

PROVIDING MORE



2020 DEVELOPER & ENGINEERING GUIDE

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TABLE OF CONTENTS

Note: Throughout this Developer & Engineering Guide, "Utility" means EPCOR Arizona Inc.

CHAPTER 1 - DEVELOPER GENERAL INFORMATION

MAIN EXTENSION PROCESS FLOWCHART	6
FEE SCHEDULE	7
SUMMARY OF KEY POINTS IN THE MAIN EXTENSION PROCESS	8
WATER METER INSTALLATION CHECKLIST	10
UTILITY OWNERSHIP OF FACILITIES	11
SUBMITTAL LIST	1ERROR! BOOKMARK NOT DEFINED.
REQUIREMENTS FOR DEVELOPER DESIGNED AND BUILT WATER/SEWER MAIN EXTENSIONS	13
CERTIFICATES OF ASSURED OR ADEQUATE WATER SUPPLY AND GRANDFATHERED RIGHTS.....	16

CHAPTER 2 - ENGINEERING MASTER PLAN AND DESIGN CRITERIA

MASTER PLANNING AND DISTRIBUTION MAIN REQUIREMENTS	18
WATER MASTER PLAN OUTLINE	20
DESIGN CRITERIA FOR WATER SYSTEMS	22
DESIGN CRITERIA FOR FIRE LINES.....	27
DESIGN CRITERIA FOR WASTEWATER SYSTEMS	ERROR! BOOKMARK NOT DEFINED.8

CHAPTER 3 - CONSTRUCTION DRAWINGS

CONSTRUCTION DRAWING REQUIREMENTS.....	33
PLAT DEDICATION VERBIAGE	35
AS-BUILT REQUIREMENTS	36
WATER/SEWER "AS-BUILT" CERTIFICATION	37

CHAPTER 4 - CONSTRUCTION INSPECTION

PROCEDURE FOR SCHEDULING WATER LINE CONSTRUCTION INSPECTIONS	39
PROCEDURE FOR SCHEDULING SEWER LINE CONSTRUCTION INSPECTIONS	40

CHAPTER 5 - BACKFLOW PREVENTION

BACKFLOW PREVENTION APPROVAL PROCESS4**ERROR! BOOKMARK NOT DEFINED.**
PREMISES REQUIRING BACKFLOW PREVENTION4**ERROR! BOOKMARK NOT DEFINED.**
BACKFLOW PREVENTION OPERATIONAL APPROVAL FLOWCHART 43

CHAPTER 6 - PRETREATMENT REQUIREMENTS

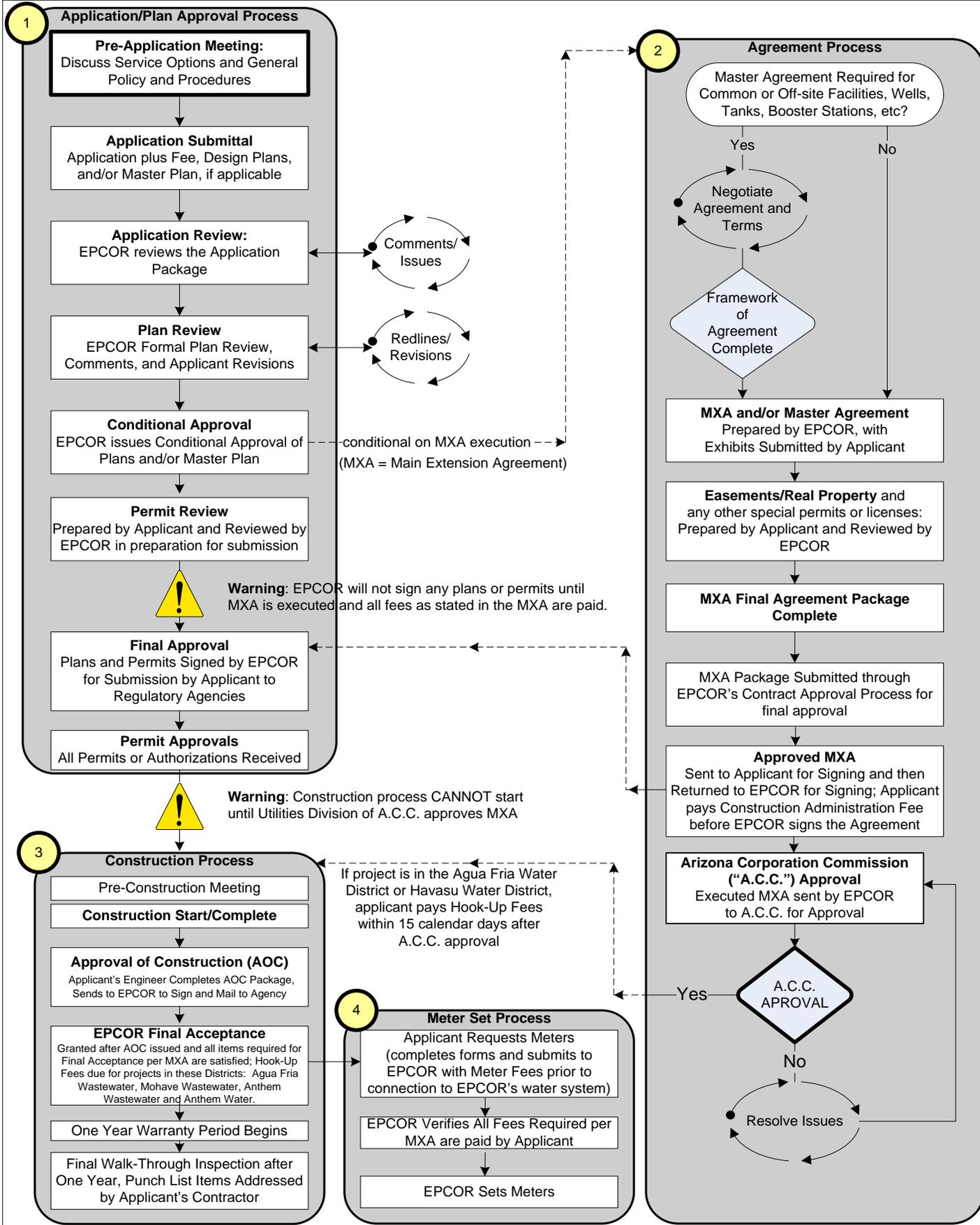
APPROVAL PROCESS..... 45
PLAN REVIEW..... 45
INDUSTRIAL DISCHARGE CRITERIA..... 45
DENTAL FACILITES 45
FOOD SERVICE FACILITES CRITERIA 45
TABLE NO. 1 - DRAINAGE FIXTURE UNITS FOR FOOD SERVICE FACILITES 46
TABLE NO. 2 - MINIMUM GGI SIZE BASED ON TOTAL DFUs..... 46
TABLE NO. 3 - GGI SIZING FOR UNFINISHED BUILDING SHELLS 46

APPENDIX

ENGINEERING DETAILS (INCLUDING GENERAL NOTES AND MATERIAL SPECIFICATIONS)

CHAPTER 1

DEVELOPER GENERAL INFORMATION



EPCOR WATER DEVELOPER SERVICES – FEE SCHEDULE

All fees are subject to change.

<p>Review Fee for Master Plan Reports for developments with 100 or less residential services</p> <ul style="list-style-type: none"> • This Fee is submitted to Utility along with the “Application for Water or Sewer Main Extension” and with the Master Plan Report. • The Types of Master Plan Reports include water, sewer, and reclaimed water. 	\$1,500 per report type
<p>Review Fee for Master Plan Reports for developments with more than 100 residential services</p> <ul style="list-style-type: none"> • This Fee is submitted to Utility along with the “Application for Water or Sewer Main Extension” and with the Master Plan Report. • The Types of Master Plan Reports include water, sewer, and reclaimed water. 	\$2,500 per report type
<p>Review Fee for Master Plan Reports for commercial developments</p> <ul style="list-style-type: none"> • This Fee is submitted to Utility along with the “Application for Water or Sewer Main Extension” and with the Master Plan Report. • The Types of Master Plan Reports include water, sewer, or reclaimed water. 	\$2,500 per report type
<p>Plan Review Fee</p> <ul style="list-style-type: none"> • Does not apply to projects that are “fire protection services only.” • This Fee is submitted to Utility along with the “Application for Water or Sewer Main Extension” and with the first submittal of engineering plans and specifications to Utility for review. 	\$5,000
<p>Plan Review Fee – for Fire Protection Services Only</p> <ul style="list-style-type: none"> • This Fee is submitted to Utility along with the “Application for Fire Lines” and with the first submittal of engineering plans and specifications to Utility for review. 	\$2,500
<p>Construction Administration Fee</p> <ul style="list-style-type: none"> • Does not apply to projects that are “fire protection services only.” • This fee is due upon execution of the Main Extension Agreement. • The developer’s engineer determines the estimated total cost of construction of the main extension, which is added as an exhibit to the Main Extension Agreement. 	\$6,500 + 5% of the Engineer’s Estimated Total Cost of Construction
<p>Line Testing Water Fee</p> <ul style="list-style-type: none"> • This fee is due upon execution of the Main Extension Agreement. • This fee is the cost of the water used during testing of the main extensions (i.e., flushing, chlorination, filling). 	9 x (volume of the main extensions) x Water Rate per the applicable Water Tariff
<p>Application for Public Fire Hydrants</p> <ul style="list-style-type: none"> • This fee is due after Utility’s review of the completed Application and before construction begins. 	\$750 per hydrant
<p>Hook-Up Fees</p>	As Stated in Tariff
<p>Water Meter Fees</p>	As Stated in Tariff

SUMMARY OF KEY POINTS In the MAIN EXTENSION PROCESS

This outline provides an overview of the key procedures involved in administration, design, and construction of water distribution or sewer collection facilities for developer-funded projects. These procedures have been designed to promote efficient completion of projects at the lowest possible cost. Adherence to these procedures will avoid costly delays.

1. When it is determined that a proposed development is within EPCOR Arizona Inc. ("Utility") service area, the Applicant will complete an Application for Water or Sewer Main Extension ("Application") and will submit the Application along with engineering plans and a \$5,000 Plan Review Fee to Utility. The Plan Review Fee is a non-refundable contribution intended to cover the initial cost of Utility's project management expenses, including reviews of engineering plans, specifications and design reports, preparation and reviews of the Main Extension Agreement (MXA) and coordination of flow tests where necessary. The Application is available on EPCOR's website ([HERE](#)).
2. The Plan Review Fee is structured to cover up to two reviews of engineering plans, specifications and design reports. If the Applicants' Engineer fails to satisfactorily address Utility's review comments with its second submittal, the remaining portion of the Plan Review Fee may not be sufficient to cover Utility's time to review the engineer's third submittal. In that case, or in any other case where the Utility's costs exceed the Plan Review Fee, Utility will not continue work until a second \$5,000 Plan Review Fee is submitted.

Second reviews of engineering plans are intended to focus only on changes requested from Utility as a result of the initial review, and will not be considered a complete review. As such, any changes made to the plans must be clearly identified so the plan reviewer can maximum the use of their time and focus solely on plan revisions. If other changes have been made to the plans (those not requested from the Utility), they must be clearly called out as changes, or there is the possibility that these changes could be rejected during construction, and result in costly delays.

3. **Utility will not begin any work until the \$5,000 Plan Review Fee is received.** Upon receipt of the Plan Review Fee, Utility will assign a project manager to coordinate with the Applicant's Engineer to assist them in developing engineering plans and specifications in accordance with Utility's requirements. These requirements are outlined in Utility's Developer Guide, which is available on EPCOR's website. During the course of plan development, the following may be required from the developer:
 - a. A letter or design report from the Engineer estimating the ultimate population equivalents for the development, the average and maximum anticipated daily water demands (or wastewater flow rates) for domestic, irrigation, and fire protection, and the anticipated number and sizes of meters and service lines and proposed backflow prevention devices.
 - b. A letter from the jurisdictional fire protection agency setting forth requirements for fire flows, public fire hydrants, and/or private fire protection systems. These requirements must be incorporated into the engineering plans. The letter and plans must show the minimum required fire flow shown in gallons per minute and duration shown in hours.
 - c. Preliminary plats or final plats showing lot numbers with corresponding street addresses and public utility easements. **A final recorded plat is required prior to final closeout.**
 - d. Easements minimum 12 feet in width for all water/sewer facilities that are out of public right-of-way. Larger width easements may be required in certain cases. Utility's easement forms are available upon request. Draft easement forms, deeds, ALTA surveys and title reports will be submitted for Utility review prior to recordation of easements or execution of deeds. After Utility approval, developer will be responsible for recording the easements. A notarized copy of the recorded document shall be provided to Utility. Recorded off-site easements will be required prior to construction. Recorded on-site easements are required prior to activation of service.
 - e. One complete set of final engineering sealed plans (approved by the fire protection agency, the governing regulatory agency, and Utility).
 - f. Copies of Certificates of Approval to Construct as issued by the governing regulatory County or State agency.
 - g. A material breakdown sheet in a format approved by Utility showing the quantity, size, and estimated construction cost of all water/sewer facilities to be conveyed to Utility, including permitting and engineering costs. This sheet must be signed and sealed by an engineer.

