



WATER

CHAPTER 3

SECTION I

**ENGINEERING
DESIGN
STANDARDS**

The City of *Buckeye* Arizona
Engineering Design Standards
Adopted June 16, 2020

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Section 3-1 – Water

This section provides policy and standards that establishes design criteria for constructing and modifying water systems that will be dedicated, and conveyed to the City of Buckeye (City) pursuant to, and in accordance with, city code. Upon city acceptance of the water infrastructure, dedication and conveyance to the city, the city will own, operate, and maintain such infrastructure. This section provides guidance on design report preparation, transmission and distribution systems, fire protection, and final plan preparation.

The requirements of this section may be modified at any time by the City Engineer.

The City Engineer may approve variances to the requirements of this design standard. Variance requests must be submitted in writing and include a justification for the variance requested. A copy of the city approved variance shall be included with the submittal of any plans or design reports that incorporate the variance.

The City Engineer is required, pursuant to Chapter 23, Article 23-2, of the city code, to develop standards and details regarding public improvements to be constructed within the city. The standards, design criteria, and policy set forth in this section were developed and recommended by the City Engineer pursuant to Chapter 23, Article 23-2 and adopted by City Council in Resolution No. 55-20.

3-1 Water

3-1.000 General Information:

3-1.001 **Water Infrastructure Requirements:**

- A. This section is to aid the engineer in developing a water infrastructure design to meet the City of Buckeye minimum standards.
- B. Developers/Landowners are required, pursuant to City Code and the City Development Code, to install at their expense, all on-site and off-site improvements necessary to provide water service to their development. This will include booster pump stations, reservoirs, transmission mains, distribution mains, pressure reducing stations, treatment technology, or other facilities, and the payment of all required development fees.
- C. This section applies to City Capital Improvement Projects.
- D. Required to pull all necessary permits.

3-1.002 **Acronyms, Definitions, and Abbreviations:**

- A. AAC - Arizona Administrative Code
- B. ABC - Aggregate Base Course
- C. ACC - Arizona Corporation Commission
- D. ACP - Asbestos-Cement (Transite) Pipe
- E. ADEQ - Arizona Department of Environmental Quality
- F. ADRE - Arizona Department of Real Estate
- G. ANSI - American National Standards Institute
- H. ANSI/NSF Standard 60 - *American National Standards Institute/NSF International Standard 60 - 2000a, Drinking Water Treatment Chemicals – Health Effects, November 2000*
- I. ANSI/NSF Standard 61 - *American National Standards Institute/NSF International Standard 61 - 2000a, Drinking Water System Components – Health Effects, November 2000*
- J. A.R.S. - Arizona Revised Statutes
- K. ASTM - American Society for Testing and Materials
- L. ATC – Approval to Construct
- M. ARV - Air Release Valve
- N. AWWA - American Water Works Association
- O. Backflow-Prevention Assembly - A mechanical device used to prevent backflow.
- P. CC&R - Conditions, Covenants, and Restrictions
- Q. City – City of Buckeye
- R. City Engineer – City of Buckeye City Engineer or designee
- S. CLSM - Control Low Strength Material
- T. CMP - Community Master Plan

- U. COB – City of Buckeye
- V. Cover - The distance between the top outside of pipe and grade elevation at location of measurement.
- W. Developer - Shall mean the individual or entity causing Development of land in the City, including Development companies authorized to act on behalf of the Developer. Developer shall also mean a contractor (“Contractor”) authorized to act on behalf of the Landowner or Developer. Developer shall also be interpreted to mean Landowner.
- X. Development or development – Any activity that changes the use of land or makes a material change to the appearance of a structure or property. In addition, the following constitute development: Clearing of land as an adjunct of construction, including clearing or removal of vegetation or soil manipulation; Deposit of refuse, solid, or liquid waste or fill on a parcel of land; Placement of a sign; Changes or alteration of a watercourse, drainage way, or other waterway; or Paving, filling, grading, or covering of land.
- Y. Distribution System - A pipeline, appurtenance, device, and facility of a public water system that conducts water from a source or water treatment plant to persons served by the system.
- Z. D.I.P. - Ductile Iron Pipe
- AA. DU - Dwelling Unit
- BB. EDU - Equivalent Dwelling Unit
- CC. Engineer or engineer - An engineer registered professionally in the State of Arizona pursuant to the provisions of A.R.S. §32-101; §§32-121-131; §§32-141-152, as amended.
- DD. EPA - United States Environmental Protection Agency
- EE. FDC - Fire Department Connection
- FF. fps – feet per second
- GG. GPCD - gallons per capita per day
- HH. GPD - gallons per day
- II. GPM - gallons per minute
- JJ. GPAD - gallons per acre per day
- KK. GPPD - gallons per person per day
- LL. GPRD - gallons per room per day
- MM. GPSFD - gallons per square foot per day
- NN. GPSD - gallons per student per day
- OO. Horizontal Separation - The dimension measured horizontally between the outside of one item to the outside of an adjacent item.
- PP. ID - Inner Diameter
- QQ. Landowner - Shall mean the owner of the land in the City on which Development occurs. “Landowner” shall also be interpreted to mean Contractor and/or Developer, including Development companies authorized to act on behalf of the Developer/Landowner.
- RR. LPPUE - Limited Purpose Public Utility Easement

- SS. MAG - Maricopa Association of Governments Uniform Standard Specifications and Details for Public Works Construction current edition.
- TT. Main lines and/or Pressure mains – Are defined as the piping under constant pressure.
- UU. MCESD - Maricopa County Environmental Services Department
- VV. MJ - Mechanical Joint
- WW. NFPA - National Fire Protection Association
- XX. NSF - National Sanitation Foundation
- YY. NST - National Standard Thread
- ZZ. OD - Outer Diameter
- AAA. OS&Y – Outside screw and yoke
- BBB. PC - Point of Curvature
- CCC. Plan(s) or plan(s) - Design drawings that are 100% complete and sealed by a registered professional Engineer as defined above.
- DDD. POU – Point of Use Treatment
- EEE. PRV - Pressure Reducing Valve
- FFF. PUE - Public Utility Easement
- GGG. PVC - Polyvinyl Chloride
- HHH. Public Works Inspector - A City employee or contracted consultant with a primary responsibility of monitoring the construction of improvements for conformance to city requirements.
- III. ROW - Public Rights-of-Way
- JJJ. Water Campus - Water facility with storage reservoir, booster station, chlorination equipment, treatment facilities, and other appurtenances required to deliver water.
- KKK. Well Transmission Mains - Are defined as the piping from a water source to a water storage facility and may or may not be under constant pressure.
- LLL. Vertical Separation - The dimension measured vertically between the outside of one item to the outside of another.

3-1.003 Design Policy:

- A. Developers/Landowners shall comply with the city's requirements for extension of water systems to newly developed areas and subdivisions inside the city's service area. See [Figure 1](#).
- B. Water mains are required along the entire length of all property line frontages with and without access, where future expansion of the water system is possible. The property line frontage is that portion of the property that abuts a street or public ROW.
- C. The engineer shall analyze the water demands from a proposed development and determine its impact on the city's water distribution, pumping, and storage systems. The engineer shall provide an analysis that encompasses the development area, adjacent mains and booster stations where deemed necessary by the city. All analyses shall conform to the approved master plans within the study area. The effects of peak water demands and fire flows shall be evaluated to ensure proper sizing of proposed water facilities. If no water campus exists to serve the development, the engineer

shall demonstrate to the satisfaction of the city, that a water source or water sources are available to serve the demands of the development and that a water campus can be constructed to serve the demands of the development.

- D. City approval of plans and associated design reports are valid for one year from the date of City Engineer's signature.
- E. Engineering Bulletin No. 10, *Guidelines for the Construction of Water Systems* published by the Arizona Department of Environmental Quality, as well as the Arizona Administrative Code, *Title 18 – Environmental Quality*, contain specific requirements for submittals, approvals and notifications when improvements of public water system are proposed. The Developer/Landowner and the engineer designing the plans shall comply with all laws, regulations, and requirements.
- F. All Developers/Landowners required or desiring to connect to the City of Buckeye water system are required to be annexed within the city's corporate limits.
- G. All construction documents shall be prepared by a registered Professional Civil Engineer licensed and practicing in the State of Arizona pursuant to the provisions of A.R.S. §§32-101, 32-121 to 131; 32-141 to 152. Each sheet of the plans shall include the appropriate professional State of Arizona seal, signature, date and date of expiration below seal. The city does not require original seals and or signatures (wet seal) on design documents during the review cycle.
- H. All final plans that include connection to or extension of the city's water system, or on a system that is to be dedicated to the city, shall be submitted to the City of Buckeye for review and approval. Plan review fees shall be paid at the time of plan submittal.
- I. All final plans including plans for fire protection within the city's corporate limits, even if the water provider is a private water provider, shall be submitted to the City of Buckeye for review and approval. Plan review fees shall be paid at the time of plan submittal.

3-1.004 Diligence:

- A. Developers/Landowners shall verify the need for any water system improvements necessary to provide service to a site or to provide onsite facilities. It is the Developer's responsibility to become familiar with all the existing site conditions. Available resources in which to find this information:
 - 1. Records – obtain existing utility maps and As-Built drawings.
 - 2. City's website – <http://www.buckeyeaz.gov>
 - 3. The City Engineer can confirm the need for any required extension or condition for water service.
- B. All entities seeking water service from the city need to be familiar with city code including Chapter 17 of the city code.
- C. Any apparent field condition, error, omission, etc. shall be brought to the attention of the City Engineer.

3-1.005 MAG Reference:

- A. The engineer should be familiar with the *MAG Uniform Standard Specifications for Public Works Construction*, including all applicable Standard Details. These documents contain construction related specifications and details that impact the design of water systems including trenching, bedding, backfill, and pavement replacement, etc.

3-1.006 Standards:

A. The following is a list of national, regional and local resources (the latest editions unless otherwise stated), which are referenced and used for the design within the City of Buckeye.

1. Resources, Standards and References:
 - a. American Water Works Association, AWWA
 - b. American National Standards Institute, ANSI
 - c. ADEQ Engineering Bulletin No. 8 and 10
 - d. MAG Uniform Standard Specifications for Public Works Construction

3-1.007 Assured Water Supply:

- A. A certificate of an assured water supply is required for subdivisions pursuant to Arizona law.
1. ADWR defines a “subdivision” (per A.R.S. §32-2101), as six or more parcels with at least one parcel having an area less than 36 acres. This includes residential or commercial subdivisions, stock cooperatives, condominiums, and all lands subdivided as part of a common promotional plan (including golf courses, parks, schools, and other amenities).
 2. The applicant shall demonstrate financial capability to construct any necessary water storage, treatment, and delivery systems for the development.

3-1.008 EPA Regulations:

- A. The EPA requires the city to develop and implement a program to protect the public health and welfare by ensuring that all potable water distributed or sold to the public by public water systems is free from unwholesome, poisonous, deleterious, or other foreign substances, and filth or disease-causing substances or organisms. The City’s Water Resources Department is the City Department authorized by City Council to enforce provisions of Chapter 17 of the City Code. Contact the Water Resources Department at (623) 349-6800 for details and requirements of such Chapter.

3-1.009 MCESD Requirements:

- A. Policy:
1. MCESD is required to review and approve all public water main extensions and construction of water related facilities within the city’s service area, prior to the city approving the final plans.
 2. In order to gain City approval, i.e., City Engineer’s signature on a plan set:
 - a. The plans shall be signed and dated by MCESD approving the plans.
 - b. An executed copy of the MCESD approved “Certificate of Approval to Construct” shall be submitted at time of City permit issuance.
 3. Before the water system is accepted or put into service and prior to any issuance of a Certificate of Occupancy, the Developer/Landowner shall submit a Certificate of Approval of Construction signed by MCESD.

3-1.010 Implementation:

- A. The implementation and enforcement of the design standards set forth in this section shall be effective the date of City Council’s adoption of the resolution approving the standards and requirements of this section and shall apply to the following:
1. All new plans and reports submitted to the City following the effective date of City Council's

adoption of the resolution approving the standards and requirements of this section.

2. All plans and reports seeking a new City Engineer's signature or a re-approval from the City Engineer.
3. All expired plans and reports shall be brought into conformance with the design standards.
4. All plans and reports produced under an approved CMP shall follow or be brought into conformance with the design standards.
5. All current approved plans that have not been permitted shall comply with the requirements of the design standards. Prior to the issuance of the construction permit, the engineer shall submit a written letter to the City Engineer acknowledging the construction and materials shall be performed and supplied pursuant to the requirements of the design standards.
6. All expired or abandoned plans and reports shall be per the adopted Development User Fee Schedule.

3-1.011 Service Area Establishment:

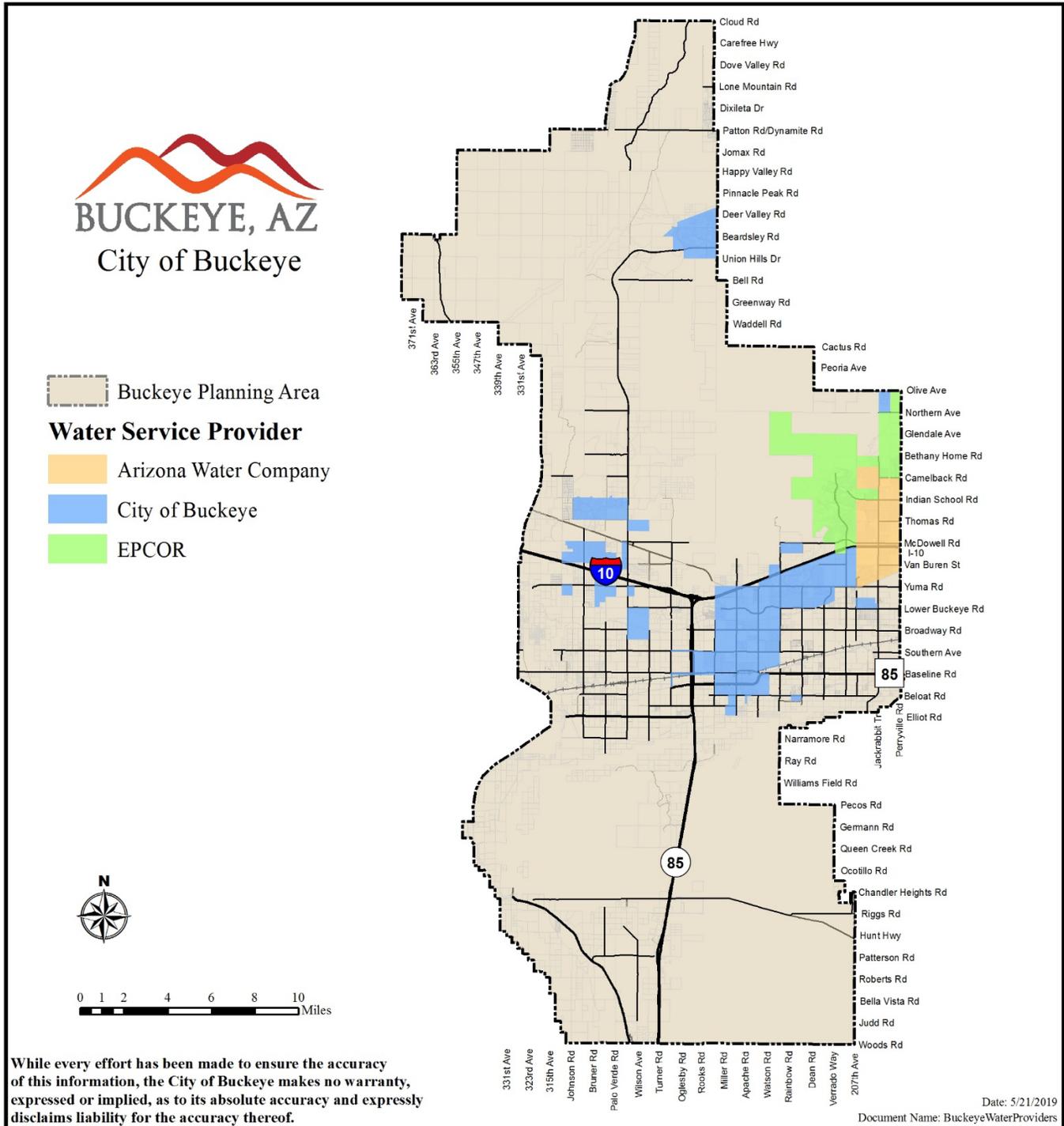
- A. If a development requires that a new water service area be established, the Developer/Landowner shall provide at no cost to the city, valid groundwater rights or other water rights approved by the Arizona Department of Water Resources and acceptable to the city, in sufficient quantities to establish a new service area to serve the development per City Code, Section 25-2.

3-1.012 Private Water Companies:

- A. Existing Private Water Companies:
 1. Portions of the City's municipal area are provided water service by private water companies. [Figure 1](#) delineates these areas. Proposed private water mains located within the city's ROW or easements will require an agreement between the City and the private water company delineating liability and maintenance responsibilities. Current private water providers are:
 - a. EPCOR Water Company (previously Arizona American Water Company) (also provides sewer service in some areas)
 - b. Arizona Water Company
- B. Responsibility of Private Water Companies:
 1. Developer/Landowner shall obtain the approval of the applicable private water company for the construction of and modification to water systems within the franchise areas. Prior to obtaining city approval of the design documents, the Developer/Landowner shall submit to the city written documentation that the private water company has approved facilities shown on the final plans. The private water company approval of the design plans shall be evidenced by written signature or stamp of the authorized individual from the company on the plans. The design plans required to be approved by the private water company shall also comply with fire protection requirements of the city.
 2. A letter from the private water company approving the As-Built shall be provided to the city. This letter will serve as the official record of the As-Built approval.
 3. The private water company shall issue an approval of the As-Built in order to allow paving to commence.
- C. City Review of Private Water System Extensions:

1. The city cannot provide water service within private water company franchise areas. However, plans for private water system extensions shall be submitted to the city for review and approval. The review is not for comprehensive enforcement of the private utility requirements. City review is restricted to public health, safety and welfare issues which includes compliance with the city fire protection requirements and work that is to occur within the City's ROW. A note will be placed on the final plans stating that the operation and maintenance of franchise lines is not the responsibility of the City.
2. All private water mains shall be located within the ROW and within the standard locations for water mains in the paved portion of the street. Private water mains shall not be located within a PUE or LPPUE as this easement is restricted for dry utilities only.
3. All private water mains located adjacent to a City ROW but not constructed under the current or ultimate paving section shall be required to have private exclusive easement for the water main outside of the LPPUE and ROW.
4. A LPPUE shall be shown on the final plat that is for dry utilities use only.

FIGURE 1 WATER SERVICE AREA MAP



3-1.013 Waste, Erosion, Sediment Control Plan:

- A. If the proposed construction will be larger than one acre, including linear construction, an ADEQ storm water permit is required. Proposed construction is defined as disturbed area. The Waste, Erosion, Sediment Control Plan and Best Management Practices are required by state law and shall be submitted to the city for review during the plan review process. The Waste, Erosion, Sediment Control Plan shall also be maintained at the construction site for reference during construction in accordance with the most current Arizona storm water construction general permit requirements. The ADEQ storm water permit is required to submit an application for and receive a City of Buckeye construction permit.

3-1.014 Water Service Agreement:

- A. The County's "Water Service Agreement" on the Application for Approval to Construct (ATC) form should be completed by the engineer and submitted with the final plans to the City Engineer. It is the Developer/Landowner's responsibility to obtain necessary signatures from the applicable City divisions. The agreements will not be signed by the City prior to the City approving the final plans.

3-1.100 Water Reports:

The purpose of the water report is to describe the layout and design of the proposed water system that will be owned, operated, and maintained by the City following City acceptance, dedication and conveyance of the improvements and real property to the City. The description shall include the criteria and all assumptions used, the layout and sizing of the system, and provide all calculations and resources used. The proposed system shall meet the requirements of the City.

3-1.101 General Report Requirements:

- A. All reports shall be sealed and signed on the cover and table of contents by a registered Professional Civil Engineer in the State of Arizona.
- B. Information from a previous report or other reports that is important to the design of the proposed project shall be included in the submitted report unless the report is a supplement to a master report.
- C. Reports should be letter size, bound with a hard cover.
- D. Maps and exhibits should be folded in sleeves with a maximum size of 24 inches by 36 inches and must be legible.
- E. Provide the project title on every page of the water reports.
- F. All redline reports shall be returned with the submittal of the next report for review.
- G. Cover Sheet:
 1. Project title
 2. Submittal date and submittal number
 3. List all prior submittal dates and corresponding submittal number
 4. Prepared for including: contact name, company name, address, telephone number, and email
 5. Prepared by including: contact name, company name, address, telephone number, and email
 6. City approval block, see [Figure 2](#).
 7. Engineers seal

8. All pages of the report shall have a sequential page number, except the cover.

FIGURE 2 CITY ENGINEER SIGNATURE/APPROVAL BLOCK

| | |
|---|------|
| DISCLAIMER: | |
| THE CITY APPROVES THIS REPORT FOR CONCEPT ONLY AND ACCEPTS NO LIABILITY FOR ERRORS OR OMISSIONS | |
| BY: _____ | DATE |
| BUCKEYE CITY ENGINEER | |

- H. Table of Contents:
 1. List all sections
 2. Figures
 3. Tables
 4. Exhibits
 5. Appendices
- I. Executive Summary Paragraphs:
 1. Criteria used
 2. Criteria met
 3. Project challenges
 4. Overall observations
 5. Conclusions
 6. Recommendations
- J. Introduction:
 1. Provide project name, size, description, land use and type of development.
 2. Purpose of the report.
 3. Describe the water campus service area in which the development is located. Provide general information about the water campus.
 4. Explain the objectives of the report and include a description of the infrastructure requirements for the development. The introduction of the report shall also include a summary describing how the proposed water system complies with regulatory requirements. In addition, the introduction shall include an evaluation of the development's impact on the existing system.
 5. Indicate if the proposed water system is public or private.
- K. Project Location:

1. Township, Range, and Section
 2. Description of the major cross streets
 3. Vicinity Map
 4. Relationship to other developments and water improvements
 - a. Provide a map labeling all adjacent developments and water improvements.
- L. Existing Conditions:
1. Describe the existing water system infrastructure:
 - a. Include all:
 - i. Storage reservoirs
 - ii. Booster stations
 - iii. Wells
 - iv. Transmission/Distribution lines
 - v. Treatment facilities
 2. Topography
 - a. General slope of the property, high and low elevations
 - b. Challenging topographic features or constraints
 - c. Benchmark(s) being used
 3. All adjacent land uses
- M. Service Area:
1. Describe the service area in which the proposed development is located and how it is being accommodated with the proposed design.
 2. Include pressure zone(s) in the service area.
- N. Criteria:
1. All design criteria shall be in compliance with the standards in this section.
 2. Summarize and include all City of Buckeye and other agency requirements and design criteria used for this report.
- O. Design Methodology:
1. Identify land use, population, density, demand factors, fire flow, fire duration, and peaking factors.
 2. All calculations shall be converted to EDUs as well as flow.
 3. Summarize all project demands according to concentration points.
 4. Summarize all offsite demands per concentration points.
 5. Include a demand allocation summary.
 6. Include totals for each pressure zone and grand total.

P. Storage Reservoirs:

1. Prepare calculations showing the required storage for use and fire storage and how they are being met in the connecting system.
2. Include discussion on how the proposed development impacts the storage for the service area of the water campus providing storage.
3. Provide solutions for storage if the development causes storage shortfalls for the water campus service area.
4. Include totals for each pressure zone and grand total.

Q. Booster Stations:

1. Prepare calculations showing the required pumping for use and fire flow. Include how they are being met in the connecting system.
2. Include discussion on how the proposed development impacts the pumping to the service area of the water campus by providing pumping/fire flow.
3. Provide solutions for pumping if the development causes pumping shortfalls in pumping for the water campus service area.
4. Include totals for each pressure zone and a grand total.
5. The booster station section in this report does not replace the booster station design report required to accompany the design plans for the booster station.

R. Well Supply:

1. Prepare calculations showing the required raw water requirements for the development and how they are going to be met.
2. Include discussion on 18-hour pumping requirements per “Design Standards – Section 3 – 5 Water Well Facility.”
3. Provide solutions for providing well capacity for the proposed development.
4. Include totals for each pressure zone and a grand total.
5. The well supply section in this report does not replace the well supply design report required to accompany the design plans for the wells.

S. Treatment:

1. Include discussion on water treatment requirements per the “Design Standards – Section 3-5 Water Well Facility.”

T. Modeling:

1. InfoWater or approved equal output that can be input into the city’s model shall be used for modeling of the water system. This allows the City to easily add the proposed development to the City’s overall model.
2. Identify all assumptions made.
3. Include a section in the report that discusses the source of pressures used to calibrate the model, i.e. fire flow tests or calibrated master plan model, etc.
 - a. If the model is for an existing system or extension to a master system, the model shall be

- calibrated to the current constructed and operating infrastructure.
- b. Show all current calibration data or fire flow test.
 - c. If the model is not calibrated to the actual system, the report cannot be approved.
4. Include the following information in tabular form. The column headers listed are the minimum required to be used in the Average Day, Max Day, and Peak Hour Demand Reports. Separate reports will be required for each phase and pressure zone of the development.
- a. Pipe Report:
 - i. Pipe label
 - ii. Pipe length (ft)
 - iii. Pipe diameter (in)
 - iv. Pipe Material
 - v. Flow rate (gpm)
 - vi. Pipe roughness coefficient
 - vii. Head loss gradient (ft/1,000 ft)
 - viii. Velocity (ft/sec)
 - b. Junction Report:
 - i. Node label
 - ii. Node elevation
 - iii. Node pressure (psi)
 - iv. Node pressure head (ft)
 - v. Base flow (gpm)
 - c. Max Day Plus Fire Flow Report:
 - i. Node label
 - ii. Needed fire flow (gpm)
 - iii. Total flow needed (gpm)
 - iv. Total flow available (gpm)
 - v. Satisfies fire flow (true/false)
 - vi. Maximum pressure (psi)
 - vii. Residual pressure (psi)
 - viii. Calculated residual pressure (psi)
 - ix. Calculated minimum zone junction at total flow needed
5. Provide an electronic copy of the InfoWater model or any excel spreadsheets from other approved modeling software with the approved report.
6. Include a map of the water system showing all junction numbers, pipe segments, pipe diameter (by color), wells, storage reservoirs, booster station/pump, PRVs, treatment facilities, and any

other model appurtenances. The map shall be provided at a readable scale. Use multiple pages, if necessary. Separate maps will be required for each phase and pressure zone of the development.

U. Conclusion:

1. Summarize the work that has been completed.
2. Summarize all recommendations.
3. Summarize junctions and pipes that are at the extreme, e.g. highest and lowest pressure, flow and velocity, etc.
4. List all reference documents.
5. Conclusion shall also include confirmation that all the City requirements as well as all other agencies have been satisfied.

V. Appendices:

1. Supporting calculations.
2. Attach all relevant portions of external approved reports, including cover page, that validate the design assumptions of this report.
3. All other supporting information.

3-1.102 Types of Water Reports:

- A. There are five different types of reports that can be submitted to the city. Each type of report has a specific use. The following is a description of each of the reports and their use:
- B. Master Water Report:
1. A master water report is required to accompany and support all CMP submittals to the city.
 2. Master water reports are intended to cover large areas addressing all service areas of a specific water campus.
 3. Master water reports can vary in detail, but the overall requirement is to show how the entire master planned area is being served by the water campus. It must cover water supply, treatment, storage, and distribution.
 4. The City may require a Master Water Report for any development.
- C. Preliminary Reports:
1. Preliminary water reports are required to accompany and support a preliminary plat or preliminary site plan.
 2. Preliminary reports shall comply with all general report requirements.
 3. Preliminary reports can further detail areas within a master water report, multi-phased project, or a stand-alone un-phased project.
 4. Preliminary reports vary in detail. However, enough detail is required to prove how the entire preliminary plat or preliminary site plan is served by a water campus, and that the proposed design meets all City criteria.
 5. If the preliminary report is following an approved master water report, describe all changes from the approved master water report.

6. Use the most current design criteria. Reference Tables 1-3 for design criteria.
 7. Modeling is not mandatory for a preliminary report but may be required by the city at the sole discretion of the City Engineer.
 8. Solutions provided should include enough design calculations to validate the proposed water improvement.
 9. Preliminary plats cannot be approved prior to the approval of the preliminary water report. This may also apply to preliminary site plans, depending on the nature of the preliminary site plan and its location.
- D. Final Reports:
1. Final reports are required to accompany and support all final plats, site plans, and final design plans.
 2. Final reports shall comply with all general report requirements.
 3. Final reports shall complete the design from a preliminary report or master water report.
 4. Describe all changes from the master water report or preliminary report. All changes shall be incorporated into the report, models, and results.
 5. The final report must include criteria, assumptions, special conditions, complete calculation tables and figures to provide a complete description of the proposed water system as a basis of final plans and specifications.
 6. All models and tables shall be complete.
 7. Use the most current design criteria. Reference Tables 1- 3 for design criteria.
 8. Final plat, site plans, and/or final plans shall not be approved until the final report is approved.
- E. Water Letter:
1. Water letters shall be used for pad developments and developments not requiring a water model.
 2. Water letters shall be in general compliance with the Master Site and Master Water Report.
 3. Water letter shall contain the amount of water that will be used.
- F. Private Facilities Reports:
1. Reports submitted to private water companies with service areas within the City of Buckeye shall also be submitted to the City for approval.
 2. The City has authority over fire protection for a development located with the City that is within a private water company service area.
 3. The City has authority over the location and surface facilities in public ROW and property owned or controlled by the City.
 4. Reports to private water companies and the City will not be approved by the City unless first approved by the private water company.
 5. Private reports must show that the private water company can provide adequate capacity to serve the proposed development and meet City's fire protection requirements in addition to demonstrating compliance with the water service requirements of the private water company.

6. Private reports shall comply with all general report requirements in this section.
7. A signature line for the private utility provider shall be provided on the front cover of the report.
8. The executed “will serve” letter from the private utility company is required to be part of the report.

3-1.200 Distribution System:

3-1.201 General Requirements:

- A. All water mains installed on multi-family, commercial, and industrial developments shall be private and maintained by the property owner or designee.
- B. A City approved backflow prevention device is required at all water main locations that leave ROW or city easements.
- C. Public water mains not installed in the ROW shall be located within an exclusive easement granted to the city by the Developer/Landowner in accordance with city requirements.
- D. No private water mains or other water improvements are allowed within the ROW, LPPUE, PUE or City easements, except for water mains owned by a private water service provider which are allowed in the ROW and as agreed to by the city.
- E. It shall be the Developer/Landowner responsibility to extend water mains to their development to provide potable service and fire flow. These main extensions shall be constructed and installed by the Developer/Landowner at no cost to the city. Individual owners may be required to connect or extend the public system, at no cost to the city, in order to serve the development.
- F. The city requires the extension of water mains along a frontage, or through a subdivided parcel, to the boundary where future extension of the water main is possible, providing a point of service to adjacent properties, or as determined necessary by the city.
- G. Each lot is required to have safe, reliable, and potable water in sufficient volume and pressure for domestic use and fire protection. This shall be determined by the engineer and verified by the City Engineer.
- H. Dry water mains are considered on a case by case basis by the City Engineer.
- I. Design of the water mains shall minimize high points.
- J. When connecting to or replacing existing water mains, extreme caution should be taken to assure minimum disruption and down time to existing customers. In most cases, maximum down time will be eight hours. In extreme cases, maximum allowable down time will be twelve hours. All outages shall be coordinated with the City Water Resources Department. A note requiring this coordination shall be placed on the plans.
- K. Minimum separation requirement between potable water lines and non-potable lines shall meet the requirements of MAG Standard Detail 404-1.

3-1.202 Design Criteria:

- A. Demand Criteria: See [Table 1](#).
- B. Design Flows:
 1. Water demand for each development will be calculated using the average day demands, as

shown in Table 1. Designs will include all necessary improvements, including booster pumping stations, reservoirs, distribution and transmission lines, and all appurtenances to meet the system's ultimate demand.

- Hydraulic calculations will demonstrate that the system will provide average day, peak-hour demand, maximum-day demand and maximum day plus fire flow. The peaking factors are as shown in Table 2. These factors shall be appropriately increased for restaurants and high-demand water users.

TABLE 1 AVERAGE DAY WATER DEMANDS IN GALLONS PER DAY

| AVERAGE DAY WATER DEMANDS | | | | |
|--|----------------------------------|-------|----------------------|----------|
| Residential Demand per Dwelling Unit (gallons) | | | | |
| Land Use | Capita/DU | Use | Total Use | Unit |
| Low and Medium Density (less than dwelling units per acre) | 3.2 | 113 | 362 | per unit |
| High Density (Greater than 8 units per acre includes apartments) | 2.5 | 113 | 283 | per unit |
| Active Adult (max 8 units per acre) | 2 | 113 | 226 | per unit |
| Service And Employment | | | | |
| Land Use | Design | Use | Unit | |
| Commercial / Mixed Use | Master Planning | 2,009 | gpap | |
| Commercial / Mixed Use | Specific Use | 240 | gppd | |
| Commercial High Rise / Multi Story | Master Planning and Specific Use | 240 | gppd or per 1,500 sf | |
| Industrial ¹ | Master Planning | 2,009 | gpap | |
| Industrial ¹ | Specific Use | 130 | gppd | |
| Hotel / Motel | Master Planning and Specific Use | 200 | gprp | |
| School ² | Master Planning | 5,000 | gpap | |
| School ² (without lunch or showers) | Specific Use | 75 | gpsp | |
| School ² (with lunch or showers) | Specific Use | 125 | gpsp | |
| Malls / Retail Areas | Master Planning and Specific Use | 0.5 | gpspd | |
| Non-Specified ³ | Master Planning and Specific Use | 220 | GPR | |
| 1. Does not include water for industrial and hospital operations. 2. Does not include irrigation for landscape areas. 3. All non-specified uses require approval by the City Engineer. | | | | |
| Landscaping | | | | |
| Land Use | Design | Use | Unit | |
| Turf | Master Planning and Specific Use | 4,325 | gpap | |
| Developed Open Space (non-turf areas) / Public Right-of-Way | Master Planning and Specific Use | 1,786 | gpap | |

Note: Complete design flows are not provided for industrial and hospital facilities because case-by-case evaluation is necessary due to varying water demands observed for these use types. Some industrial uses such as data warehouses, food processing, bottling plants, and semi-conductor manufacturing can use more than ten times as much water as compared to warehousing or dry assembly manufacturing with no cooling tower use. Water use in hospitals varies greatly depending upon cooling tower and boiler use, the extent of which the hospital is used as a research and teaching facility, the amount of out-patient versus in-patient services provided, and the types of equipment used. Estimates of anticipated water use and wastewater generation must be produced for each new development or

major expansion using projections of demands taking into account the following types of categories:

- Water for cooling towers: Cooling towers use can make up more than fifty percent of water demand at industrial facilities having large refrigeration units or cooling of servers. In most cases, cooling towers use twenty to forty percent of the water requirements for industrial operations and hospitals.
- Water used as input for production: In some manufacturing operations, water is used as an input in the manufacturing process and must be included in demand projections because of the large volumes used. Examples include ice making, soft drink, or water bottling operations, and food manufacturing such as industrial bakeries.
- Water used in production/activities: In many manufacturing operations water is used for cooling, cleaning, or other operational activities and must be included in demand projections. Example include metal forming and finishing, semi-conductor wafer production, and aerospace parts manufacturing. Processes employing newer technologies tend to use less water than older technologies, but estimates must be made on a location and process-specific basis. Some medical facilities are now using the newer medical imaging techniques and sterilization processes that use little or no water, while some medical equipment still requires significant amounts of water.

