shall provide and install all the necessary conductor for a complete installation from the pull box to the luminaire, including pole foundations.

b. UTILITY

I. The utility shall install the conductors from the source of feed to the pull box as required to serve the specific street lighting plan.

II. The utility shall make all necessary connections within the pull box.

Note: The point of delivery for underground electric energy service will be at the pull box.

3. OVERHEAD REQUIREMENTS (Special approval required)

a. DEVELOPER

I. A minimum length of 18” of conductor will be coiled and left by the developer, from the luminaire arm, at the pole attachment.

II. On joint-use pole installations, the developer shall adhere to current conductor and equipment clearance standards as specified in the National Electrical Safety Code.

b. UTILITY

I. The utility shall install all conductors from their source of feed to the base of the mast arm and make all necessary connections.

II. The point of delivery for overhead electric energy service shall be at the base of the mast arm.

4. ADDITIONAL REQUIREMENTS

a. DEVELOPER

I. The street lighting shall be installed by the developer concurrent with other required off-site and on-site improvements prior to occupancy. Plans submitted to the City will indicate street lighting and will include street light location, luminaire type, lamp type/size, mounting height, and pole type. Street light locations may be adjusted <u>not more than 20'</u> in the field without approval from the Transportation Division. If the approved pole locations require modifications in excess of 20', 2 copies of the revised plans showing new pole locations will be submitted to the Transportation Division for review, and approval. It should be noted, however, that any adjustments or modifications, whether they be in the field or submitted for approval, may incur additional costs from the utility company.

II. Street lighting structures shall use high-pressure sodium full cut-off luminaries, controlled by individual photocells, mounted on steel poles. The spacing of the poles will be based on light level requirements, type of street, mounting height, type of luminaire, and illumination level requirements contained herein.

III. All installations shall be in accordance with the National Electrical Code and National Electrical Safety Code, and shall also conform to city laws and codes governing such work.

IV. Street lights shall be fully shielded in such a manner that light emitted by the fixture, either directly from the lamp or indirectly from the luminaire, is projected below a horizontal plane running through the lowest point on the fixture where light is emitted.

V. It is the developer's responsibility to call for rough inspection by the City Engineering inspector, on items for which power is requested. The City shall then give the utility company authorization to energize these street lights.

VI. All street lights shall be connected (by the utility) to the permanent power supply and function properly prior to the final acceptance of the off-site improvements.

Note: Additional costs may be incurred by the developer should the utility company be unable to facilitate the connection for power due to deficiencies in materials and/or workmanship provided by the contractor.

VII. Trenching, excavating and backfill shall be in accordance with City of Tempe Details T-450 and MAG Specifications Section 601, unless otherwise specified.

Note: For standard type street lighting and architectural type street lighting systems, the developer shall coordinate all trenching requirements with the utility.

VIII. Conduit under existing streets shall be installed by boring or jacking. All boring or jacking shall comply with the applicable requirements of MAG Specifications Section 602 and the City of Tempe supplement specification, except that steel casing or steel liner plate is not required.

IX. On each approved set of street lighting plans, all street lighting locations shall be marked with the identifying number, utility index number, and street station. Address and index numbers will be provided to the developer by the City. These numbers are to be used in conjunction with the project name.

X. The developer is required to install identifying index letters and/or numbers on the street side of each pole (this does not apply to the antique type poles). All letters and numbers shall be 2” high and mounted vertically on each pole with the bottom number placed a minimum of 7’ above the base of the pole. The letters/numbers shall be stenciled on the pole using black enamel based paint.

XI. Prior to energization, test all circuits and grounds for continuity, operate contactors, and control circuits. All systems shall test free of shorts and grounds and shall be free of mechanical and electrical defects. Demonstrate that all equipment furnished and installed and/or completed functions in the required manner.

XII. It is the developer’s responsibility to restore all property (private or public), landscaping, sidewalks, etc. to meet or exceed the original condition that is disturbed during street lighting construction.

XIII. Street lighting connection charges shall be paid by the developer concurrent with off-site permit fees payable to the City of Tempe, and submitted to the Development Services Center for issuance of permits.