4. **Construction Administration Fee**

Before Utility will sign the approval block on the engineering plans, Utility must receive the Construction Administration fee, described in the Main Extension Agreement. The Construction Administration fee covers Utility's estimated construction administration expenses, including inspecting and testing the construction work, participating in construction progress meetings, reviewing as-built engineering drawings, coordinating with the Utilities Division of the Arizona Corporation Commission (see paragraph 7 below), coordinating with the governing regulatory County or State agency to obtain the Certificate of Approval of Construction, reviewing Applicant's invoices (see paragraph 8.b below), reviewing ALTA surveys, title reports, easement and deed documents, coordinating meter set requests, and facilitating other numerous internal project management activities. An invoice for this fee will be sent to the Applicant at the time the plans are ready to be signed by Utility. **The Construction Administration fee is \$6,500 plus 5% of the Engineer's Estimated Total Cost of Construction.** The Engineer's Estimated Total Cost of Construction is the agreed-upon cost as detailed in paragraph 3.g above. This fee is a non-refundable contribution in aid of construction.

5. Where Utility is responsible for constructing the project, the following steps will be taken:

- a. Utility will sign / approve the engineering plans provided by the Applicant's Engineer.
- b. Applicant's Engineer will obtain all required permits, including the "Approval to Construct" and the Certificate of Assured Water Supply, and will furnish copies of these permits to the Utility.
- c. The Applicant must specify, in writing, the date for the Utility to put the project out to bid ("Request to Bid"). Utility will determine the bid due date. Any Applicant requirements regarding time constraints (construction completion deadlines) must be noted in the Request to Bid. Please note the estimated time required from the invitation to bid to the start of construction may be four to eight weeks.
- d. Utility will solicit bids from qualified contractors.
- e. After Utility receives and reviews the bids, Utility will provide Applicant a bid evaluation report that includes the recommended contractor, the bid amount, and the Contractor's construction schedule. If the Applicant deems the contract price or construction schedule is unreasonable, the Applicant may solicit bids from bonded contractors provided that all bids are submitted by the bid due date stipulated by Utility. If a lower bid is obtained, or if a bid is obtained at an equal price with a more preferred construction schedule, Utility may continue to use Utility's chosen contractor but only if the chosen contractor meets the terms and conditions of the bid proffered; otherwise, Utility will be required to contract with the contractor proffering such bid.
- f. Prior to the start of construction, the Applicant will pay to Utility, as a refundable advance in aid of construction, the cost of the selected Contractor's bid, plus the estimated cost of Utility's labor and overhead, contingency for the construction costs, which is calculated as 10% of the total of construction and Utility's labor.
- g. After construction completion Utility will issue a final acceptance letter for the project and audit the projects costs. If the actual costs are less than the amount advanced by the Applicant, Utility will refund the difference to the Applicant within 30 days after construction completion.
- h. Utility will refund the Applicant's refundable advances in aid of construction in accordance with Arizona Administrative Code § R14-2-406.D for water and § R14-2-606.C for sewer. Any unrefunded balance of such advances remaining at the end of the applicable refund period shall become non-refundable. No interest shall be paid on any amount advanced by Applicant.

6. The Contractor's insurance coverage must be in the types and amounts required by Utility and must include Utility as an additional insured. A sample certificate of insurance form with the required coverage is available upon request. The Contractor is responsible to coordinate the site pre-construction meetings, inspection schedules and testing of new facilities by notification to Utility two business days prior to any planned activity.

1. All main extension agreements will be filed with and approved by the Utilities Division of the Arizona Corporation Commission ("ACC"). No agreement will be approved by the ACC unless accompanied by a Certificate of Approval to Construct or an exemption letter by the State or County regulatory agency. Construction shall not begin until approval is received from the Utilities Division of the ACC, which typically takes a minimum of 4 to 6 weeks.

8. After completion and testing of the new facilities, the following items are required to be submitted to and approved by Utility prior to activation of water/sewer service:

- a. All items listed in section 3

- b. Copies of Certificates of Approval of Construction as issued by the governing regulatory County or State agency.
 - c. Applicant's actual cost breakdown, including copies of all contracts and paid bills, invoices and other statements of expenses incurred by developer, covering all of the costs of permitting, design, and construction of the water/sewer facilities
 - d. Unconditional lien waivers and releases
 - e. One set of sealed and certified as-built engineering plans on full-size bond paper, and one set on flash drive or as a PDF file
 - f. Recorded plat, easements and deeds
 - g. Backflow Certification, as required per Chapter 5, Backflow Prevention
 - h. Final walk-through inspection by Utility and resolution of all punch list items
 - i. Payment of all applicable tariff fees (meter fees, hook-up fees, etc.)
9. For all projects that involve a Main Extension Agreement, the above information is required before Utility will accept the facilities constructed by the Applicant and before refunds of advances are initiated. After Utility issues its written final acceptance of the new facilities, project closeout begins, which includes the final balancing of Applicant advances. **Utility will not provide water service until after it provides the final acceptance letter.**

The above steps are not necessarily all inclusive, but rather an outline of critical points in the development of developer-funded projects. These steps should be referenced when planning such projects. Other specific project requirements may apply on a case-by-case basis.

WATER METER INSTALLATION CHECKLIST

Before Utility will set a meter, the Applicant is responsible to ensure the following items have been addressed:

- o **Parcel Name, lot and address must be clearly posted in front of the premises.**
- o All lot grading must be within six (6) inches of final grade.
- o Meter box must be unbroken (with lid), level and adjusted to final grade.
- o Meter box must be free of all dirt and debris.
- o Meter box must be unobstructed and accessible.
- o Angle valve must be undamaged, flush with box and in correct location (see EPCOR Detail 342-2)
- o Backflow device (if required – such as for irrigation meters) must be installed prior to meter set.

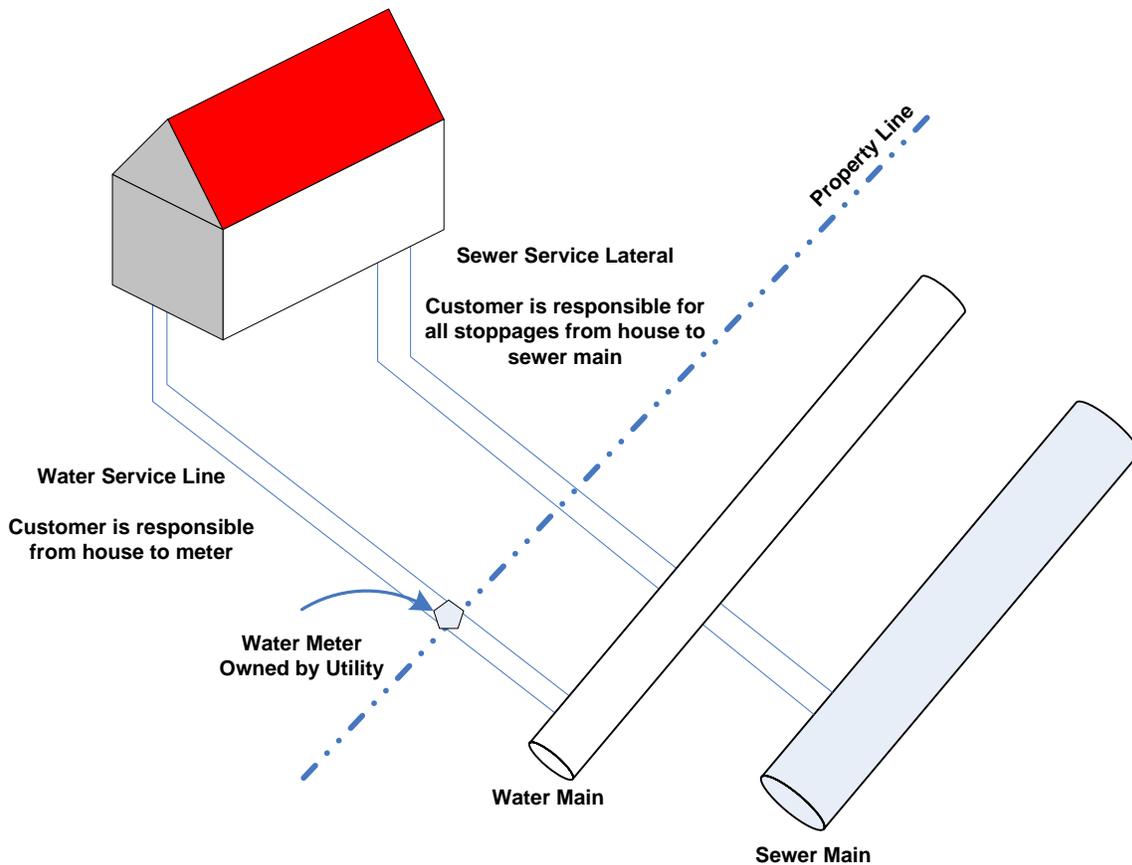
The Customer shall provide and maintain a private cutoff valve within 18-inches of the meter on the Customer's side of the meter in accordance with AAC R14-2-405.B.3.

The Applicant must complete a water meter application and attach a clearly visible photo of the water meter box, lid, and lot sign showing the lot number or address of the property requesting water service.

UTILITY OWNERSHIP OF FACILITIES

All water facilities on the Utility side of the service meter, including meter, are owned by Utility. All fire hydrants and related facilities are owned by Utility (except in Mohave County). Fire sprinkler taps, isolation valves, and that portion of the fire sprinkler services in the street rights-of-way or dedicated public utility easements are owned by Utility.

All sewer mains are owned by Utility. Utility will repair all leaks and will remove all stoppages in the sewer main. The property owner is responsible for all leaks and stoppages in the sewer service lateral. For that portion of the sewer service lateral outside the boundary of the parcel of private property, the property owner is responsible for all stoppages and Utility is responsible for all structural defects or failures (including penetration of tree roots). In all cases, when a problem arises with a sewer service lateral within the boundaries of the private property, the property owner is solely responsible.



The water and sewer facilities to be owned by Utility as described above shall become the sole property of Utility when Utility issues Final Acceptance of such facilities. Full legal and equitable title in the facilities shall be vested in the Utility, free and clear of any liens, without the requirement of any written document of transfer to Utility or acceptance by the Utility.

DEVELOPER SERVICES SUBMITTAL LIST

<u>Item</u>	<u>Code</u>	<u>Item Description</u>
1.	a,1	24" x 36" Blue-line Plan and electronic PDFs of each sheet
2.	c,1	Water/Sewer Material Specifications
3.	a,1	Property Legal Descriptions in 8 ½" x 11" format suitable for incorporation into the Main Extension Agreement
4.	a,1	Project Drawing showing property, easements, water/sewer facilities and ROWs in 8 ½" x 11" format suitable for incorporation into the Main Extension Agreement
5.	a,1	Legal Descriptions in 8½" x 11" format for incorporation into the easement document (if needed). All legal descriptions shall have a corresponding exhibit.
6.	a,1	Engineer's Estimate of Probable Cost
7.	a,1	Certificate of Approval to Construct (ATC)
8.	d,1	Main Extension Agreement (MXA)
9.	a,1	Master Plans/Design Report for subdivision development
10.	a,1	Water/Sewer Service Agreement
11.	a,1	Address/Lot Map/CAD File
12.	c,2	Trench Compaction Test Results
13.	a,2	Final Recorded Property Plat and/or Final Recorded Easement
14.	c,2	Backflow Prevention Assembly and Certification Data submitted to Utility's Backflow Prevention Specialist for Approval
15.	a,1	Pre-treatment Approvals
16.	b,2	Certificate of Assured or Adequate Water Supply, whichever applies
17.	a,2	Certified As-Built Plans on 24" x 36" bond paper (plus one set on 11" x 17" paper), and one set as CAD and PDF files
18.	b,2	Complete Project Invoice/Cost Data, Approval of Construction (AOC)
19.	c,2	Lien Waivers
20.	a,1	Well Siting Study
21.	a,2	ADWR Non-Exempt Well Permit
22.	b,2	ADWR form Request to Change Well Information (change of ownership)

Codes:

a - Typically provided by Engineer	1 - Required prior to Start of Construction
b - Typically provided by the Applicant	2 - Required prior to Final Acceptance
c - Typically provided by Contractor	
d - Provided by Utility	

*All items listed with code of 1 shall be submitted to the Utility and approved prior to the Utility's approval of the Applicant's construction Plans

Items from Developer by 2nd plan review submittal:

1. Current ALTA survey of parcel with the future alignment of Easement mapped (if possible).
2. Current Title Report for Easement Property.
3. Boundary Closure Certification of Easement
4. Signed and Sealed by Engineer 8.5 x 11 Legal Description and Exhibit
5. Verify Public Access to the Easement, may have to submit Approved Site Plan, showing dedicated public access
6. Whenever possible, Easements should be recorded on the Final Plat with EPCOR Dedication Language provided in our Developer Guide.
7. GIS Data submittal for Legal Description Exhibit (Mapping see Requirements below). EPCOR requires digital submission of easement data, including (a) PDF format for the instrument itself, and (b) the geometry of the easement in GIS (SHAPE or GDB) or CADD (.DWG or .DGN) format. Graphics relating to the easement shall be on a separate layer so it can be isolated from adjacent graphics.