TABLE 2 DEMAND PEAKING FACTORS

| Demand | Peaking Factor |
|--------------------|--------------------------|
| Maximum Day Demand | 1.8 x Average Day Demand |
| Peak Hour Demand | 3.0 x Average Day Demand |

C. Fire Flow:

1. Fire flow requirements are per [Table 3](#). These values shall be used for tank, booster pump, treatment, and pipe sizing.
2. The fire flows in [Table 3](#) are not affected with specific fire sprinkler designs except in cases where they are exceeded. If these flows are exceeded there are two options available:
 - a. The development requiring larger fire flows than the public system has been planned or constructed for shall build onsite facilities to accommodate the fire flow requirements.
 - b. If there is the ability to upgrade existing public facilities (storage, pumping, and parallel distribution mains) serving the development which may require larger fire flow, a proposal may be submitted to the City for consideration.
3. Sprinkler systems are still required to be designed per City Code and approved by the City of Buckeye Fire Department.

TABLE 3 FIRE FLOW

| Land Use | Fire Flow (gpm) | Duration (hours) |
|---|-----------------|------------------|
| Low and Medium Density (less than 8 dwelling units per acre) | 1,500 | 2 |
| Active Adult (max 8 units per acre) | 1,500 | 2 |
| High Density (Greater than 8 units per acre includes apartments) | 2,000 | 4 |
| Commercial / Mixed Use | 3,000 | 4 |
| School | 3,000 | 4 |
| Malls / Retail Areas | 4,000 | 4 |
| Industrial / Warehouse | 5,000 | 4 |
| Commercial High Rise / Multi Story ₁ | 5,000 | 4 |

1. This is a minimum requirement and shall be verified for each high rise.

D. Hydraulic Criteria:

1. Velocity:

- a. Maximum velocity is 5 feet/sec for average day, maximum day, and peak hour flows.
- b. Maximum velocity is 10 feet/sec for maximum day plus fire flow.

2. Head loss Coefficient (Hazen-Williams "C" Value):

- a. Ductile Iron Pipe = 110
- b. PVC Pipe = 130
- c. Steel Pipe = 140

3. Minimum Pipe Size:

- a. The City's water distribution system operates on a grid system. Minimum line size requirements for this grid are as follows, unless otherwise approved by the City Engineer:
 - i. Minimum pipe size for water main is 8 inches.
 - ii. Minimum pipe size for water main in half-mile streets and collector streets are 12 inches.
 - iii. Minimum pipe size for water main in mile streets and arterial streets is 16 inches.
 - iv. In no case shall there be less than one 16-inch main connecting to each adjacent booster station or adjacent development. The 16-inch main connections shall be coordinated with the adjacent booster service area.
- b. 10-inch, 14-inch, 18-inch, and 20-inch water mains are not allowed.

3-1.203 Pressure Requirements:

- A. A sudden drop in water pressure could cause a cross contamination of the system, and high pressures may cause ruptures or breaks in the network and/or residential or commercial fixtures. [Table 4](#) lists the pressure zones to be followed in the City.

TABLE 4 SUMMARY OF PRESSURE ZONES IN THE CITY OF BUCKEYE

| Pressure Zone | Low Elevation (feet) | High Elevation (feet) |
|---------------|----------------------|-----------------------|
| 1 | 820 | 950 |
| 2 | 950 | 1,080 |
| 3 | 1,080 | 1,210 |
| 4 | 1,210 | 1,340 |
| 5 | 1,340 | 1,470 |
| 6 | 1,470 | 1,600 |
| 7 | 1,600 | 1,730 |
| 8 | 1,730 | 1,860 |
| 9 | 1,860 | 1,990 |
| 10 | 1,990 | 2,120 |

- B. The City maintains several pressure zones and care must be taken to identify boundary conditions when designing near a zone line.
- C. See Table 4 for water pressure zone boundaries. Static water pressure tests will be taken on a fire hydrant located on each leg of the existing water system where connections are proposed.
- D. System Pressure:
1. Fifty psi shall be maintained during average day, maximum day, and peak hour conditions.
 2. Twenty psi shall be maintained during maximum day plus fire flow conditions.
 3. The residual pressure in the distribution system shall not exceed 110 psi.
 4. PRVs are required on all residential lots.
- E. Water hammer may produce momentary pressures more than normal static pressures, thus increasing the probability of water main failure. Suitable provisions must be made to protect the system from water hammer pressures. The occurrence and severity of water hammer can be reduced by using slow-closing valves, pressure-release valves, surge tanks, variable frequency drives, soft start motor controllers and air chambers. In cases where pressures exceed 110 psi or water hammer conditions are developed, all elements of the system will be designed accordingly.

3-1.204 Pipe System Layouts:

- A. For purposes of MAG Standard Detail 404 and MAG Standard Specification 610 horizontal and vertical separation, storm drains, non-potable water lines, reclaim lines, irrigation lines, and well transmission lines shall be treated as non-potable / sewer mains. Additionally, non-potable water, well transmission, and reclaim lines shall be classified as pressurized sewer lines.
- B. To provide appropriate water pressure, water circulation and redundancy, all new water mains must be designed in a looped configuration, providing a minimum of two connections that can be isolated by a shut-off valve.
- C. All city owned and operated water facilities shall be located on city property or within ROW. Public water mains are not allowed on commercial, industrial, or other private property. Water mains may be allowed to be located in easements on a case by case basis as approved by the City Engineer.
- D. Pipe Cover:
1. Cover or depth of bury for water mains will be measured from the proposed finished grade as

follows:

- a. For 8-inch and 12-inch diameter mains (in local streets), provide a minimum cover of 48 inches over the top of pipe.
 - b. For 12-inch and 16-inch diameter mains (in collector and arterial streets), provide a minimum cover of sixty 60 inches over the top of pipe.
 - c. For all mains 24 inches and greater in diameter, special design is required with a minimum of 60 inches of cover.
 - d. In no case will water mains be installed with less than four feet of cover over the top of the pipe, unless otherwise approved by the City Engineer.
2. Special cover and trench design shall be required where water mains are not located in City ROW, poor soil conditions exist, where a water main is located in non-typical terrain, washes, rivers, rock, and other areas as required by the City.
 3. If a water main is installed within an area to be filled, at a later time, adequate pipe protection shall be provided. This may include temporary berming for pipe protection or constructing the water main to a minimum depth of five feet below the existing grade and adjusting to standard bury depth in the future. The City Engineer shall be notified when cover could become an issue. In no case shall the main be installed without adequate cover.
 4. A dewatering plan is required. Special trench and backfill requirements shall be required if a water main is installed in water logged areas.
- E. Horizontal Location:
1. Generally, water mains constructed along a street grid should be aligned parallel to, and north or east of the street centerline.
 2. Mains should not cross the street centerline except in cases where curvilinear street alignments are encountered, and then only as specified by the City Engineer.
 3. Public water mains (if approved by the City Engineer) within commercial, industrial or multi-family developments shall meet all City easement requirements.
 4. Water mains shall be placed under the pavement. When not in pavement or within City ROW, they shall be placed in an exclusive easement granted to the City in accordance with City requirements.
 5. In local streets, water mains shall be placed seven feet from street monument line. On curvilinear streets and knuckles, water mains may be placed five feet to nine feet from monument line. Alternate locations must be approved by the City Engineer.
 6. If storm drains are present and shown at their typical monument line location, the water main separation shall be six feet outside of pipe to outside of pipe, except that the outside of the water main shall not be within two feet of the lip of gutter.
 7. In collector and arterial streets, water mains shall be centered in a travel lane or on a lane line. Typical standard offsets from street monument lines are 18, 24, 30, 36-feet, etc. However, it is the engineer's responsibility to ensure that the vehicle wheel path criteria are met.
 8. The outside of water pipe in all streets shall be no closer than two feet to the centerline of the roadway and two feet to the lip of any gutter or four feet from the back of any curb.
 9. Water mains shall not be placed in easements under retention basins.

10. Water mains in easements at wash crossings shall not locate appurtenances such as manholes, fire hydrants, or valves within the 100-year flood elevation of the wash.
 11. Where existing easements or ROW are encountered, the City will review the use of these on a case by case basis.
 12. Design deflection shall not exceed half of the manufacturer's recommendations.
 13. Curved water mains are permissible where the individual joint deflection does not exceed one-half (1/2) the manufacturer's recommendations. Where water main deflection exceeds the above criteria, MJ fittings will be required.
- F. Vertical Location and Vertical Separation:
1. Vertical separation of water and sanitary sewer mains must be in compliance with AAC, Title 18 – Environmental Quality and MAG Standard Specification Section 610.5. The Zones requiring extra protection are as shown in MAG Standard Detail 404-1.
 2. Water mains shall not be allowed to cross under sewer mains, at any depth. For this reason, typical vertical realignment construction and details are not applicable. The engineer shall take this into account when preparing preliminary analysis and detailed design plans. To accommodate this requirement, separation criteria and minimum cover requirements of the water main may be allowed, as long as minimum State regulations and MAG Detail 404-1, Zone 'A' criteria are met. When existing shallow sewers are encountered, a meeting shall be scheduled with the City Engineer to discuss proposed water and sewer extensions in the areas of shallow conditions.
 3. Where conditions prevent adequate horizontal and vertical separation:
 - a. The water main shall be constructed of D.I.P. (minimum pressure Class 350) with restrained joints for a minimum distance of 10 feet on each side of the crossing. No ductile iron sewer pipe is allowed in the City of Buckeye. The sewer main shall be encased in 6 inches of Class "C" concrete, for a minimum distance of 10 feet on each side of the water main, per MAG Standard Detail 404-3.
 - b. An alternative methodology is to install either or both sewer and water mains in a steel sleeve, a minimum of ten feet on each side of crossing.
 - c. Where an existing water main is not restrained ductile iron, the water main shall be replaced with restrained D.I.P. per MAG Standard Detail 404-2 and 404-3.
 - d. Where the existing or proposed sewer main requires extra protection, the sewer main shall be encased in Class "C" concrete per MAG Standard Detail No. 404-3.
 - e. Water mains crossing over culverts and storm drains must maintain both a minimum of 12 inches (24 inches preferred) vertical separation and the minimum depth of bury. If the design cannot provide these clearances, a vertical realignment below the storm drain is necessary.
 - f. Any vertical realignment that is not shown in profile shall be designed per the [COB Detail 31225](#).
 - g. The clearance under culverts, storm drains, and other utilities shall be a minimum of two feet.
 - h. For profiled water mains full dips to avoid utilities is highly discouraged. The profile of the water main needs to be modified to only cause one-half (1/2) of the dip section to be

needed. One-half ($\frac{1}{2}$) vertical realignments shall be used to avoid dip sections where possible and shall be constructed of D.I.P.

i. Deflecting of pipe for vertical realignment is not allowed.

4. Minimum separation requirement between potable water lines and non-potable lines shall meet the requirements of MAG Standard Details 404-1, 404-2, and 404-3.
5. Design calculations for wall thickness will be required in cases where pipelines could be subjected to heavy external loads. These include, but are not limited to, pipelines crossing under storm drain lines greater than 36 inches in diameter, pipelines in the roadway alignments that would be exposed to heavy construction vehicle loads prior to paving, and installations exceeding the pipe manufacturer's maximum depth of bury.
6. Vertical clearance between water mains and sewer service connections, the main shall not be less than 12 inches above the sewer service.

G. Horizontal Separation:

1. Minimum separation requirement between potable water mains and all other utilities is six feet.
2. Provide a horizontal separation from any structural footing or substantial improvement. The separation shall be calculated by a structural engineer and submitted for review and approval.
3. All horizontal clearances shall be measured from the largest outside dimension on each utility, including manholes.
4. Separation of water and sewer mains shall be per the following criteria:
 - a. Caution should be taken in the design and construction of the water mains in the vicinity of sewer mains to protect all water supplies from wastewater contamination, per MAG Section 610.

3-1.205 Easement Requirements:

A. Easements may be considered in the following cases:

1. For single family, individually lotted, residential developments, city water mains may be constructed in private streets, meeting the minimum width of 32 feet back of curb to back of curb, and meet the minimum easement width and requirements below.
2. The development route falls in a future ROW alignment.
3. The development route falls in a major utility, canal, or drainage channel corridor.
4. For a short segment of water main, such that is not technically feasible to design the water main in the ROW and the proposed alignment of the water main is in an easement results in more efficient operation of the water network.

B. All city water mains proposed outside of the ROW require approval of the City Engineer.

C. Water Main Easement:

1. Water mains outside of a public ROW are required to be located within an exclusive easement granted to the city by the landowner in accordance with city requirements. PUEs is not acceptable.
2. Such easement shall be free from any dry or private utilities running parallel to the water main. No other non-city utilities are allowed in a city easement.

3. All city water easements shall be located in tracts, open space, or public access easements. In no case shall the water easement be located on residential lots.
4. The minimum easement width shall be per [Table 5](#) for a single water main. If multiple water mains (separate pressure zone mains or well transmission main) are to be located within the same easement an additional 15 feet per additional main shall be added to the minimum easement. A maximum of three water mains may be located in any water easement.
5. The minimum easement widths may be increased by the City Engineer to accommodate construction or maintenance activities or topographical challenges.
6. All water mains located within an approved private access way shall have a minimum easement width of 25 feet, back of curb to back of curb. The private access shall also have ten foot PUEs on both sides to accommodate the other utilities.
7. Single water mains are to be located in the center of the easement. In special cases with City Engineer approval, the water main can be offset in the easement but in no event closer than the standard offset shown in [Table 5](#) to the edge of the easement.
8. Multiple water mains are to meet separation requirements of these standards; in no event shall any water main be closer than 15 feet to the edge of the easement.
9. For water easements not located within a public or private access, an all-weather access road is required. The access road shall have a minimum width of ten feet and shall be paved or constructed of minimum six-inch-thick stabilized decomposed granite or MAG ABC. Each end of the access road shall connect to a public street or private access way or a turn-around easement shall be provided. The maintenance of access roads in which the easement(s) is located is the responsibility of the property owner or HOA and shall be indicated as such in the CC&Rs. A copy of the CC&Rs providing evidence of this maintenance responsibility by the HOA or other ownership group shall be submitted to the city for verification.
10. Water easements shall not have a slope greater than 10:1 or 10% in any direction.
11. The easement shall not be located in a fenced area or areas with restricted access, and will be accessible at all times to city service equipment such as trucks, backhoes, etc.
12. No new cacti are allowed within a water easement. Native cacti will be allowed.
13. Trees shall only be located in the outer five feet of the easement when the pipe is centered in the easement. The only landscaping allowed within the entire easement is average size shrubs and ground cover as approved by the city.
14. It is not the responsibility of the city to maintain, repair, or replace any landscaping within the easement.
15. No landscaping shall be placed within an easement which would render the easement inaccessible by equipment. The City may cause any obstruction to be removed without notice to the property owner and all related costs shall be the property owner's responsibility. The maintenance of all landscaping in easements is the responsibility of the property owner or HOA and shall be indicated as such in the CC&Rs. A copy of the CC&Rs providing evidence of this maintenance responsibility by the HOA or other ownership group shall be submitted to the City for verification.
16. Easements shall be free and clear of improvements, i.e. screen walls, fences, retaining walls, and other obstructions.

17. If the water main crosses a wash, access is required from both sides of the wash. In the case where the wash is not passable with a typical maintenance vehicle, a widened easement is required on both sides of the wash to provide a turn-around area.
18. Easements or ROW dedication shall be through a map of dedication or final plat or by separate instrument with prior City Engineer approval.
19. All real property to be conveyed to the City, or real property interests granted to the City through an easement, shall first comply with City requirements set forth in Chapter 25 of the City Code.
20. Regardless of the easement width, buildings shall have a sufficient setback from the easement boundary such that buildings, building foundations, or building slabs will not be undermined or damaged by a water main break. Proposed developments with buildings, building foundations, or building slabs proposed to be closer than 20 feet from a waterline boundary, shall be required to submit structural and soil calculations, signed and sealed by a registered Arizona professional engineer, which verify integrity of structures adjacent to the water main under the condition of a main failure.
21. Water easements shall not infringe on storm water retention/detention basins. A water easement may be allowed adjacent to a basin if all basin contours are located outside of the easement limits.

TABLE 5 EASEMENT WIDTH

| Main Diameter | Cover Depth, Location | Minimum Easement Width | Standard Offset |
|-------------------------------|-----------------------|------------------------|-----------------|
| 12 inches and smaller | < 8 feet | 25 feet | 10 feet |
| 12 inches and smaller | > 8 feet | 50 feet | 15 feet |
| 16 through 30 inches | < 8 feet | 50 feet | 20 feet |
| 16 through 30 inches | > 8 feet | 70 feet | 35 feet |
| Larger than 30 inches | < 8 feet | 70 feet | 35 feet |
| Larger than 30 inches | > 8 feet | 80 feet | 40 feet |
| Fire hydrants, blow-off, etc. | | 12 feet by 12 feet | Centered |

D. Wastewater and Water Main Easements:

1. When wastewater and water mains must be placed in a common exclusive easement to be granted to the City, the following criteria shall apply:
 - a. The sewer main shall be typically located in the standard location of the sewer easement. To place a water main in a common water and sewer easement, calculate the sewer easement as normal, per "Design Standards - Section 4-1 Gravity Sewer", then add an additional 15 feet for less than 8 feet deep water main.
 - b. The water main shall be located 15 feet from the edge of the total easement opposite the sewer.
 - c. For water mains greater than eight feet deep use half of the value in [Table 5](#) in addition to the sewer easement.

3-1.206 Service Main and Meters:

- A. The water service main and meter will be sized based upon the total daily demands for the development.
- B. For new water meter installations, the city will own the service up to and including the meter. The service line after the meter will be private and owned and maintained by the property owner.
- C. Design of the private on-site portion of the water service shall comply with the latest applicable codes, ordinances, and resolutions as adopted by the City.
- D. Each meter shall require its own service line.
- E. Water services shall be one inch minimum.
- F. Copper tubing for one inch thru two inches shall be new seamless copper conforming to all the requirements of ASTM Designation B-88-49 Type "K" soft copper.
- G. Due to the City's water billing rate structure, meter sizes will not exceed the size of the service main such as a 1½-inch meter will not be allowed on one-inch service.
- H. Extra attention is recommended when sizing services for custom home lots where demands occasionally necessitate meter sizes exceeding one inch and residential fire suppression systems are common.
- I. Service mains are required to be sized to meet domestic, fire, and irrigation demands.
- J. Connection of two or more meters in a manifold (or yolk) configuration is prohibited.
- K. Commercial service taps or "T" main shall be constructed per [COB Detail 31370](#).
- L. Installation of metered one inch to two inch water services will be in accordance with [COB Detail 31330](#).
- M. Installation of four inch to six inch metered services require a tee and gate valve, or tapping sleeve and valve on the public main per MAG Standard Detail No. 340 and 391-2, and in accordance with [COB Detail 31335](#).
- N. Final plans will show locations of service mains and meters to each unit referenced with stations and dimensions, or offsets, from the street centerline or monument line. For services not perpendicular to the main, station the tap at the main and provide an offset from the end of service to the property line at the ROW, or an identifiable end point.
- O. Service mains and meter boxes will be located within public ROW, easement within a private street tract, or a City water easement.
- P. Meters shall be accessible to City workers at all times and shall be located as close as possible to the main.
- Q. Services shall be continuous from the main to the meter with no bends, fittings or welded joints. There shall be no joints within public ROW.
- R. No service connections or fire protection systems will be made directly to water mains larger than 12 inches in diameter, or to water mains designed solely to transmit water from one pressure zone to another pressure zone unless approved by the City Engineer.
- S. No service connections are allowed directly to transmissions lines.
- T. All existing public galvanized iron and polyethylene water service mains in sizes one inch through two inch, which are exposed during construction, will be replaced in their entirety with Type "K"

soft copper tubing. This includes the replacement of iron service saddles with bronze saddles and replacement of both the corporation stop and meter stop in all cases. This includes the removal of the saddle and/or corporation stop and installation of bronze double band saddle or full circle repair clamp.

- U. Existing water services not used by a development will be noted on the plans to be abandoned at the main. If the saddle meets this design standard's minimum standards, install a brass plug. If not, a full circle repair clamp shall be used.
- V. Developments having more than one building or user are required to construct an onsite private main. This private main can be fed by a "gang" of meters or a single larger meter. Private mains require a minimum of two connections to the public main along with reduced pressure backflow preventers after each tie-in location.
- W. All meters shall be supplied by the City and installed by the Water Resources Department.
- X. Location:
 - 1. All service main connections shall be installed perpendicular to the water main with no bends until connecting to the water meter except for cul-de-sacs or knuckles.
 - 2. All services shall be marked with a steel stud painted blue. The service location shall also be stamped in the curb using a "W" to mark the location per [COB Detail 31220](#).
 - 3. Water service mains shall have a continuous slope from the main line to the meter. No localized high points shall be allowed.
 - 4. Opposite side service taps must be a minimum of three feet apart.
 - 5. Same side service taps shall be a minimum of six feet apart.
 - 6. Water services shall not be located closer than three feet to the property line.
 - 7. As an alternate location the water service may be placed in the middle of the lot.
 - 8. Water services must be located a minimum of ten feet from sewer services.
 - 9. The engineer shall coordinate all utilities to avoid conflicts with the water service.
 - 10. Water services shall not be installed under or within two feet of driveways.
 - 11. Water service mains and meters shall not be placed in driveways, sidewalks, washes, PUEs, LPPUEs, or retention/detention basins.
- Y. Water mains and sewer mains shall be designed to allow for the water service mains to pass above sewer mains with 12 inches of vertical clearance to comply with MAG clearance requirements.
- Z. Service connections to existing mains:
 - 1. All taps to existing mains shall be hot tapped under the supervision of the City. The coupon shall be given to the City representative onsite.
 - 2. A City approved service saddle appropriate for the pipe material shall be used.
 - 3. Any time a water main is tapped, a new service main to the ROW is required.
 - 4. A new meter box and meter are required.
 - 5. Where a service connection to an existing main is made a "W" shall be ground/cut, minimum ¼-inch deep in the existing curb directly over the new service per [COB Detail 31220](#).

3-1.207 Valves:

- A. Valves will be installed on water mains at locations within the distribution system that allow sections of the system to be taken out of service for repairs or maintenance without significantly curtailing service in other areas.
- B. Special consideration should be given to the number of fire hydrants taken out of service.
- C. A sufficient number of valves should be provided on water mains so that inconvenience and sanitary hazards will be minimized during repairs.
- D. Valves will be located such that closing no more than four valves can isolate any section of the system, or a maximum of 30 dwelling units.
- E. Two valves are required at all tees and three valves are required at each cross.
- F. Maximum spacing of water distribution main isolation valves shall be as follows:
 - 1. Valve spacing shall not exceed 600-foot intervals in commercial, institutional, multi-family, and industrial areas.
 - 2. In single family residential, valve spacing shall not exceed 800-foot intervals.
 - 3. Maximum spacing of water transmission main isolation valves shall be per [Table 7](#).
- G. Any design not complying with the above spacing requirements must be approved in writing by the City Engineer.
- H. Valves 12 inch and larger located on arterial streets shall be installed at the PC of curb returns at street intersections and aligned with a property line or lot line at mid-block locations. All other valves shall be located at the tee or cross.
- I. All valves must be stationed and offset from monument line.
- J. There shall be one valve on each side of a major crossing including, but not limited to, the following: canals, railroads, freeways, bridges, and drainage channels regardless of size.
- K. Provide a valve on each hydrant branch per MAG Standard Detail 360-1.
- L. Do not install valves in sidewalks, curbs, valley gutters, residential driveways, handicap ramps, multi-use paths or bicycle lanes.
- M. All valves 16 inches or smaller shall be direct bury resilient wedge gate type.
- N. All valves 24 inches and larger shall be direct bury resilient wedge gate with bypass.
- O. Pressure rating on all valves shall be equal to or greater than the pressure rating of adjacent piping.
- P. Valve boxes shall be installed per MAG Standard Detail No. 391-2, and shall be heavy duty with a minimum lid height of five inches.
- Q. The grade of a valve box and cover located outside of a paved area shall be one to two inches above adjacent grade. Where valve boxes are located outside the street or sidewalk, there shall be a Class “B” concrete ring six inches thick, and 30 inches in diameter placed around the valve box, and flush with the top of the valve box. There shall be a number four bar centered in the concrete ring and the contractor shall install a Blue Carsonite Marker labeled “WATER VALVE” within two feet of the valve.
- R. Valve bypass shall be required on all 24-inch and larger diameter lines, as shown on [COB Detail 31420](#).

- S. Valve bypass shall be required on every other valve. See [COB Detail 31420](#).
- T. All valves shall be blocked per MAG Standard Detail 301. For mains larger than 12 inches, the engineer shall provide design calculations and details on the plans.
- U. All valves shall be manufactured, tested, and/or installed in accordance with AWWA.

3-1.208 Fittings:

- A. No water main will be deflected either vertically or horizontally, more than one-half (½) of that recommended by the manufacturer of the pipe or coupling without the appropriate use of approved fittings.
- B. All fittings shall match rating specifications with piping.
- C. A minimum distance between fittings shall be three feet; measured from edge of fitting to edge of fitting. The engineer is responsible for verifying the minimum distance between fittings for maintenance purposes.
- D. All fittings shall be manufactured, tested, and/or installed in accordance with AWWA and other standards.
- E. All fittings shall be blocked per MAG Standard Detail 380. For mains larger than 12 inches, the engineer shall provide design calculations and details on the plans.
- F. All fittings shall be D.I.P.

3-1.209 Thrust Restraint:

- A. Thrust restraint shall be used at all bends, elbows, tees, crosses, dead ends, stubs, fire hydrants and valve locations, and all diameter water mains where water flow changes direction or is stopped.
- B. Thrust blocking is the preferred method of thrust restraint in the City and required on all fire hydrants. Thrust blocks shall be constructed in accordance with MAG Standard Detail 380.
- C. Joint restraint systems are not allowed for use on any pipe material except D.I.P. Joint restraint is prohibited on PVC pipe.
- D. Where line size exceeds MAG published sizes the engineer shall submit calculations and add a thrust block sizing table to the plan set.
- E. Thrust restraint other than thrust blocking shall be provided as follows:
 - 1. Tie Rod restraint per MAG Standard Detail 302-1.
 - 2. Joint Restraint per MAG Standard Detail 303-1.
 - 3. Welded joints in steel pipelines.
- F. The determination of whether a given section of pipeline needs restrained joints, or other means of anchorage, shall be made by the engineer and reviewed by the City Engineer.
- G. Design all thrust restraint for one and one-half (1½) times the static line pressure or 200 psi, whichever is greater.
- H. MAG Standard Detail No. 303-1 and 303-2 include acceptable means of joint restraint. The engineer should pay attention to the water pressures and soil bearing pressures that are assumed by the standard details.
- I. The MAG Standard Detail No. 303-1 and 303-2 are minimum restraining joint lengths and shall be verified by the engineer for the soil conditions where the main will be placed. In no case will the

city allow shorter restrained lengths than published in the MAG table.

- J. All restrained pipe lengths must be specified on the final plans or referenced to a standard detail and sealed by an Arizona registered engineer.

3-1.210 Tracer Wire:

- A. All water main lines within the City shall have tracer wire attached directly to the top of the pipe and will be taped to the main every plus/minus (+/-) ten feet.
- B. The wire must be copper clad reinforced tracer wire and be manufactured by “Copperhead Industries” or approved equal.
- C. The wire must be 10 gauge, direct bury, solid core wire with a minimum 30 mil polyethylene insulation. The wire color shall be utility appropriate (blue = potable water, purple = reclaim water).
- D. An approved type, five-pound magnesium anode shall be installed for each 1,000 linear feet of tracer wire or at least one anode at each end of the development as follows:
 - 1. Tracer wire connection stations shall consist of upper sections of the City approved water valve boxes. Tracer wire will be routed along the outside of the C900 valve riser piping (see MAG Detail 391-2).
 - 2. The anodes for water main tracer wire shall be installed at fire hydrants or water valves (not in the roadway). The anode shall be placed at a tracer wire connection station under the valve box. Upon approval from the City Engineer, tracer wire connection stations may be located adjacent to water services. Connection stations shall be located a minimum of one foot away and a maximum of three feet away from hydrants, valves, or services.
 - 3. A tracer wire connection station shall be installed at each fire hydrant, one station for each 500 linear feet of water main, and at each end of the project (located on the same side of the street). Tracer wire will be routed along the outside of the C900 valve riser piping (see MAG Detail 391-2).
 - 4. No tracer wires shall be wrapped around a fire hydrant barrel.
 - 5. The tracer wire shall be looped from the main tracer wire and run to a connection station located adjacent to a fire hydrant.
 - 6. Three wraps of tracer wire shall be loosely coiled around the valve riser.
 - 7. The contractor shall “As-Built” the location of all tracer wire, anodes, and connection stations.
 - 8. All tracer wire splices shall be carefully soldered. Wires are to be inserted into a direct burial splice, use “Scotch 3M DBR-6” or equivalent.
 - 9. The tracer wire, anodes, and connection stations shall be detailed on the water line construction plan As-Built drawings.
 - 10. All tracer wire shall be tested and verified by the City to ensure that there are no breaks in the wire prior to any paving operations.

3-1.211 Air Release Valves (ARV):

- A. The use of ARVs is required at well-defined high points:
 - 1. Water main changes from a positive slope to a zero slope, or a negative slope in the primary direction of flow.

2. Water main changes from a zero slope to a negative slope in a primary direction of flow.
 3. For vertical alignment changes to cross under or over another facility, such as utility, drainage washes, etc. See [COB Detail 31225](#).
 4. All ARVs will be a combination air/vacuum release type and installed per [COB Detail 31340-1 and 31340-2](#).
 5. All water mains shall be designed to eliminate high points to the greatest extent possible.
 6. ARVs shall be placed at all high points of the water mains 12 inches and larger unless requested or approved by the City Engineer.
- B. On 8-inch (un-profiled) mains, the use of full vertical realignments is allowed. Install ARVs at high points on high side(s) of the vertical realignment, as necessary to bleed off entrapped air.
- C. On 12-inch and larger mains, the use of full vertical realignments is prohibited, unless specifically approved by the City Engineer. One-half (½) vertical realignments will be allowed and a fire hydrant installed if a high point is created.
- D. ARVs shall be per [COB Detail 31340-1 and 31340-2](#) adjacent to the roadway where applicable. Locations for all valves and vent pipes must be shown on the final plans and will be within the ROW, private street tract, or easement.

3-1.212 Backflow Prevention and Cross Connection Control:

- A. All metered services within the City, other than single family residential, require the installation of an approved backflow prevention device immediately adjacent to the meter on private property unless approved otherwise by the City Engineer. Installation within the PUE or LPPUE may be allowed.
- B. The backflow prevention valve and the service main will be of equal size, unless the engineer submits calculations with final plans demonstrating that losses through a smaller device do not adversely affect water pressure to the building.
- C. All backflow prevention devices shall be shown to scale and stationed on the plans. The location of backflow preventers and the adjacent meter shall take into consideration opportunities to screen with landscaping or consolidate into common areas providing utility service to a building.
- D. Generally, backflow preventers shall not be located at:
1. Entrances to buildings unless appropriately screened.
 2. Locations where they interfere with opening car doors.
 3. Areas of high visibility.
 4. Clear zones adjacent to roadways.
- E. Every effort must be made to locate the water meter above grade with a security cage in the public ROW and that can accommodate a properly installed backflow preventer. Refer to [COB Detail 31370](#) for proximity of meter to backflow preventer.
- F. When the location of a backflow preventer cannot be accommodated adjacent to the meter, the designer shall:
1. Request permission from the City Engineer to separate the meter from the backflow preventer.
 2. Backfill the water service between the meter box and the backflow preventer with one-half (½) sack CLSM per MAG, Section 728. CLSM shall be placed to the full width of the trench

- and to six inches above top of pipe.
3. Note on the plans that inspection of the water piping connecting the meter to the backflow preventer shall be done by a city backflow prevention specialist prior to CLSM and backfill.
- G. Backflow prevention devices larger than two inches require location to be stationed and offset on the final plans.
 - H. Fire lines require backflow prevention at either the property line or within the vertical riser, when permitted.
 - I. The city requires backflow prevention on temporary construction meters for all extensions of the water system.
 - J. All private water mains, fire lines or any type of extension that are not owned or maintained by the city shall have backflow prevention where jurisdiction goes from public to private.
 - K. All fire lines that service sprinkled buildings shall have double check backflow preventers only. Reduced pressure backflow devices are not allowed for sprinkled buildings, other than single family residential units.

3-1.213 Temporary Dead-End Lines and Stub Outs:

- A. Temporary dead-end water mains in the city will comply with the following requirements:
 1. The maximum length for a temporary dead-end water distribution main, 8-inch and 12-inch diameter will be 660 feet in length.
 2. The maximum length for a temporary dead-end transmission main, 16-inch and larger shall be 1,000 feet. Temporary dead-end transmission mains exceeding 1,000 feet in length requires approval from the City Engineer.
 3. Temporary dead-end mains shall be extended one pipe length beyond the edge of paved surfaces or 20 feet, whichever is greater.
 4. Temporary capped dead-end mains will be fitted with a flushing device as per MAG Standard Detail No. 390, Type "A".
 5. Valves on temporary dead-end mains that will be extended shall be provided with two full pipe lengths between the valve and the plug for mains 12 inches and larger, and one full pipe length for mains smaller than 12 inches.
 6. Curb stop with flushing pipe (MAG Standard Detail No. 390 Type A) will be installed at the end of temporary dead-end mains to allow periodic flushing of the mains. Flushing devices shall not be located in washes, detention areas, retention areas, sidewalks, driveways, or paved areas.
- B. Water stub outs must be provided for all adjacent undeveloped property and all major parcels within, or adjacent to a development. All water stubs shall be D.I.P.
- C. A commercial 'T' main, per [COB Detail 31370](#) shall be provided on commercial, institutional, industrial, and multifamily applications.
 1. The function of a 'T' main is to provide a single main connection with a manifold to provide domestic water, irrigation, fire protection systems, and a public fire hydrant.
 2. Single, small fire, domestic, and irrigation connections may be permitted with the approval of the City Engineer.