XIV. The developer shall provide and submit to the City Engineering Division, accurate “As-Built” plans on the approved set of construction plans, prior receiving “Occupancy” approval.

XV. The developer shall warranty all workmanship for a period of not less than one full year from the date of acceptance by the City.

b. CITY

I. Should the developer require major modification to pole locations, he/she shall submit two copies showing the modifications to the City for approval. The City shall then submit two copies of the approved revised plans to the utility company for circuit re-design where necessary.

II. The City shall provide to the utility written authorization for the connection and energization of new street lightings that have been properly installed and have been approved, in writing by a City Engineering inspector.

III. The City will accept the street lighting system upon verification by the utility, approval by the City Engineering inspector, and successful energization of the system.

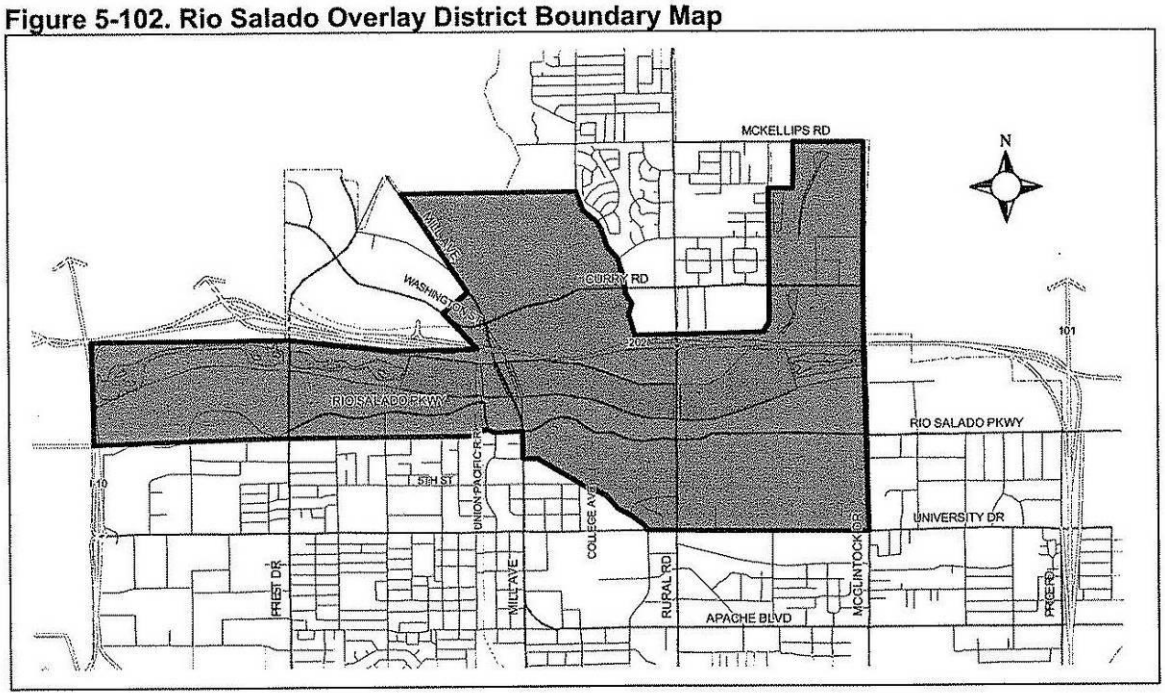
c. UTILITY

I. All connections to the permanent power source and the energization of power to each street light shall be made by the utility serving the area.