Note: All easements must be entered into simultaneously with the related MXA or the related MXA must be in effect and fully executed prior to delivery of the easement.

Note: The easement grantor need not necessarily be the same party as the Applicant. The easement grantor needs to be the party that owns the affected real property. In any case, where the Applicant and the easement grantor are different, consult with **EPCOR Real Property Manager (see contact list)**.

GIS Requirements: The digital easement geometry should conform to the basic topology rules including:

Lines must not overlap	Must not have gaps
Must not intersect with existing parcels	Cannot overlap self
Must be closed polygon (in the case of polygons)	

Digital submittals must follow an existing EPCOR spatial reference (coordinate system and horizontal datum):

AZ – Phoenix metro and Tubac: NAD 1983, State Plane Arizona Central, Feet

AZ – Mohave County: NAD 1983, State Plane Arizona West, Feet

NM – Edgewood/Thunder Mountain: NAD 1983, State Plane New Mexico Central, Feet

NM – Clovis: NAD 1983, State Plane New Mexico East, Feet

**REQUIREMENTS FOR DEVELOPER-DESIGNED AND BUILT
WATER/SEWER MAIN EXTENSIONS**

1. Applicant shall prepare and submit Water or Sewer Plans in accordance with the requirements outlined in Chapter Three.
2. Utility will be available to discuss plan development and design concepts. Applicant is encouraged to contact Utility prior to plan development for special instructions that may apply to a particular expansion.
3. Easements, legal descriptions and exhibits are required for all Utility owned facilities that are not within dedicated rights-of-way. Easements shall have a minimum width of 20 feet and shall be centered about the centerline of the Utility-owned facilities. Utility may require wider easements for larger diameter water or sewer mains or where deeper excavation is required or where soil conditions require wider trenching. For cases where Utility will have a waterline and sewerline within the same easement, the easement shall have a minimum width of 30 feet (with a minimum of 4 feet between edge of pipe and easement boundary). The easement legal descriptions and exhibits shall be submitted on 8½" X 11" sheets and signed and sealed by a Professional Civil Engineer or Land Surveyor registered in the State of Arizona. No other utilities are permitted within EPCOR's easements except when crossing the easement in 90-degree angles.
4. Water and sewer mains must have a minimum distance of 12 feet from buildings or retaining walls, as measured from the edge of the building foundation or wall to the outside of the main. In rare cases where a water or sewer main must encroach within 12 feet from a building or retaining wall, additional protection is required. Additional protection may include the use of a sleeve for the

main, or modifications to the footing of the structure, to prevent damage in the event of a main break.

5. For all main extensions, Applicant is responsible to install the main along the entire length of the Applicant's property line frontage of that property being developed. The property line frontage is defined as that portion of a parcel of property that abuts a street, easement, or public rights-of-way. If a parcel to be developed has more than one frontage, the main shall be extended along all frontages.
6. Prior to commencing construction, Applicant must supply Utility with an "Approval to Construct" as issued by the Maricopa County Environmental Services Department (for projects in Maricopa County), by the Santa Cruz County Department of Environmental Quality (for projects in Santa Cruz County), by the Arizona Department of Environmental Quality (for projects in Mohave County), or approved delegate. For projects that are exempt from the plan review requirements per A.A.C. R18-5-505.B.3, the Applicant shall submit to Utility a letter from the applicable regulator confirming the exemption. The ATC and exemption letter are also required by the Arizona Corporation Commission ("ACC") when filing main extension agreements with the ACC.
7. Applicant shall only install materials approved in writing by Utility.
8. Applicant shall construct all infrastructure in accordance with the Standards and Specifications of the Arizona Department of Environmental Quality, the Maricopa Association of Governments (regardless of project location), and the Utility.
9. Utility will conduct periodic inspections of Applicant's construction. Utility does not provide full time on-site inspection. Responsibility for proper installation rests with Applicant. Such inspection as the Utility personnel may perform in no way relieves Applicant of its responsibility for construction and installation of the infrastructure.
10. Applicant shall not make any changes from approved plans and specifications without prior written approval of Utility. Field Directives authorizing changes in the approved plans and specifications must be co-signed by Utility and Applicant's engineer of record prior to construction.
11. Utility will give final acceptance upon completion of all construction, including final adjustments of all valve boxes, manholes, meter boxes, etc. and submittal of any other required documentation.

**REQUIREMENTS FOR DEVELOPER-DESIGNED AND BUILT
WATER/SEWER MAIN EXTENSIONS
(CONTINUED)**

12. Unless indicated otherwise by the provisions of the applicable main extension agreement, the date of final acceptance shall be the date of the Final Acceptance Letter from Utility to Applicant unless otherwise stated in that letter. Applicant shall be responsible for the repair of the facilities installed for one year from the date of final acceptance.
13. In order to establish actual cost of construction, Applicant shall provide copies of all invoices for material and labor for that portion of the work conveyed to the Utility. The invoices must be provided in a binder, itemized, and include engineering, construction supervision, actual installation costs, and any other costs directly associated with the project.
14. Applicant shall provide unconditional lien releases from all contractors, subcontractors and material suppliers for all water and sewer construction projects.
15. Applicant shall provide freshly sealed and certified "As-Built" plans of facilities installed. The "As-Built" plans shall include the locations of all vertical and horizontal pipe bends, valves, manholes, sewer taps, etc., by station/offset and northing and easting on State plane coordinates. Applicant shall provide three sets of as-built drawings on full-size bond paper, one set on 11" x 17" paper, and one set on flash drive in CAD and PDF formats. The plans must be certified for correctness by a Professional Civil Engineer or Land Surveyor registered in the State of Arizona. Reference the "As-Built" section, Chapter Three - Construction Plan Requirements, for detailed "As-Built" plan requirements.
16. No refunds for "Advances in Aid of Construction" will be made prior to receipt of invoices, lien waivers and approved "As-Built" plans.

Utility will not provide water service until after the items above are received and it provides the Final Acceptance Letter.

CERTIFICATE OF ASSURED OR ADEQUATE WATER SUPPLY AND GRANDFATHERED RIGHTS

Prior to the approval of a plat and the issuance of a public report for a new development located within an Arizona Active Management Area (AMA) (the Utility's Agua Fria, Anthem, Paradise Valley, Sun City, Sun City West and Tubac water districts), Arizona law requires that developments secure a 100-year Assured Water Supply. This can be done in one of two ways:

- 1) the Applicant secures a Certificate of Assured Water Supply (CAWS) for the proposed development, or
- 2) The water provider that will serve the proposed development (in this case, the Utility) has a Designation of Assured Water Supply (DAWS).

Currently, Utility does not possess a DAWS and it is therefore the Applicant's responsibility to secure a Certificate of Assured Water Supply for the proposed development. Accordingly, Utility requires that developers of subdivisions and commercial properties on lands having Irrigation Grandfathered Rights (groundwater pumping rights) file with the State to "extinguish" the rights and pledge the rights to the Applicant's CAWS. This requirement is included in the main extension agreement.

For new developments located outside of an AMA (the Utility's Mohave and Havasu water districts), Arizona law requires that the development apply for a 100-year Adequate Water Supply prior to the platting and the issuance of the public report. It is the Utility's policy that all developments have sufficient supplies and obtain the 100-year Adequate Water Supply.

If Irrigation Grandfathered Rights or Type I Non-Irrigation Grandfathered Rights are associated with the land to be developed, the Applicant shall, within 30 days of plat recordation or prior to execution of a Membership Agreement with the Central Arizona Groundwater Replenishment District, whichever occurs first, submit to the Director of the Arizona Department of Water Resources (ADWR), a notarized Statement of the Intent to Extinguish the Grandfathered Rights, including the Certificate of Grandfathered Right to be Extinguished. If the Grandfathered Right is a Type I right, proof of ownership of the land shall be submitted with the Statement of Intent. Any forms required to be submitted by ADWR shall also be included with the Statement of Intent.

The Statement of the Intent to Extinguish the Grandfathered rights shall include the statement, "It is requested that the Director of the Department of Water Resources make the extinguishment credits available for use by pending CAWS application number [insert appropriate CAWS application number]." A statement pledging the credits to the appropriate application for a CAWS shall also be indicated as appropriate on the extinguishment forms submitted. A copy of the Statement of the Intent to Extinguish Grandfathered Rights with all enclosures and a copy of the ADWR extinguishment forms shall be mailed to:

EPCOR Arizona Inc.
Attn: Water Resources Manager
2355 West Pinnacle Peak Road, Suite 300
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CHAPTER 2

ENGINEERING MASTER PLAN AND DESIGN CRITERIA

MASTER PLANNING AND DISTRIBUTION MAIN REQUIREMENTS

Utility requires that distribution systems be designed in accordance with Utility's design requirements, applicable state and county requirements, any authority having jurisdiction within Utility's service area, commonly accepted engineering practices, and other applicable codes or recognized standards.

Distribution systems should be designed with sufficient "looping" and other redundancies as may be necessary to minimize outages to customers in the event of main breaks, routine maintenance, and repairs. Avoiding dead-end segments by providing looped distribution circuits also enhances potable water circulation and reduced age therefore minimizing the formation of disinfection byproducts. Distribution systems should be sized to accommodate sufficient fire flows as may be required. The design and sizing of the distribution systems should include a main break analysis to ensure the provision of adequate fire flows and service to our customers.

As a condition of service, and in addition to the distribution system design standards, Utility requires that distribution systems include a **secondary 8-inch diameter distribution main** in addition to the normally required "backbone" or larger diameter distribution mains. This requirement is most easily achieved by increasing the size of portions of typically 6-inch diameter distribution piping to 8-inch diameter. The selected alignment of the secondary 8-inch distribution main would ideally traverse the center of the development or phase of development, originating and terminating at larger "backbone" mains. This requirement is not to be construed as a request for over-sizing, rather as a sound engineering design condition. In accordance with Arizona Corporation Commission rules and regulations, no waterlines less than 6 inches in diameter will be accepted.

Plan submittals will be reviewed for the inclusion and acceptability of the 8-inch secondary distribution main and its alignment. An approved water distribution analysis is required to accompany all waterline Construction Drawings. The analysis shall identify proper distribution system sizing based on the required flow parameters, as well as the criteria stated in this Developer & Engineering Guide.

Where a land developer has subdivided any piece of land for development by another party, Utility may require an individual water master plan in line with these guidance notes, unless the principal land developer's approved master plan has adequately covered distribution of all individual parcels. All developers should coordinate with Utility's Developer Services and Planning Division to identify whether or not additional master plans are required for their area of development.

Where land is intended to be developed in phases, details and timing of the phases of the development must be included in the master plan. The phasing information should include details and timing of any landscaped areas requiring irrigation from the potable water system (where the system tariff structure allows), especially where this will be effective prior to construction and/or sales of dwelling units.

Master plans will be reviewed by Utility's Engineering to ensure new developments are coordinated and consistent with the long term master plans of the relevant service area. Applicants are required to submit two copies of the master plan and the appropriate electronic files of the hydraulic analysis. Initial master plan reviews may take up to 8 weeks for initial review depending on the complexity of the project. This does not include any time needed for revisions and subsequent reviews. Failure to provide two copies of the master plan as well as electronic files for the hydraulic model may result in a delay of Utility's review that may then take more than 8 weeks.