3. The ‘T’ main shall be installed to the back of the P.U.E.

3-1.214 Wash Crossings:

- A. All wash crossings will be constructed using restrained Mechanical Joint D.I.P. or “Field Lok” style joint restraints.
- B. Bury requirements to place water mains under washes or channels shall be based upon the 100-year, 6 or 24-hour peak design discharge (Q100), including scour depth considerations in the channel or wash.
- C. All wash crossings will be designed to have the water main a minimum of three feet below the scour depth of the wash. See [Table 6](#) for the minimum criteria that shall be used for wash crossings.
- D. Wash crossings with a 100-year flow above 500 cfs will use the Arizona State Standard Attachment SSA 5-96, Guideline 2, Level 1, as published by the ADWR to estimate the scour depth. The engineer will estimate the depth of scour and design the top of pipe to be three feet below the estimated scour depth. The engineer will provide a detailed analysis of the scour depth with final plans or in final water report for review and approval.

TABLE 6 MINIMUM DEPTH OF BURY FOR WASHES

| 100 Year Flow Rate | Minimum Depth Of Bury |
|--------------------|---|
| 1 to 49 cfs | 6 feet |
| 50 to 99 cfs | 7 feet |
| 100 to 499 cfs | 8 feet |
| More than 499 cfs | Scour depth based on scour analysis, Minimum 8 feet |

- E. All pipelines shall be located out of the scour zone.
- F. All water mains crossing under culverts or storm drains whose span exceeds 20 feet shall be installed within a steel casing.
- G. All pipes within any casing shall be D.I.P.
- H. Valves, ARVs, or other appurtenances shall not be allowed within a wash crossing.

3-1.215 Main and Water Appurtenance Protection:

- A. Any water appurtenance that has been proposed in what is deemed by the city to be in “harm’s way” requires approval by the City Engineer. If approved, an engineered design shall be required to fully protect the water appurtenance. Requirements for protection of the water appurtenance shall be determined in the city's sole discretion.
- B. Anytime access to a water main is restricted by 20 or more feet by items such as multiple storm pipes, box culverts, 404 washes, ROW not controlled by the city, or other items; the water main shall be constructed in a casing per city requirements.
- C. If the water main is located outside the pavement or with less than four feet of cover, the city may require a concrete cap be placed on the water main per [COB Detail 31382](#).

3-1.216 Easement Abandonments:

- A. Requirements:

1. Written requests for the abandonment or termination of public water easements shall be submitted to the City Engineer.
2. All existing utilities within an easement to be abandoned or terminated shall be relocated and removed out of such easement with prior approval of the City Engineer and at no cost to the city.
3. All requests for easement abandonments and terminations require the approval of the City Engineer.
4. If a water main is to be abandoned within the abandoned easement, remove the main and cap it at appropriate end points.

3-1.217 Private Water Mains:**A. Within ROW:**

1. Private water mains and appurtenances are not permitted within city ROW or PUEs.
2. The only exception for private water mains within ROW is mains owned and operated by a private utility company authorized by the ACC.
3. All on-site private water mains must meet the MCESD, City of Buckeye fire protection, and the City Code requirements for approval.
4. Private water mains and appurtenances authorized to be installed within City ROW shall be pursuant to the private utility company's requirements, except for structure location, which the city may dictate in order to minimize impact on traffic and roadway features within the city, such as valves, covers, and other appurtenances.

B. Outside of ROW:

1. All on-site private water mains shall comply with requirements of MCESD, AAC, and City of Buckeye Code.

3-1.218 High Groundwater Areas:

- A. High groundwater levels have been identified adjacent to the Gila River extending northerly to the Buckeye Water Conservation and Drainage District Canal. This area is referred to as the "Waterlogged Area" in the City Water Resources Plan. It is noted in the Water Resources Plan that the depth to groundwater is less than five feet in portions of the City. For water main design plans that propose installation of improvements within the high groundwater area, the following additional requirement shall be included with the design plan submittal.

B. General Requirements:

1. A geotechnical engineer shall prepare and submit for approval a groundwater investigation plan that characterizes the expected groundwater levels along the alignment of the work and investigates the composition of the soils that constitute the zones of water main foundation and trench.
2. Buoyancy of water mains shall be considered, and flotation of the pipe shall be prevented with appropriate construction where high groundwater conditions are anticipated.
3. The geotechnical report shall propose effective mitigation measures for the dewatering of trenches and excavations, possible trench shoring methods, and identify locations to discharge any extracted groundwater. The report shall address the effects of the high groundwater during and after construction.

4. The design shall consider measures to preclude flotation of the work, during and after construction. The design shall additionally include any measures adopted from the geotechnical report.
5. The plans will note in profile the water depth information obtained in the investigation stage and any measures to mitigate the effects of high groundwater.
6. The design shall address possible migration of the groundwater and any transport of “fines” within the bedding and backfill zones.

3-1.219 Cathodic Protection:

- A. All D.I.P. that is installed within any high voltage easement, greater than 69 kV, shall be cathodically protected.
- B. All D.I.P. that is installed adjacent to or within the influence of an electrically charged gas pipeline shall be cathodically protected.
- C. All cathodic protection shall be designed by “Corrpro Waterworks” or city approved equal.

3-1.220 Asbestos-Cement Pipe (ACP):

- A. When more than three feet of existing ACP or other unapproved materials are exposed during construction and the bedding is disturbed, the water main shall be replaced with approved pipe material.
- B. ACP water main shall be removed to the nearest joint and the collar removed. The contractor shall tie into the milled end of the ACP.
- C. Contractor shall be responsible for clean-up and disposal of all friable asbestos per approved standards.

3-1.221 Sampling Stations:

- A. Water sampling stations are required in all new residential subdivisions.
 1. One sampling station minimum per subdivision.
 2. Sampling stations are required for a maximum of every 100 lots.
 3. A sampling station will be installed within the first phase of any parcel or subdivision. This will serve the first 100 lots and then prior to the subsequent phases of 100 lots.
- B. Sampling stations shall be located:
 1. Within the ROW, private street tract, or utility easement.
 2. In front of tracts and open space. Sampling stations shall never be located in front of a single-family lot.
 3. Three feet behind the sidewalk and within five feet of a property line.
- C. Construction shall be per [COB Detail 31375](#).
- D. Sample stations shall be Koraleen XLT-0001-3 or approved equal.

3-1.300 Transmission Mains:**3-1.301 General Requirements:**

- A. Transmission mains shall meet all requirements of standard distribution mains unless modified by

this section.

- B. Service connection will not be allowed on transmission mains.
- C. All mains 48 inches and larger require special design parameters set forth by the City on a project by project basis.

3-1.302 Design Criteria:

- A. See [Table 7](#) for design requirements.
- B. Transmission mains for distribution water shall be designed to carry peak flow including fire flow without exceeding maximum velocities.
- C. Transmission mains for raw water shall be designed to carry max day flow without exceeding maximum velocity.
- D. Transmission mains for specific uses shall have a City approved design flow but will meet all the minimum velocity criteria.

3-1.303 Location / Alignment:

- A. Line segments shall be set at a constant slope.
- B. Roller coaster type of vertical alignment shall be avoided.
- C. Shall meet all distribution horizontal and vertical criteria.
- D. All directional line changes will have a marker ball placed above all 22, 45, and 90-degree bends.

3-1.304 Valves:

- A. All valves shall be resilient wedge gate valves.
- B. If the city requires the installation of electronic monitoring and remote operation equipment, the line valve must be a gate valve with a rectangular vault, housing the valve operator and telemetry equipment. Each installation will require individual details. The engineer shall verify with the city on acceptable equipment and the specific design requirements.

3-1.305 Thrust Restraint:

- A. All bends, fittings, line valves and bulkheads shall be restrained by using a joint restraint system compatible with the type of pipe. The City shall approve all restraint systems. The length of the restraint system shall be shown on the construction plans and complete supporting data on the restraint system design shall be submitted to the City for review and approval.
- B. Concrete thrust blocks will not be accepted.

3-1.306 Cathodic Protection:

- A. All transmission mains 36 inches and larger require cathodic protection.
- B. All D.I.P. that is installed within any high voltage easement, greater than 69 kV, shall be cathodically protected.
- C. All D.I.P. that is installed adjacent to or in proximity to an electrically charged gas pipeline shall be cathodically protected.
- D. All cathodic protection shall be designed by “Corrpro Waterworks” or City approved equivalent.

3-1.307 Geotechnical:

- A. When requested by the City, a geotechnical engineer shall perform a soil investigation to determine the soil bearing capacity, soil backfill suitability, presence of groundwater or bedrock, corrosion potential and other conditions, which may affect the construction of the transmission main. Test holes shall be located at a maximum spacing of not more than 1,000 feet and at railroad, highway, and canal crossings.

TABLE 7 HEAD LOSS AND VELOCITY CRITERIA

| Pipe Size (inches) | Maximum Allowable Velocity (fps) (Avg. Day, Max Day, and Peak Day) | Maximum Allowable Head Loss (ft/1000 ft) | Maximum Valve Spacing (ft) |
|--------------------|--|---|----------------------------|
| 12 | 5 | 6.17 | 2,640 |
| 16 | 5 | 6.06 | 2,640 |
| 24 and larger | 5 | * | 5,280 |

* For larger pipe diameter the City will approve all head loss values.

3-1.308 Materials:

- A. All materials for transmission mains shall conform to materials as standard mains except as modified herein.
- B. Valves shall be ductile iron.
- C. Fittings shall be ductile iron.
- D. Pipe Material:
1. Eight inch through 48-inch class 350 D.I.P.
 2. Thirty-six inch through 48-inch concrete cylinder pipe
 3. Forty-eight inch and larger shall be D.I.P. or concrete cylinder pipe

3-1.400 Fire Protection:

3-1.401 General Requirements:

- A. It is the intent of the City to establish requirements consistent with nationally recognized practices for safeguarding life and property from hazards of fire and explosion arising from the storage, handling and use of hazardous substances, materials and devices, and from conditions hazardous to life and property arising from the use or occupancy of buildings or premises.
- B. All design shall meet the City adopted version of the International Fire Code.

3-1.402 Design Policy:

- A. If the development is to be supplied with domestic service and with fire flows from a storage tank or facility, the engineer must provide a report indicating that sufficient volumes exist, as required by the City, and are available to meet the calculated fire demands as defined by the Fire Department.
- B. Particular attention will be given to the fire hydrant locations on final plans for infrastructure where future building locations are not identified.
- C. Final building location and elevation may necessitate the addition of another water main, fire hydrant, and/or fire pump to serve that structure after the City has accepted the system.
- D. Compliance with the fire hydrant spacing and pressure requirements are the responsibility of the party requesting a building permit.

3-1.403 Fire Hydrants:

- A. The spacing of fire hydrants is to be measured along the street or roadway centerline in which a fire hose would be laid. Generally, this spacing is measured along the centerline and shall be inclusive of the distance up a private driveway to the proposed structure.
- B. The Fire Department will stipulate fire hydrant locations during the site planning process or on the final plans review. The following standards shall be used as a guide:
 1. All residential single-family dwellings shall be 500 feet on center.
 2. All commercial and industrial complexes shall be 300 feet on center.
 3. Additional hydrants and attention to the spacing may be required to meet the distances above for large lots including, but not limited to:
 - a. No structures shall be located more than 500 feet from a fire hydrant, as measured along the street centerline, ROW, private street tract, or utility easement.
 4. A six-inch fire hydrant lateral shall not be tapped for fire sprinkler supply lines or water services.
 5. Auxiliary fire hydrant valves must be connected to the water main by flanged tee.
 6. A fire hydrant is required at the beginning and end of all cul-de-sacs.
 7. Fire hydrants spacing on Arterial and Collector streets (with no lot frontage) shall be 1,000 feet maximum.
- C. Hydrant connections must have a minimum bury depth of four feet.
- D. Hydrants that require adjustment as a result of improvements will be adjusted using a "Gradelok" or approved equal when vertical adjustment is in excess of six inches.
- E. Fire hydrants shall have the following setbacks from back of curb:
 1. Arterials no closer than six feet and no further away than ten feet.
 2. Collectors no closer than four feet and no further away than eight feet.
 3. Local streets with roll curb or vertical curb and/or attached walk, two feet behind walk.
- F. Fire hydrants being located on streets without curb shall be located out of the clear zone as calculated per the AASHTO requirements.

G. For more information contact the City of Buckeye Fire Department.

3-1.404 Pavement Markers:

- A. Two-way, reflective blue raised pavement markers shall be provided to identify the location of fire hydrants and remote fire department connections. These markers are readily available from businesses providing highway marker materials. Refer to [COB Detail 31440](#) for Pavement Markers for Fire Hydrants.

3-1.405 Fire Lines and Building Sprinkler Lines:

- A. Determine the location of on-site fire lines and taps by the site relationship of the fire department connection, riser location, emergency access, and fire hydrant locations.
- B. Determine the size of fire lines from the flow test data provided by the engineer for design of the development.
- C. Fire systems must include a city approved backflow prevention device. Refer to [COB Detail 31430 and 31431](#).
- D. An approved vertically mounted backflow prevention device located on the building riser is preferred by the city.
- E. Fire lines servicing a single building can have backflow prevention device in the building.
- F. Fire lines servicing multiple units requires an external back flow prevention device.
- G. Show all fire lines on the civil site plans.
- H. Installation of one and one-half to two-inch fire lines requires a saddle connection.
- I. Installation of three inch and larger fire lines use a tee and valve.
- J. Meters are not required on services used solely for fire sprinkler systems.
- K. Fire lines shall be installed perpendicular or radial to the main line.
- L. All on-site fire line construction shall comply with the MAG Standard Specifications and Details and the City Engineering Design Standards.

3-1.406 Fire Department Connection (FDC):

- A. FDCs:
1. FDCs shall be located on the building whenever possible.
 2. FDCs shall be located within 30 feet of any fire lane.
 3. A fire hydrant is required to be located within 15 to 50 feet of the FDC.
 4. Pavement markers for FDCs shall be provided.
- B. Remote FDC:
1. If a remote FDC for a sprinkler system is required, it must be installed between four and eight feet from the back of curb of a public or private roadway, on-site driveway, or sidewalk. The location of the sprinkler system connection must be unobstructed and readily accessible to the Fire Department.
 2. A fire hydrant is required to be located within 15 to 50 feet of the remote FDC.
 3. All remote fire departments connections shall have the building address that it serves.

- C. Pavement markers for FDCs shall be provided.

3-1.407 Auxiliary Storage Tanks and Pumps:

- A. All auxiliary tanks and pumps shall meet all requirements of the City. Sizing of tanks and pumps shall comply with the requirements of this section.
- B. A fire pump and tank package installation may be required when the building's construction type, occupancy fire load commodities' classification, volumetric building areas, building height and individual square footage areas per floor level produce a pressurized fire flow demand in excess of the water transmission mains capabilities.
- C. All privately constructed fire protection shall be certified for fire use.

3-1.408 Fire Signage:

- A. See all signage details for addressing and labeling.
- B. All buildings shall be labeled per addressing details.
- C. All FDCs and remote FDCs requires a sign per City requirements.
- D. All fire lanes require signage per [COB Detail 31452 and 31454](#).
- E. All fire riser rooms require signage per [COB Detail 31450](#).

3-1.409 Fire Lanes:

- A. Shall meet the current City adopted version of the International Fire Code.
- B. All non-paved fire lanes shall meet the following criteria:
 - 1. MAG 222 Type A curb on the edges of the fire lane.
 - 2. A minimum of an eight-inch ABC base.
 - 3. A four-inch thick $\frac{3}{4}$ -inch minus granite surface wetted and compacted at installation.
 - 4. Calculations shall be submitted with the fire lane submittal to verify the City's minimum thickness is acceptable to carry the weight of a standard fire truck (approx. 75,000 lbs). If the design requires a larger section than the City's minimum, the larger section shall be constructed.
- C. All paved fire lanes shall be a minimum of 20 feet clear in width, 6% on grade elevation or approved by the Fire Marshall, a minimum vertical clearance of 13'6", and conform to the City's local street paving section at a minimum.
- D. For access control on fire lanes see [COB Detail 31460](#).
- E. For fire access turnarounds see [COB Detail 31445](#).

3-1.500 Plan Preparation:

3-1.501 General Requirements:

- A. All plans shall comply with "Design Standards - Section 1-2 Plan Submittal Requirements" General Construction Notes and Standard Sheets for Infrastructure Plan Submittals.

3-1.502 Design Plan Requirements:

- A. All plans shall be neat and legible.

- B. All plans shall be drawn to scale.
1. Horizontal scale shall not be smaller than 1:40 feet on plan views.
 2. Vertical scale shall not be smaller than 1:4 feet on profile views unless otherwise approved by the City Engineer.
- C. A Summary of Quantities is required on the cover sheet. The minimum items listed in [Table 8](#) are as follows:

TABLE 8 SUMMARY OF QUANTITIES

| Description | Unit | Quantity |
|---|------------------|----------|
| Waterline | Linear Foot (LF) | |
| Water Service, (New Main) | Each (EA) | |
| Water Service Tap to Existing Main, less than 2 inch | Each (EA) | |
| Water Service Tap to Existing Main, greater than 2 inch – less than 6 inch | Each (EA) | |
| Tapping Sleeve and Valve / Tie-in | Each (EA) | |
| Flush / Curb Stop / Blow-off | Each (EA) | |
| Mainline / Lateral / Fire Hydrant Valve | Each (EA) | |
| Fire Line | Linear Foot (LF) | |
| Fire Hydrant | Each (EA) | |
| Backflow Device up to and including 3 inches | Each (EA) | |
| Backflow Device greater than 3 inches | Each (EA) | |
| Sampling Station / Air Release Valve | Each (EA) | |
| Provide separate Summary of Quantities tables for City water quantities and private water quantities. | | |

- D. Plans shall have only one plan and profile per sheet.
- E. Water design is the only design allowed on the water plans; no other utility designs allowed.
- F. Plans shall not be phased.
- G. All design shown shall be constructed under one permit and construction sequence.
- H. Profile all water mains 12 inches and larger with line gradients and elevations.
- I. All pipe stubs 12 inches and larger shall be profiled.
- J. Water mains are required to be stationed and offset from the centerline/monument line of the roadway.
- K. All profiles shall contain the following information:
1. Pipe size, length, slope, and pipe material.
 2. Existing and finished ground or paving elevation over the water main.
 3. Pipe invert elevations every 400 feet and invert elevations of all fittings.
 4. Show all fittings and taps.
 5. All utilities that cross or are proposed to cross the proposed water main shall be shown in the profile.
 6. All utilities shall have an invert elevation and a calculated vertical separation shown. All

vertical separations shall be calculated considering pipe wall thicknesses. All separation dimensions shall be from outside of pipe to outside of pipe.

7. Show and label all separation remediation protection.
 8. All commercial services within the ROW shall be profiled.
- L. All plan views shall contain the following information:
1. Stationing and offset for all services, valves, hydrants, blow offs and all other appurtenances associated with the construction of the water main.
 2. Show and label all separation remediation protection.
 3. All services and pipe stubs that are not perpendicular to the main shall have a dimension from the property line at the ROW. Pipe stubs may require a station and offset depending on the complexity.
 4. In the case of knuckles and cul-de-sacs, the service shall be stationed at the main line connection. An additional dimension from the nearest property line to where the service crosses the ROW line shall be shown.
 5. All easement information including widths, slopes, access road, etc.

3-1.503 Submittal Requirements:

- A. Plan Review Submittals:
1. Booster pump stations, PRV stations, wells and reservoirs require separate plan submittals in accordance with the respective sections of the water design standards.
 2. In addition to bond copies, a physical electronic copy with the following items is required to accompany the plans submitted for signature to the City:
 - a. Base map for the area on the plans seeking approval including all property lines, ROW, PUEs, easements etc.
 - b. All water mains, fire hydrants, services, and other water items shown and located properly.
 - c. All the information shall be shown on a single map, not cut sheets like the plans and located on reasonable layers in CAD.
- B. Plan Revisions or Re-Approvals:
1. City approval of plans and associated design reports are valid for one year from the date of the City Engineer's signature.

3-1.504 City of Buckeye Permit:

- A. The Developer/Landowner shall secure a permit from the City for constructing all water infrastructure on the approved water plans.
- B. If a revised plan set is submitted, approved by the City, and signed then the Developer/Landowner is responsible for securing a revised permit from the City.

3-1.505 Materials:

- A. All materials in contact with water shall meet and be certified per the requirements of NSF-61 (no lead).
- B. Submittals:

1. All materials used on the development or incorporated into the construction are subject to approval or rejection by the City Engineer.
 2. City approved technical material/manufacturer data is required for all pipe materials and appurtenances used on the development before work commences.
 3. All delivered materials shall match the approved technical data or it will be rejected.
 4. The contractor shall submit two copies of the submittals to the City Engineer.
 5. All work installed prior to approval of submittals is subject to rejection by the City.
 6. A copy of the approved material submittals shall always be on the jobsite.
 7. Each of the submittals shall clearly show the manufacturer and have comprehensive technical data for the proposed product.
 8. All material submittals shall be submitted at or before the pre-construction meeting for review and approval by the City Engineer.
- C. Pipe Material:
1. Eight-inch distribution mains on local streets shall be PVC AWWA C900 with a DR 14 rating or class 350 D.I.P.
 2. Eight-inch distribution mains in collector and arterial streets shall be class 350 D.I.P.
 3. Twelve-inch through 48-inch water mains shall be class 350 D.I.P.
 4. Transmission mains that will operate between pressure zones, have a working pressure above 175 psi, shall be D.I.P. with a minimum thickness class of 54 and require special design by the engineer.
 5. All D.I.P. shall be cement lined per ANSI/AWWA.
 6. ACP is not allowed in any size.
- D. Service Material:
1. All brass shall be lead free brass.
 2. All copper shall be type “K” copper.
 3. All corporation stops and angle meter stops shall be brass and be Pac-Joint (stainless steel ball) style.
 4. Saddles shall be Stainless strap style for PVC and double Bronze strap for D.I.P.
 5. All water meter boxes shall be polymer concrete.
- E. Pipe Zone Material:
1. Pipe embedment zone material shall be MAG ABC per MAG Section 702.
- F. Gate Valves:
1. Shall be ductile iron in accordance with ANSI/AWWA.
 2. Shall be resilient wedge gate valves.
 3. Have a minimum working pressure of 250 psi.
- G. Fittings:

1. All fittings shall be ductile iron in accordance with ANSI/AWWA.
 2. For standard use fittings three through 24-inch shall be rated for 350 psi working pressure.
 3. For standard use fittings 30 through 48-inch shall be rated for 250 psi working pressure.
 4. All fittings shall be cement lined per ANSI/AWWA.
- H. Valve Boxes and Lids:
1. Shall be rated heavy duty with adjustment per MAG 391-2.
 2. Shall be two piece cast iron slip type.
 3. Shall have a minimum ID of eight-inch diameter.
 4. Shall be coated with asphaltic bituminous coating minimum of 1.0-millimeter thickness.
 5. Lids shall be a minimum of 12 pounds.
 6. Lids shall be a minimum of five inches in height.
- I. Tracer Wire:
1. The wire must be 10 gauge, direct bury, solid core wire.
 2. Shall have a minimum of 30 mil polyethylene insulation.
 3. The wire insulation color should be utility appropriate (blue = potable water, purple = reclaimed water, etc.).
 4. Boxes shall be D.I.P. valve box (Tops only) or equivalent.
- J. Tapping Sleeves:
1. Type 316 or 304 stainless steel with:
 - a. Stainless steel nuts and bolts
 - b. With a complete circle gasket
 - i. SBR gasket (ASTM D 2000)
 - ii. Virgin EPDM gasket (ASTM D 2000)
 - iii. Virgin NBR gasket
 - iv. Viton gasket
 2. Same size taps require a two-piece heavy-duty ductile iron tapping sleeve.
- K. Marker Balls:
1. Shall be model 3M 1403-XR or approved equal in design and are to be utilized at all directional changes such as dips, 22, 45, and 90-degree bends.
- L. Sample Stations:
1. Shall be Koraleen XLT-0001-3 or approved equal.

3-1.600 As-Built Drawings:**3-1.601 General Requirements:**

- A. All plans shall comply with “Design Standards - Section 1-2 Plan Submittal Requirements.”

3-1.602 "To Pave" As-Built Drawings:

- A. This review is to identify any underground issues that may have been missed during construction. These issues can more easily be fixed prior to the placement of the pavement; therefore, “To Pave” As-Built drawings are required prior to paving. Street paving shall not be permitted to start prior to the approval of these As-Built drawings.

- B. “To Pave” As-Built drawings required for submittal:

1. All stations and offsets.
2. All plan inverts shown.
3. All utility crossing dimensions and separations (outside of utility to outside of utility).
4. All pipe length, pipe slope, pipe sizes, and pipe material.
5. All service stationing and dimensions.
6. Horizontal location of the water, including dimensioning from center line.
7. All water services located.
8. All offset dimensions to the property line shall be As-Built.
9. Dimensions shown from centerline to water main are to be As-Built.

3-1.603 "For Final" or “Final” As-Built Drawings:

- A. "For Final" As-Built drawings required for submittal:

1. All fire hydrant stationing and offsets shall be completed.
2. All valve adjustments shall be verified.
3. All tracer wire and anode connections to be verified.
4. All new sample stations shall be verified.
5. All monuments and brass caps shall be As-Built.
6. All air release valve stations shall be As-Built.

3-1.604 Tolerances and Corrections:

- A. Water As-Built review is separate from construction inspection and field quality control measures.
- B. All field identified problems shall be corrected prior to As-Built drawing review commencing.
- C. Deviations because of construction activities may be allowed by the City, but deviations beyond certain limits will not be allowed. Any deviation allowed by the City will be determined at the City’s sole discretion. In these cases of non-compliance, the waterline and appurtenant facilities shall be removed and replaced at the Developer/Landowner’s expense. A partial listing of unacceptable water installations is shown below:
1. Water services not constructed to the designed development.

2. Separation from sewer or other “non-potable” pipeline that violate the MAG Zone “A” tolerances.
3. Creation of high points that did not exist in the design or that does not have a proper way to bleed air.
4. If a test location fails to pass hydrostatic (leakage) tests after two attempts, the failing test section shall be replaced in its entirety.
5. If the City minimum cover decreases by six inches or greater the water main shall be removed and replaced.
6. Water mains outside of ROW or City easements shall be removed and replaced.
7. All water mains within five feet of the edge of the easement shall be removed and replaced.

[END OF SECTION]

Appendix 1 Standard Details

| | |
|---------|--|
| 31100-1 | Water Notes, Page 1 of 2 |
| 31100-2 | Water Notes, Page 2 of 2 |
| 31200 | Unauthorized Water Valve Shut Off |
| 31220 | Service Brand Detail |
| 31225 | Dipped Water Line |
| 31330 | Water Service Line Connection |
| 31331-1 | Water Meter Box No. 2 |
| 31331-2 | Water Meter Box Cover No. 2 |
| 31335 | Water Meter Enclosures 3" & 4" |
| 31339 | Water Meter Boxes - Traffic Rated |
| 31340-1 | Combination Air/Vacuum Release Valve (ARV) |
| 31340-2 | Combination Air/Vacuum Release Valve (ARV) |
| 31342 | Air Release Hydrant Assembly with Flushing Hydrant |
| 31344 | Tapping Sleeves |
| 31350 | Double Check Valve Assembly w/ Bypass Meter, 3" Through 10" |
| 31351 | Double Check Valve Assembly ¾" Through 2" |
| 31352 | Reduced Pressure Principle Backflow Assembly, 3" Through 12" |
| 31353 | Reduced Pressure Principle Backflow Assembly, ¾" Through 2" |
| 31354 | "N" Shaped Double Check Valve Assembly, 3" Through 12" |
| 31355 | "N" Shaped Double Check Valve Assembly, ¾" Through 2" |
| 31356 | Pressure Vacuum Breaker Assembly, ½" Through 2" |
| 31358 | Backflow Prevention Enclosures |
| 31359 | Guard Posts for Backflow Prevention Assemblies |
| 31364 | Hydrant Meter Assembly |
| 31368 | Water Stub Out |
| 31370 | Commercial "T" Main |
| 31375 | Water Quality Sampling Station |
| 31380 | Water Trench Detail |
| 31382 | Concrete Cap |
| 31384 | Casing Pipe & Spacer |
| 31410 | Fire Hydrant Location |
| 31412 | Fire Hydrant Clearance |
| 31414 | Fire Hydrant Identification and Color |
| 31420 | Fire Hydrant Bypass Assembly |
| 31425 | Fire Hydrant Out Of Service Signs |
| 31430 | Fire Sprinkler Riser Detail - Vertical Installation #1 |
| 31431 | Fire Sprinkler Riser Detail – Vertical Installation #2 |
| 31435 | Remote Fire Department Connection |
| 31436 | Single Feed Horizontal Standpipes |
| 31440 | Pavement Markers for Fire Hydrants |
| 31441 | Fire and Emergency Access and Delineation |
| 31445 | Fire Apparatus Turnaround Requirements |
| 31450 | Fire Riser Room Placard |

- 31452 Fire Lane Sign
- 31454 Fire Lane Signage (Private Streets and Subdivisions)
- 31456 Fire Department Connection Signage
- 31458 Building Address Identification
- 31460 Fire Department Access Barrier

WATER NOTES

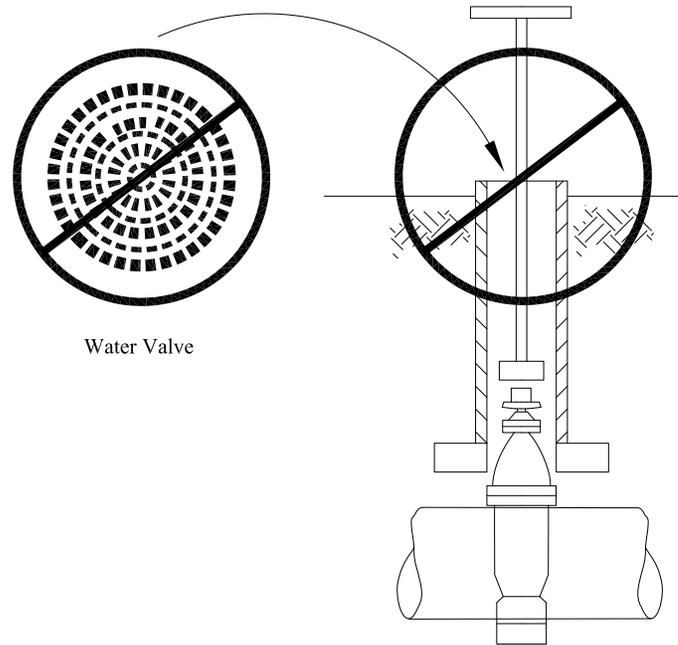
1. Arrangements for construction water can be made by calling the Water Resources Department at (623) 349-6800.
2. Backfilling shall not be started until lines have been inspected and approved by the City.
3. Fire hydrants shall be Waterous "Pacer", Mueller, or Clow break-away, dry-barrel design and shall be furnished by the Contractor. All fire hydrants shall be painted NFPA Yellow or other colors based on Standard Detail 31414 after installation. Each fire hydrant shall be furnished with a gate valve and National Standard threads. Fire hydrants shall be installed such that the centerline of the main pumper nozzle shall not be less than 18-inches or more than 24" above finished grade or adjacent top of curb.
4. All valves shall be resilient wedge gate type and open to the left.
5. All service lines shall be type "K" copper pipe from the City main to meter (through 2" size). Service connections shall conform to the City of Buckeye Standard Detail 31330.
6. All taps shall use a bronze double service saddle.
7. Meter boxes and lids shall be supplied by the Developer and installed facing the lot. Adjustment to final grade shall be by Developer or its Contractor. Polymer meter boxes with polymer lids and a AMI touch read hole shall be used for all installations per COB Details 31331 through 31336.
8. All water meters shall be purchased from the City Water Resources Department. For private development, all water meters shall be installed by the City Water Resources Department. For CIP projects, all residential water meters shall be installed by the City Water Resources Department and water meters that are not residential shall be installed by the Developer/Landowner or the City Water Resources Department depending on the contract language. All meters and boxes shall be in accordance with City standards and shall be compatible with AMR system. 5/8" and 3/4" meters are not permitted.
9. All valve boxes shall be MAG Standard Detail 391-2 and manufactured by Tyler Union, Sigma heavy duty rated, or City approved equal. Where valve boxes are located outside the street or sidewalk there shall be a class 'B' concrete ring 6" thick, and 30" in diameter placed around the valve box and flush with the top of the valve box. The valve box shall be set 0.1' higher than the surrounding grade. There shall be a #4 bar centered in the concrete ring and Contractor shall install a Blue flexible utility Marker labeled "WATER VALVE."
10. All waterline compaction shall be Type 1 per MAG Specification Section 601.
11. All waterline fittings shall be ductile iron with mechanical joints.
12. All backflow preventers shall have AWWA certification. Prior to occupancy, Contractor or Owner shall provide testing by a certified tester for all backflow preventers. Testing shall be witnessed by the City Inspector. A copy of test reports shall be provided to the City Inspector.
13. Water line testing shall be in conformance with MAG Standard Specification 610.15. One hundred (100%) percent of all new waterlines, services, and appurtenances shall be pressure tested. Disinfection shall be in accordance with MAG Standard Specification 611.
14. Refer to COB Standard Detail No. 31200 for unauthorized water valve shutoff requirements.
15. Water jetting per MAG Standard Specification 601.4 is allowed only for waterline trench backfill in new, local, and collector street roadways within new developments. Backfill material lifts for water jetting shall not exceed 4' (loose) in depth. Water consolidation shall not be allowed for backfill and compaction of water line trenches in or adjacent to existing roadways or new arterial street roadways. Trench flooding is not allowed.
16. Shut-downs and night tie-ins shall be approved and scheduled with the City of Buckeye Water Resources Department.
17. All DIP shall be poly-wrapped and cement mortar lined.
18. 1" water meter curb stops to be set 8" below the bottom of meter box lid. All water services shall be 1" or larger.

WATER NOTES (cont.)