II. The utility shall verify the operation of each street light at the time of connection and energization.

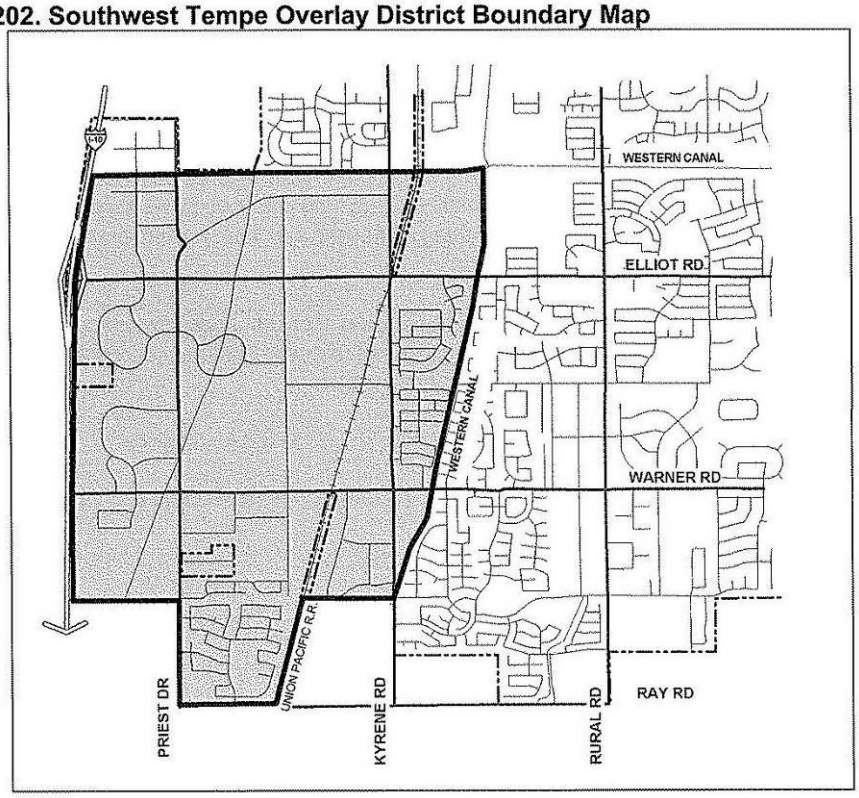
RIO SALADO OVERLAY DISTRICT MAP

Figure 5-102. Rio Salado Overlay District Boundary Map



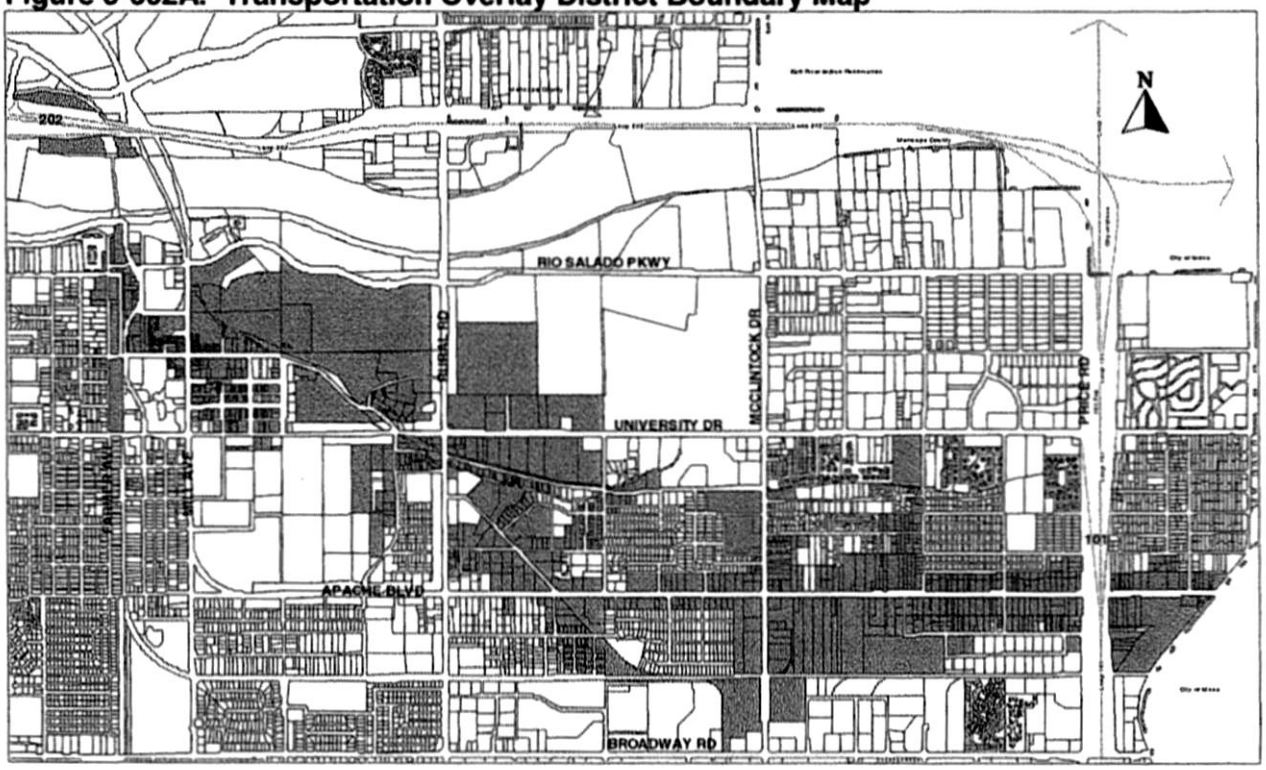
SOUTHWEST TEMPE OVERLAY DISTRICT MAP

Figure 5-202. Southwest Tempe Overlay District Boundary Map



TRANSPORTATION OVERLAY DISTRICT MAP

Figure 5-602A. Transportation Overlay District Boundary Map



VARIANCE / INTERPRETATIONS / APPEALS

The City Engineer is authorized to interpret the criteria and grant variances where particular application would cause undue hardship to an applicant.

An applicant can appeal the decision of the City Engineer to the City Council upon filing a written notice of appeal with the City Engineer within fifteen days of mailing of notice of interpretation or denial of variance to the address on file for applicant. Applicant shall pay an appeal fee of $40.00 to the City of Tempe upon filing of the Notice of Appeal.

The City Council upon receipt of a Notice to Appeal shall set a hearing on the appeal and may grant, deny, or remand the decision with directions to the City Engineer.

VARIANCE / INTERPRETATIONS REQUEST FORM

PUBLIC WORKS-ENGINEERING DESIGN CRITERIA

Project Name: _____Project Address: _____

Owner: _____ Telephone Number:_____

Applicant: _____ Title: _____

Description of Variance/Interpretation Request:

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Originator: _____ Organization: _____

Title:_____ Telephone Number: _____

For City Use Only:

Staff Recommendation: _____Approval _____Rejection

By:_____ Department/Division_____

PD Engineering Supervisor Recommendation_____ Approval_____ Rejection
By: _____ Date:_____
PD Engineering Supervisor

City Engineer Action:_____ Approved _____Rejected

By: _____ Date _____
City Engineer

Applicant Notified By:_____ Date:_____

FINAL DECISION REGARDING EXACTIONS / DEDICATIONS