MASTER PLANNING AND DISTRIBUTION MAIN REQUIREMENTS

(CONTINUED)

A hydraulic analysis using the current version of WaterCAD (or equivalent with prior approval of Utility), must be performed for the proposed water distribution system and submitted as part of the Master Plan. The Master Plan shall be prepared in accordance with Utility's master plan outline. A color exhibit showing water line locations, sizes, parcel boundaries, junctions, contour elevations, pressure zone boundaries, etc. shall be submitted as part of the Master Plan. In addition to the hard copy documents required here, the submittal must also include a copy of the full hydraulic model and any tabular files used for the hydraulic analysis in electronic format on CD. The Master Plan shall be signed and sealed by a Registered Professional Civil Engineer in the State of Arizona and submitted to Utility for review and approval.

Any and all criteria not listed herein shall be in accordance with, but not limited to, the following governmental agency requirements and any such criteria presented in the Master Plan shall be referenced appropriately for Utility review: Environmental Protection Agency (EPA), Arizona Department of Environmental Quality, Arizona Department of Water Resources, Maricopa Association of Governments, Maricopa County Health Code Chapter V (if applicable to development), local jurisdictional Planning and Zoning Requirements, and appropriate municipality regulations, if development is in a municipality serviced by Utility. If a development is outside Maricopa County or outside Arizona, it must conform to regulations and requirements of state and local jurisdictions and governmental agencies. All developments shall be compliant with AWWA standards. Fire flow requirements shall be determined by the jurisdictional Fire Marshal and the requirements shall be stated in a letter from the Fire Marshal, which must be included as an appendix with the Master Plan.

The "Demands" table provided in the Design Criteria in this Chapter shows typical demand values used by Utility for internal planning purposes. It should be noted, however, that this table may not be applicable to certain developments. **In all instances, engineers should coordinate with Utility's Developer Services and Planning Division prior to development of master plans, to ensure appropriate demand projections are made.**

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WATER MASTER PLAN OUTLINE

The following outline shall be used for the preparation of master plan reports:

1. Cover Sheet
 - a) Title (Development Name), Date, Revision Date(s)
 - b) Applicant and Engineer's contact information.
 - c) Sealed by a Professional Engineer registered in the state of Arizona.
2. Table Of Contents
 - a) Sealed by a Professional Engineer registered in the state of Arizona.
3. Executive Summary
 - a) 1 or 2 pages with emphasis on proposed facilities to serve the development.
4. Introduction
 - a) Plan Objective – state purpose of the report
 - b) Site Location w/ vicinity map.
 - c) Proposed Development
5. Design Criteria
 - a) Demands, Pressures, Storage, Booster Pumps, Wells, Distribution System (pipe sizing)
 - i. Utility Developer Guide criteria
 - ii. MAG, ADEQ, other governmental agency criteria as applicable
 - iii. Generally accepted engineering standards (requires Utility approval)
6. Demands
 - a) Single family, multi family, commercial, school, open space, parks, landscaping etc.
 - b) Details of all zoning obtained within development, including any pending re-zoning applications.
 - c) Quarterly projections of demands from beginning of construction (construction water) to buildout, to include a breakdown of any phasing that may be involved with construction. This should include an exhibit to show locations, and a schedule showing the expected timing of demand growth for any phases as applicable. The intention would be to show how demand is projected to increase at all locations over time through buildout of the development.
 - d) Summary narrative of demands table. Discuss which demand scenario governs design (Peak Hour or Maximum Day plus Fire Flow)
 - e) Tabular calculations (spreadsheet) of all demands.
7. Existing Facilities/Conditions
 - a) Reference any previous master plans used and their dates as applicable.
8. Proposed Facilities
 - a) Required storage, proposed location, or expansion of existing if applicable.
 - b) Required booster pump capacity.
 - c) Required well capacity, number of wells if applicable.
 - d) Distribution system piping, onsite as well as any offsite infrastructure needed.
 - e) PRV's if applicable.
 - f) Phasing if applicable. Where facilities will be constructed in phases, the timing and responsible party for each facility must be defined. If the timing of more than one development in adjacent areas allows, developers are encouraged to meet and plan with Utility to maximize the possibility and benefit of regionalization of facilities.
9. Water Model
 - a) Describe model used.
 - b) Assumptions
 - i. Pump curves obtained from Utility information/staff or otherwise accepted test
 - ii. Criteria used in the model.
 - c) Results/Discussion – proposed facilities are adequate to serve development based on hydraulics

10. Summary/Conclusions

- a) Discuss how the objective of report has been met, i.e. proposed facilities will serve the proposed development in accordance with established criteria.
- b) List major facilities required and phasing as applicable.

11. Appendices

a) Water Modeling Results Organized by:

- i. Average Day
- ii. Maximum Day
- iii. Peak Hour
- iv. Maximum Day plus Fire Flow

b) The following information is to be included for the above scenarios:

- i. Junction/Node report showing node label, elevation, demand in gpm, hydraulic grade line in feet, pressure in psi, and assigned pressure zone for that node (zone assignment to node shall be in accordance with the existing operation of the service area and in accordance with Utility naming conventions). Also, for phased developments, reports and exhibits should identify those nodes that are active and those that are inactive for various model runs.
- ii. Pipe report showing pipe label, start/stop node, length, diameter, Hazen-Williams "C" value, flow, velocity, headloss, headloss gradient, and intended year of installation.
- iii. Pump report showing pump label, elevation, discharge, discharge pump grade, and pump head. An attachment to the pump reports should also be included to show assumed pump patterns and efficiency curves for any pumps modeled in the hydraulic analysis.
- iv. Valve report showing valve label, elevation, diameter, valve status, and from/to hydraulic grade line.
- v. Tank report showing tank label, base elevation, maximum elevation, volume, hydraulic grade line, and flow.
- vi. Reservoir report showing reservoir label, elevation, hydraulic grade line, and outflow.
- vii. A separate fire flow report for the maximum day plus fire flow scenario shall be submitted. The fire flow report is to show the following information for all nodes: node label, satisfies fire flow constraint, needed fire flow, available fire flow, total flow available, residual pressure, minimum system pressure, and minimum system pressure node
- viii. An extended period simulation (EPS) model showing storage tank levels varying with time may be required for complex system designs, to verify adequate fire flow storage and also to verify that wells have sufficient capacity for tank replenishment during maximum day demands. Where an EPS model is used, an explanation will be required for the basis of diurnal demand patterns, and the basis of demand allocation. A clear explanation will also be required for the naming convention used for the different model scenarios. Finally, detail will be required on how the source of water has been modeled. A summary of the techniques used to generate the hydraulic model and engineering analysis should clearly be described.

c) 11" X 17" (24" X 36" for large developments as applicable) and PDF color exhibit for peak hour. Average day and maximum day exhibits may be required. Exhibits to include:

- i. Pipes and nodes labeled.
- ii. Pressures at nodes.
- iii. Major roadways labeled.
- iv. Pipe size shown by color.
- v. Major contour lines shown.
- vi. Pressure zone boundaries.

d) Cost Estimate

*Figures, exhibits, tables, spreadsheets, etc. to be placed in the body of the report where possible.

DESIGN CRITERIA FOR WATER SYSTEMS

1. Demands¹

Land Use	Unit	Average Day Demand (gal/day/unit)	Max Day Peaking Factor	Peak Hour Peaking Factor
Active Adult	Dwelling	304	1.8	3.0
Single Family	Dwelling	360	1.8	3.0
Multi Family	Dwelling	240	1.8	3.0
Commercial ²	Acre	1,700	1.8	3.0
Warehouse/Big Box Retail	1000 sq. ft.	30	1.8	3.0
Developed Open Space, including Parks ^{2, 3}	Acre	1,800	n/a	n/a
Schools ²	Acre	1,700	n/a	n/a
Resort	Room	446	1.8	3.0
Hotel (no restaurant)	Room	140	1.8	3.0
Hotel (with restaurant)	Room	200	1.8	3.0

¹Please contact Utility's Planning Division for Resource Data on other demand types.

²Acreage is based on gross number of acres.

³Developed Open Space includes general landscaped areas where irrigation will be required, such as road medians and areas to be maintained by HOAs.

2. Specific Modeling Requirements: Demands should be distributed among nodes to provide a reasonable reflection of the expected system demand distribution. Where demands are grouped and represented by only a few nodes those demands should be allocated to the nodes with the highest elevation as well as the furthest point from the development's point of supply.

3. Pressures

Minimum Pressures: 55 psi static; 40 psi at peak hour; 20 psi at max day + fire flow

Maximum Pressures: In accordance with the Uniform Plumbing Code, any structure experiencing pressures greater than 80 psi shall have an individual pressure reducing valve on the customer side of the meter. Areas where many customers experience pressures higher than 80 psi may require a PRV station or modification to the distribution system, to be approved by Utility. Distribution systems shall not be designed to operate at pressures greater than 120 psi.

4. Velocity & Headloss

10 fps maximum velocity for pipes less than 16 inches in diameter
 5 fps maximum velocity for pipes 16 inches in diameter or larger
 2 fps minimum and 6 fps maximum velocity for well transmission lines
 10 ft. headloss maximum per 1,000 linear feet of pipe for pipes less than 16 inches in diameter
 8 ft. headloss maximum per 1,000 linear feet of pipe for pipes 16 inches in diameter or larger

5. Hazen-Williams Coefficient 130 (for new pipes)

Where development models include existing pipes, appropriate coefficients will need to be selected. Where an existing calibrated model exists, the coefficients in the existing model must be used. If there is no existing calibrated model, the developer's engineer will need to consult with Utility's planners to identify suitable coefficients.

6. Fire Flows

Fire flows must be in accordance with jurisdictional Fire Marshal requirements. Provide a written statement from the jurisdictional Fire Marshal that states the minimum required flows and duration by class of customer. In the absence of a jurisdictional Fire Marshal, fire flow requirements must be in accordance with the latest version of the International Fire Code.

7. Storage Requirements

Equalization 30% of max day, plus
Emergency reserve the greater of 10% of max day OR the storage volume required based on the fire flow requirements stated above

8. Booster Pump Station

Firm Capacity Shall meet or exceed the greater of peak hour flow or max day + fire flow with the largest pump out of service for the pressure zone(s) that the booster station serves. Shared redundancy between pressure zones may be acceptable via a PRV (with the prior approval of Utility) provided adequate redundancy exists in the higher zone.

9. Water Valves

Number of Valves = number of radiating mains at intersection minus one; the unvalved branch is the line that supplies flow to the intersection.

Valve spacing shall be in accordance with ADEQ Bulletin #10

Valves in well transmission mains shall be kept to a minimum.

10. Wells

Where developments are supplied solely by groundwater wells, the following criteria must be met:

Firm Capacity: Any wellfield supplying a booster station must meet the maximum day demand for the entire station with the greatest producing well out of service. Single source wellfields are not allowed. Proposed wells supplying directly into the distribution system are discouraged and will be reviewed on a case-by-case basis.

Permitted Capacity: The total *permitted* capacity of a wellfield shall be adequate to meet the anticipated total annual demand for the development.

Well transmission lines shall have an 8" minimum diameter. Where a transmission line will have multiple wells connected to it, the pipe shall be sized such that **all** wells connected to that line can run simultaneously at their full capacity while meeting the velocity and headloss constraints defined in this guide. If this cannot be achieved, contact Utility's Developer Services Division for guidance.

11. Fire Hydrants

Fire hydrant spacing shall be in accordance with the requirements of the local jurisdictional agency.

12. Air/Vacuum Release Valves

Air vacuum release valves shall be located at all high points and at vertical realignments of the water line.

13. Pressure Reducing Valves

Pressure reducing valves shall be located on transmission/distribution mains to maintain design pressure ranges in accordance with approved water master plans. These locations must be coordinated with, and approved by, Utility. PRV sizing shall be based on anticipated minimum/maximum flow ranges.

14. Wash Crossings

All waterlines that cross washes or channels shall be MEGALUG restrained joint ductile iron pipe (Class 350). The depth requirement for placing waterlines under washes or channels shall be the deeper of the following two cases:

- a. Per the Arizona Department of Environmental Quality's Engineering Bulletin No. 10, the minimum cover over the pipe shall be greater than or equal to two (2) feet below the scour depth (based on Scour Analysis described below).
- b. The minimum cover over the pipe may be based on the 100-year flow rate of the wash or channel as shown in the table below. Note that the "additional depth" in the table refers to the depth of pipe that must be added to the normal cover requirements that are provided in Detail No. 350-1.