19. Contractor shall mark all meter locations with a 2" x 4" metal stud marker, painted blue, placed 3' below grade and 2' above grade. All meter locations shall also be reference marked with blue paint on adjacent concrete as directed by the City Inspector.
20. Tracer wire shall be used on all water line construction. The wire shall be 10AWG (THHN) and attached directly on top of the water main during construction and backfill. The wire shall be run with all water mains, looped up all connection station valve boxes, and run to all termination points of the water line. There shall be minimal underground splices. If a splice is necessary, the connection shall be made with a water tight connector (approved by the City Engineer) as to protect all un-insulated wire. Tracer wire is not required on copper service lines.
21. Non-detectable plastic warning tape shall be placed above all water lines. The tape shall be 6" wide, blue, and have a permanent marking: "CAUTION BURIED WATER LINE BELOW," spaced every 36".
22. Contractor shall provide adequate cut/elevation construction staking for all water line installations, to allow for proper depth installation and inspections. Minimum staking locations include all mechanical fittings and valves.
23. All plans submitted to the City for water main installation, shall include the technical data for the following items, for review and approval by the City, prior to construction (submittal requirements shall not be limited by the following):
 - 23.1. Pipe material including all fittings, valves, gaskets, tapping sleeves, couplings, corporation stops, copper pipe, meter stops, fire hydrants, blow-offs, air release valves, copper fittings, meter boxes, valve boxes, tracer wire, ABC, concrete, and all other items as requested by the City.
24. All backfilling of excavations made for installalling water mains and/or laterals shall be in accordance with COB Detail 31380.

NOTE:

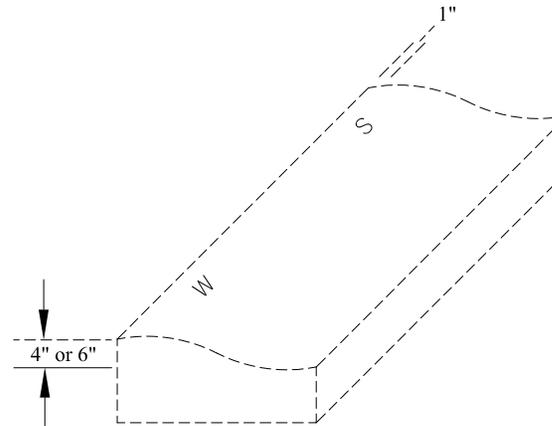
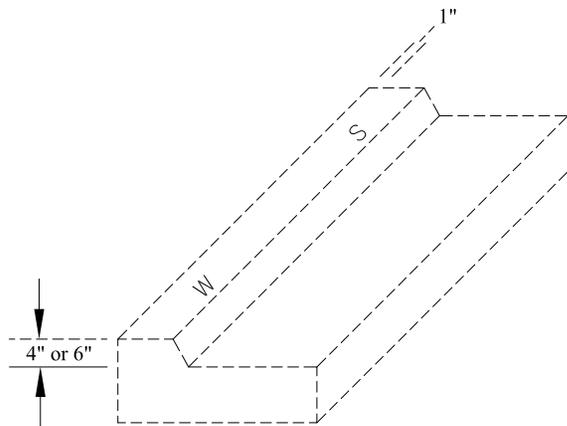
Unauthorized Personnel Shutting Off Water Valves And Fire Hydrants Are In Violation of City of Buckeye Requirements. Contact the Water Resource Department 48 Hours Prior To Schedule All Shut Downs - (623) 349-6800 Monday - Thursday 7 AM to 6 PM.



Water Valve

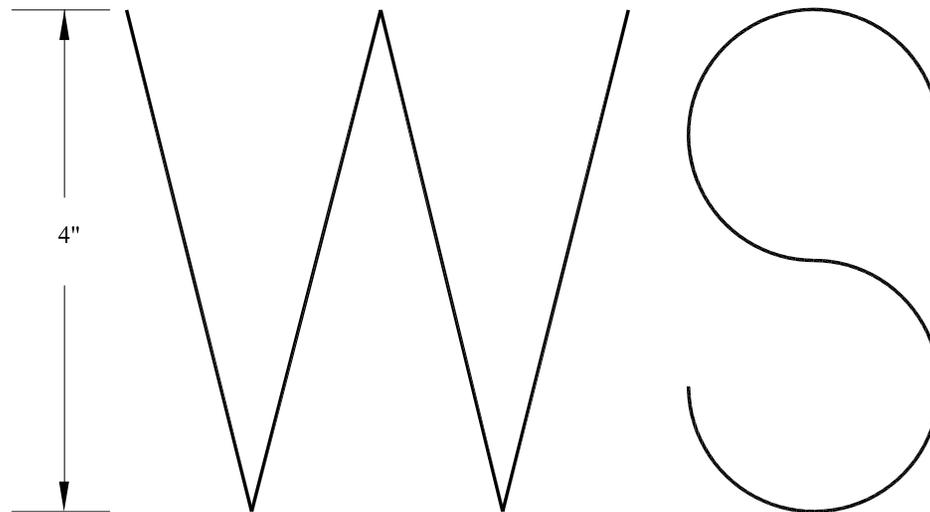
Superintendent Signature: _____ Date: _____

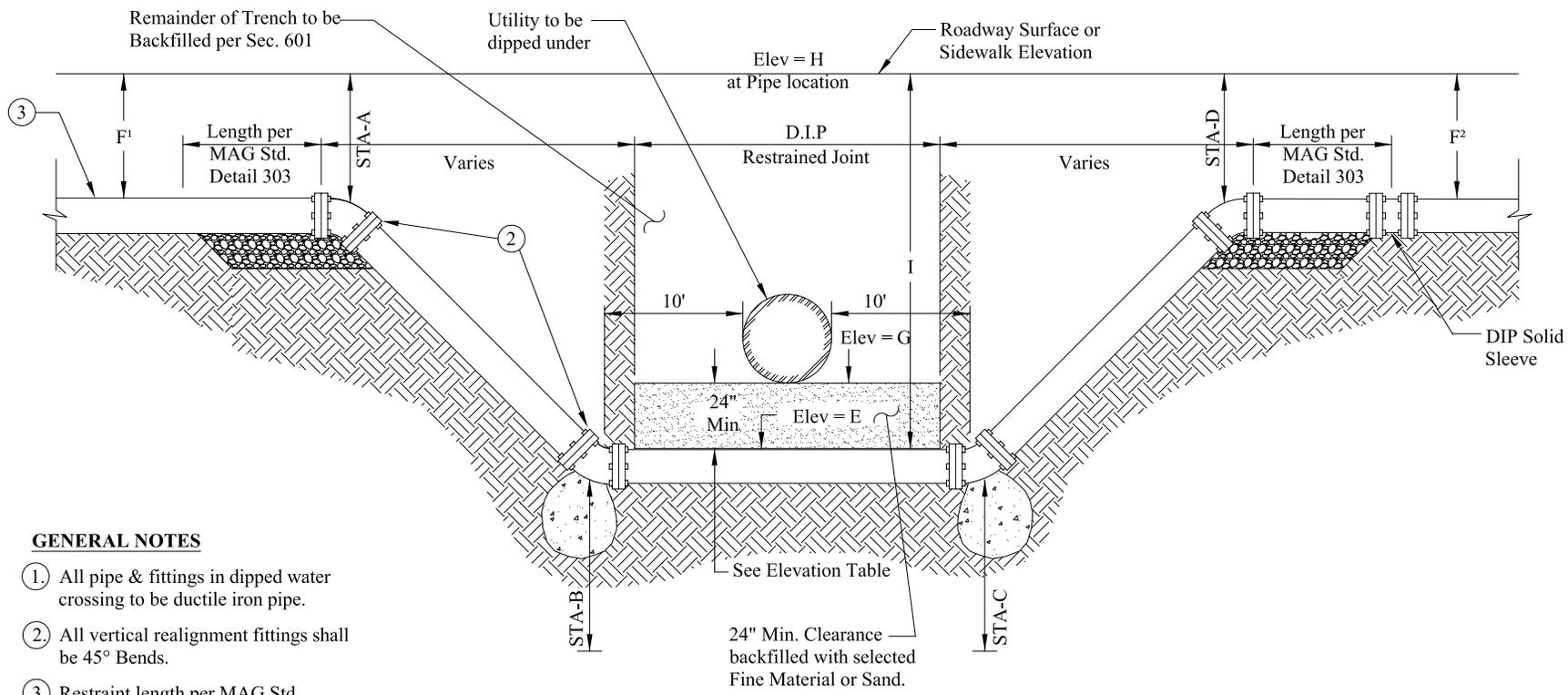
This Is To Be Posted In The Construction Office



GENERAL NOTES

1. Sewer/water services locations shall be located by branding a "W" or "S" in the top of the curb.
2. The "W" or "S" shall be 4" in height. It shall have a minimum impression of $\frac{1}{4}$ ".
3. The brand shall be constructed of cast or machined lettering. Re-Bar is not allowed.
4. The impression of the brand must be within 6" of the actual service location.
5. The brand must be a minimum of 1" from back of curb.



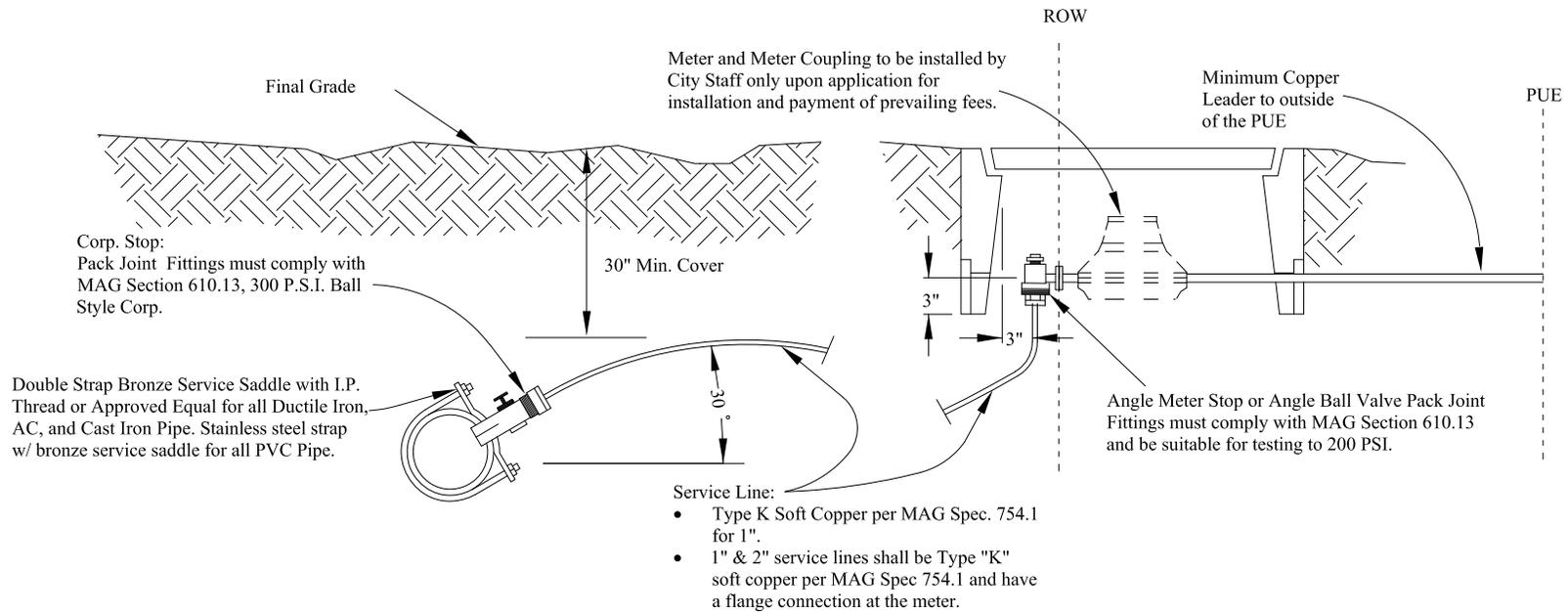


GENERAL NOTES

- ① All pipe & fittings in dipped water crossing to be ductile iron pipe.
- ② All vertical realignment fittings shall be 45° Bends.
- ③ Restraint length per MAG Std. Detail 303-2. Typical both sides.

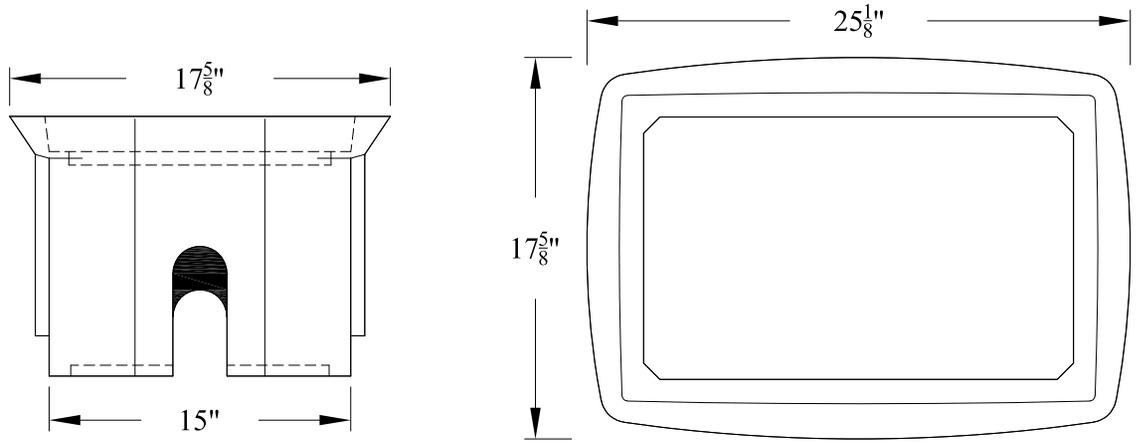
**Dipped Water Crossing Ductile
Iron Restrained Mechanical Joint
(MAG Std. Detail 370 & 404)**

| LOCATION | SHEET | STA-A | AB-A | STA-B | AB-B | STA-C | AB-C | STA-D | AB-D | E | AB-E | F ¹ | AB-F ¹ | F ² | AB-F ² | G | AB-G | H | AB-H | I | AB-I |
|----------|-------|-------|------|-------|------|-------|------|-------|------|---|------|----------------|-------------------|----------------|-------------------|---|------|---|------|---|------|
| 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 6 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 7 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |



GENERAL NOTES:

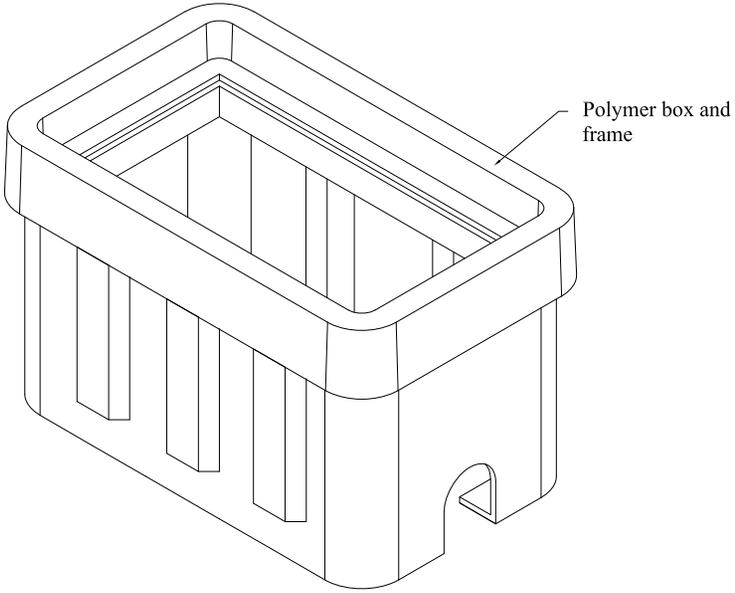
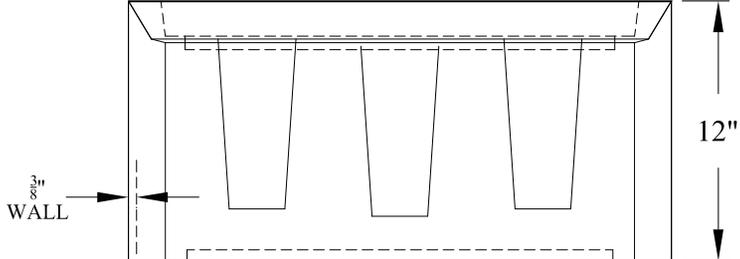
1. All taps must be made using a service saddle.
2. All Service Line sizes shall have the pack joint compression fittings for corp stops and meter stops.
3. Where a contractor is installing new water lines, all water service connections shall also be installed. The contractor's installation shall include the service saddle, corp. stop, service pipe, appurtenant fittings, meter stop, polymer meter box and polymer box cover, per COB Details 31331 through 31333.
4. Copper Service Lines in the 1" and 2" sizes that cross streets will be one continuous piece.
5. Rough grade shall be set to 1-1/2" below top of meter box. Final landscape grade shall be set flush to top of meter box.
6. Service lines shall be shaded w/ sand or native material meeting ASTM D2321 Class II Standard SW sand gradation.
7. Hinged Saddles are not allowed.
8. Meter size shall be determined by the water utility provider.
9. Within the COB service area a minimum meter size of 1" shall be used.
10. For water meter sizing outside of the City of Buckeye service area refer to the requirements of the specific water provider or as stated on the improvement or building plans.
11. Bedding and initial backfill material within the ROW shall be ABC. Sand conforming to ASTM C33 can be used with the approval of the City Engineer. Compaction shall be per MAG Table 601-2.

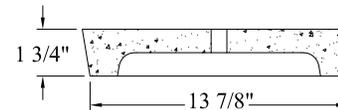
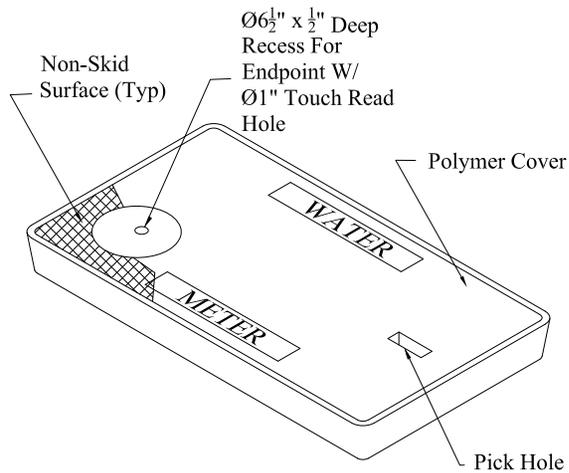
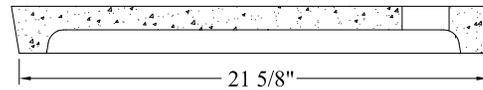
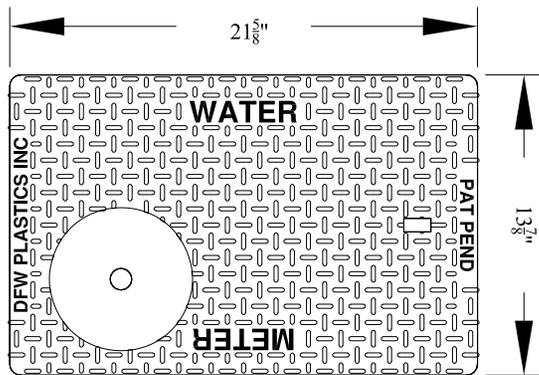


GENERAL NOTES

Water Meter Boxes

1. This box shall be utilized in dirt and grass only. Application in traffic areas is not authorized.
2. Each meter box shall be placed on minimum of 2-inches of compacted A.B.C.
3. Meter boxes shall be polymer type manufactured by DFW Plastics, Inc. or approved equal.

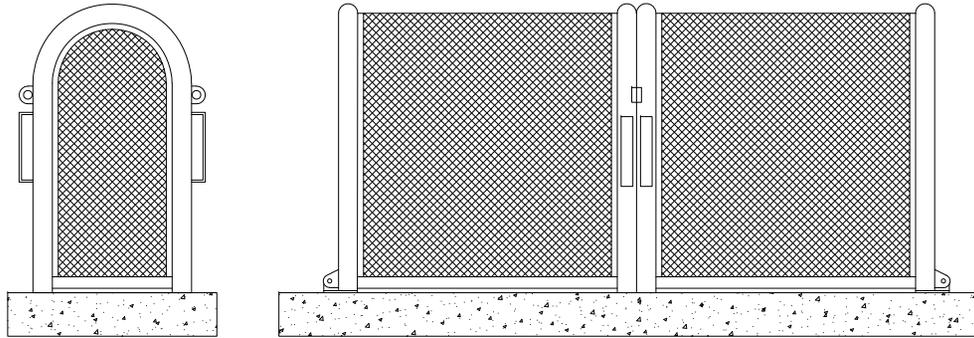




GENERAL NOTES

Water Meter Box Covers

1. This meter box cover shall be utilized in dirt and grass areas only. Application in traffic areas is not authorized.
2. Meter box covers shall be polymer type, gray color as manufactured by DFW Plastics, Inc. or approved equal with "WATER METER" imprinted on the top.



NOTE:
Product Submittals will be required to be submitted to the City of Buckeye for review and approval.

GENERAL SPECIFICATIONS

- All pipe shall be 1 ¼" schedule 40 A.S.T.M. A-53 Grade A- Electric Weld pipe.
- Angle Iron shall be 1" x 1" x ½" steel.
- Stainless steel units shall be 1 ¼" schedule 10 A.S.T.M. A-312 304 S.S.
- Expanded metal shall be ½" spacing x # 13 Ga. flattened diamond pattern steel.
- All hinges shall have hidden/internal mounting points.
- All stainless steel shall be sandblasted after fabrication to remove burrs, flashing and sharp edges.
- There shall be no exposed ends of expanded metal on the outside of the enclosure.
- Welding shall be a minimum of ¼" long welds on 4" spacing.
- Hardware kits provided for mounting enclosures. See HK-300/HK-700 for hardware specifications.
- On 304 S.S. units, all hinges, exposed hardware, and brackets shall be 304 S.S.
- All hardware shall be securely attached to enclosures.
- All enclosures shall withstand a minimum of 200 lbs. per square foot without any permanent deflection or distortion.
- 3/8" spacing between angle iron framework of enclosure and slab to prevent rusting. Only pipe ends to touch slab.

PRE-POWDERCOAT TREATMENT PROCESS

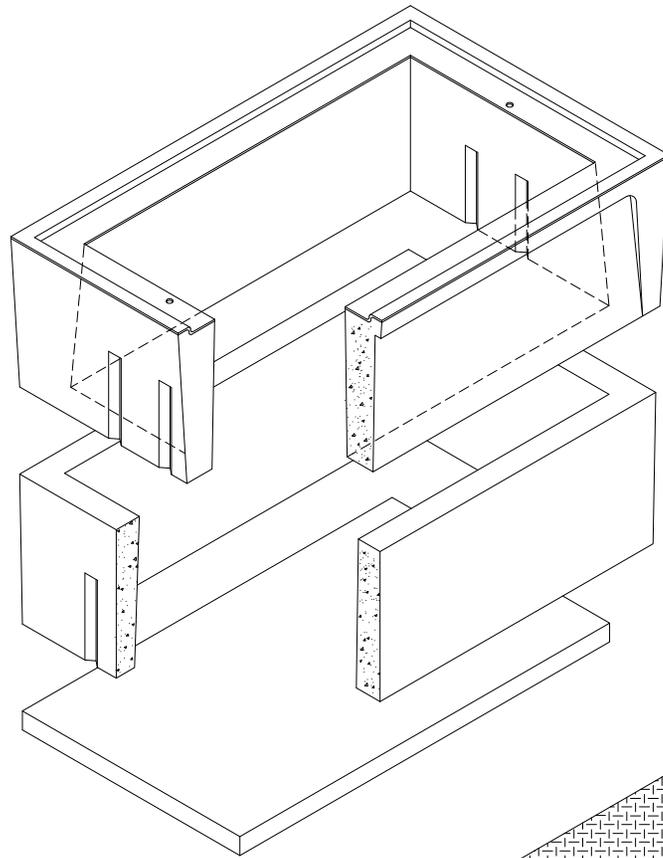
Clean unit with a S-44 alkaline cleaner, overflow rinse, apply an AC-8115 iron phosphate treatment, overflow rinse and finish with a #198 sealer rinse to prevent rusting and improve adhesion.

POWDERCOAT TREATMENT PROCESS

Units shall be preheated and coated by electrostatic application of 2.0 to 3.5 mil thickness on all surfaces. Powder shall be RAL 1019 Woodlands Tan or TCI 8810-6058 Forest Green or approved equal Impact Resistance Finish 160 inch pounds direct 160 inch pounds reverse, per ASTM D-2794 specs. Gloss Finish >85, per ASTM D-523. Adhesion to be rated excellent when tested to ASTM D-3359 standards.

STAINLESS STEEL ELECTRO-POLISH FINISH

All 304 Stainless Steel units shall be chemically electro-polished to impart a lustrous finish to the unit.

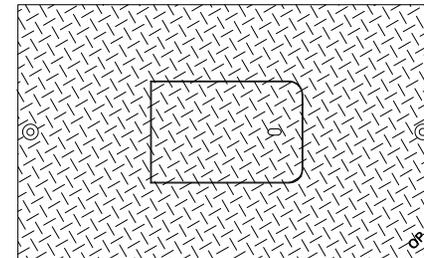
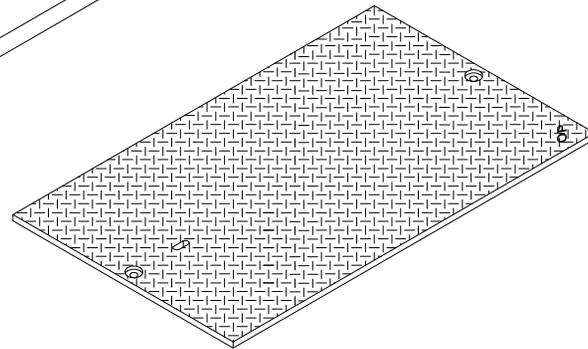


| Size | #1 | #2 | #3 | #4 | #5 |
|----------|--------------|--------------|--------------|--------------|----------------|
| A | 21-1/4 (539) | 29-1/2 (749) | 36-3/4 (933) | 43 (1092) | 54-7/16 (1383) |
| B | 14-5/8 (371) | 18-3/4 (476) | 23-3/4 (603) | 31 (787) | 36-5/16 (922) |
| C | 17-1/4 (438) | 24 (610) | 30 (762) | 36 (914) | 48-1/4 (1226) |
| D | 10-5/8 (270) | 13-1/4 (336) | 17 (432) | 24 (610) | 30-1/4 (768) |
| E | 18-1/2 (470) | 25 (635) | 31-1/4 (794) | 37-1/2 (953) | 49-1/2 (1257) |
| F | 11-7/8 (302) | 14-1/4 (362) | 18-1/4 (464) | 25-1/2 (648) | 31-1/2 (800) |
| G | 12 (305) | 12 (305) | 12 (305) | 12 (305) | 12 (305) |
| H | 12 (305) | 12 (305) | 12 (305) | 12 (305) | 12 (305) |
| J | 1-1/2 (38) | 1-1/2 (38) | 1-1/2 (38) | 1-1/2 (38) | 1-1/2 (38) |
| K | 13-5/8 (346) | 16-1/4 (413) | 20-1/4 (514) | 28 (711) | 33-1/2 (851) |
| L | 20 (508) | 27 (686) | 33-1/4 (845) | 40 (1016) | 51-3/4 (1314) |
| M | 1/2 (13) | 1/2 (13) | 1/2 (13) | 1/2 (13) | 1/2 (13) |
| Q | 5 (127) | 5 (127) | 5 (127) | 5 (127) | 5 (127) |

Dimension in inches (mm)

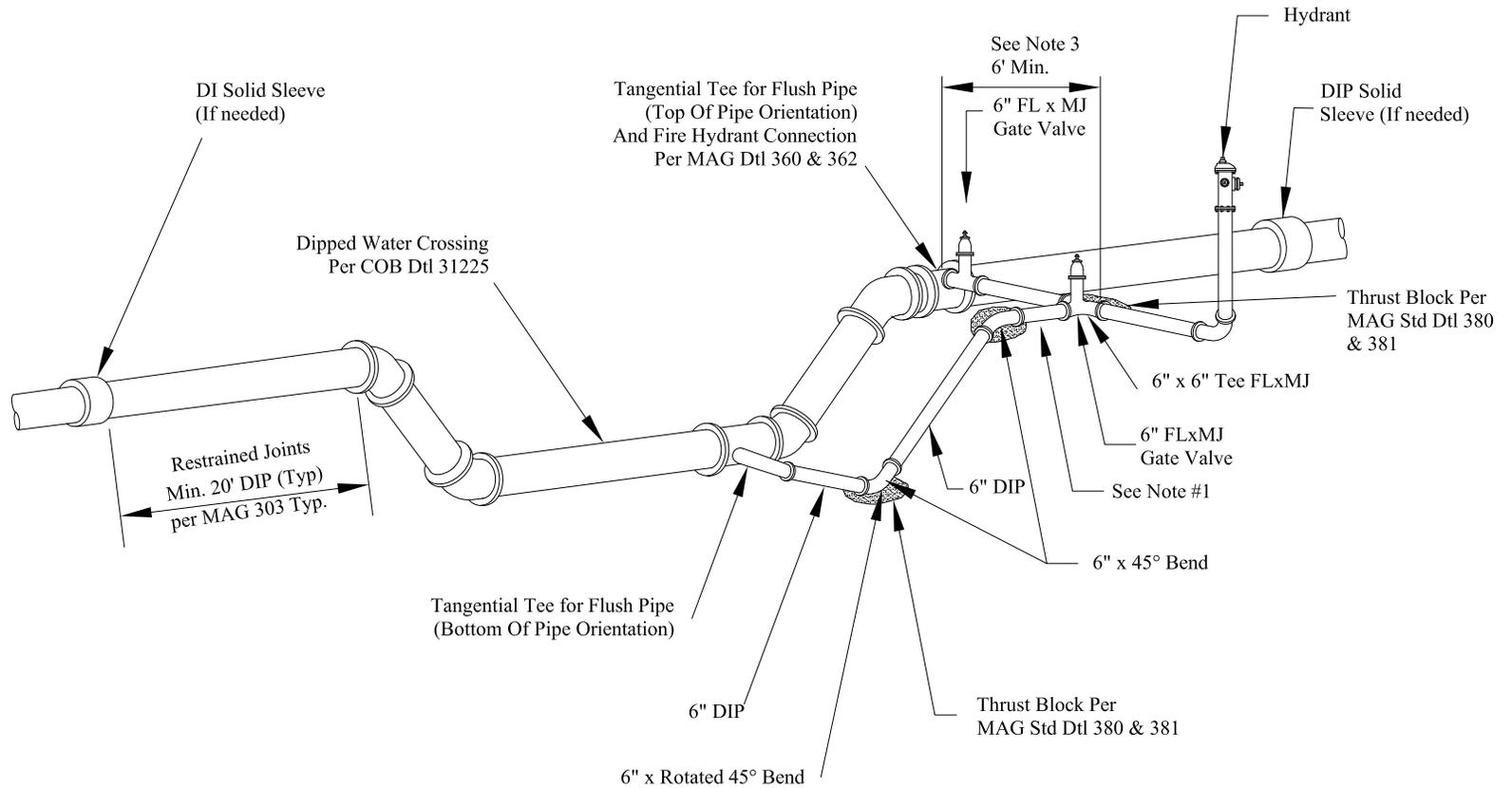
GENERAL NOTES

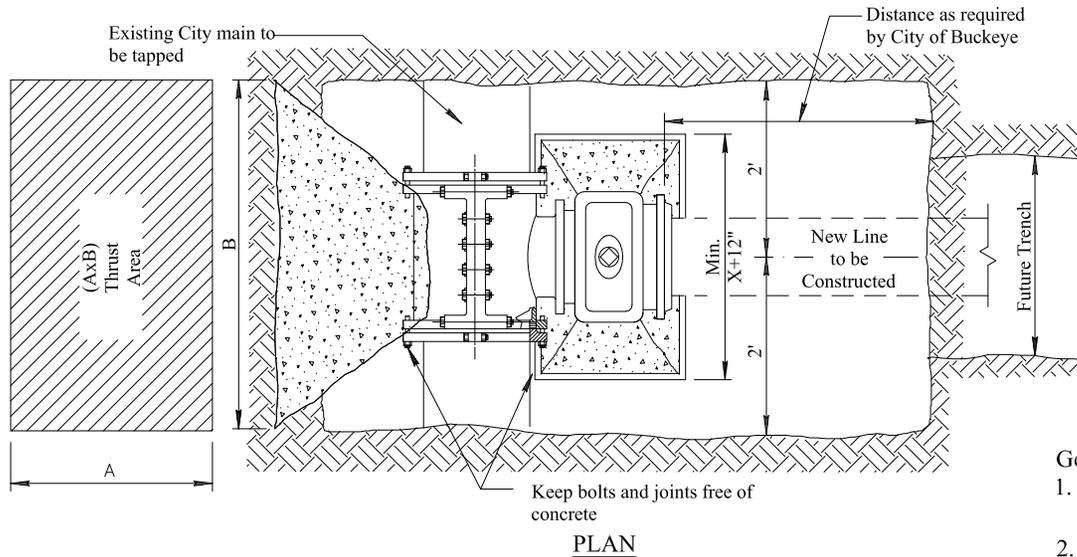
1. All concrete shall be high strength (4000 PSI min.).
2. All concrete shall be fiber reinforced.
3. Steel checker plate shall meet H20 loading.
4. Boxes and lids shall be H20 certified.
5. All boxes shall be Arizona DOT approved.
6. All boxes shall meet the minimum dimensions shown above.
7. All lids shall be galvanized.



GENERAL NOTES

1. Piping system to be restrained per MAG Std Dtl 303-1 and 303-2 for all vertical piping.
2. All piping within the DIP Section shall be Restrained Joint.
3. Ensure water valve is not in curb and gutter or sidewalk.