Per the Tempe City Code, the City Engineer is responsible for formulating criteria necessary to enforce the intent of the Code. Typical improvements required for a development include water and sewer extensions, street paving (including curb, catch basins, street lights, sidewalks, etc.), storm water retention and undergrounding of overhead utilities on or adjacent to the development.

The requirements that you may receive on marked-up plans include both City Code/Ordinance requirements and policy requirements established by the City Engineer. Exaction (non-ordinance) items are identified by “1a,” “1b,” etc. through “3i” on the following matrix. Comments on the marked-up plan identified by “1a,”, “1b,” etc. through “3i” may be appealed. Please see the “Notice of Appeal Rights” for instructions for the appeal procedure.

EXACTION POLICY: NOTICE OF APPEAL RIGHTS

Applying for final approval for development or a building permit may lead to an administrative decision to condition approval of your permit on a dedication or an exaction. In accordance with ARS §9-500.12, we must inform you of your right to appeal such a determination and how that process operates.

In order to comply with the requirements for appeal, you must file with or mail a Notice of Appeal (in writing) with the City's designated hearing officer within thirty (30) days of the administrative decision. The Notice of Appeal shall set forth specifically the condition of approval requiring a dedication or exaction which does not bear an essential nexus with a legitimate government interest and is not a condition which is roughly proportional to the impact of the use to which you wish to place your property together with any reasons underlying your disagreement with said condition

Mail your Notice of Appeal to:

City of Tempe Hearing Officer
c/o Andy Goh, P.E., Deputy PW Director/City Engineer
31 East 5th Street
Tempe, AZ 85281

There is not fee for filing. A hearing will be scheduled within thirty (30) days of the receipt of the appeal, and you will receive then (10) days notice of the date, time and place of your hearing, unless you indicate that you do not need then (10) days. A decision must be made by the hearing officer within five (5) days of the hearing and he may affirm, modify, or delete the requirement.