100-Year Flow Rate	Additional Depth
1 to 49 cfs	1 foot
50 to 99 cfs	2 feet
100 to 499 cfs	3 feet
Greater than 499 cfs	Scour Depth (based on Scour Analysis); minimum of 3 feet

Details on the determination of the 100-year flow rate shall be submitted to the Utility for review. The Scour Analysis shall be in accordance with the Arizona "State Standard for Watercourse System Sediment Balance" (SS5-96), Guideline 2, Level III, as published by the Arizona Department of Water Resources (<http://www.azwater.gov/azdwr/SurfaceWater/FloodManagement/StateStandards.htm>).

The Scour Analysis shall be submitted to the Utility for review for all wash crossings. Note: If a sediment transport analysis has been performed by the Flood Control District of Maricopa County for the subject wash crossing, this can be submitted to Utility for review, and this may eliminate the need for additional analysis.

15. Minimum Residential Potable Water Meter Sizing

All residential meters shall be sized in compliance with the current Uniform Plumbing Code (UPC) and any applicable municipal or other governmental requirements. For residential meters 1-inch or larger, the municipality-approved architectural calculations shall be submitted to Utility to document the sizing of meters. For residences that include fire sprinklers or landscape irrigation, the meter size shall be the greater of the following:

- a. meter size as determined by the current UPC, or
- b. from each fire sprinkler zone within the residence, the highest of these fire flows must be in accordance with the table below (i.e., if the calculated fire sprinkler flow is 31 gpm, then a 1-inch meter will be required), or
- c. the landscape irrigation flow must be in accordance with the table below:

Minimum Required Meter Size (inches)	Maximum Allowed Fire Flow or Irrigation Flow (gal/min)
5/8	20
3/4	30
1	50
1 ½	100
2	160
3 and larger	Determined on a case-by-case basis

The maximum flows provided in the table above should only be imposed on the meter for short, intermittent periods. Meters should not be operated on a continuous 24-hour service at flows greater than one-half of the maximum flows provided in the table above.

16. Service Line Size

The minimum service line size is 1-inch, installed in accordance with Utility's STD. DET. 342-2. The appropriate adapter shall be installed with the meter box as shown on STD. DET. 342-2. Where the water meter size is greater than 1-inch, the service line must be the same size as the meter. The

diameter of new service lines cannot exceed 50% of the service main diameter. A new water main extension may be required where Utility determines that existing main capacity has been exceeded.

17. Meter Location

- a. Install meters side-by-side, straddling the lines where possible, not at road intersection corners, and not adjacent to fire hydrants.
- b. Each service line requires a separate tap to the main.
- c. Residential fire sprinkler and irrigation water service is permitted through the domestic service line and meter. Commercial developments require separate water meters for building and landscape.
- d. Each parcel of land must have its own separate service line and meter. A single service line and a master meter can be used for two or more buildings located on the same lot such as an apartment complex, trailer courts or similar projects covering one lot. In high density applications where an assured continuous water supply must be maintained, the development must have two master meters, each with its own service connection to Utility's main to create a secondary looped connection to the development.
- e. No service connections or fire protection systems will be made to water lines greater than 12 inches in diameter.
- f. Existing service lines that will not be used by a development shall be abandoned and plugged at the main.

18. Water System Layout

- a. To provide appropriate (i) water pressure, (ii) water circulation, (iii) redundancy, and (iv) minimize taste and odor issues, all water mains must be designed with a minimum of two sources (**looped configuration**) – see “Dead-End Lines” below for exceptions.
- b. Water and sewer mains must have a minimum distance of 12 feet from buildings or retaining walls, as measured from the edge of the building foundation or wall to the outside of the main. In rare cases where a water or sewer main must encroach within 12 feet from a building or retaining wall, additional protection is required. Additional protection may include the use of a sleeve for the main, or modifications to the footing of the structure, to prevent damage in the event of a main break.
- c. Ninety-degree (90-degree) fittings are not allowed in rights-of-way.

19. Dead-End Lines

Dead-end lines with no service connections are not allowed. Where dead-end lines with service connections do occur, cap dead-end lines with a curb stop (blow off) with flushing pipe per EPCOR Detail 390-1. All dead-end lines will be approved on a case by case basis.

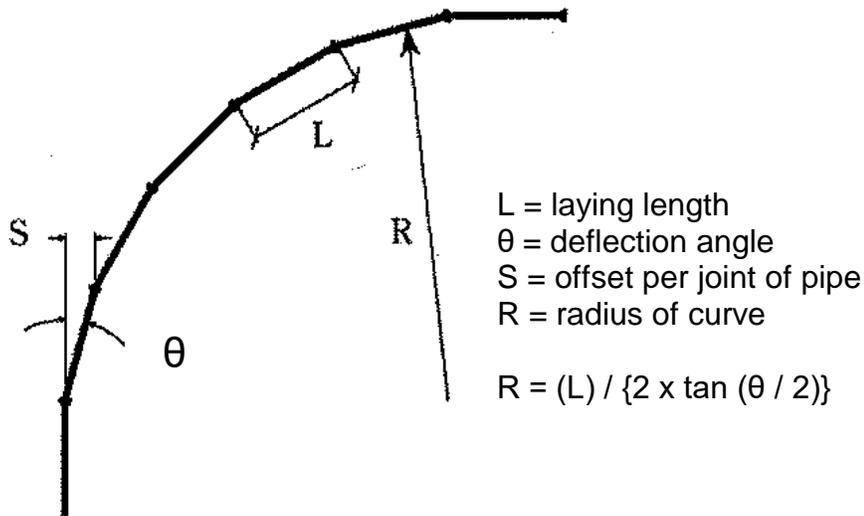
20. Thrust Blocks

Thrust blocks are not allowed in rights-of-way. Use restrained joints per MAG Standard Detail 303-1 and 303-2 in rights-of-way in place of concrete thrust blocks.

(Continued)

21. Curvilinear Alignments

Design constraints are provided below:



L = laying length
 θ = deflection angle
 S = offset per joint of pipe
 R = radius of curve

$$R = (L) / \{2 \times \tan (\theta / 2)\}$$

C900, DR14, PVC Pipe

<u>Pipe Diameter</u>	<u>Laying Length</u>	<u>Max Deflection Angle</u>	<u>Offset per joint of pipe</u>	<u>Min. Curve</u>
6"-12"	20'	2.0°	8.4"	573'

C905, DR14, PVC Pipe

In accordance with AWWA C605-94, section 5.6, the bending of the PVC Pipe barrels larger than 12-inch (300-mm) nominal diameter is not allowed due to the forces required. The curved alignment of PVC pipelines larger than 12-inch (300-mm) in diameter shall be determined by one-half the pipe manufacturers published axial-joint-deflection limits. Manufacturer's technical data sheets shall be submitted to Utility for review and approval.

Ductile Iron Pipe, AWWA C150/151/153

<u>Pipe Diameter</u>	<u>Laying Length</u>	<u>Max Deflection Angle</u>	<u>Offset per joint of pipe</u>	<u>Min. Curve</u>
8"-12"	18'	2.5°	9.4"	413'
14"-16"	18'	2.0°	7.5"	516'
18"-20"	18'	1.5°	5.7"	688'
24"	18'	1.0°	3.8"	1032'
8"-12"	20'	2.5°	10.4"	459'
14"-16"	20'	2.0°	8.4"	573'
18"-20"	20'	1.5°	6.2"	764'
24"	20'	1.0°	4.1"	1146'

DESIGN REQUIREMENTS FOR FIRE LINES

1. Fire line connections to Utility's mains shall be used for fire protection systems only. Metered services cannot be connected to fire lines.
2. The minimum size fire line connection shall be 4 inches.
3. For fire lines, backflow prevention devices are required within 75 feet of the main. If the building riser is within 75 feet from the main, then a vertically mounted backflow prevention device may be located on the building riser. If the building riser is further than 75 feet from the main, then a backflow prevention device shall be installed as close as practicable to the service connection (property line).
4. Backflow prevention devices are not required for private hydrant connections that are not looped and that do not have fire sprinkler connections.
5. Backflow prevention devices shall have been issued a certificate of approval by the University of Southern California Foundation for Cross-Connection Control and Hydraulic Research. The certificate of approval shall be forwarded to Utility's Backflow Prevention Specialist prior to Utility's Final Acceptance of the fire lines.
6. Backflow prevention devices shall not be located in rights-of-way, sidewalks, driveways, visibility triangles, or other locations where accidental damage or visibility obstruction would likely occur.
7. Backflow prevention devices shall be fully accessible for testing, repairs, and replacement. There shall be an unobstructed radius of not less than four - feet from the outer perimeter of each backflow prevention device.
8. Per the Uniform Plumbing Code (610.2), in the absence of specific pressure drop information, the diameter of the inlet or outlet of any backflow prevention device or its connecting piping shall not be less than the diameter of such water distribution piping to the fixtures served by the device. If available, pressure drop information shall be provided with the submitted plans.
9. Per the Uniform Plumbing Code (603.3.11), looped on-site fire line systems shall have backflow preventers at each point of connection to the public water system.
10. A control valve is required at ALL fire line connections to public water mains. The control valve shall not be located in sidewalks, driveways, curbs or gutters.
11. Thrust blocks are not allowed in rights-of-way.

DESIGN CRITERIA FOR WASTEWATER SYSTEMS

A hydraulic analysis must be performed for the proposed wastewater collection system and submitted as part of the Master Plan. The design methodology shall be presented and appropriately referenced. The results of this analysis shall be presented in tabular form with at least the following information presented:

- pipe number
- to/from manhole number
- pipe size
- pipe slope (slopes that are less than minimum design shall be noted)
- average daily flow
- peak hour flow
- d/D ratio at peak hour
- velocity at peak hour

An analysis of sewer force mains must be performed, including impacts due to pump surge, and submitted as part of the master plan. Force main hydraulic losses shall be performed using the Darcy-Wiesbach equation. A 24" X 36" color exhibit, as well as PDF, showing flow contributing area, sewer line number and manhole number locations, flow direction, property boundaries, contour elevations, etc. shall be submitted as part of the Master Plan. The Master Plan shall be signed and sealed by a Registered Professional Engineer and submitted to Utility for review and approval.

1. Average Daily Wastewater Design Flows

Land Use	Unit	Average Daily Flow (gal/day/unit)	Peak Hour Peaking Factor
Active Adult	Dwelling	190	3.0
Single Family	Dwelling	240	3.0
Multi Family	Dwelling	180	3.0
Commercial ¹	Acre	1,500	3.0
Warehouse/Big Box Retail	1000 sq. ft.	25	3.0
Schools ¹	Acre	1,500	3.0
Resort	Room	380	3.0
Hotel (no restaurant)	Room	100	3.0
Hotel (with restaurant)	Room	150	3.0

¹Acreage is based on gross number of acres.

2. Minimum / Maximum Slopes (Manning's Roughness Coefficient of 0.013)

Pipe Diameter (inches)	Minimum Slope (%)	Minimum Velocity (ft./sec)	Maximum Slope (%)	Maximum Velocity (ft./sec)
8	0.368	2.1	6.760	9
10	0.300	2.2	5.020	9
12	0.257	2.3	3.937	9
15	0.208	2.4	2.924	9
18	0.163	2.4	2.293	9
21	0.144	2.5	1.867	9
24	0.130	2.6	1.562	9
27	0.111	2.6	1.335	9
30	0.104	2.7	1.160	9

3. Sewer Capacity Ratio

The ratio of flow depth in the pipe to the diameter of the pipe shall not exceed 0.75 in peak hour flow conditions.

4. Minimum Pipe Diameter

The minimum sewer main diameter is 8 inches.

5. Depth of Cover

- a. Sewer mains greater than 12 inches in diameter shall have a minimum of 7 feet 6 inches of cover.
- b. Sewer mains 12 inches in diameter or less shall have a minimum of 6 feet of cover.
- c. Sewer service lines shall have a minimum of 5 feet of cover at the property line.

6. Wash Crossings

All sewer lines that cross washes or channels shall be concrete-encased PVC. The depth requirement for placing sewer lines under washes or channels shall be based on the 100-year flow rate of the wash or channel as shown in the table below.