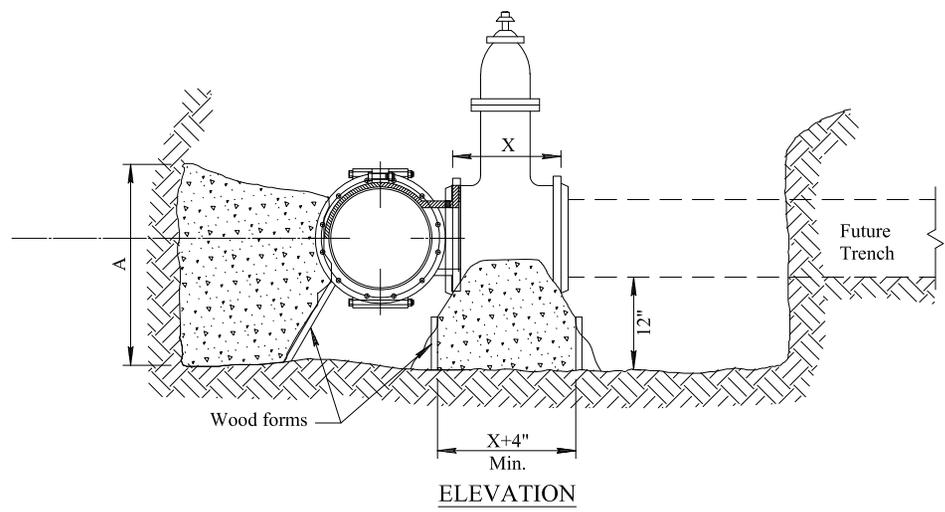


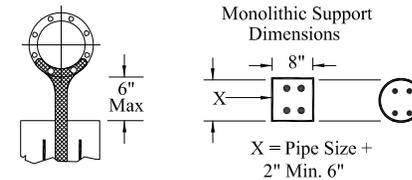
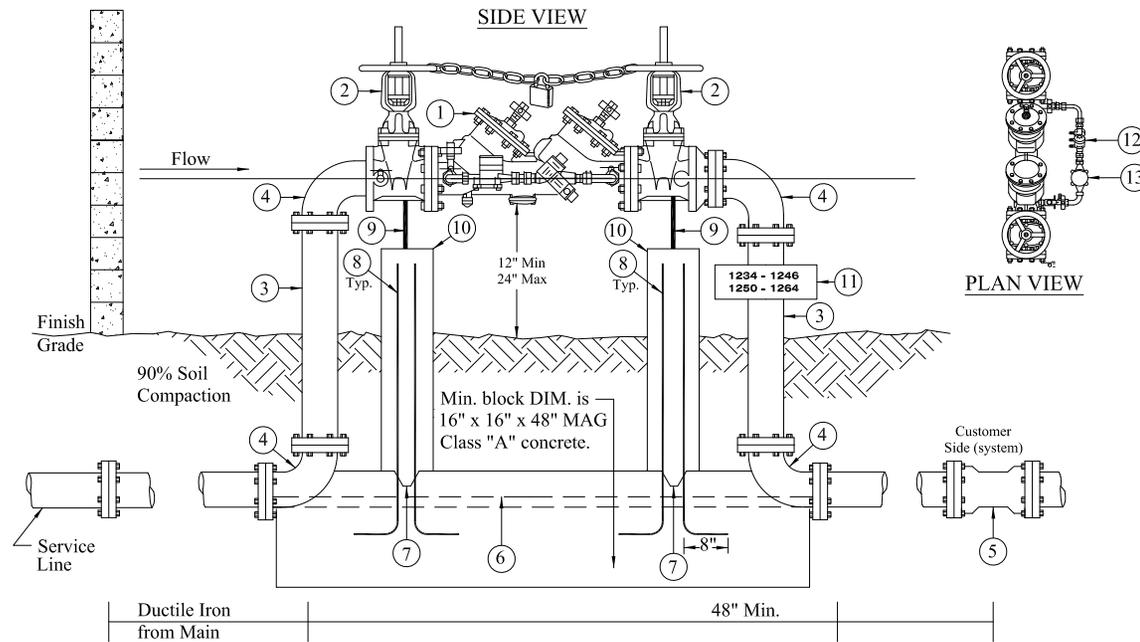
| Size of Pipe Being Connected | Minimum Thrust Area Required Equals (AxB) (Square Feet) |
|------------------------------|---|
| 4" and less | 3 |
| 6" | 4 |
| 8" | 6 |
| 12" | 13 |
| 16" | 23 |

* All tapping sleeves shall be 2 piece ductile iron.

General Notes:

1. Tapping sleeve to be placed a minimum of 18" from any bell coupling, valve, fitting or other obstruction.
2. Contractor shall excavate as shown and shall set tapping sleeve and valve and tighten all bolts prior to the pressure test.
3. All tapping sleeves and valves must be pressure tested prior to blocking or tapping. The test must be witnessed and approved by the inspector.
4. Blocks are to extend to undisturbed ground and be installed before the tap is made. All flange bolts shall be free and clear of concrete.
5. Concrete thrust blocks shall be class 'B' per Sect. 725. Normally, cure time for concrete is 24 hours before backfilling.
6. Taps shall be made by City crews at prevailing rates or by approved contractors when allowed by agency. This detail covers tapping sleeves 4" through 16" in size on ductile iron, cast iron, and asbestos cement pipe. Any other size or type of pipe will require a separate submittal and approval by the engineer.
7. Same size taps shall be approved by the City Engineer.
8. The inspector shall observe the coupon after tap is complete.
9. For pipe 16" and larger the thrust block shall be designed by the engineer.





LIST OF MATERIALS

- 1 Approved double check valve backflow prevention assembly.
- 2 Resilient seated OS & Y gate valve.
- 3 Pipe spool. (Flanged D.I.P.)
- 4 90° elbow. (Flanged D.I.P.)
- 5 Ductile iron solid sleeve (where required).
- 6 3/4" Zinc coated threaded rod, bolted to flanges, four minimum, equally spaced. (5/8" Rods on 3" & 4" sizes)
- 7 Construction joint key to be 1-3/4" x 2-1/2".
- 8 #6 reinforcing steel, deformed bar, 4" apart, evenly spaced; 2" apart for 6" supports.
- 9 Adjustable pipe support permanently attached to base with minimum 1" adjusting rod.
- 10 Square or round monolithic cast in place concrete column, minimum MAG Class "A" concrete.
- 11 COB signage per COB Std. Dtl. 31456.
- 12 3/4" reduced pressure back flow per City Requirements.
- 13 3/4" meter to be supplied by the City. Contact COB Water Resources Department.

NOTES

1. Double check valve assembly with bypass meter shall be UL listed or FM approved for fire protection use and shall be as approved by U.S.C. foundation for cross-connection control and hydraulic research. This assembly is to be used for pollution hazards only as recommended in the AWWA-M14 MANUAL.
2. All piping, valves, fittings and appurtenances downstream of the service line side O.S. & Y. valve shall be approved for fire protection use and installed per N.F.P.A. #24.
3. For backflow preventers requiring guard posts See Detail 31359. Backflow preventers enclosed by screening shall maintain a 24" clearance around assembly.
4. Valve Hand wheels shall be secured with chain and lock.
5. Assemblies shall be painted Tenemec desert sands or COB approved equal. Do not paint name tags or brass parts.
6. Call for underground inspection before backfilling trench.
7. Bypass meters are required on un-metered lines.
8. Backflow assemblies shall be tested by a certified tester recognized by the City.
9. Screen walls and landscaping shall be no closer than 24" to the assembly.
10. Test cocks with Brass Plugs or adaptors with caps installed

31
350

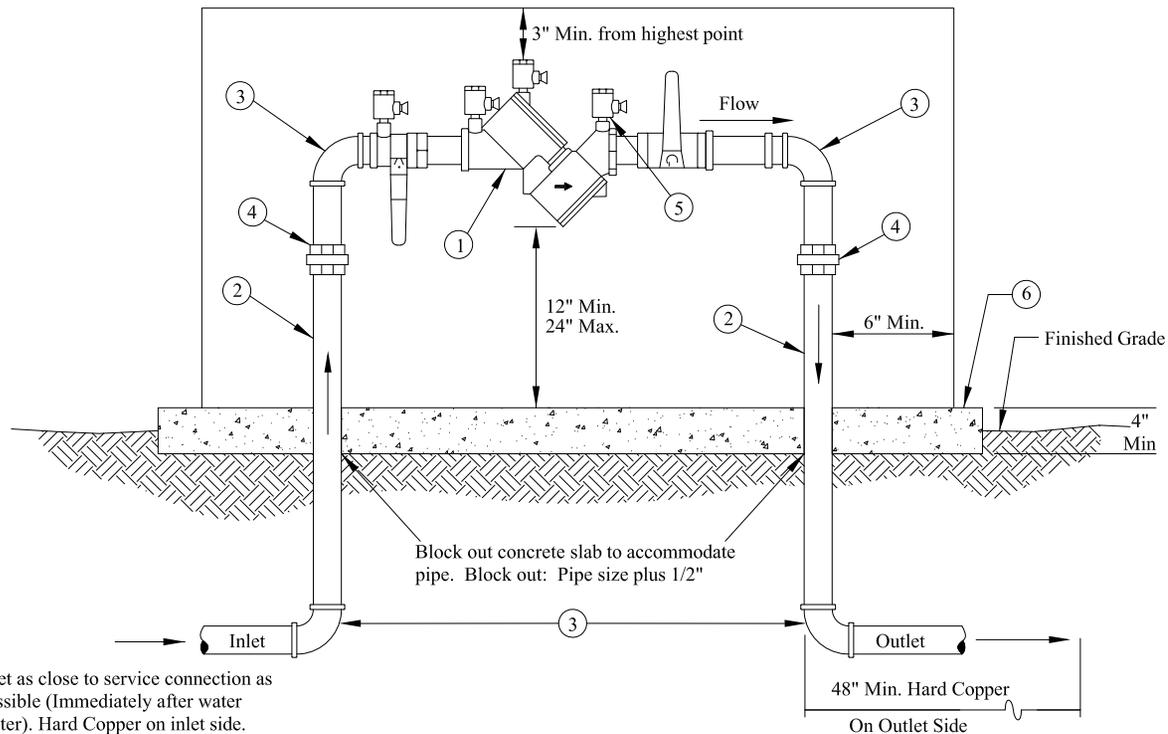


City of Buckeye
Standard Details

DOUBLE CHECK VALVE ASSEMBLY W/ BYPASS METER, 3" TO 10"

Revised:
06-16-20

Detail:
31350

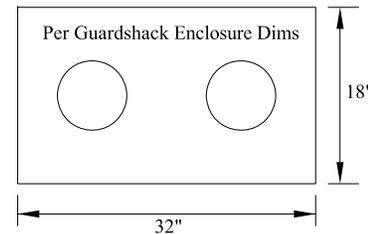


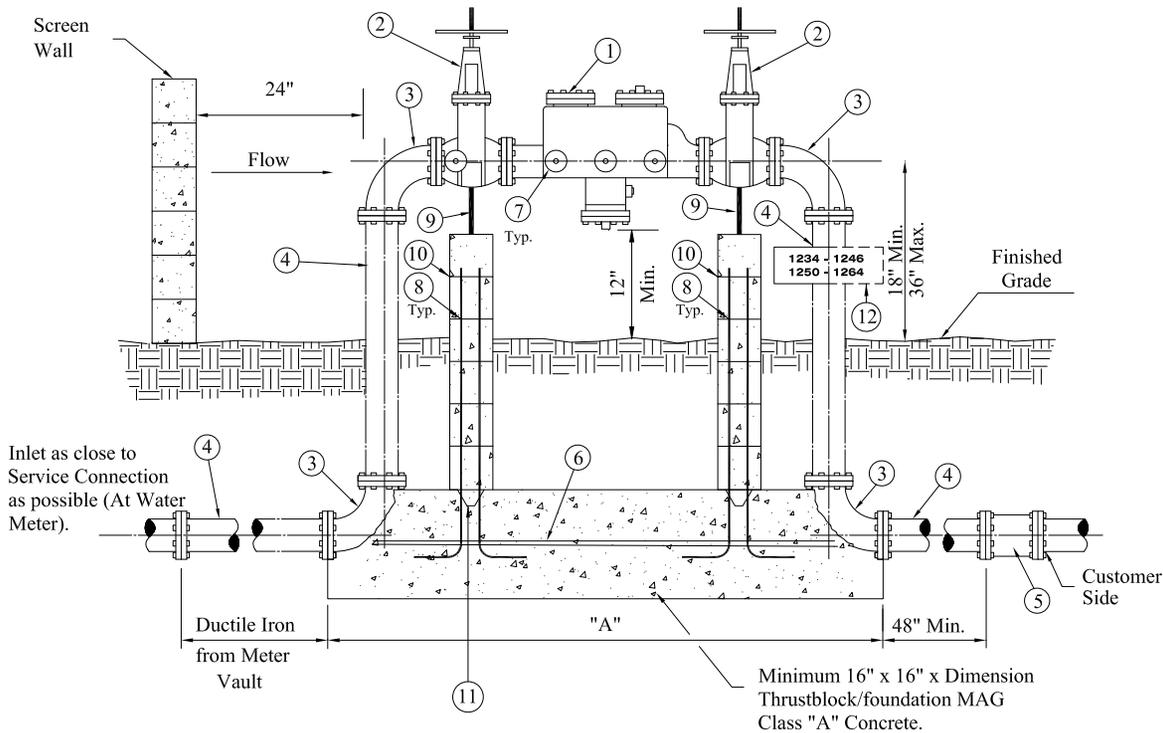
Inlet as close to service connection as possible (Immediately after water meter). Hard Copper on inlet side.

- GENERAL NOTES**
1. Backflow assemblies shall be tested for proper operation per the COB requirements. All testing shall be performed by a certified tester recognized by the City.
 2. Copper fittings shall be connected with lead free solder joints.
 3. Finished grade underneath the backflow preventer shall be at 95% compaction.
 4. All nipples to be copper or brass.
 5. Inlet / Outlet piping must be type "L" hard copper.
 6. Call for underground inspection before backfilling trench.
 7. Vertical installations of assemblies on fire sprinkler systems are allowed using assemblies approved for use in the vertical position on fire systems.
 8. Approved backflow assemblies shall have a Seal of Approval from the American Society of Sanitation Engineers. Backflow assemblies installed on fire suppression systems must also have approval from Underwriters Laboratories and/or Factory Mutual Research Corporation.
 9. Reducer Pressure Principle Backflow Assemblies shall not be allowed on sprinkled commercial buildings.

LIST OF MATERIALS

- 1 Approved double check valve backflow prevention assembly, (2) ball valves included.
- 2 Type "L" hard copper, 3/4" thru 2".
- 3 90° ell, hard copper, 3/4" thru 2" sweat fittings.
- 4 Pipe union, brass or copper.
- 5 Test cocks with brass plugs or adaptors with caps installed. (4 Required)
- 6 Install 4" concrete pad , enclosures and hardware. Enclosures shall be "Guardshack, GS-M1" or approved equal (Minimum pad DIM 32" x 18" x 4" - L x W x Thickness).



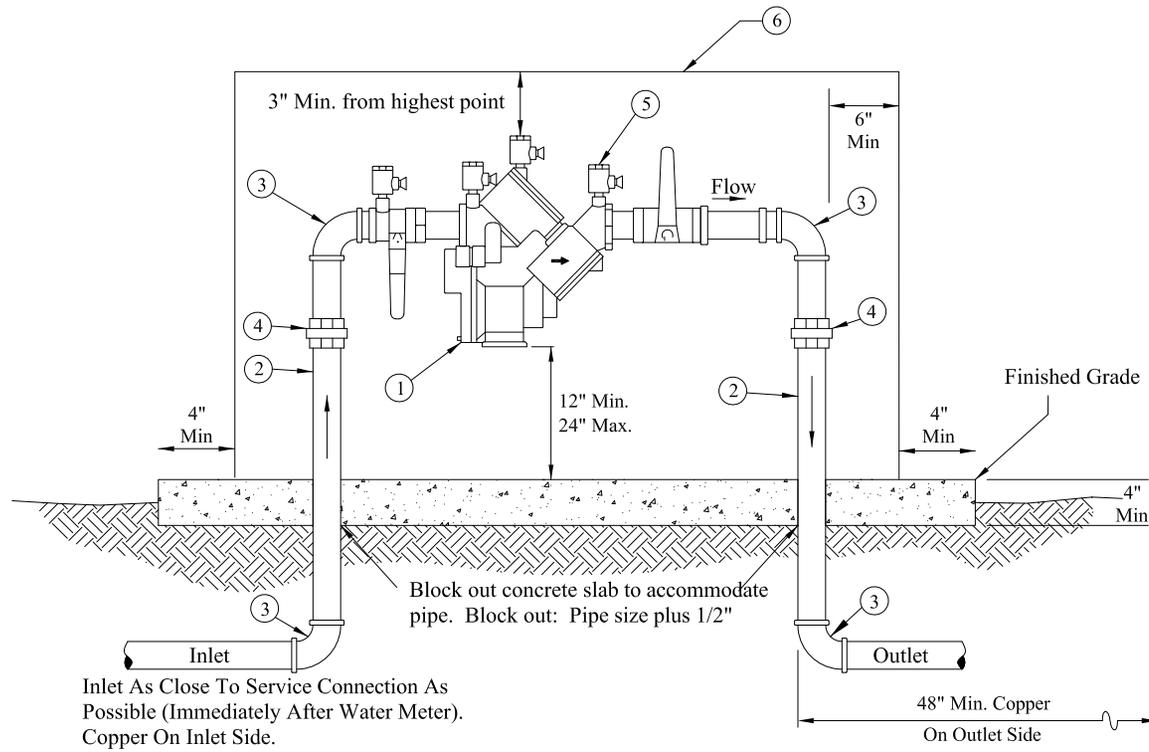


LIST OF MATERIALS

- ① Approved reduced pressure principle backflow prevention assembly.
- ② Resilient seated gate valve. O.S. & Y. (fire line connection). N.R.S. (non fire line).
- ③ 90° elbow flanged D.I.P. 3" thru 12", may be used on underground joints.
- ④ Pipe spool. flanged D.I.P. 3" thru 12", Mega Lug or approved equal may be used on underground joints.
- ⑤ Restrained ductile iron solid sleeves.
- ⑥ 3/4" zinc coated threaded rod, (5/8" rod on 3" to 4" sizes), bolt to flanges as shown, typical both sides.
- ⑦ Test cocks with brass plugs or adaptors with caps installed. (4 required).
- ⑧ #6 reinforcing steel, deformed bar, 4" apart, evenly spaced; 2" apart for 6" supports.
- ⑨ Adjustable pipe support permanently attached to base with minimum 1" adjusting rod.
- ⑩ Square or round monolithic cast in place concrete column, minimum MAG Class "A" concrete.
- ⑪ Construction joint key to be 1-3/4" x 2-1/2".
- ⑫ COB signage per COB Std. Dtl. 31456.

GENERAL NOTES

1. Backflow assemblies shall be tested for proper operation per the COB requirements. All testing shall be performed by a certified tester recognized by the City.
2. Backflow preventers shall be painted Tenemec desert sands or COB approved equal. Do not paint the name plate or any brass parts on the assembly.
3. For backflow preventers requiring guard posts see Detail 31359. Backflow preventers enclosed by screening shall maintain a 24" clearance around the assembly.
4. Finished grade underneath the backflow preventer shall be at 95% compaction.
5. Backflow preventers on fire lines may require tamper switches on the shut off valves. Contact COB Building, or Fire Department for more information on switches.
6. Call for underground inspection before backfilling trench.
7. Approved backflow assemblies shall have a Seal of Approval from the American Society of Sanitation Engineers. Backflow assemblies installed on fire suppression systems must also have approval from Underwriters Laboratories and/or Factory Mutual Research Corporation.
8. Reducer Pressure Principle Backflow Assemblies shall not be allowed on sprinkled commercial buildings.

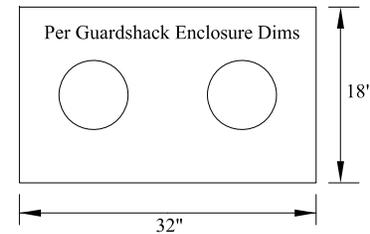


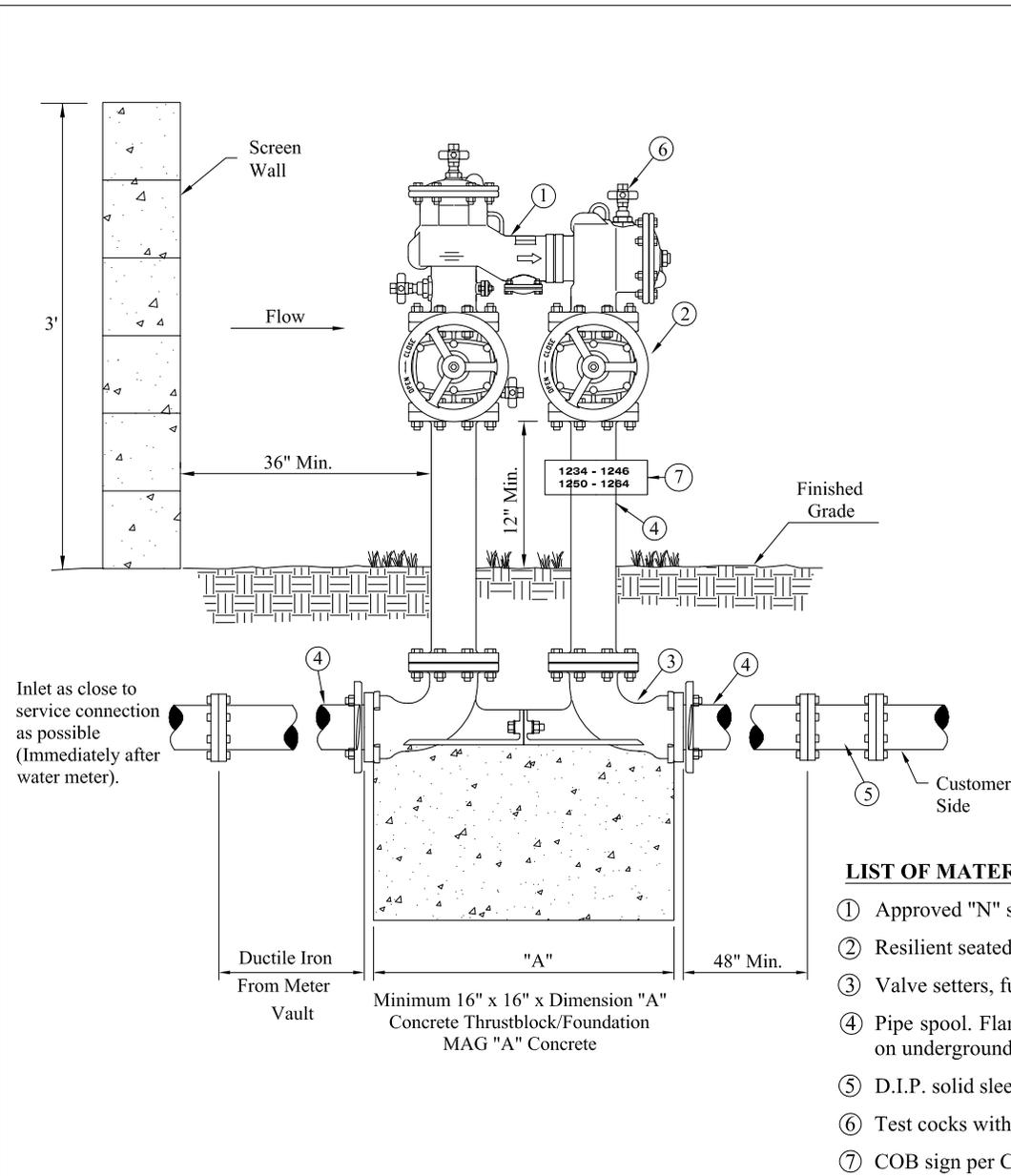
GENERAL NOTES

1. Backflow assemblies shall be tested for proper operation per the COB requirements. All testing shall be performed by a certified tester recognized by the City.
2. Copper fittings shall be connected with lead free solder joints.
3. Finished grade underneath the backflow preventer shall be at 95% compaction.
4. All nipples to be copper or brass.
5. Piping under the City right of way must be type "K" copper.
6. Call for underground inspection before backfilling trench.
7. Approved backflow assemblies shall have a Seal of Approval from the American Society of Sanitization Engineers. Backflow assemblies installed on fire suppression systems must also have approval from Underwriters Laboratories and/or Factory Mutual Research Corporation.
8. Reducer Pressure Principle Backflow Assemblies shall not be allowed on sprinkled commercial buildings.

LIST OF MATERIALS

- ① Approved reduced pressure principle backflow prevention assembly, (2) ball valves included.
- ② Pipe spool, type "L" hard copper, 3/4" thru 2".
- ③ 90° ell, copper, 3/4" thru 2" sweat fittings.
- ④ Pipe union, brass or copper.
- ⑤ Test cocks with brass plugs or adaptors with caps installed (Four (4) required)
- ⑥ Install 4" concrete pad, enclosure and hardware. Enclosure shall be "Guardshack, GS-M1" or approved equal (Min pad DIM - 32" x 18" x 4" - L x W x Thickness).



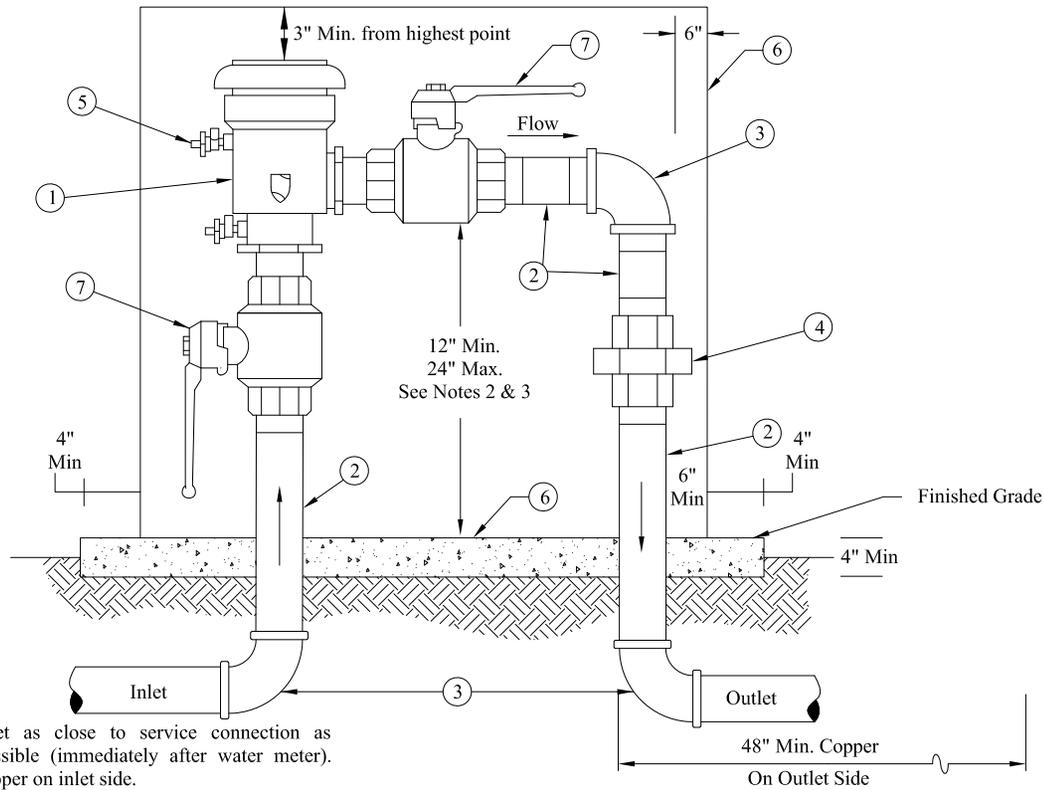


GENERAL NOTES

1. Backflow assemblies shall be tested for proper operation per the COB requirements. All testing shall be performed by a certified tester that is recognized by the City.
2. Backflow preventers shall be painted Tenemec Desert Sands or COB Approved Equal. Do not paint the name plate or any brass parts on the assembly.
3. For backflow preventers requiring guard posts see Detail 31359. Backflow preventers enclosed by screening shall maintain a 36 inch clearance around the assembly.
4. Finished grade underneath the backflow preventer shall be at 95% compaction.
5. Backflow preventers on fire lines may require tamper switches on the shut off valves. Contact City Of Buckeye Building or Fire Departments for more information on switches.
6. Call for underground inspection before backfilling trench.
7. Approved backflow assemblies shall have a Seal of Approval from the American Society of Sanitation Engineers. Backflow assemblies installed on fire suppression systems must also have approval from Underwriters Laboratories and/or Factory Mutual Research Corporation.

LIST OF MATERIALS

- ① Approved "N" shape double check valve backflow prevention assembly.
- ② Resilient seated gate valve. O.S. & Y. (fire line connection) N.R.S. (non fire line)
- ③ Valve setters, fusion epoxy coated ductile iron, plated nuts and bolts. (2 required)
- ④ Pipe spool. Flanged D.I.P. 3" thru 12", Mega Lug or approved equal may be used on underground joints.
- ⑤ D.I.P. solid sleeve.
- ⑥ Test cocks with brass plugs or adaptors with caps installed. (4 required)
- ⑦ COB sign per COB Std. Dtl. 31456.



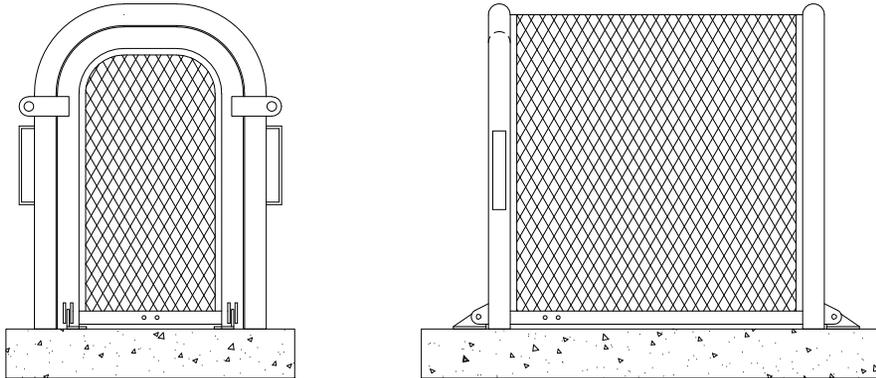
LIST OF MATERIALS

- ① Approved pressure vacuum breaker assembly.
- ② Type "L" hard copper, 1/2" thru 2".
- ③ 90° ell, copper, 1/2" thru 2" sweat fittings.
- ④ Pipe union, brass or copper.
- ⑤ Test cocks with brass plugs or adaptors with caps installed. (2 required)
- ⑥ Install 4" MAG "A" concrete pad, enclosure and hardware. Enclosure shall be "Guard Shack GS-M1" or approved equal (COB Detail 31358).
- ⑦ (2) ball valves included.

GENERAL NOTES

1. Backflow assemblies shall be tested for proper operation per the COB requirements. All testing shall be performed by a certified tester recognized by the City.
2. Pressure vacuum breakers must be installed at least 12" above all downstream piping.
3. If this distance exceeds 24", a reduced pressure principle backflow prevention assembly must be utilized.
4. Copper fittings shall be connected with lead free solder joints.
5. Finished grade underneath the backflow preventer shall be at 95% compaction.
6. All nipples to be copper or brass.
7. Piping under the City right of way must be type "K" copper.
8. Call for underground inspection before backfilling trench.
9. Approved backflow assemblies shall have a Seal of Approval from the American Society of Sanitization Engineers. Backflow assemblies installed on fire suppression systems must also have approval from Underwriters Laboratories and/or Factory Mutual Research Corporation.
10. Block out concrete slab to accommodate pipe. Block out: Pipe size plus 1/2"

STANDARD BACKFLOW ENCLOSURES



STANDARD ENCLOSURE SIZES - INTERNAL DIMENSIONS

- 16" W x 37" H x 18" L HINGED W/ GATE
- 16" W x 48" H x 18" L HINGED W/ GATE
- 24" W x 40" H x 31" L HINGED W/ GATE
- 24" W x 40" H x 38" L HINGED W/ GATE
- 30" W x 48" H x 47" L HINGED W/ GATE
- 38" W x 60" H x 47" L HINGED W/ GATE
- 38" W x 60" H x 58" L HINGED W/ GATE

Provide additional information when ordering 304 S. S.

GENERAL SPECIFICATIONS

- All pipe shall be 1 1/4" schedule 40 A.S.T.M. A-53 Grade A- Electric Weld pipe.
- Angle Iron shall be 1" x 1" x 1/8" steel.
- Stainless steel units shall be 1 1/4" schedule 10 A.S.T. M. A-312 304 S.S.
- Expanded metal shall be 1/2" spacing x # 13 Ga. flattened diamond pattern steel.
- Stainless steel units shall be 1/2" spacing x # 13 Ga. flattened expanded metal diamond pattern type 304 S.S.
- All stainless steel expanded metal shall be sandblasted prior to fabrication to remove burrs, flashing and sharp edges.
- There shall be no exposed ends of expanded metal on the outside of the enclosure.
- Welding shall be a minimum of 1/4" long welds on 4" spacing.
- Standard mounting brackets shall be welded on each end of lift off enclosures.
- One bracket on hinged units shall be welded on end opposite hinges.
- Hardware kits provided for mounting enclosures.
- On 304 S.S. units, all hinges, exposed hardware, and brackets shall be 304 S.S.
- All hardware shall be securely attached to enclosures.
- All enclosures shall withstand a minimum of 200 lbs. per square foot without any permanent deflection or distortion.
- 3/8" spacing between angle iron framework of enclosure and slab to prevent rusting. Only pipe ends to touch slab.

POWDERCOATED UNITS

Pre-powdercoat Treatment Process

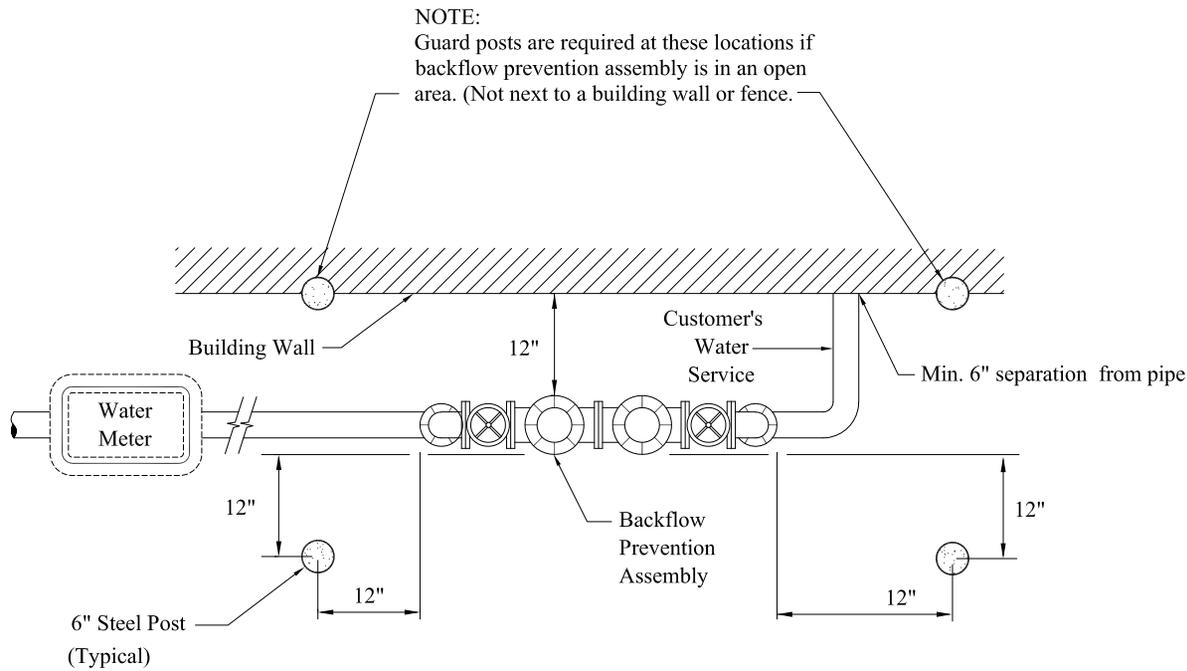
Unit with a S-44 alkaline cleaner, overflow rinse, apply an AC-8115 iron phosphate treatment, overflow rinse and finish with a #198 sealer rinse to prevent rusting and improve adhesion.