If you are dissatisfied with the decision, you may file a complaint for a new trial with the Maricopa County Superior Court within thirty (30) days of the hearing officer's decision. At all times during the appeals process, the burden is on the City to prove the conditions placed on your permit bear an essential nexus with a legitimate government interest and that the condition required is roughly proportional to the impact of the use, improvement, or development you have proposed.

You will be notified of specific requirements for exactions or dedications in writing by the City upon final plan check.

_____
Andy Goh, P.E.
Deputy PW Director/City Engineer

R = Required unless individualized determination finds unnecessary
N = Not required unless individualized determination finds unnecessary

Definition of Categories	Large	Medium	Small	
Manufacturing/Industrial	70,000 + SF	18,000-70,000 SF	0-18,000 SF	(Building Size)
Commercial/Retail	45,000 + SF	8,000-45,000 SF	0-8,000 SF	(Building Size)
Residential (Single & Multifamily)	75 + UNITS	25-75 UNITS	0-25 UNITS	(Building Size)

RIGHT OF WAY (ROW) DEDICATION/IMPROVEMENTS	Manufacturing/Industrial			Commercial/Retail			Residential		
	Large	Medium	Small	Large	Medium	Small	Large	Medium	Small
1. Public Health and Safety Requirements or Requests									
1a. ROW/Install turning lane	R	R	R	R	R	N	R	R	N
1b. Install looped water system where pressure/supply problems would otherwise exist.	R	R	R	R	R	R	R	R	R
2. Trip Generation Rate Requirements or Requests									
2a. ROW for arterial street	R	R	N	R	R	N	R	R	N
2b. Full arterial half-street improvements (see 1b & 1e)	R	R	N	R	R	N	R	R	N
3. Individualized Determination or Requests									
3a. Bus pad dedications for bench	R	R	N	R	R	N	R	R	N
3b. Bus pad installation for bench	R	N	N	R	N	N	R	N	N
3c. Bus shelter dedication	R	R	N	R	R	N	R	R	N
3d. Bus shelter installation	R	N	N	R	N	N	R	N	N
3e. Bus bay dedication (Arterial/Arterial, Arterial/Collector)	R	R	R	R	R	R	R	R	R
3f. Bus bay installation (Arterial/Arterial, Arterial/Collector)	R	N	N	R	N	N	R	N	N
3g. Multi-use path easement	R	N	N	R	N	N	R	N	N
3h. Multi-use path construction (including Lighting)	N	N	N	R	N	N	R	N	N
3i. Construction of looped water main where existing pressure/supply is inadequate to service subject property	N	N	N	N	N	N	N	N	N

MATRIX OF PROPORTIONATE DEVELOPMENT REQUIREMENTS

GENERAL AND SITE PLAN NOTES

1. All construction under the Public Works permit shall conform to the City of Tempe Supplement to the MAG Specifications and Details, Maricopa Association of Governments Uniform Standard Specifications and Details (MAG Specifications and Details), and City of Tempe Traffic Barricade Manual.

2. A permit issued by the Engineering Division shall be required for all work in the City of Tempe rights of way. An investigation assessment, in the amount defined by section 29-19 Engineering Fees, Appendix A of Tempe City Code , will be charged for any work within the City of Tempe rights-of-way in which a permit has not been issued prior to commencement of work.

3. The City shall be notified prior to any construction work. Call the Engineering Request Line at (480) 350-8475 at least one business day before start of construction to request inspections. Construction work concealed without inspection by the City shall be subject to exposure at the contractor's expense.

4. Right of way improvements shall not be accepted until 3 mil minimum double matte black line mylar reproducible "as-built" plans have been submitted to and approved by the Engineering Division.