100-Year Flow Rate	Minimum Depth from Bottom of Wash to Top of Pipe
1 to 49 cfs	5 feet
50 to 99 cfs	6 feet
100 to 499 cfs	7 feet
Greater than 499 cfs	Scour Depth (based on Scour Analysis) plus 3 feet; minimum of 7 feet

Details on the determination of the 100-year flow rate shall be submitted to EPCOR for review. The Scour Analysis shall be in accordance with the Arizona "State Standard for Watercourse System Sediment Balance" (SS5-96), Guideline 2, Level III, as published by the Arizona Department of Water Resources (<http://www.azwater.gov/azdwr/SurfaceWater/FloodManagement/StateStandards.htm>). The Scour Analysis shall be submitted to Utility for review for all wash crossings.

The sewer lines must be designed and constructed with an extension of at least 10 feet beyond the boundary of the 100-year storm scouring.

7. Manhole Rim Elevations

All manhole rim elevations must be above the 100-year floodplain elevation. Concealed pick-hole manhole covers are required where covers are located within 3 feet of the edge of a gutter, in areas that are unpaved, in areas that are prone to flooding, and in all areas within Mohave County. Rim elevations should be set 0.2 feet above finish grade in all unpaved areas. Manholes are not permitted in washes without prior approval from Utility.

8. Minimum Manhole Diameter

- a. The minimum manhole diameter for sewer lines that are 15 inches in diameter or greater is 5 feet.
- b. The minimum manhole diameter for any sewer line that is 10 feet or deeper below finished ground surface (to bottom of pipe) is 5 feet.
- c. The minimum manhole diameter for all other conditions not met above is 4 feet.

Note: All sewer manholes shall have a 30-inch frame and cover.

9. Manhole Spacing

Manholes shall be installed at all grade changes, size changes, alignment changes, sewer intersections, and to comply with the following spacing requirements:

Sewer Pipe Diameter (inches)	Maximum Manhole Spacing (feet)
8 to less than 18	500
18 to less than 36	600
36 to less than 60	800

10. Manhole Stub Outs and Knock Outs

Stubs from manholes are not allowed. Knock outs may be provided in manholes for future main extensions when required by EPCOR.

11. Manhole Linings

All manholes shall be lined in accordance with EPCOR Detail No. 100-4.

12. Manhole Invert Drops

- a. If a manhole has a sewer direction change that is less than 45 degrees, then the manhole should be designed for a 0.1-foot drop across the manhole.
- b. If a manhole has a sewer direction change that is greater than or equal to 45 degrees, then the manhole should be designed for a 0.2-foot drop across the manhole.
- c. Drop manholes should be per MAG Standard Detail No. 426

13. Cleanouts

Cleanouts, instead of manholes, may be installed at the end of sewer lines that are less than 200 feet in length. Service connections are not allowed at the ends of cleanouts or within 4 feet of a cleanout.

14. Force Mains

- a. Force mains shall be designed to maintain a minimum flow velocity of 3 feet per second and a maximum flow velocity of 7 feet per second.
- b. Appropriate valves and controls are required to prevent draining back to the lift station.
- c. Air release valves shall be installed at all high points along the force main to eliminate air accumulation.

15. Curvilinear Alignments

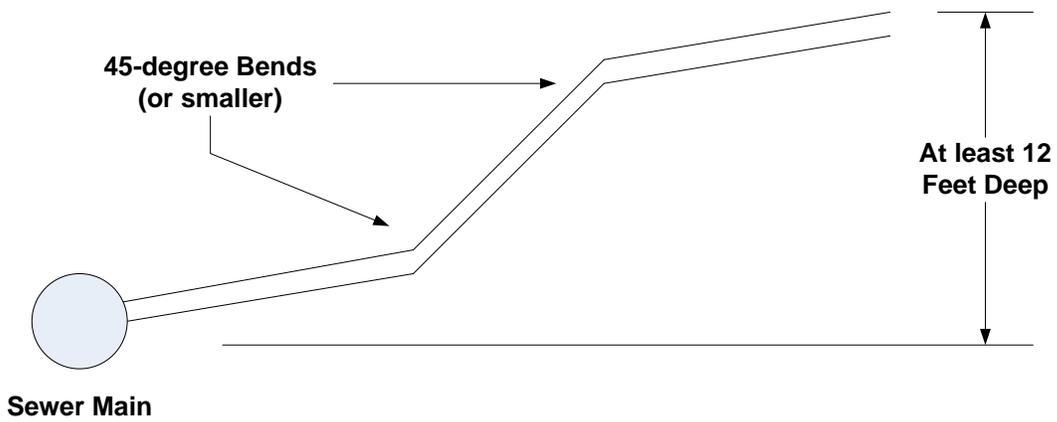
SDR 35 PVC Sewer Pipe

<u>Pipe Diameter</u>	<u>Laying Length</u>	<u>Max Deflection Angle</u>	<u>Offset per joint of pipe</u>	<u>Min.Curve</u>
8"-15"	12.5' *	2.5	6.5"	287'
8"-15"	20'	2.5	10.5"	458'

The use of reduced pipe lengths must be clearly noted on the construction plans for Contractor's attention.

16. Service Lines

No bends in sanitary sewer service lines are allowed except for services that are 12 feet deep or deeper, which may use vertical bends. For services that are 12 feet deep or deeper, 45-degree bends (or smaller bends) may be used as illustrated below.



Existing sewer service lines that have been stubbed out to a property shall be used; however, where the use of stubbed out lines are not feasible, the existing lines shall be abandoned and capped at the sanitary sewer main.

CHAPTER 3

CONSTRUCTION DRAWINGS

CONSTRUCTION DRAWING REQUIREMENTS

1. Label all construction drawings "Water" and/or "Sewer" as applicable.
2. Construction drawings shall be designed and scaled to fit on 24" x 36" sheets of paper.
3. A Professional Civil Engineer registered in the State of Arizona must sign the construction drawings.
4. Construction drawings shall meet the requirements of the Arizona Department of Environmental Quality, Engineering Bulletin #10 and A.A.C. R18-5-502 for water, Engineering Bulletin #11 and A.A.C. R18-9-E301 for Sewer.
5. Submit all design calculations and other supporting data with the construction drawings.
6. Show the Utility's "Material Specifications" and "General Notes" on the drawings, as well as all itemized quantities separated for facilities that will be Utility-owned versus those that will not be Utility-owned. Show the Utility's logo, water and/or sewer owner information, the Utility's approval signature block and As-Built block on the cover sheet of the drawings.
7. Identify the Applicant-owned facilities and Utility-owned facilities.
8. The drawings shall include the Northing + Easting Coordinate System. For projects within Maricopa County and Tubac, the coordinate system should be NAD1983, State Plane Arizona Central Zone, US Feet. For projects within Mohave County, the coordinate system should be NAD1983, State Plane Arizona West Zone, US Feet.
9. Sewer drawings shall include sewer services to the easement or right-of-way line.
10. Water drawings shall show the size and location of all water services and meters. Stubs for services for future development will be approved on a case by case basis.
11. Waterlines 12" or larger, and sewer lines 8" or larger, shall be shown in profile with the appropriate elevations (plan and profile views). Vertical deflections of waterlines shall be profiled regardless of size. Utility crossings of any waterline shall be shown in profile and dimensioned for minimum clearances and/or separations. All sewer mains shall be profiled.
12. Show all referenced details required by the Utility on the drawings. Clearly reference where the appropriate detail item is called out.
13. Show easements for Utility-owned facilities on private property. If a plat is not required, submitted for approval on 8 ½" X 11" sheets, a metes and bounds easement legal description and exhibit signed and sealed by a Professional Civil Engineer or Land Surveyor registered in the State of Arizona. .
14. Submit drawings to the Utility for review and approval in the following two ways:
 1. Drawings with less than 10 sheets: pdf on a flash drive, CD or emailed to the project manager.
 2. Drawings with more than 10 sheets: pdf on a flash drive, CD, and one hard copy delivered to the project manager.Note: Electronic submittals may be provided by Applicant established FTP site.
15. Submit an itemized Engineer's cost estimate for construction of Utility-owned facilities, sealed and certified by a Professional Civil Engineer, registered in the State of Arizona. Provide these estimates on 8 ½" X 11" sheets of paper separately for water and sewer.
16. The drawings shall include a Master Water and/or Sewer Drawings sheet.
17. Provided a site plan showing roadways and facilities on 8 ½" X 11" sheets of paper.

18. The drawings shall include a summary table showing quantities for all sewer and water constructed items. Include sizes and materials.
19. Show stationing and roadway centerline offset of the water and sewer mains and related appurtenances.
20. The cover sheet of the drawings shall contain an index map showing water and/or sewer facilities as well as the corresponding sheet number. Include a key map on each subsequent plan view sheet.
21. Show station and offset, along with northing and easting coordinates for waterlines, all valves, fittings, vertical and horizontal offsets, hydrants, meters and services.
22. Show station and offset, along with northing and easting coordinates for sewer lines, manholes, cleanouts and services.
23. Include the following information on the cover sheet of the drawings:

UTILITY OWNER INFORMATION

WATER AND/OR SEWER OWNER/OPERATOR



**2355 West Pinnacle Peak Road, Suite 300
Phoenix, Arizona 85027
(623) 445-2400**

24. The Utility owner information with logo, and the Utility's General Notes, Material Specifications and Standard Details are available in digital format. Digital files are located on EPCOR's website. For assistance, please contact the Developer Services Department as listed in the Contact List section in this guide.

PLAT DEDICATION VERBIAGE

The following plat dedication verbiage shall be on the final recorded plat if any of the facilities to be owned by the Utility will be outside of dedicated rights-of-way and separate easements are not provided:

PERPETUAL WATER AND SEWER EASEMENT ('EASEMENTS') AS DESCRIBED IN THE PLAT ARE GRANTED TO EPCOR WATER ARIZONA INC, AND ITS SUCCESSORS AND ASSIGNS (COLLECTIVELY, "GRANTEE"), TO CONSTRUCT, OPERATE, AND MAINTAIN WATER AND SEWER LINES AND APPURTENANT FACILITIES (COLLECTIVELY, "FACILITIES") UPON, ACROSS, OVER AND UNDER THE SURFACE OF THE EASEMENTS, TOGETHER WITH THE RIGHT TO OPERATE, REPAIR, REPLACE, MAINTAIN, AND REMOVE THE FACILITIES FROM THE PREMISES; TO ADD OR TO ALTER THE FACILITIES, AND TO PROVIDE GRANTEE WITH REASONABLE INGRESS AND EGRESS TO THE FACILITIES. GRANTEE WILL HAVE UNRESTRICTED ACCESS TO THE EASEMENT FOR THE ACTIVITIES DESCRIBED ABOVE AND FORMAL NOTIFICATION OR APPROVAL BY ANY ASSOCIATION PRIOR TO ACCESSING THE EASEMENT WILL NOT BE REQUIRED.

GRANTOR SHALL NOT ERECT OR CONSTRUCT OR PERMIT TO BE ERECTED OR CONSTRUCTED ANY BUILDING, STRUCTURE OR SIMILAR IMPROVEMENT WITHIN THE LIMITS OF THE EASEMENT GRANTED HEREIN, GRANTOR SHALL NOT, NOR PERMIT, THE GRADE OVER GRANTEE'S FACILITIES TO BE SUBSTANTIALLY ALTERED WITHOUT, IN EACH INSTANCE, THE PRIOR WRITTEN CONSENT OF GRANTEE, AND GRANTOR AGREES THAT NO OTHER PIPES OR CONDUITS SHALL BE PLACED WITHIN THE PREMISES SUBJECT TO THE EASEMENT GRANTED HEREIN, EXCEPT PIPES CROSSING GRANTEE'S FACILITIES AT RIGHT ANGLES, IN WHICH CASE, A MINIMUM VERTICAL DISTANCE OF TWO (2) FEET (AS MEASURED FROM THE CLOSEST POINTS ON THE OUTSIDE EDGES) SHALL BE MAINTAINED BETWEEN GRANTEE'S FACILITIES AND SUCH OTHER PIPES OR CONDUITS. UNLESS GRANTEE EXPRESSLY CONSENTS IN WRITING OTHERWISE, ANY AND ALL SEWER PIPES CROSSING THE EASEMENT GRANTED HEREIN SHALL BE LAID BELOW GRANTEE'S FACILITIES. HOWEVER, GRANTOR SHALL HAVE THE RIGHT TO CONSTRUCT AND ERECT FENCES, TO INSTALL LANDSCAPING, PARKING FACILITIES AND DRIVEWAYS, AND TO ESTABLISH OTHER USES THAT ARE NOT INCONSISTENT WITH USES WITHIN THE LIMITS OF SAID EASEMENT IN A MANNER THAT WILL NOT UNREASONABLY INTERFERE WITH GRANTEE'S ACCESS TO THE FACILITIES.