Powdercoat Treatment Process

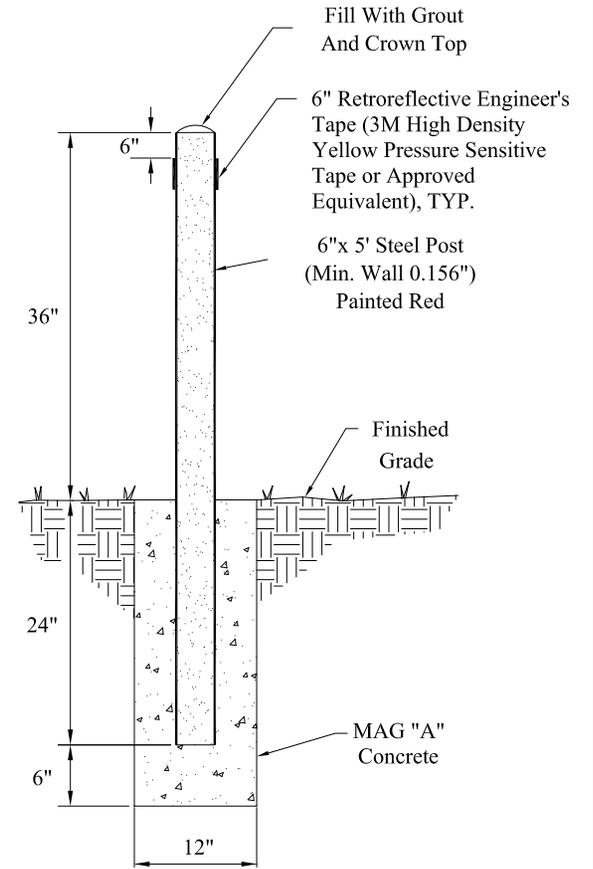
Units shall be preheated and coated by electrostatic application of 2.0 to 3.5 mil thickness on all surfaces. Powder shall be RAL 1019 Woodlands Tan or TCI 8810-6058 Forest Green or approved equal Impact Resistance Finish 160 inch pounds direct 160 inch pounds reverse, per ASTM D-2794 specs. Gloss Finish >85, per ASTM D-523. Adhesion to be rated excellent when tested to ASTM D-3359 standards.

STAINLESS STEEL ELECTRO-POLISH FINISH

All 304 Stainless Steel units shall be chemically electro-polished to impart a lustrous finish to the unit.



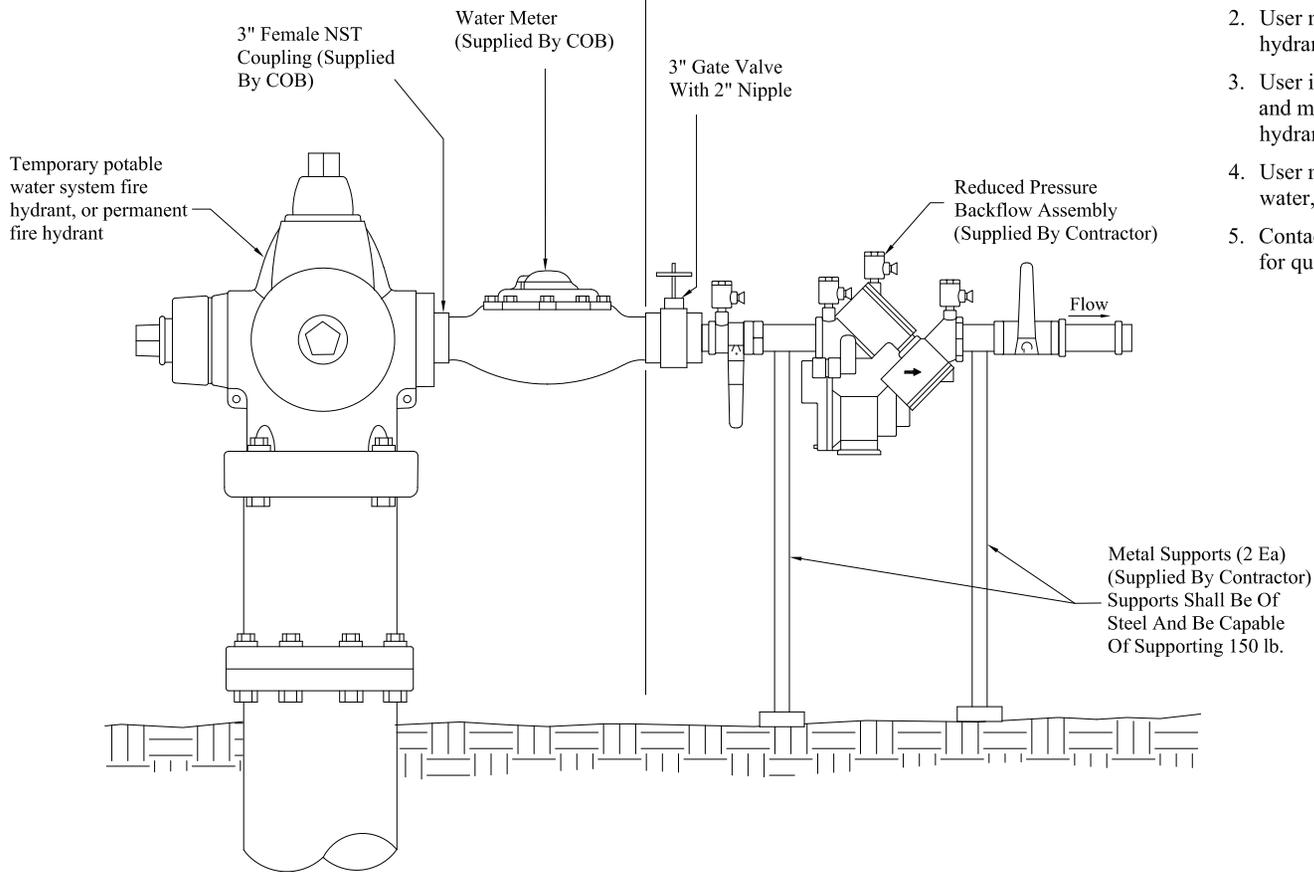
PLAN VIEW



GUARD POST SECTION

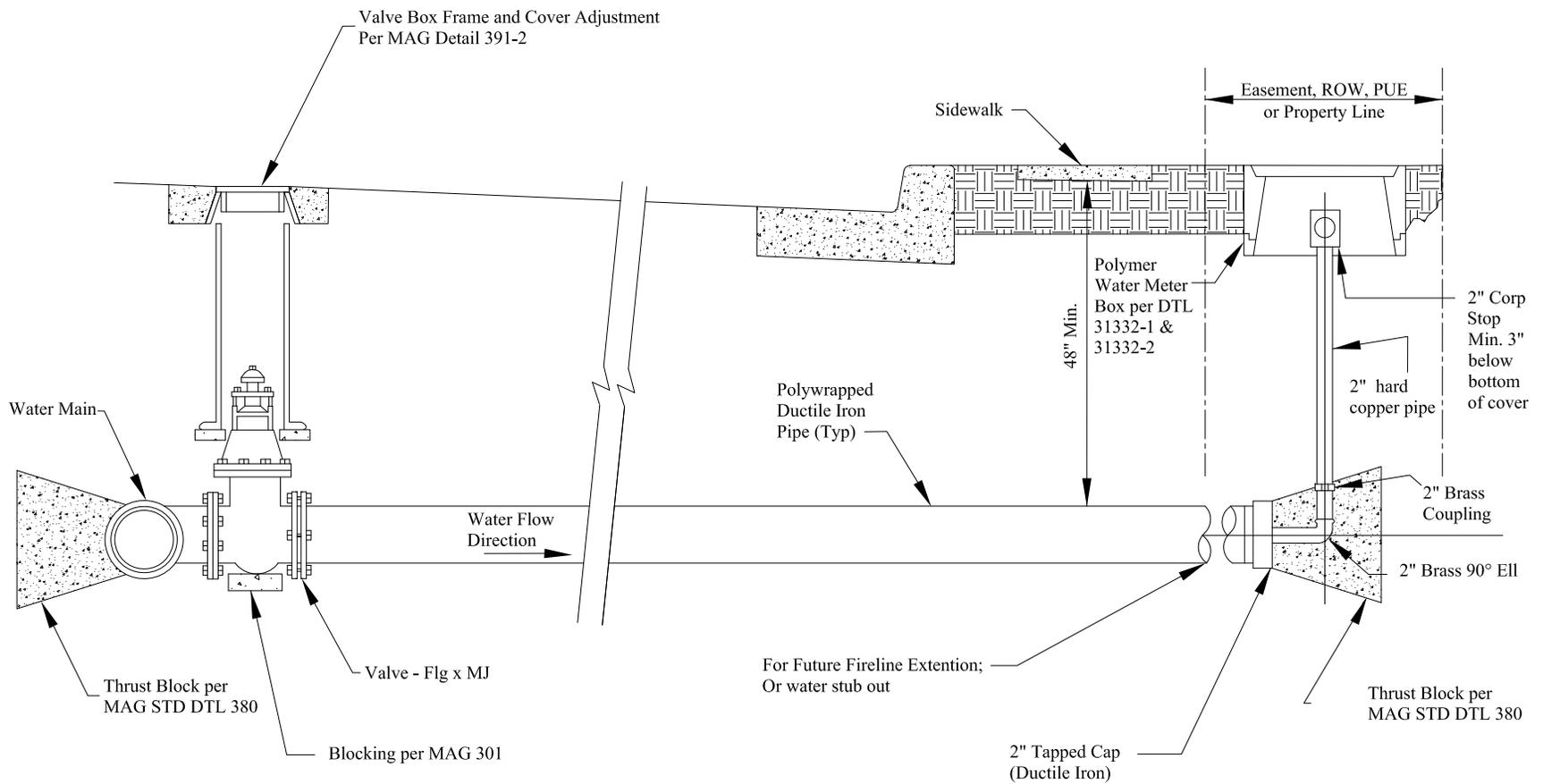
CITY SUPPLIED

CONTRACTOR SUPPLIED



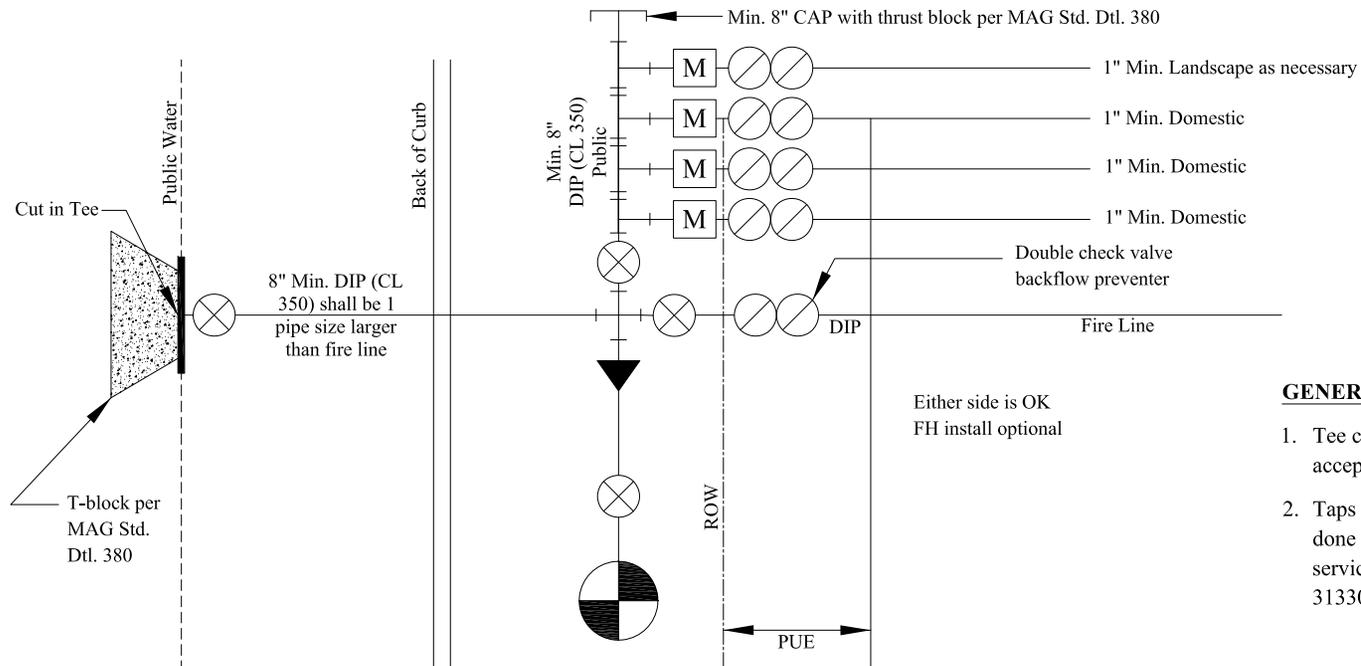
GENERAL NOTES:

1. Backflow assemblies shall be tested for proper operation per the COB requirements. All testing shall be performed by a certified tester recognized by the City.
2. User must remove backflow assembly when hydrant meter is removed or relocated.
3. User is liable for any damage to the hydrant and meter including all attachments to the hydrant.
4. User must use gate valve to control flow of water, not the hydrant valve assembly.
5. Contact COB Building, or Fire Department for questions.



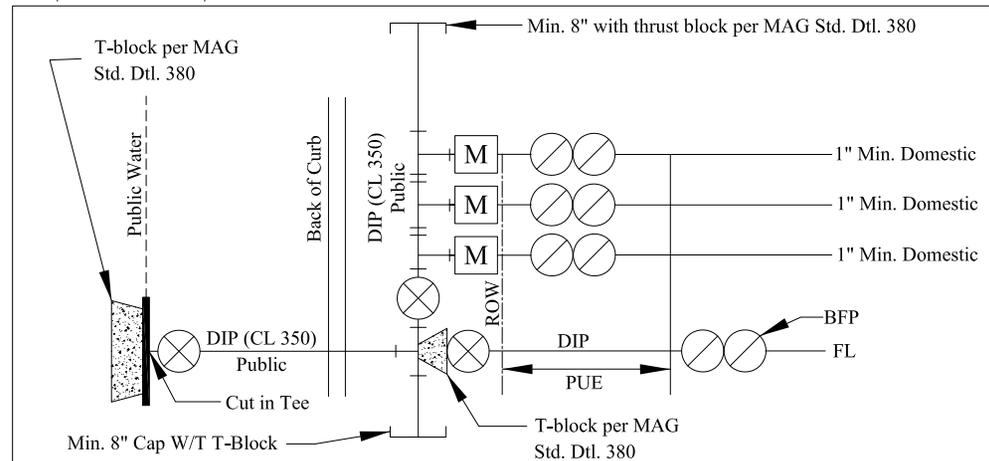
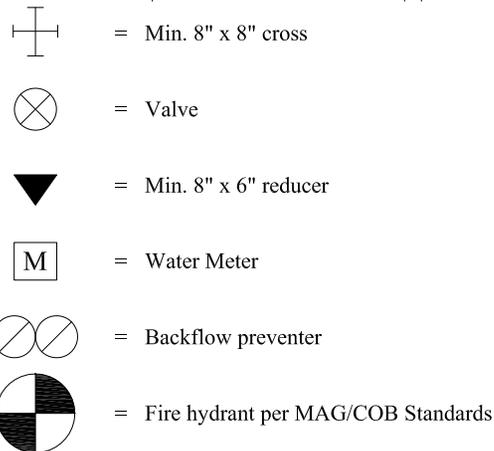
GENERAL NOTES

1. All water lines within the rights-of-way or public utility easement shall be polywrapped ductile iron pipe.
2. Joint restraint shall conform to the requirements of MAG Std. Detail 303-1 and 303-2.

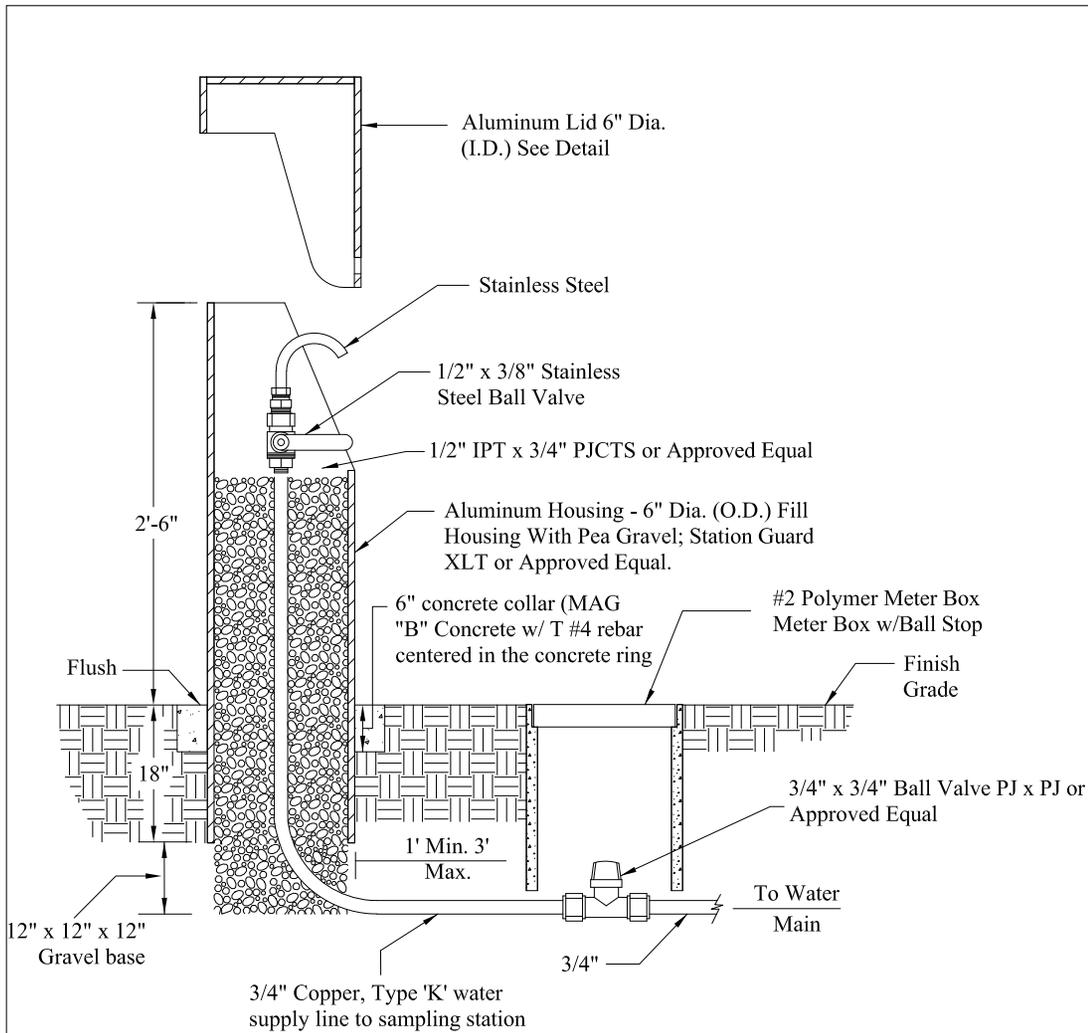


GENERAL NOTES

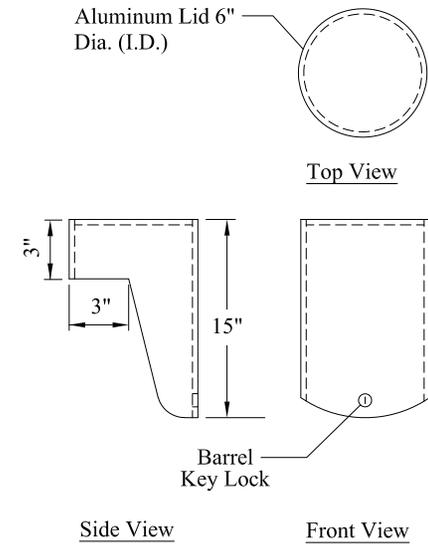
1. Tee configuration is also acceptable.
2. Taps off of the public main shall be done using a double strap bronze service saddle per COB Detail 31330.



ALTERNATE PER APPROVED PLAN



TYPICAL INSTALLATION
N.T.S.

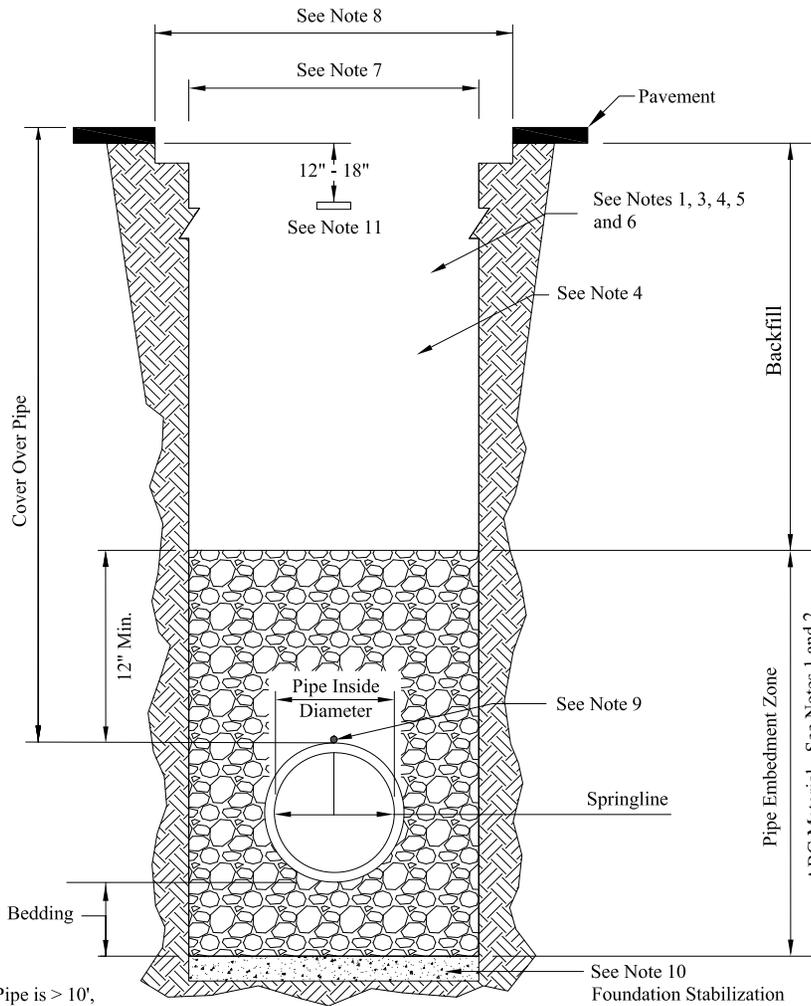


LID DETAILS
N.T.S.

GENERAL NOTES

1. Water Quality Sampling Station to be Koraleen, "Station Guard XLT" or City approved equal.
2. Keys to locks shall be delivered to COB Water Resources Department Environmental Compliance Division upon acceptance.

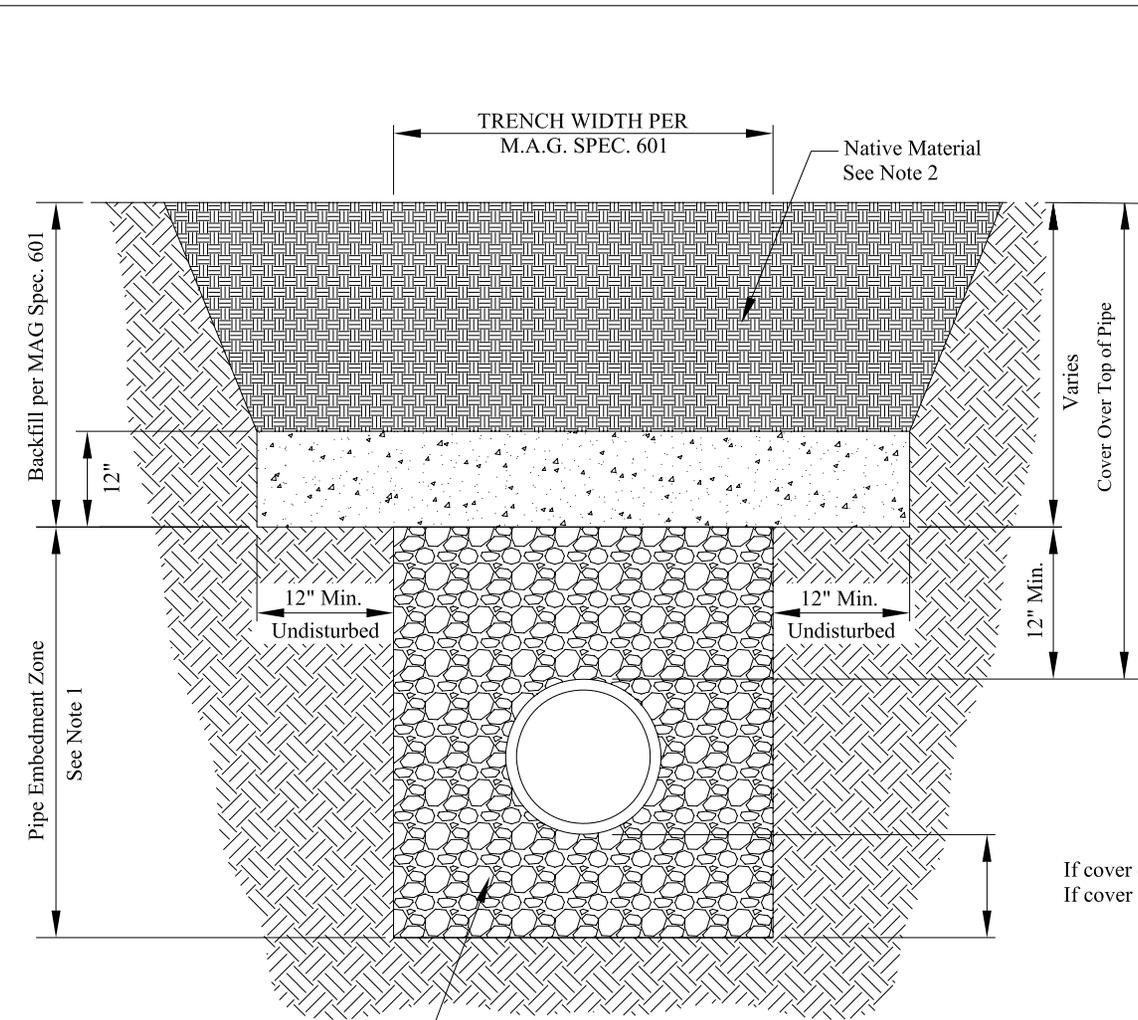
WATER TRENCH DETAIL



- If Cover Over Pipe is > 10', Bedding depth = 12" Min.
- If Cover Over Pipe is < or = 10', Bedding depth = 4" Min.

GENERAL NOTES

1. Placing and compaction of backfill, including the Pipe Embedment Zone, shall be per MAG Standard Specification 601 unless otherwise specified below.
2. Pipe Embedment Zone material shall be ABC material per MAG Standard Specification 702.
3. CLSM, where specified, shall be 1/2 sack CLSM per MAG Standard Specification 728.
4. All transverse trenching in existing paved streets shall be backfilled with ABC in the Pipe Embedment Zone and 1/2 sack CLSM from the top of the Pipe Embedment Zone to bottom of pavement replacement.
5. All longitudinal trench cuts within 2' of existing pavement, or in existing pavement, shall be backfilled with ABC in the Pipe Embedment Zone and one of the following above the Pipe Embedment Zone:
 - 1) 1/2 sack CLSM from top of the Pipe Embedment Zone to top of trench in unpaved areas, or to bottom of pavement replacement in paved areas.
 - 2) ABC as follows: ABC compacted to 95% minimum up to 24 inches from top of trench in unpaved areas or up to 24 inches from bottom of pavement replacement in paved areas. The last 24 inches of ABC backfill shall be compacted to 100% minimum.
6. All backfill (longitudinal and transverse) in unpaved streets shall be ABC in the Pipe Embedment Zone and can be native backfill per MAG Standard Specification 601 from the top of the Pipe Embedment Zone to top of trench. This also includes streets that will be completely reconstructed.
7. Excavate trench width per MAG Standard Specification 601.
8. Trenches in existing roads shall be per MAG Standard Detail 200 "T-Top".
9. Tracer wire shall be a minimum 10 AWG per COB 3-1.210 and color shall be blue. Tracer wire shall be taped (+/-) every 10 feet to the top of the pipe using 10 Mil plastic pipe tape.
10. Foundation stabilization (if necessary) shall be over excavation a min. of 6". An open graded material shall be placed back. Over excavation and open graded material shall be approved by the City Engineer or authorized representative. An approved geotextile fabric may be used between the bedding and foundation (based on soil conditions) if requested by the City Engineer or representative.
11. 6" non detectable plastic warning tape shall be placed 12" to 18" below finished subgrade. The color shall be blue and shall be permanently imprinted every 36" with: "CAUTION - BURIED WATER LINE BELOW".



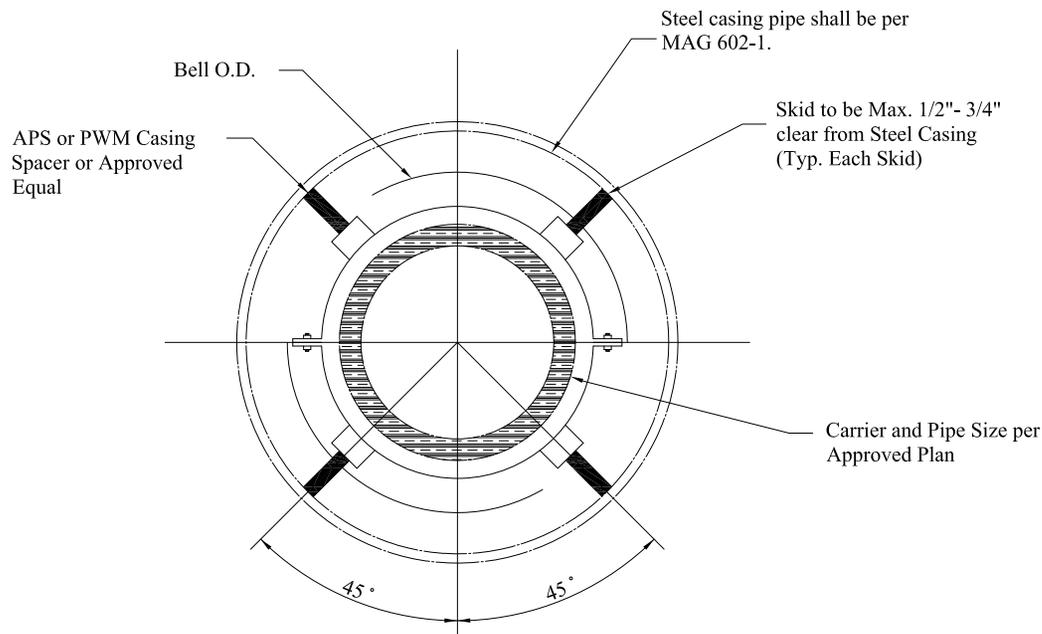
See Notes
1, 3 & 4

GENERAL NOTES:

1. Pipe Embedment Zone material to be A.B.C. per MAG Spec. 702.
2. Native material as described in MAG Spec. 601.
3. All compaction densities: Type 1 as described in MAG Spec. 601.
4. Compaction methods: As described in MAG Spec. 601.
5. All concrete shall be Class 'C', MAG Spec. 725.
6. If foundation stabilization is needed, see COB Detail No. 31380.
7. This detail is for a concrete cap that is not under paving. If the concrete cap is under paving see Detail COB 31380 for backfill options.

Installation of water pipe class, type, necessary trench width, excavation and layback shall be per MAG Specifications and project geotechnical report requirements for normal and extra depth conditions. Clarification of excavation, pipe zone and layback requirements shall be made in writing to the project geotechnical and testing consultant with a copy to the engineer.

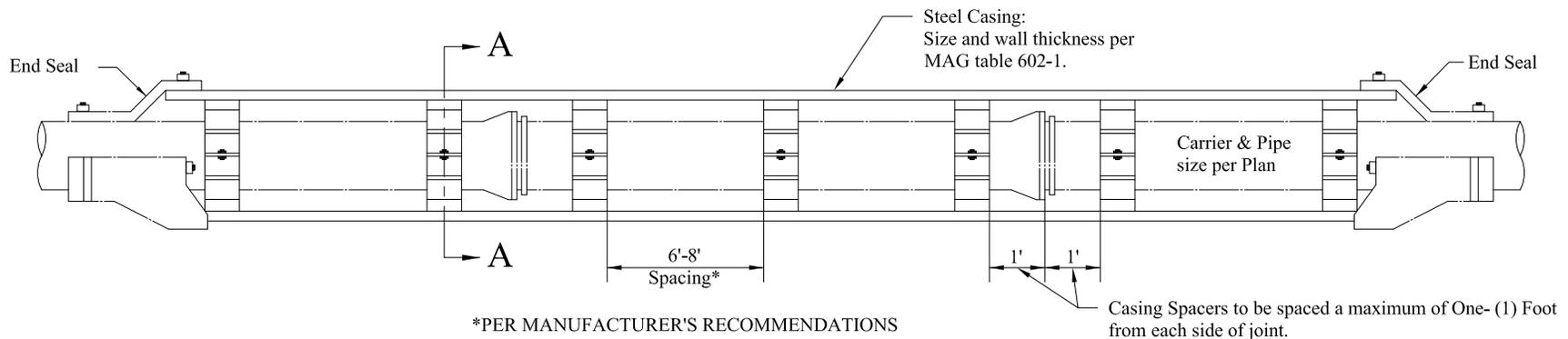
If cover over top of pipe is 10' or less = 4" Min.
If cover over top of pipe is 10' or more = 12" Min.