5. Location of all water valves, manholes, and cleanouts must be referenced at all times during construction and made available to the Water Utilities Division.

6. No job will be considered complete until all curbs, pavement, and sidewalks have been swept clean of all dirt and debris and all survey monuments are installed according to the plans.

7. The City will not participate in the cost of construction, utility relocation, construction staking, or as-built plans.

8. 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.

9. Fire riser, details and FDC are for reference only and are not approved on these drawings. Fire sprinkler plans must be submitted for separate fire department review and approval.

10. All overhead utility lines (other than transmission lines 12.5KV or greater) that on or adjacent to the site, including street or alley crossings, shall be placed underground per City Code Section 25-120 through Section 25-126 and Ordinance No. 88.85

11. All onsite private utilities and details shown in these plans are for reference only and are not approved on these drawings. See plans that are approved by Building Safety

for onsite private utilities.

12. 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. It is the responsibility of the professional engineer sealing and signing these plans to be certain that they are in full compliance with Tempe standards, details, criterion, laws and ordinances.

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

14. The City approval is for general layout in the right-of-way, on-site grading, drainage, water and sewer. This plan check approval is valid for a period of one year from application date. Construction permits shall be obtained during this period or the plans shall be resubmitted for review and approval. One 6 month extension may be granted upon request if the request is made prior to the expiration of the one year period at a cost of 25% of the total plan check fee. Permits must then be issued with 6 months and they will be valid for one year from issue date, otherwise, the project expires and permits are voided.

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

16. Construction items shall not be accepted until 3 mil minimum double matte black line mylar reproducible “As-Built” plans have been submitted to and approved by the Engineering Division.

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

18. The developer is responsible for arranging the relocation and associated costs of all utilities. A utility relocation schedule shall be submitted prior to the start of new construction.

19. The developer is responsible for obtaining or dedicating all required rights-of-way and easements to the City prior to approval of improvement plans.

20. The contractor shall contact Arizona Blue Stake at 602-263-1100 at least 2 working days prior to construction, in accordance with A.R.S. § 40-360.21, *et seq*.

21. The contractor shall barricade construction sites at all times per the City of Tempe Traffic Barricade Manual. When required by the City, a traffic control plan shall be submitted for approval in advance of construction.

22. The contractor may obtain a fire hydrant meter for construction water from Customer Services. 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.

23. All broken or displaced existing concrete curb, gutter, or sidewalk shall be removed and replaced as directed by the City of Tempe Engineering Division inspector.

24. All City facilities, alleys and roadway surfaces damaged by developer/contractor during construction shall be repaired/restored to the satisfaction of the City of Tempe Engineering Division inspector per the respective City and/or MAG standard detail.

PAVING PLAN NOTES

1. No paving construction shall be started until all underground utilities within the roadway prism are completed.

2. The maximum stake interval for grades of 0.2% or less shall be 25' for concrete work and 50' for asphalt roadway section, except on horizontal or vertical curves where a maximum stake interval of 20' for concrete work shall be required. All curb returns shall be staked at the P.C., P.T. and the midpoint of the return. No grade stake interval shall exceed 50'.

3. Gutters will be water tested in the presence of the City Engineer, or designee, to insure proper drainage, prior to final approval by the Engineering Division.

4. Exact point of matching, termination and overlay, if necessary, may be determined in the field by the Engineering Division.

5. Underground street light and traffic signal circuits shall be installed as part of the offsite improvements. New foundations for traffic signal poles shall be poured far enough in advance to allow sufficient time for concrete curing and for scheduling the relocation of the existing traffic signals.

6. Address overlay requirements where open cutting is permitted. Finished pavement surface materials such as rubberized asphalt shall be matched in field.

7. Paving improvements shall not be accepted until 3 mil minimum double matte black line mylar reproducible "as-built" plans have been submitted to and approved by the Engineering Division.

SEWER, WATER and UTILITY PLAN NOTES

1. The contractor shall uncover all existing lines being tied into to verify their location, size, material type, etc. prior to construction of new lines. The contractor will locate or have located all existing underground pipelines, telephone and electric conduits, and structures in advance of construction and will observe all possible precautions to avoid damage to same. Call Blue Stake at 602-263-1100.