“AS-BUILT” PLAN REVIEW REQUIREMENTS

1. Plans shall be 24” x 36” (two blue line copies), each submittal until approved.
2. Plans must be fully approved and signed by all required agencies.
3. Sealed and Certified by a Professional Civil Engineer or Land Surveyor registered in the State of Arizona.
4. Station/offset and state plane northing/easting coordinates on all water fittings, including valves, tees, bends, all vertical and horizontal changes, etc.
5. Station/offset and state plane northing/easting coordinates on all sewer manholes, clean-outs and other facilities.
6. Swing ties to fixed points may be required for commercial projects that do not have a roadway centerline for stationing within a reasonable distance from the project.
7. Distances from lot lines to sewer taps.
8. Call out all water and sewer pipe lengths between fittings and branches.
9. Elevations for all DIP sections regardless of the pipe diameter.
10. As-Built profiles for all sewer lines 8” and larger including manhole rim and invert elevations.
11. As-Built profiles for all water lines 12” and larger.
12. As-Built all changes in pipe materials and sizes.
13. Correct street names, addresses and lot numbers.
14. Written approval by the Utility is required prior to submitting three sets of as-built drawings on full-size bond paper, one set on 11” x 17” paper, and one set on flash drive in both CAD and PDF formats.
15. The Utility’s receipt and approval of as-builts is a condition to the Utility’s final approval of water and sewer facilities. In addition, no refunds will be issued on facilities until as-builts have been received and approved by the Utility and the Utility’s final acceptance has been granted.

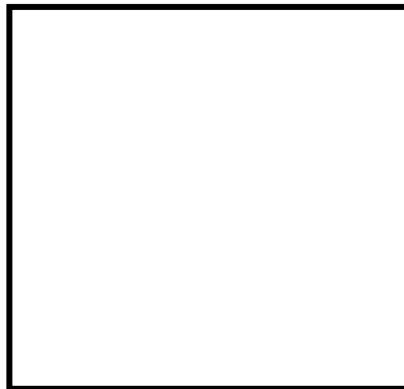
WATER/SEWER “AS-BUILT” CERTIFICATION

The following “As-Built” certification shall be on the cover sheet of the plans:

WATER/SEWER “AS-BUILT” CERTIFICATION

I hereby certify that the “as-built” measurements as shown herein were made under my supervision or as noted, and are correct to the best of my knowledge after due review. Additionally, I hereby certify that all mains and services have been installed within the limits of easements dedicated to EPCOR Water Arizona Inc., or inside dedicated street rights-of-way or public utility easements.

Seal



CHAPTER 4

CONSTRUCTION INSPECTION

PROCEDURE FOR SCHEDULING WATER LINE CONSTRUCTION INSPECTIONS

To schedule appointments, contact the Utility's Construction Inspection Division at (602) 309-1164, or see the "Contact List" near the front of this guide for direct phone numbers.

NOTE: When appointments are arranged at least 48 hours in advance, the inspection/test will be conducted as scheduled.

When appointments are requested for the same day, the Utility's Construction Inspector will conduct the inspection/test based upon his availability.

The Utility's Construction Inspector and the Applicant's contractor can schedule the following items in the field:

- Open trench before pipe is installed in trench.
- After pipe, bends, fittings, joint restraints, etc. has been installed in trench, but before backfilling is started to verify position and type.
- All waterlines - Inspection after backfill, installation of marking tape and prior to other backfilling of trench.
- After bedding (from bottom of trench to one [1] foot above pipe) has been placed into trench and properly compacted.
- After each lift of backfill material has been placed into the trench and properly compacted.
- Blocking and thrust blocks where required.
- Compaction sampling.
- Pressure test for tapping sleeve.
- Pressure test for waterline.
- Waterline chlorine injection.
- Bacteriological sampling.
- Operational Inspection, Final Inspection and re-inspection if required.

NOTE: If the Applicant's Contractor proceeds with construction before having approval of the Utility's Construction Inspector, the Applicant's Contractor will be required to expose the pipeline, valve, thrust blocks, etc., at no cost to the Utility, to permit inspection by the Utility's Construction Inspector. The required exposure of pipeline by the Applicant's contractor shall not deem acceptance of facility by the Utility. The Utility reserves the right to reject any facility not properly scheduled for inspection by the Utility for any reason. The rejection shall be final.

PROCEDURE FOR SCHEDULING SEWER LINE CONSTRUCTION INSPECTIONS

To schedule appointments, contact the Utility's Construction Inspector at (623) 309-1164.

NOTE: When appointments are arranged at least 48 hours in advance, the inspection/test will be conducted as scheduled.

When appointments are scheduled for the same day, the Utility's Construction Inspector will conduct the inspection/test based upon Construction Inspector's availability.

The Utility's Construction Inspector and the Developer's contractor can schedule the following items in the field:

- Tying off sewer plugs.
- Open trench before pipe is laid into trench.
- After pipe has been installed in trench and before backfilling is started.
- After each lift of backfill material has been placed into the trench and properly compacted.
- Each new manhole, including manhole coatings.
- Connecting to an existing manhole.
- Installation of service tap before service line is connected to saddle.
- Low-pressure air test on sewer line.
- Post manhole ring adjustment Hydrovac to ensure MH and lines do not have debris.
- Operational Inspection, Final inspection and re-inspection if required.
- The Contractor shall uniform slope test all sewer lines, including sewer service lines, by video recording and shall vacuum or water test all manholes in accordance with A.A.C. R18-9-E301. These tests shall be conducted prior to operational inspection and coordinated with the Utility's Construction Inspector. Documented results and video recordings shall be submitted to the Utility for approval - via DVD or flash drive.

NOTE: If the Applicant's Contractor proceeds with construction before having approval of the Utility's Construction Inspector, the Applicant's Contractor will be required to expose the pipeline, manhole, etc., at no cost to the Utility, to permit inspection by the Utility's Construction Inspector. The required exposure of pipeline by the Applicant's Contractor shall not deem acceptance of facility by the Utility. The Utility reserves the right to reject any facility not properly scheduled for inspection by the Utility for any reason. The rejection shall be final.

CHAPTER 5

BACKFLOW PREVENTION

BACKFLOW PREVENTION APPROVAL PROCESS

Approval Process (see flowchart)

1. The Applicant will submit Backflow Prevention Assembly (BPA) specifications with the Design Plans during the Application Process. Specifications shall include location of the proposed BPA, the manufacturer, model, and size of BPA, and the purpose of the waterline on which the BPA will be installed (fire line, irrigation, domestic/multipurpose). The Applicant will include the class of fire line. All BPA's must be lead free in accordance with the definition of lead free in section 1417 of the Safe Drinking Water Act.
2. After approval of the BPA specifications by the Utility's Project Manager, the Applicant will install and test the BPA in accordance with A.A.C. R-18-4-215F, EPCOR standards, and approved Design Plans. The Applicant will submit the post installation test report to the Project Manager.
3. The Applicant/Contractor will schedule the operational inspection of the BPA with the Utility's Construction Inspector.
4. The Construction Inspector will confirm the correct installation of the BPA.
5. Once the Construction Inspector confirms correct installation of BPA the new water service passes Utility Final Inspection (provided that all other Operational Inspection items have no deficiencies).

PREMISES REQUIRING BACKFLOW PREVENTION

All water lines which do not serve a single family residence require a backflow prevention assembly (BPA). BPA's must be approved by University of Southern California Foundation for Cross-Connection Control and Hydraulic Research (USC-FCCCHR). The approval list may be found on the USC-FCCCHR website. BPA's increase in degree of protection from DCDA's to RP's. The highest degree of protection for a cross-connection is an Air Gap.

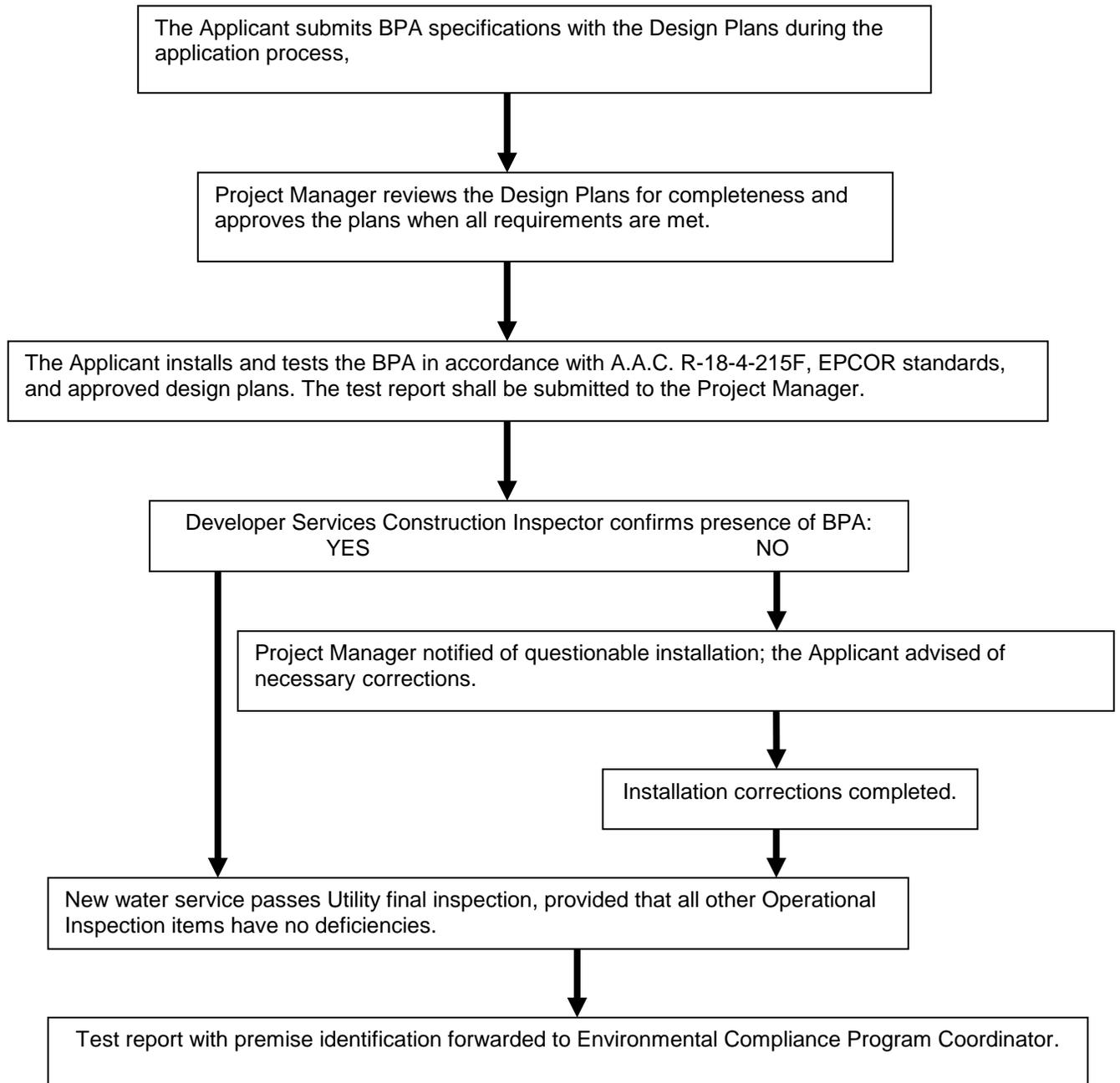
IRRIGATION - A Reduced Pressure Principle Assembly (RP) is the only BPA that can be used for irrigation.

FIRE LINES – A Double Check Detector Assembly (DCDA) is the minimum protection BPA that can be used for class 1 & 2 fire protection lines.

DOMESTIC / MULTIPURPOSE SERVICE – An RP is the only BPA allowed for a service line that is not a class I or II FIRE LINE.

HIGH HAZARD APPLICATIONS – Air Gaps will be required for water lines servicing areas with high hazard of contamination. High hazard applications will be determined on a case by case basis.

BACKFLOW PREVENTION OPERATIONAL APPROVAL FLOWCHART



CHAPTER 6
PRETREATMENT REQUIREMENTS

PRETREATMENT APPROVAL PROCESS

Approval Process

1. Applicant shall prepare and submit Sewer Plans in accordance with the requirements outlined in Chapter Three.
2. The Utility's Pretreatment Program Coordinator (PPC) will be available to discuss pretreatment requirements. The Applicant is encouraged to contact the Utility's Pretreatment Coordinator for special instructions that may apply to developments which will have an industrial or commercial discharge to the sewer.
3. If the business occupying the building is expected to generate an industrial or commercial (such as car wash or food service) wastewater discharge, then the Applicant or business owner must fill out an Industrial Discharge Sewer Agreement (IDSA) application and submit the application, with plans, to the PPC.