**CASING SPACER DETAIL
SECTION A-A**

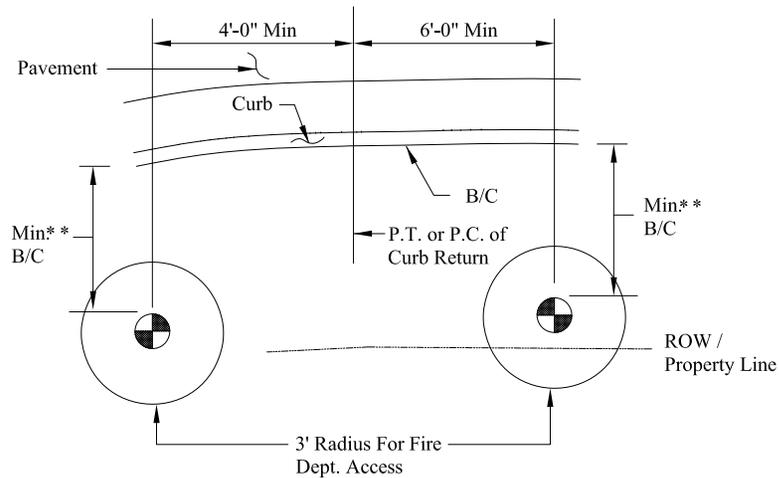
GENERAL NOTES

1. Installation to be in accordance with Manufacturer's Specifications.
2. Safety: Equipment Certification for installation of Casing / Carrier Pipe.
3. End seal to provide a water tight connection shall be approved by the COB. All end seals to include a MAG 427 brick plug.
4. Casing spacers shall be constructed of a T-304 stainless steel band with an elastomeric EDPM liner. The runners shall be beveled, abrasion resistant and constructed of a glass filled polymer.
5. Alternate spacers may be PWM inject molded with City Engineer approval.
6. All hardware within the casing shall be a minimum T-304 stainless steel.
7. Do not fill annular space.

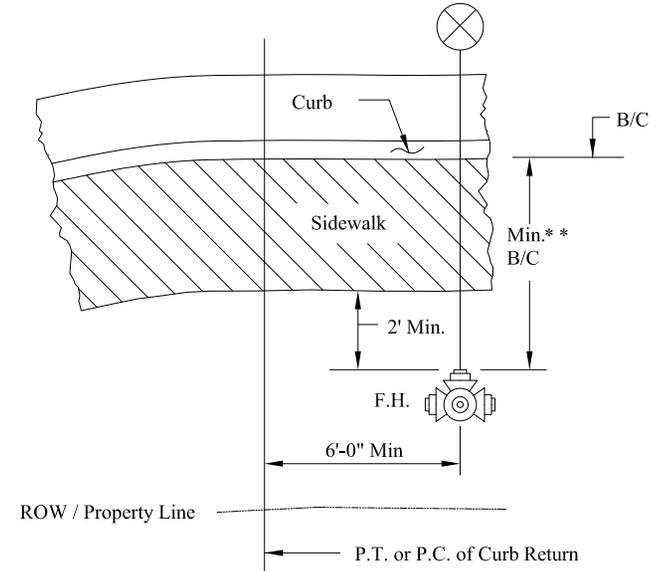


*PER MANUFACTURER'S RECOMMENDATIONS

Casing Spacers to be spaced a maximum of One- (1) Foot from each side of joint.



PARKWAY AREA, NO SIDEWALK



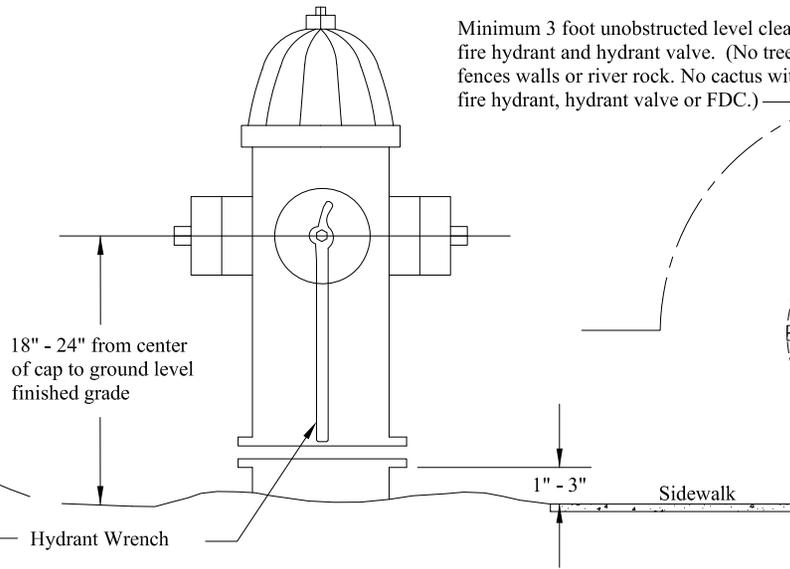
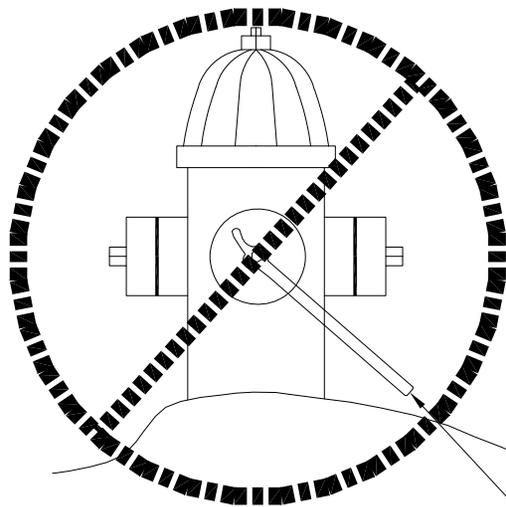
PARKWAY AREA WITH SIDEWALK

GENERAL NOTES

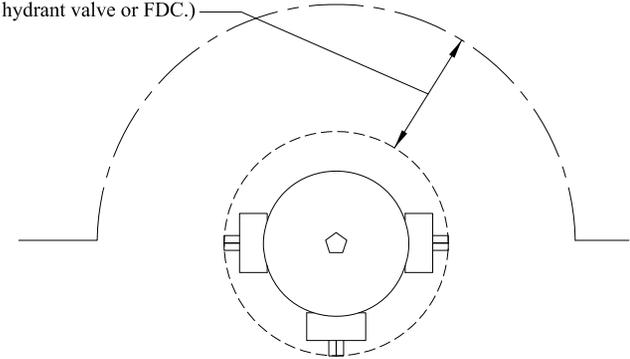
1. Obstructions such as utility poles, street signs, irrigation boxes, fences, etc., must not be placed between curb and hydrant.
2. Dimensions shown on construction drawings supersede locations shown here.
3. On mid-block locations, the fire hydrant shall be aligned with a property line and 6' minimum from driveways.
4. All fire hydrants installed per MAG standards and will be located in accordance with this detail.
5. In Industrial/Commercial zones a minimum of 6' from driveways must be maintained with valve installed away from driveway.
6. Bottom flange of fire hydrant shall be 1" to 3" above sidewalk or curb.
7. All dimensions shall be measured from end of main steamer nut.

** Fire hydrant offsets shall be:

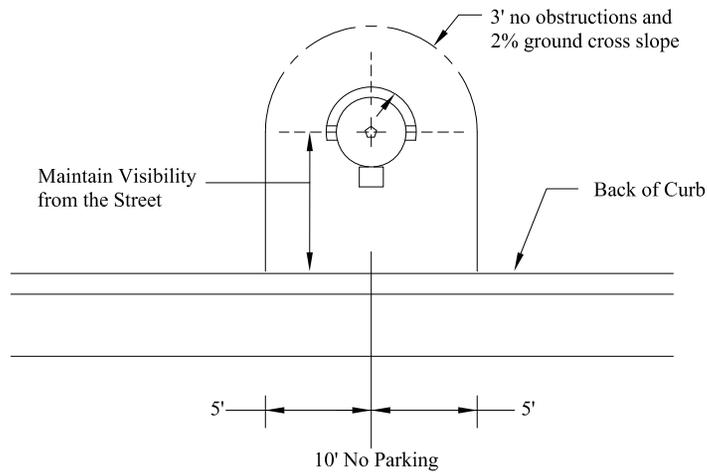
- Arterial: No closer than 6', no farther than 10'
- Collector: No close than 4', no farther than 8'
- Local: With Attached Sidewalk: 2' behind sidewalk
With Curb & Gutter, and No Sidewalk: 3' behind curb



Minimum 3 foot unobstructed level clearance around fire hydrant and hydrant valve. (No trees, bushes, fences walls or river rock. No cactus within 10 feet of a fire hydrant, hydrant valve or FDC.)

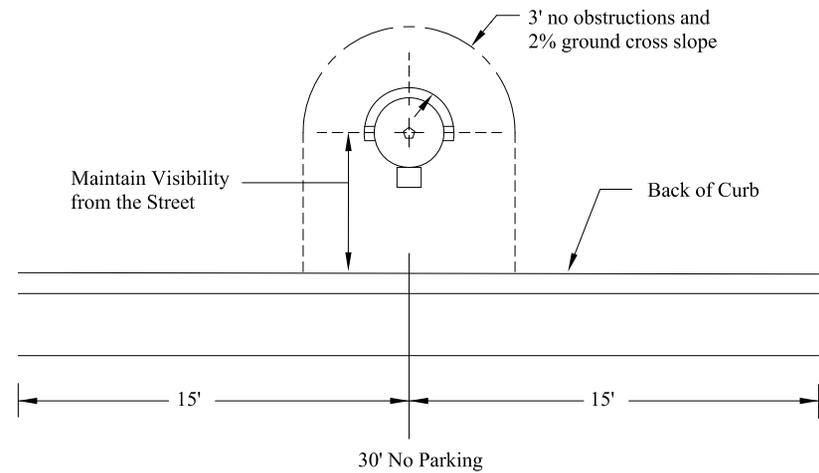


A clear and level space of 3 feet shall be maintained around fire hydrants and hydrant valve. (No trees, bushes, fences, walls or river rock. No cactus within 10 feet of a fire hydrant, hydrant valve or FDC).

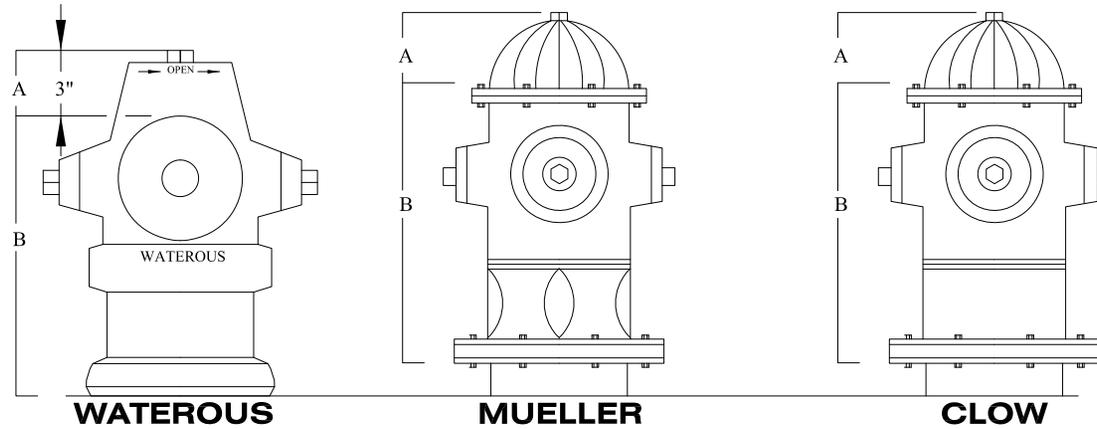


Residential

A clear and level space of 3 feet shall be maintained around fire hydrants and hydrant valve. (No trees, bushes, fences, walls or river rock. No cactus within 10 feet of a fire hydrant, hydrant valve or FDC).



Non-Residential



LEGEND

- 1. (A) = Bonnet
(B) = Barrel
- 2. Type Denotes Color Code Designation:
(CY) = Cat Yellow
(BR) = Brilliant Red
(GW) = Gloss White

| Type | A | B |
|------|----|----|
| 1 | CY | CY |
| 2 | GW | CY |
| 3 | BR | BR |

GENERAL NOTE

- 1. On Waterous Hydrants only: Bonnet (A) will be painted 3" down from the top.

COLOR CODE

The City of Buckeye Water Resources Department and Fire Department utilize the following Color Code in distinguishing the various types of Fire Hydrants:

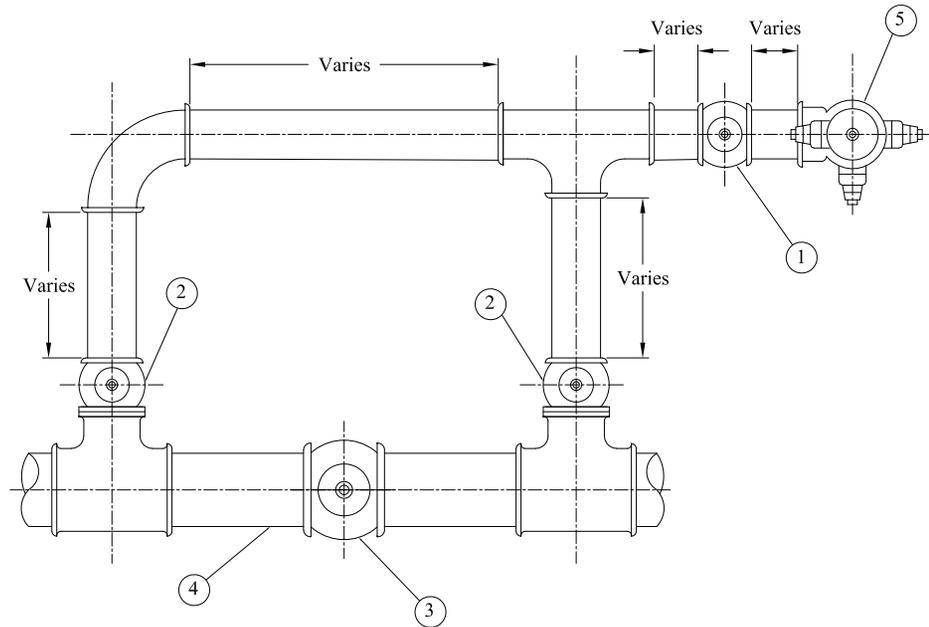
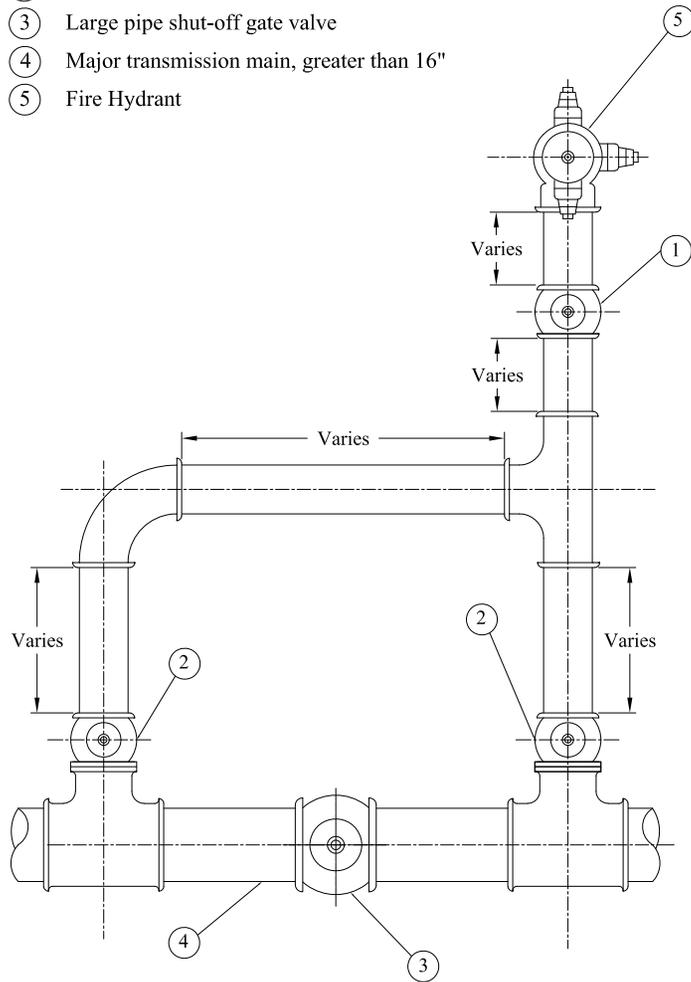
- 1. **Cat Yellow:** The barrel and bonnet of all fire hydrants installed on public water mains in rights-of-way and in public utility easements (PUE's) shall be painted cat yellow.
- 2. **Gloss White/Cat Yellow:** The bonnet of all fire hydrants installed on privately owned property shall be painted gloss white. The barrel shall be painted cat yellow.
- 3. **Brilliant Red:** The barrel and bonnet of all fire hydrants installed on private fire lines shall be painted brilliant red. All such fire hydrants shall be isolated from the municipal water system by double detector check valves. All red hydrants shall be approved by the City Fire Marshal.

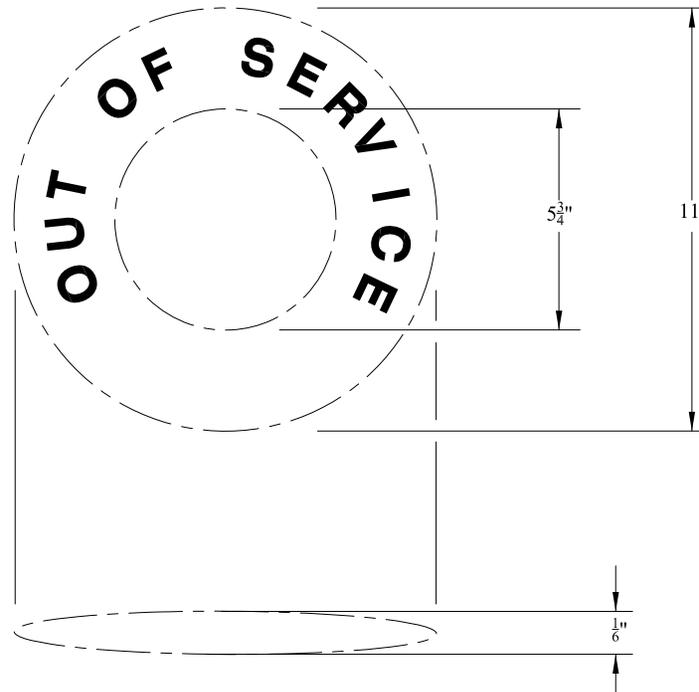
List Of Materials

- ① 6" valve MJ X MJ
- ② 6" valve FLG X MJ
- ③ Large pipe shut-off gate valve
- ④ Major transmission main, greater than 16"
- ⑤ Fire Hydrant

GENERAL NOTES

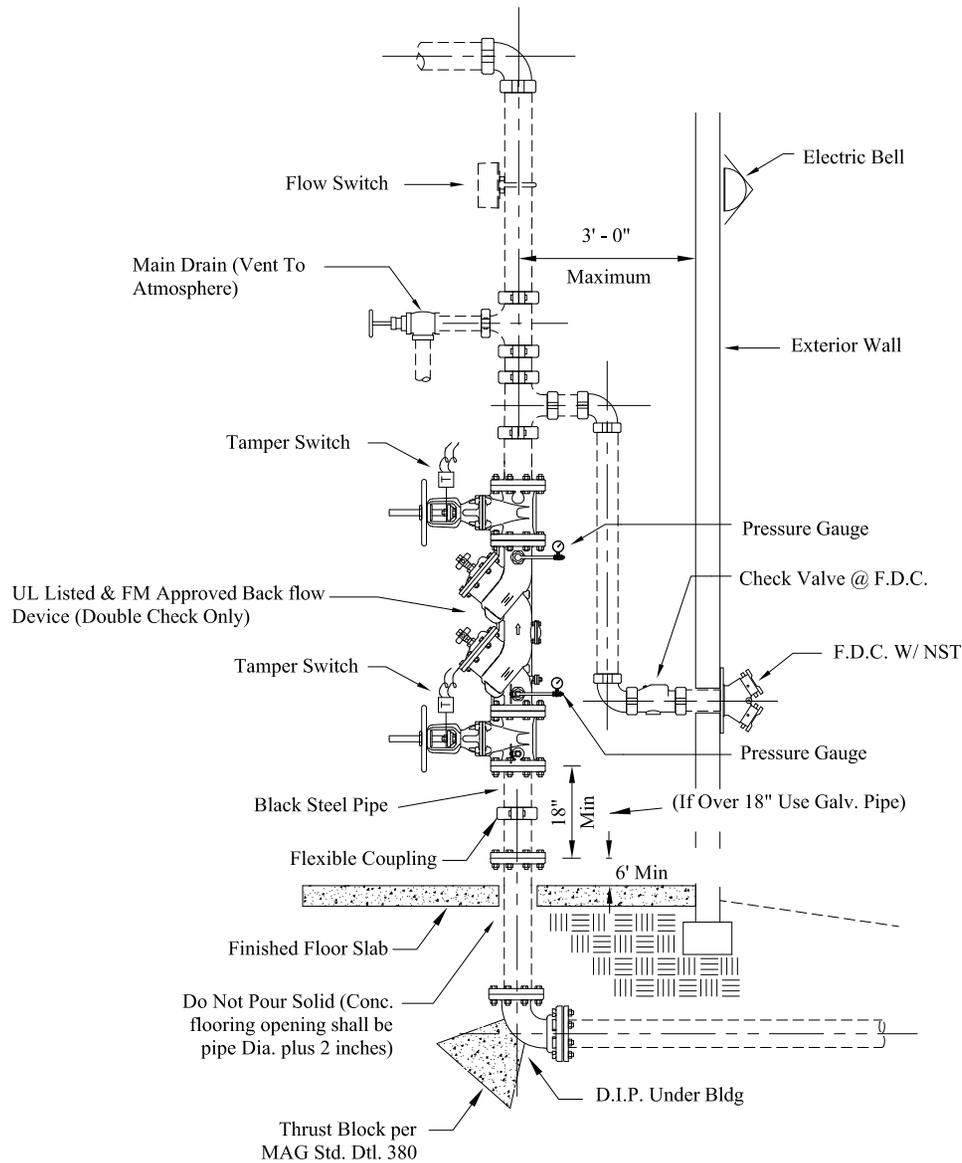
- 1. All joints in hydrant run-out to be restrained joints.
- 2. See MAG Std. Detail 391-2 for valve box installation.
- 3. For water valve blocking see MAG Std. Detail 301.
- 4. For additional information see MAG Std. Detail 360.
- 5. Bypass assembly shall be ductile iron pipe.





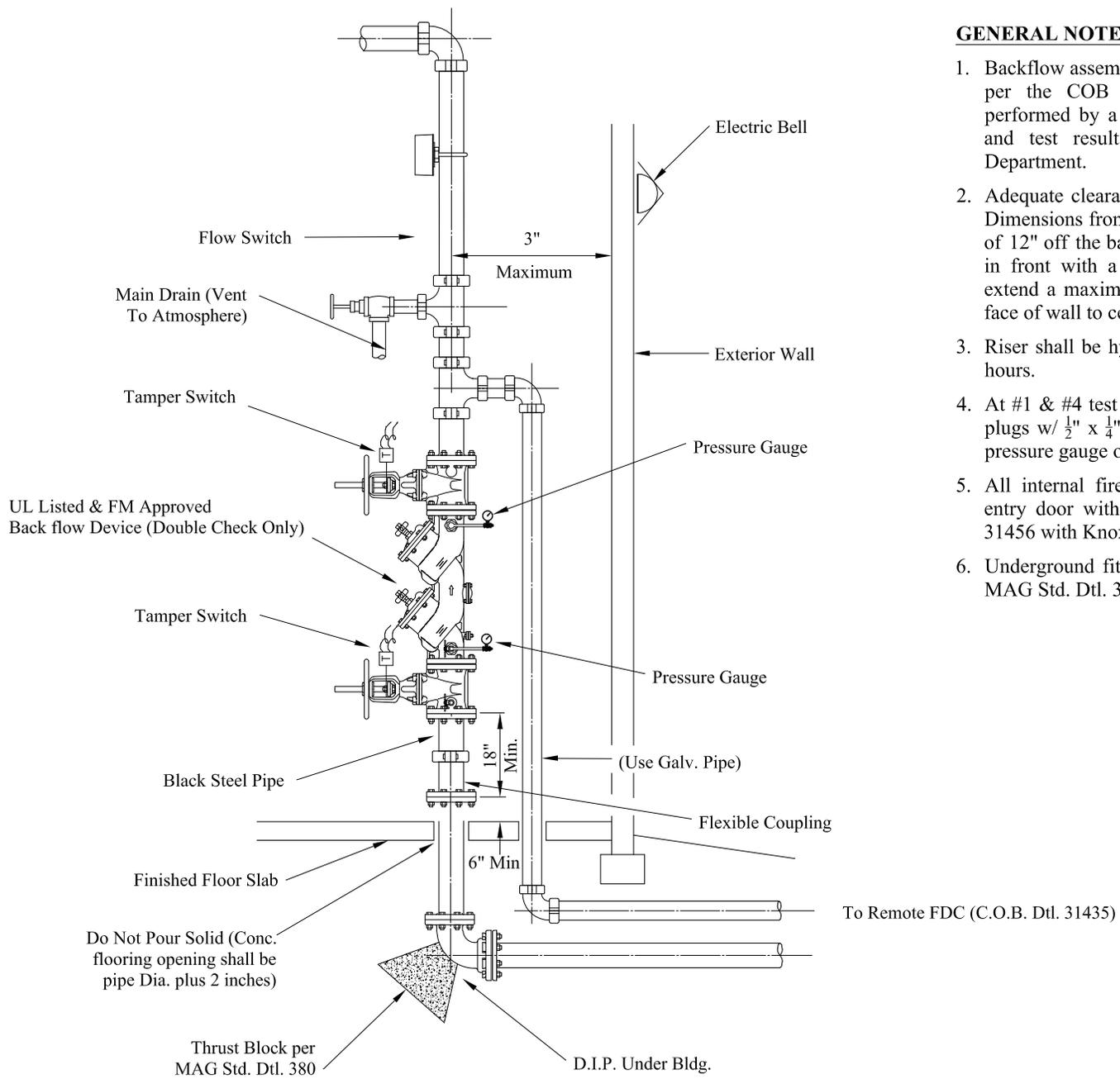
GENERAL NOTES

1. All fire hydrants installed on private and public water lines shall be provided with "Out of Service" sign if hydrant is out of service.
2. Upon completion of required inspections, tests, acceptance, and approval of the water system by a COB Inspector and the system is verified to be in service, the "Out of Service" signs shall be removed.
3. A hydrant removed from service shall be provided an "Out of Service" sign within the initial 2 hours of being notified of the service interruption.
4. Signs shall be in accordance with this detail.
5. Signs shall be permanently marked and constructed of weatherproof metal or rigid plastic material.
6. The color of lettering on signs shall be in high contrast with their background.
7. Signs shall have the words "Out of Service" on the sign in block capital letters not less than 1 1/2" in height with a stroke of not less than 1/4".



GENERAL NOTES

1. Backflow assemblies shall be tested for proper operation per the COB requirements. All testing shall be performed by a certified tester recognized by the City and test results provided to the Water Resources Department.
2. Adequate clearance shall be provided around fire riser. Measure a minimum of 12" off the back wall, 18" on each side and 36" clear in front with a full height door. The fire line shall extend a maximum of 3' into the building from inside face of wall to center of pipe.
3. Riser shall be Hydrostatically tested at 200 PSI for two hours.
4. At #1 & #4 test ports install a $\frac{1}{2}$ " brass nipple, tee & plugs w/ $\frac{1}{2}$ " x $\frac{1}{4}$ " male flared connection w/ cap (Install pressure gauge on tee outlet).
5. All internal fire riser shall have a separate external entry door and lock box with a Fire Dept. placard per COB Detail 31456 with Knox Box.
6. Underground fittings shall be flanged or restrained per MAG Std. Dtl. 303-2.

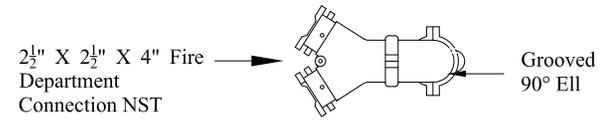


GENERAL NOTES

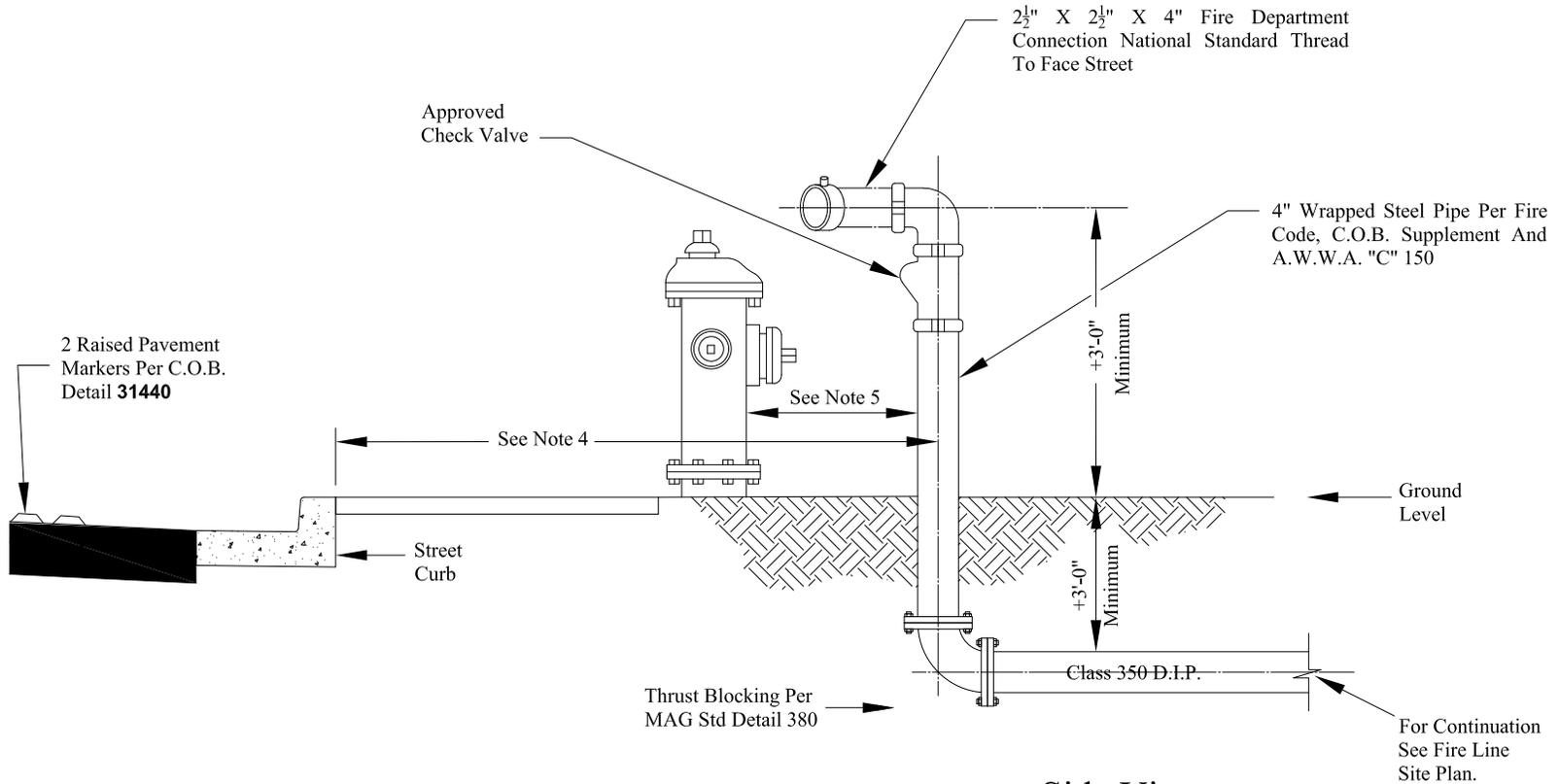
1. Backflow assemblies shall be tested for proper operation per the COB requirements. All testing shall be performed by a certified tester recognized by the City and test results provided to the Water Resources Department.
2. Adequate clearance shall be provided around fire riser. Dimensions from face of pipe shall measure a minimum of 12" off the back wall, 18" on each side and 36" clear in front with a full height door. The fire line shall extend a maximum of 3" into the building from inside face of wall to center of pipe.
3. Riser shall be hydrostatically tested at 200 PSI for two hours.
4. At #1 & #4 test ports install a 1/2" brass nipple. Tee and plugs w/ 1/2" x 1/4" male flared connection w/ cap (Install pressure gauge on tee outlet).
5. All internal fire risers shall have a separate external entry door with a Fire Dept. placard per COB Detail 31456 with Knox Box.
6. Underground fittings shall be flanged or restrained per MAG Std. Dtl. 303-2.

GENERAL NOTES:

1. Provide building I.D. on remote Fire Dept. connection per COB Detail 31456.
2. No trees, bushes or walls within 5' radius of Fire Department connection.
3. If fire sprinkler design indicates demand of 1000 GPM Or greater, the underground Fire Dept. connection line shall be increased to 6" diameter with a three way 2½" Fire Dept. hose connection.
4. 4' min. to back of curb, or 2' min to back of sidewalk, or when no curb, 4' max. outside the clear zone.
5. Locate FDC within 50' of an approved fire hydrant.