2. Summits in water lines shall be located at fire hydrants.

3. Backfilling shall not be started until lines are approved by the Engineering Division.

4. If a backflow prevention assembly is required to be installed, the contractor will call the Development Services Department at 480-350-8341 for an inspection before backfilling the assembly.

5. All public water lines shall be Pressure Class 350 DIP, protected with high density polyethylene corrosion protection per MAG Specification 610.

6. All new water and sewer connections to existing lines shall be done only by open-cut on major arterial streets, major intersections or the presence of a major water or sewer line. Bored installations must be clearly identified and specifically approved by the City Engineer, or designee.

7. All on-site sewer systems are considered private unless otherwise noted on plans and must be approved by the City of Tempe Building Safety Division of the Development Services Department.

8. In accordance with AAC R18-4-119, all materials added after January 1, 1993, which may come into contact with drinking water shall conform to National Sanitation Foundation Standards 60 and 61.

9. All manhole installations shall be complete in place including all excavation, backfill, sweeps, and conduits necessary to complete the installation of the manhole and connections to the mainline conduits.

10. For the existing sewer stub connections only. (To be signed on “As-Built” mylar.) “This is to certify that an actual field flow test on the existing sewer stub was performed and was found to be acceptable and free of any obstructions prior to final building connection”

_____	_____	_____
Engineer	Date	Arizona P.E. Number

11. All valves shall be flanged to fittings, preferably tees.

12. Thrust & anchor blocks per MAG Standard Detail 301, 380 & 381.

13. Only the City of Tempe Water Utilities Division personal shall operate any existing valves or any valve connecting new work to the existing city water system.

14. Sewer, water and utility improvements shall not be accepted until 3 mil minimum double matte black line mylar reproducible “as-built” plans have been submitted to and approved by the Engineering Division.

15. Water, storm drain & sanitary sewer separation/protection shall be per MAG Standard Detail 404 with City approval. The City considers storm drains to be “sewer” when crossing water lines. The City considers storm drains to be “potable water” when crossing sanitary sewer lines.

16. The contractor shall take every precaution to prevent foreign material from entering the pipe while it is being stored.

17. During installation and at all times when pipe laying is not in progress, the open ends of the pipe in the trench shall be closed by a water-tight plug or other means approved by the City of Tempe Engineering inspector. If in the opinion of the City of Tempe Engineering Inspector the pipe contains dirt that will not be removed during the flushing operation, the interior of the pipe shall be cleaned and swabbed, as necessary, with a .005 to .010 percent chlorine solution.

18. After pressure testing and before placing in service, all water lines shall be disinfected and tested for water quality in accordance with MAG Standard Specifications Section 611. If the waterline fails the chlorine residual test or fails to meet the water quality test more than three (3) times, the City of Tempe Engineering inspector reserves the right to require the installed waterline to be cleaned by pigging the line, in accordance with standard procedures, at no cost to the City.

ON-SITE DRAINAGE PLAN NOTES

1. A Public Works permit issued by the Engineering Division shall be required for the onsite drainage of the project.

2. Drywells must be registered with the Arizona State Department of Environmental Quality. An Aquifer Protection Permit (APP) may also be required.

3. Prior to acceptance the owner/developer shall furnish the following:

   a. Drilling log and certification of compliance for all dry wells.

   b. A 3 mil minimum double matte, black and white reproducible mylar copy of the approved plans with this certification signed by a registered professional engineer:

4. "This is to certify that an actual field survey was made under my supervision of the subject site and that finish floor and retention elevations are the true "As-Built" conditions, and they meet or exceed the original retention requirements as shown on this approved plan."

_____	_____	_____
Engineer	Date	Arizona P.E. Number

5. Underground storm water storage systems when used and specifically approved by the City Engineer, or designee, shall be the sole responsibility of the owner, including the design, construction, inspection, monitoring and maintenance. The owner shall be liable for any and all claims resulting there from. The City of Tempe, by allowing this system assumes no liability or responsibility for the design, construction, inspection, monitoring, and/or maintenance of the system. A deed restriction describing the system shall be recorded. This document shall state that the deed restriction cannot be relinquished or abandoned without the written approval of the City of Tempe.