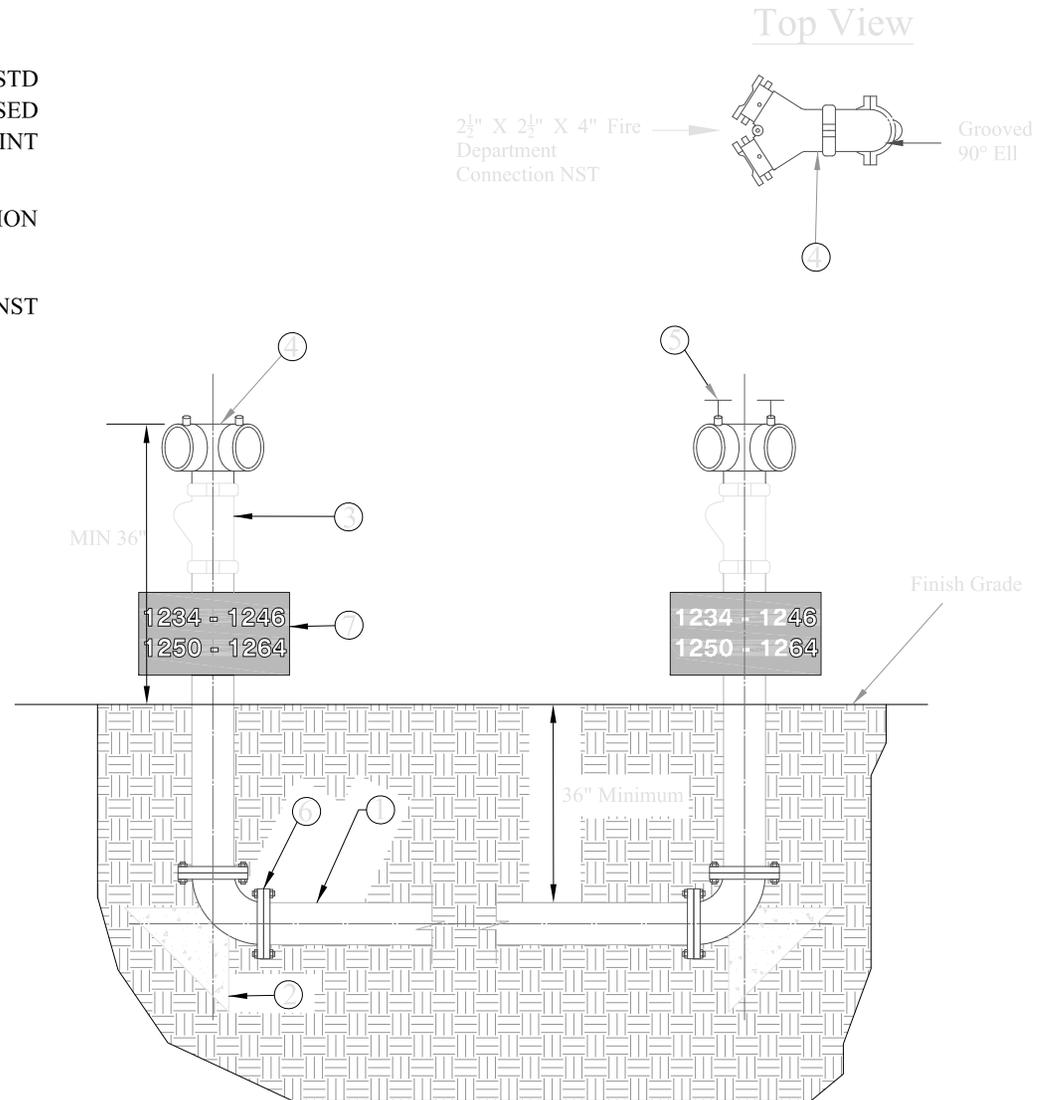
Top View

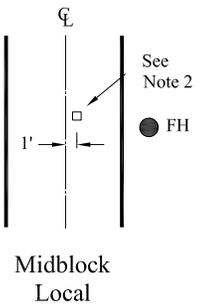


Side View

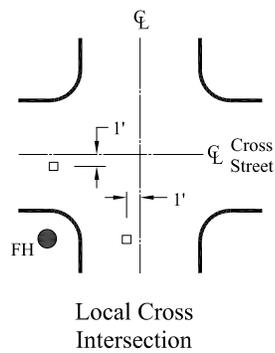
CONSTRUCTION NOTES:

- ① 4 INCH CLASS 350 DUCTILE IRON PIPE.
- ② THRUST BLOCK PER MAG STD DETAIL 380.
- ③ 4" WRAPPED STEEL PIPE PER FIRE CODE, MAG STD SPECIFICATION 610, AND AWWA "C" 150. ALL EXPOSED MATERIAL TO BE PROTECTED WITH AN APPROVED PAINT MATERIAL.
- ④ STANDARD BRASS FDC FEMALE THREADED CONNECTION (2) 2 ½" NST CLAPPERED WITH NO VALVES.
- ⑤ BRASS MALE THREADED CONNECTION WYE (2) 2 ½" NST GATED VALVES WITH CAPS.
- ⑥ 4 INCH FLANGED D.I.P. 90° EL.
- ⑦ SANDPIPE SIGNAGE PER COB STD DTL 31456.

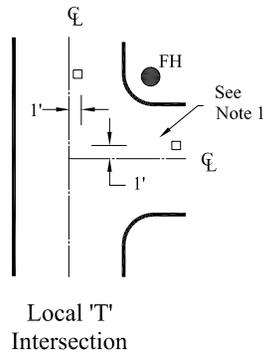




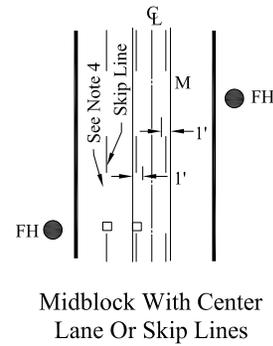
Midblock Local



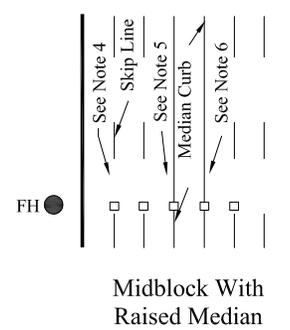
Local Cross Intersection



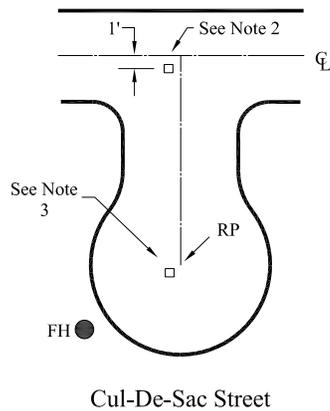
Local 'T' Intersection



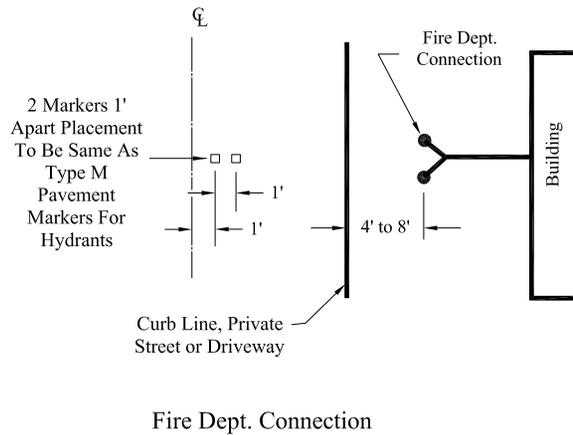
Midblock With Center Lane Or Skip Lines



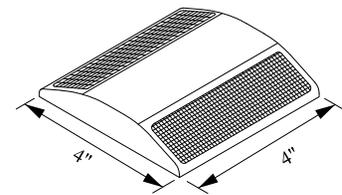
Midblock With Raised Median



Cul-De-Sac Street



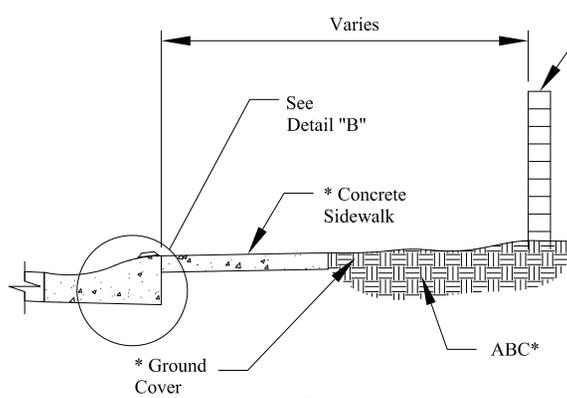
Fire Dept. Connection



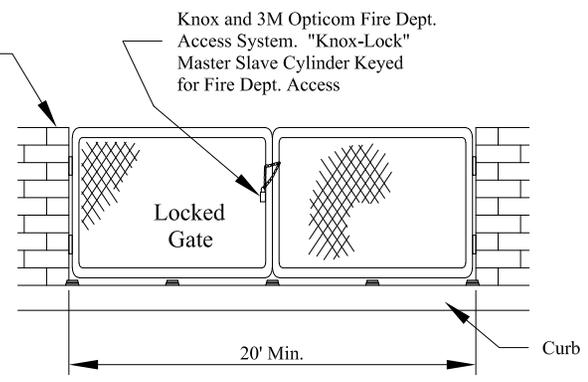
Type M Pavement Marker (2-way reflective blue)

GENERAL NOTES

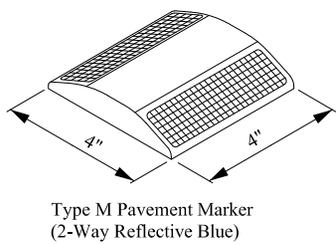
1. Not required on Dead End Streets without Hydrants.
2. Place on Hydrant side of centerline.
3. Not required when Cul-de-Sac is less than 250'.
4. To be placed in line with Skip Line.
5. Place on Gutter or adjacent to Curb.
6. Place on Top of Curb. (This location optional).
7. Pavement Markers shall not be placed within One (1) Foot of a Paint Line (Center to Center).



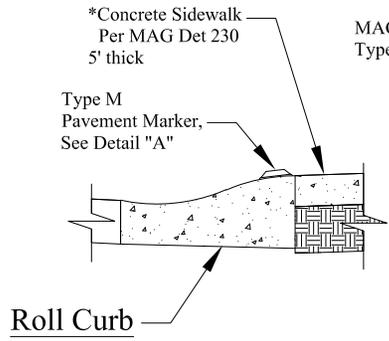
Side View



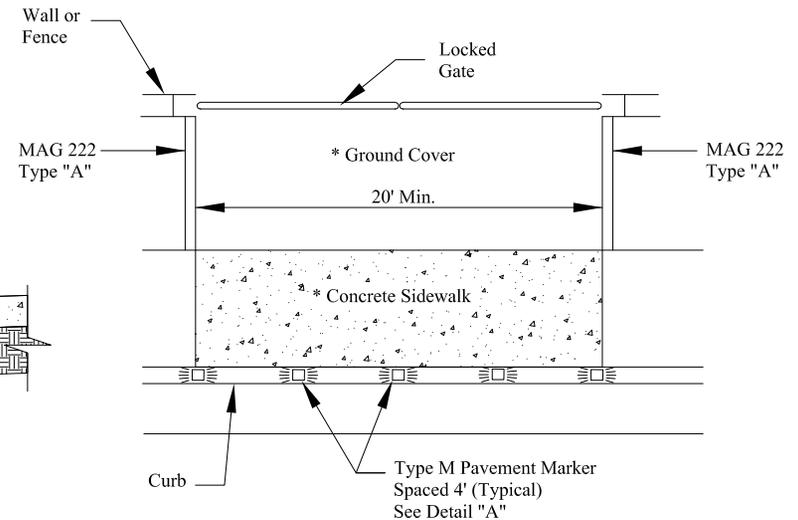
Front View



Detail "A"

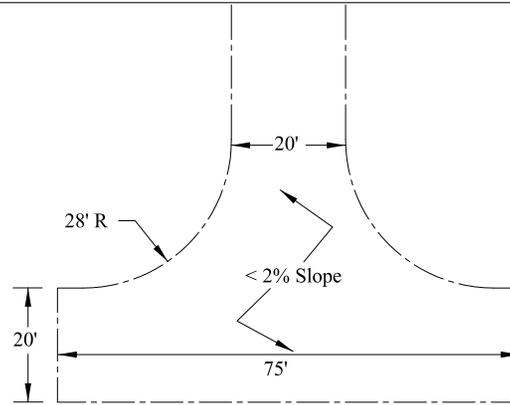
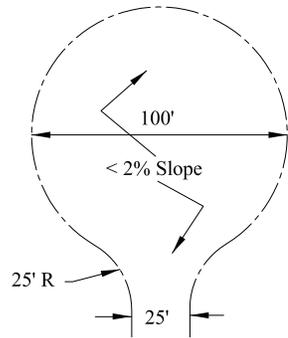


Detail "B"

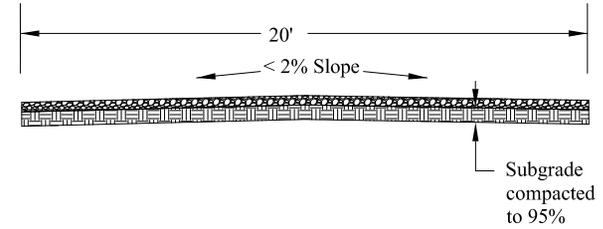


Top View

*Note: Sidewalk and/or 4" Max. ground cover over Min. 8" ABC



DETAIL A



DETAIL B

GENERAL NOTES

1. Unpaved Temporary access shall be in accordance with the Fire Code.
2. Access shall be constructed as per Detail B above and fire apparatus turnarounds shall be in accordance with either example in Detail Above when the access is in excess of 150'.
3. Fire apparatus access shall be designed and maintained to support the imposed loads of fire apparatus (75,000 lbs min.) and shall be provided with a surface so as to provide all weather driving capabilities.
4. For both UNPAVED and PAVED all dimensions displayed above are minimum values.
5. Paved Access Requirements

Turnarounds: All dead-end fire apparatus access in excess of 150' in Length shall be provided with approved apparatus turnarounds.

Surface: Paved per COB local street section minimum. Unpaved 3/4-minus decomposed granite on 8" MAG ABC all compacted to 95%.

Height: Unobstructed vertical clearance shall be not less than 13'- 6".

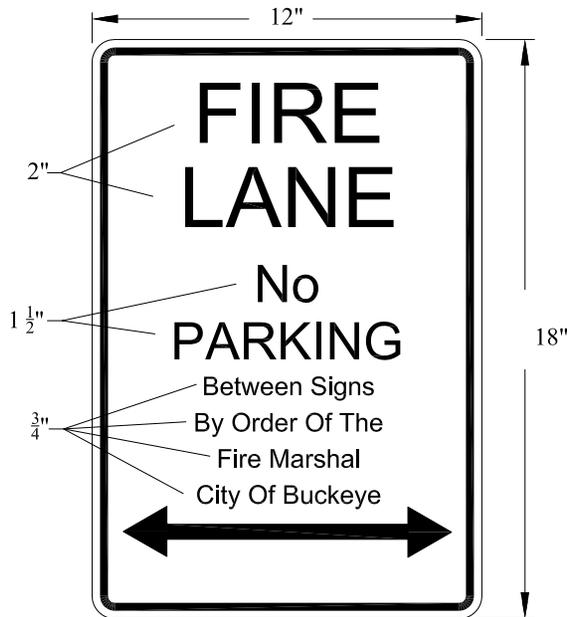
Width: Unobstructed width shall not be less Than 20'.

Slopes: Max slopes within the "T" & cul-de-sac shall be no greater than 2% in any direction.

GENERAL NOTES

1. Red reflective lettering with white background shall be 2" in height and 1/2" stroke.
2. Red reflective lettering with white background shall be 1" in height and 1/8" stroke.
3. All signs shall be weather resistant.
4. Font used on the sign shall be "CLEARVIEW"

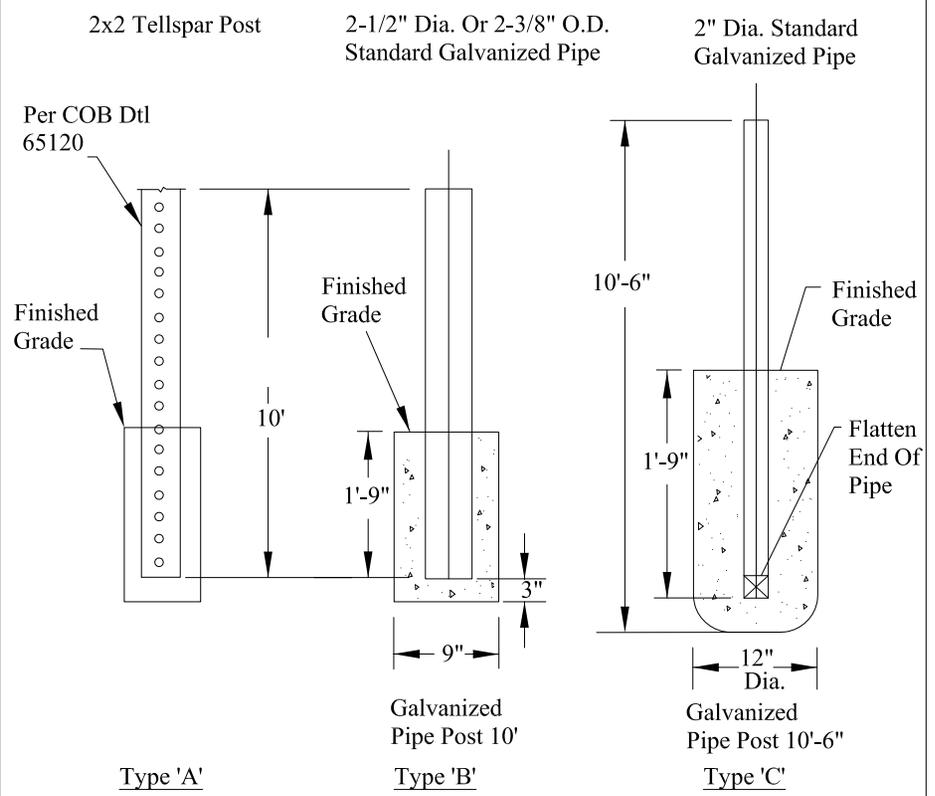




GENERAL NOTES

1. At the beginning and end of the fire lane, the sign shall have a single headed arrow pointing in the direction the regulation is in effect. The intermediate signs shall have double headed arrows pointing in both directions.
2. The maximum spacing of the signs shall be 100', contingent upon the City Engineer's review and approval.
3. The signs shall be set at an angle of not less than 30° nor more than 45° with the curb or line of traffic flow.
4. The clearance to the bottom of the sign shall be 7'. There shall be no other signs attached to the sign or the sign pole.
5. The sign plate shall be a minimum of 12" x 18" with a thickness of 0.80".
6. The sign face shall meet the COB sign sheeting standards. Use the standard sign face blank for a R7-32 or equivalent.
7. Signage lettering shall use the font Highway Gothic Modified "C".

Fire Lane Sign Base



- Type 'A': 2x2 Tellspar Post
- Type 'B' & 'C': Concrete base foundations shall be Class 'C' concrete.

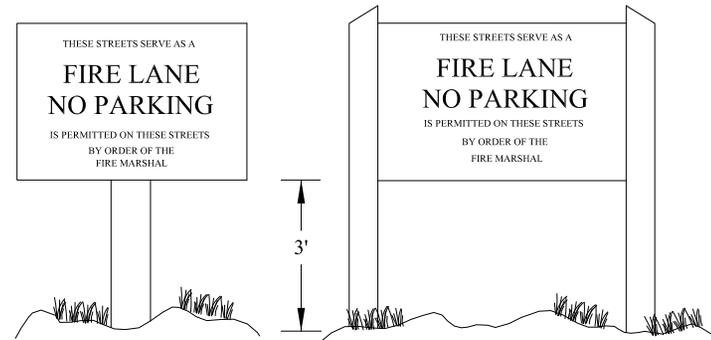
Minimum street width for fire lane sign placement

| * Width | Parking Conditions | Signs Required |
|----------------------|--|----------------|
| Less than 25' | No parking on Either side of street | This detail |
| 25' to less than 32' | Parking on one side Of street only | One side |
| 32' or more | Parking on both Sides of street | Not required |

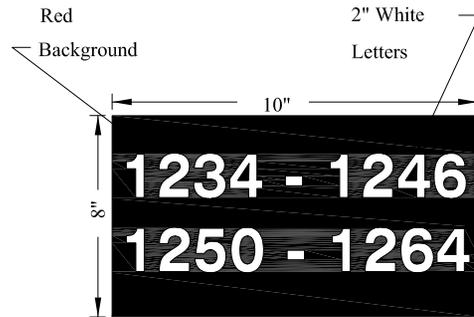
- * Rolled curbs shall be measured from back of curb to back of curb.
- * All other curbs shall be measured from face of curb to face of curb.

GENERAL NOTES

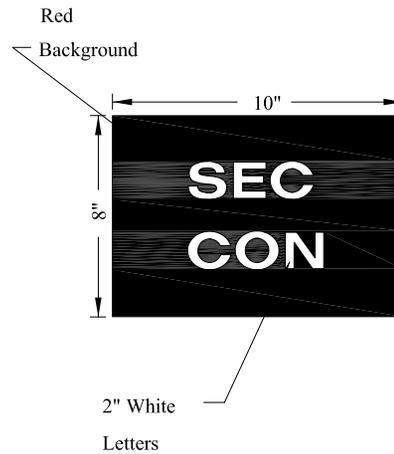
1. This sign may be used for private street and subdivisions in lieu of fire lane signs being posted every 75' and painted curbs.
2. 3" letters are 5/8" wide
3. 2-1/2" letters are 1/2 inch wide
4. 1" inch letters are 1/8" wide
5. All letters are red with a white background
6. Signs shall be mounted on either a single center post or double side posts. Posts may be Aluminum or wood.
7. Signs shall have a minimum dimension of 24" by 18" high.
8. The bottom of the sign is to be 3' above grade signs and posts are not supplied by the COB.
9. All signs shall be visible upon entering the private street.
10. All signs shall be maintained, so they are legible.



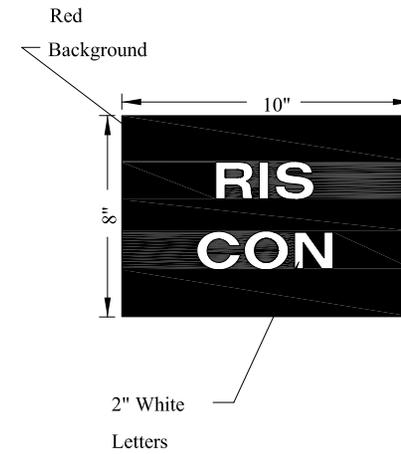
SIGNAGE A



SIGNAGE B

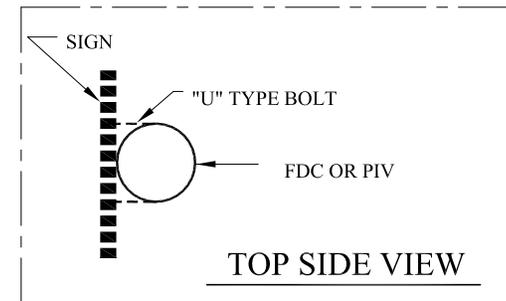


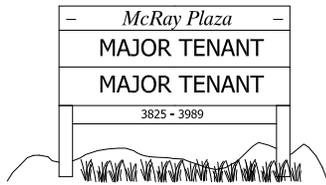
SIGNAGE C



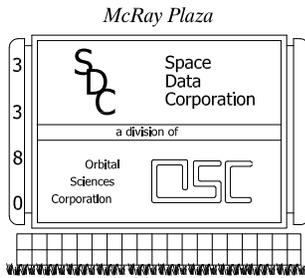
GENERAL NOTES

1. The signs shall include the address(s) of the premise(s) serving the FDC or PIV.
2. The signs shall be red in color with white lettering and shall be 0.08 gauge Aluminum and shall be securely attached to the FDC or PIV with "U" type bolts.
3. The sign face shall meet all COB sign sheeting requirements.

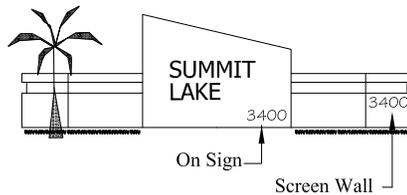




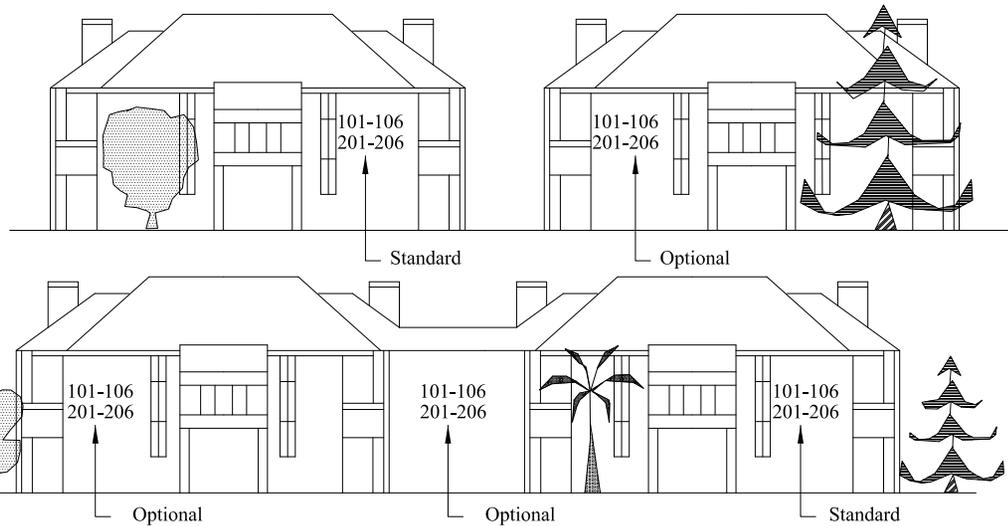
The low-high address shall be posted on the center identification sign at main entrance of commercial mall, center, village, or square, so as to be visible from a North-South or East-West direction.



Permanent fixture with the Situs Address shall be placed in a conspicuous location if not viewable from thoroughfare frontage so as to be visible from a North- South or East-West direction.



Address may be displayed on a complex identification sign or on the screen wall at the main entrance so as to be visible from a North-South or East-West direction.



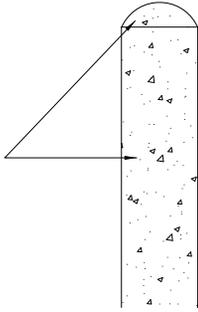
Building identification numbers and intervals of sub-structure suffixes assigned to individual units shall be displayed in the upper, right hand corner at the end of each building so as to be plainly visible from the access thoroughfare. Alpha characters may be assigned for building identification for multi-family developments where single digit sub-structure suffixes are used. Multifamily developments with internal drives, building letters/numbers and range of sub-structure suffixes shall be posted on each side of building so as to be clearly visible from all access drives and thoroughfares.

**** EXCEPTION:** Interval of sub-structure suffixes may be displayed elsewhere on building due to required landscaping, subject to approval of the street naming and addressing coordinator. Color of numbers/letters and background shall contrast and conform to requirements for Helvetica Medium numbering/lettering. Distance at which letters/numbers shall be legible from center of thoroughfare:

- 0-50' 4" - Applies to single family and multifamily residential, commercial malls, centers or villages.
- 50-200' 10" - Interval of low-high sub-structures suffixes for Multi-Family developments may be a minimum of 6"-8" in height. Interval of low-high situs addresses on center identification sign may be a minimum of 8" in height.
- 201-300' - 12"
- 301-400' - 14"

For commercial malls, centers, villages and squares, distance to be measured from center of access drive to structure(s).

Post to be filled with concrete and rounded on top



6" reflective engineer's tape (3M high density yellow pressure sensitive tape or approved equivalent)

6" galvanized steel pole

Concrete

6" x 7'-4.5" sign to be red reflective with white reflecting letters. Each sign facing opposite direction (Typ)

2" MIN
4" MAX

12" MIN.

Eye bolt (Typ)

1/4" steel chain link with cut link

Max 6" sag

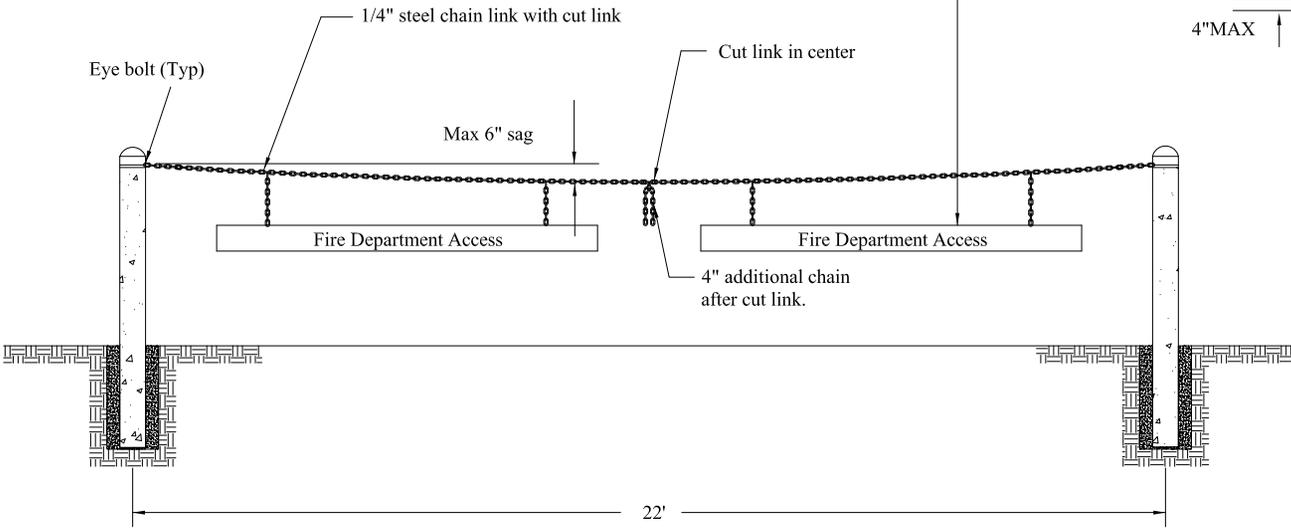
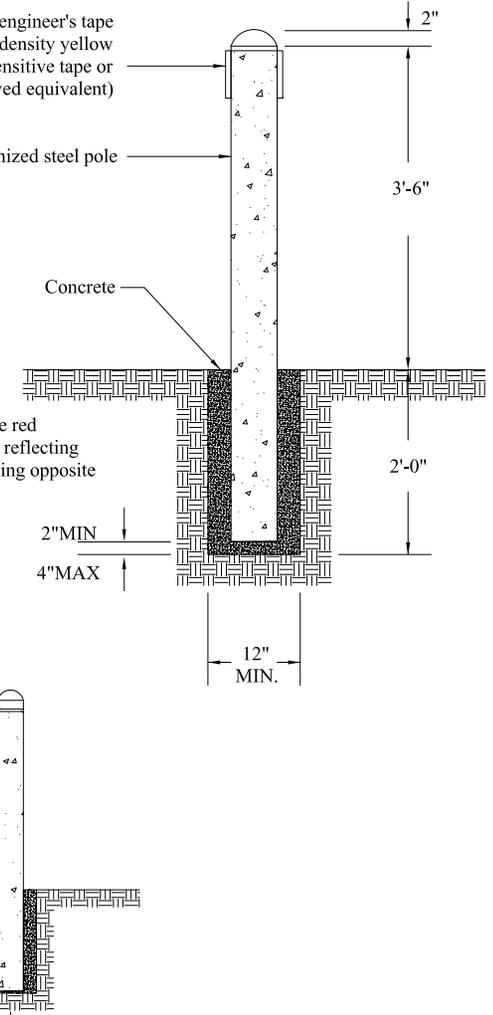
Cut link in center

Fire Department Access

Fire Department Access

4" additional chain after cut link.

22'



RESOLUTION NO. 55-20

A RESOLUTION OF THE MAYOR AND CITY COUNCIL OF THE CITY OF BUCKEYE, ARIZONA, APPROVING AND ADOPTING THE JUNE 16, 2020 WATER ENGINEERING DESIGN STANDARDS; AND DECLARING AS A PUBLIC RECORD THAT CERTAIN DOCUMENT ENTITLED “CITY OF BUCKEYE WATER ENGINEERING DESIGN STANDARDS” DATED JUNE 16, 2020.

BE IT RESOLVED BY THE MAYOR AND CITY COUNCIL OF THE CITY OF BUCKEYE, ARIZONA, as follows:

WHEREAS, the City Code of the City of Buckeye, Arizona (the “City”), including the City Development Code, requires landowners and/or developers to design, construct, install and pay for and, until accepted by the City pursuant to City requirements, be responsible for the cost of operating, maintaining and repairing any and all facilities and appurtenances on-site and/or off-site, necessary to produce, treat and deliver water to the development or subdivision of the landowner and/or developer.

WHEREAS, in order to provide to the development community written City policy, design criteria and standards for designing, constructing and installing the required water infrastructure to serve the water demands of the proposed development, the City Engineer prepared certain water engineering design standards which were adopted by Mayor and City Council (formerly Town Council) in December, 2012 by adoption of Resolution No. 133-12.

WHEREAS, the City desires to modify and replace the water engineering design standards adopted by Resolution No. 133-12.

NOW THEREFORE, BE IT RESOLVED BY THE MAYOR AND CITY COUNCIL OF THE CITY OF BUCKEYE, ARIZONA, as follows:

Section 1. The certain document entitled “City of Buckeye Water Engineering Design Standards,” dated June 16, 2020, of which at least three paper copies or one paper copy and one electronic copy are on file in the Office of the City Clerk and open for public inspection during normal business hours, is hereby declared to be a public record and said copies are ordered to remain on file with the City Clerk.

Section 2. The City of Buckeye Water Engineering Design Standards, dated June 16, 2020, are hereby approved and adopted, and the previous water engineering design standards adopted by Resolution No. 133-12 are hereby replaced by the City of Buckeye Water Engineering Design Standards approved and adopted by this Resolution No. 55-20.

Section 3. The Water Engineering Design Standards may be modified or revised from time to time by Mayor and City Council of the City of Buckeye; provided however, that the City Engineer is hereby authorized to make typographical or technical corrections to the Water Engineering Design Standards, including corrections or improvements to maps, drawings, detail,

and graphics of the Water Engineering Design Standards, that do not result in substantive changes to the Water Engineering Design Standards.

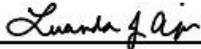
Section 4. The Mayor, the City Manager, the City Clerk, the City Attorney and the City Engineer are hereby authorized and directed to take all steps necessary to carry out the purpose and intent of this Resolution.

PASSED AND ADOPTED by the Mayor and City Council of the City of Buckeye, Arizona, this 16th day of June, 2020.



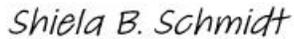
Jackie A. Meck, Mayor

ATTEST:



Lucinda J. Aja, Town Clerk

APPROVED AS TO FORM:



Shiela B. Schmidt, City Attorney