6. All best management practices (BMPs) shall be installed and maintained in accordance with the specifications of Volume III, Erosion Control, of the Drainage Design Manual issued by the Flood Control District of Maricopa County (2012). The perimeter of the project site shall have BMPs in accordance with the Storm Water Pollution Prevention Plan (SWPPP). Designated Washdown Areas shall be onsite and follow the specifications of the General Housekeeping Best Management Practice GH-4. Onsite stock piles shall have perimeter control BMPS installed around the stock pile. Offsite storm drain inlets shall be protected by BMP SPC-7 if upstream construction activities may result in stormwater discharges.

STREET LIGHTING PLAN NOTES

1. Street lights to be Streamline Steel Poles and installed on foundations per City of Tempe Standard Detail T-651.

2. Street lights to be Architectural Street Lights and installed on foundations per City of Tempe Standard Detail T-652.

3. Street lights to be architectural Tempe Special District Lighting and installed on foundations per City of Tempe Standard Detail T-645.

4. Street lights to be decorative Special District Street Lights and installed on foundations per City of Tempe Standard Detail T-653.

5. All street lights to have individual pull box (J-Box), (provided by the utility company), installed within 2 to 4' from the base of the pole and per City of Tempe standard Detail T-650.

6. All street lights to be 2' from back of curb where recessed or no sidewalk exists, or 2' back of walk to the face of pole unless otherwise approved by City.

7. All street light conduits to be 2-1/2" PVC Schedule 40.

8. Street lighting improvements shall not be accepted until 3 mil minimum double matte black line mylar reproducible "as-built" plans have been submitted to and approved by the Engineering Division.

PERMIT AND AS-BUILT INFORMATION BLOCK

To be placed on the cover sheet of all projects requiring permits.

AS-BUILT INFORMATION IS INCLUDED IN THESE AREAS ON THIS SET OF DRAWINGS		PERMITS REQUIRED FOR THIS SET OF DRAWINGS
___☐ SEWER	___☐ U.G. FIRE LINE	___ DRAINAGE
___☐ WATER	___☐ CITY IRRIG.	___ PAVING
___☐ WATER-RECLAIMED	___☐ BIKE PATH	___ WATER
___☐ STORM DRAIN	___☐ LANDSCAPE	___ SEWER
___☐ DRYWELL	___☐ SPRINKLER	___ STREET LIGHTS
___☐ PAVING	___☐ STREET LIGHTS	___ FLOODPLAIN
___☐ OFFSITE (C,G,SW,DW)	___☐ BUILDINGS	___ U.G. FIRELINE
___☐ GRADING/DRAINAGE	___☐ _____	___ OTHER
AS-BUILT PLANS CHECKED FOR FIELD CHANGES INSPECTOR:_____ DATE:_____		PARCEL # _____ PROJECT #_____

UTILITY COMPANY SUBMITTALS

1. These plans have been submitted to the following utility companies and the work contained in these plans has been approved by these companies within their area of interest. The size and locations, as shown, of the gas, telephone and power lines, and connections agree with the information contained in the utility company's records. Where the work to be done conflicts with any of these utilities, the conflicts shall be resolved as specified in the special provisions and/or as otherwise noted on these plans. Conflicts arising during the course of construction from unforeseen circumstances shall be reported to the interested utility company and be resolved by them and the design engineer.

2. The City will not participate in the cost of construction or utility relocation.

Salt River Power District _____
Company Representative Contacted Date

SRVWUA _____
Company Representative Contacted Date

Arizona Public Service _____
Company Representative Contacted Date

CenturyLink _____
Company Representative Contacted Date

El Paso Natural Gas Co. _____
Company Representative Contacted Date

Southwest Gas Co. _____
Company Representative Contacted Date

Cox Cable T.V. _____
Company Representative Contacted Date

Air Products _____
Company Representative Contacted Date

_____ _____
Company Representative Contacted Date

_____ _____
Company Representative Contacted Date

_____ _____
Company Representative Contacted Date