Pan Review

The plan review shall confirm the need, size, location, and other requirements of the pretreatment necessary to control discharges. Written approval from the Utility must be obtained prior to installation of the pretreatment equipment. The review of such plans and operating procedures shall in no way relieve the user from the responsibility of modifying such facilities as necessary to produce discharge acceptable to the Utility in accordance with the Tariffs approved by the Arizona Corporation Commission (ACC).

Industrial Discharge Criteria

If the discharges expected from this facility are subject to the requirements of **40 CFR 405 – 471** the Applicant must contact the Pretreatment Coordinator to obtain an IDSA application and a Baseline Monitoring Report as required by **40 CFR 403.12**.

Dental Facilities

Dental Facilities are required to fill out a One-time Dental Compliance Report as required in **40 CFR 441.10**. Contact the Utility's PPC for the Compliance Report.

Food Services Facilities Criteria

Any drains that are used to convey wastewater that has the potential to contain grease from food preparation and cleaning operations must discharge to a properly sized Gravity Grease Interceptor (GGI), Hydro-mechanical Grease Interceptor (HGI) when appropriate, or an alternative grease intercepting device (note, the use or placement of industrial food grinders and/or garbage disposals in food establishments will not be allowed). This includes, but is not limited to: drains from pre-rinse and or pre-wash sinks; one, two, three or four compartment sinks; meat prep sinks; wok stoves; kitchen floor drains; floor sinks; soup kettles; rotisseries with drains; steam ovens with drains; food prep sinks; hand wash sinks; dishwashers; self-cleaning ventilation/exhaust hood; food waste disposal units and mop sinks. No waste from water closets, urinals, and other fixtures conveying human waste shall drain into or through the GGI.

Any business requiring a GGI shall have that GGI serving that business only. Shared GGIs are only allowed under limited circumstance and must be approved by the Utility. Any approval for a shared GGI will require the owner or property manager to be responsible for the maintenance of the GGI. This agreement must be in writing and be provided to the Utility prior to any approval of shared GGIs. All GGIs and associated plumbing shall be designed and installed by a licensed plumber or contractor. GGIs shall be installed for easy access, inspection and cleaning. Each compartment shall be accessible by a traffic rated manhole. The inlet and outlet manholes shall be located directly above the inlet and outlet piping "Ts", per EPCOR Detail 450-1. The "T" on the inlet piping must be provide with a removable cap. Sweeping cleanouts must be installed before and after the GGI.

The sizing of the interceptor shall be determined using the following Tables 1-3 (Sizing based on Uniform Plumbing Code 2012). If the GGI is being sized for a vacant shell building, Table 3 shall be used to determine the GGI volume. Alternative grease interceptor-type devices may be used with prior approval.

Table 1

Drainage Fixture Units for Food Service Facilities			
Fixture Type	Drainage Fixture Unit (DFU) Value	Quantity	Total
* 2-Compartment Sink	2		
* 3-Compartment Sink	3		
* Automatic Dishwasher less than 2 inch Drain	3		
* Automatic Dishwasher greater than 2 inch Drain	6		
* Food Prep Sink	2		
Hand Sink	2		
Mop Sink/Mop Basin	3		
* Pre-Rinse Sink	3		
* Sink w/Food Waste	3		
* Rotisserie w/Drain	3		
* Tilt Soup Kettle	3		
* Wok Stove	4		
Floor Drain 2" & 3"	2		
Floor Sink 2"	4		
Floor Sink 3"	6		
Floor Sink 4"	8		
TOTAL DFUs			

** Fixture type not specifically identified in the 2012 Uniform Plumbing Code. DFU value assigned for calculation convenience.*

Table 2: Minimum GGI Size based on Total DFUs

Total DFUs (from Table 1)	GGI Volume (gallons)
Up to 21 DFUs	750 gallons
22-35 DFUs	1000 gallons
36-90 DFUs	1250 gallons
91-172 DFUs	1500 gallons
173-216 DFUs	2000 gallons
217-307 DFUs	2500 gallons
308-342 DFUs	3000 gallons
For total DFU counts greater than 342, please contact EPCORs Pretreatment Coordinator.	

Table 3: GGI sizing for Unfinished Building Shells

GGI Inlet Pipe Size (inches)	GGI Size (gallons)
2"	750 gallons
3"	1000 Gallons
4"	2000 Gallons

APPENDIX

ENGINEERING DETAILS

(Including General Notes and Material Specifications)

GENERAL NOTES:

1. Any changes from approved plans must be submitted to EPCOR for written approval prior to installation.
2. Contractor shall keep a clean, current set of contract drawings as a record of the location of all work completed as part of the project. Revisions, additions, and deletions shall be annotated on the record set of drawings in Red. Contractor shall ensure that survey-grade GPS equipment is used to record northing, easting, and elevation data for certain buried appurtenances. For water mains, appurtenances to be located include valves, crosses, tees, bends, reducers, and other fittings as required by the construction inspector. For sewer mains, appurtenances include the rim and invert elevations of manholes, clean-outs and other features as required. GPS coordinates will utilize the North American Datum (NAD) 1983, State Plane Arizona Central Zone in Maricopa and Santa Cruz counties, and State Plane Arizona West Zone in Mohave County. All units will be in US feet. Prior to completion of the work, provide the red-lined drawings to the Engineer of record for preparation of the project Record Drawings. Final completion will not be made until the Engineer of Record receives satisfactory red-lined drawings.
3. Contractor shall notify EPCOR Construction Inspections Department 48 hours in advance of any construction. Use the Contact List in EPCOR's Developer Guide to schedule inspection (EPCOR general phone number is 623-445-2400). When appointments for inspection are arranged at least 48 hours in advance, the inspection/test will be conducted as scheduled, otherwise the request will be scheduled based on availability.
4. Contractor shall be responsible for obtaining required permits and inspections from appropriate governmental agencies for all work in public rights-of-way (Maricopa County Department of Transportation, City Engineering Department, etc.). Inspections by EPCOR do not relieve contractor of responsibility to obtain required inspections from other interested governmental agencies (Building Safety, Fire District, etc.).
5. All work and testing shall be in accordance with Maricopa Association of Governments (MAG) Standard Specifications and Details unless otherwise stated on plans.
6. All potable waterlines and fittings shall have NSF-PW seal. All materials and products used in the potable water system shall conform to NSF Standards 60 and 61 in accordance with AAC R18-4-213. All materials shall be lead-free as defined in AAC R18-4-101 and R18-4-107.
7. Pipe Separation:
 - a. Separation between water and sewer lines will be a minimum of 6 feet from outside edge to outside edge of pipe. Two feet separation is required between water lines, storm drains, and dry utilities.
 - b. Vertical and Horizontal separation of pipes and pipe crossings of varying degrees of water quality shall be in accordance with State & local government requirements.
8. Dip Section: All dip sections shall be constructed of restrained ductile iron pipe (DIP) per EPCOR's STD. DET. 370-1. All dip sections shall be joint restrained DIP with polyethylene wrap for the entire length per MAG SEC. 610.6. Joint restrained lengths will follow MAG STD. DET. 303-1 and 303-2. Anchor blocks/thrust blocks must be installed for vertical bends per MAG STD. DET. 381. Air/Vacuum release valves are required at all highpoints and at vertical realignments of the water line.
9. Concrete Encasement: All water and sewer encasements shall follow MAG STD. DET. 404-1. When a water line must be constructed under a sewer or reclaimed water line, the water line must be a minimum of 2' below the sewer or reclaimed water line and extra protection is required. Protection for the sewer main should be constructed with mechanical joint or restrained joint ductile iron pipe for a distance of ten feet on both sides of the water main. A full length of DIP will be centered over/under the water main. When DIP is not used for the sewer main, both the water and sewer lines will be encased in concrete for a length of 10' on both sides of the crossing, per MAG STD. DET. 404-2. Refer to MAG STD. DET. 404-1 regarding force mains. All encasements require rebar and class "C" concrete.
10. Gate valves shall be resilient seated in accordance with EPCOR's "Water Material Specifications" and MAG SEC. 630.3.
11. Valve supports shall be in accordance with MAG STD. DET. 301.
12. Valve boxes shall be in accordance with MAG STD. DET. 391-1, type C. Note: Valve box lids used in City of Surprise shall be Bingham & Taylor, Model # CUL5LHVTSK4WCL35
13. Water Valve Debris Caps: Debris caps are required when water valves are constructed within 2 feet of the edge of gutter, in areas that are unpaved, and areas prone to flooding. Valves should be set 2-tenths above finish grade in all unpaved areas. Concrete collar with carsonite marker is required on all valve locations outside of right-of-way.
14. Concrete thrust blocks shall be in accordance with MAG STD. DET. 380. Thrust blocks are NOT allowed in Right-of-ways (ROWs). Restrained joints per MAG STD. DET. 303-1 & 2 shall be used in ROWs in place of concrete thrust blocks. 90-degree fittings are NOT allowed in ROW's, but may be used in other areas as approved by EPCOR.
15. Field lock gaskets are not allowed.
16. Water services 2 inches and smaller shall be in accordance with EPCOR STD. DET. 342-2.
17. Fire hydrants located on "Dead End" water mains shall have a blow-off, in accordance with EPCOR STD. DET. 390-1, installed at the end of the water main.
18. Hydrant coating: "Safety Yellow". Complete hydrant preparation prior to inspection for painting. Inspection is also required after painting for contractor to receive final acceptance.
19. Pumper nozzle shall be oriented to provide best accessibility for fire truck. All hydrant ports must be lubricated with a food-grade lubricant, or NSF 60 product.
20. Fire hydrants shall be in accordance with EPCOR STD. DET. 360-1 or 360-2 as indicated on the Plan. In Mohave County, fire hydrants shall be in accordance with EPCOR STD. DET. 360-2.

100-1 & 2.DWG 07/30/20 - 03:42pm

DATE:	July '20		2355 W Pinnacle Peak Rd, Ste 300 Phoenix, AZ 85027 P 623.445.2400 F 623.587.1044	GENERAL NOTES	DETAIL NO. 100-1
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GENERAL NOTES (CONTINUED)

21. Reclaimed waterlines shall be installed in accordance with MAG SEC. 601, 610 and 616. Testing shall be in accordance with MAG SEC. 610 and 611 including disinfection/chlorination. Final flushing and bacteriological testing as specified in MAG SEC 611.15 shall not be required.
22. Any shutdown to EPCOR's system requires a minimum of 48 hours notice to EPCOR's Inspector. Shutdowns will only be allowed on Tuesdays, Wednesdays and Thursdays. Time restrictions may also apply.
23. Concealed Pick-hole Manhole Covers: Concealed Pick-hole manhole covers are required when the edge of the manhole covers are constructed within 3 feet of the edge of gutter, in areas that are unpaved, and areas prone to flooding. Manholes should be set 2-tenths above finish grade in all unpaved areas. Concrete collar with carsonite marker is required on all manhole locations outside of right-of-way. Concealed Pick-hole manhole covers are required for all manholes in Mohave County.
24. Water Pressure Testing: All water lines will be tested per MAG SEC. 610.15. Modifications to these specifications include; the testing to be at a minimum of 200 psi, higher test pressures may be required in certain circumstances, and loss/leakage calculations will be based upon a maximum of 1500-feet, starting with the smallest diameter pipe.
25. The Contractor is required to uniform slope test all sewer lines by video and vacuum test all manholes in accordance with A.A.C. R18-9-E301. Deflection testing shall be performed per MAG SEC. 615.11. Testing documentation and flash drives shall be submitted to EPCOR Development Services Project Manager for approval prior to acceptance. All required repairs are the responsibility of the contractor and must be coordinated with EPCOR inspectors.
26. Sewer Testing: All sewer mains and laterals shall be pressure tested and video tested. All sewer mains shall also be mandrill tested. The maximum allowable sag is 0.5 inches.
27. When using mechanical plugs to test sewer mains/manholes contractor must follow EPCOR STD. DET. 420.
28. In Mohave County, solid sleeves are not allowed as a remedy to a failed pressure test on a new line.

BACKFLOW PREVENTION GENERAL NOTES:

1. Backflow Prevention Devices: All landscape and commercial water services require backflow prevention devices, meeting the requirements of EPCOR. Backflow devices shall be in place prior to meters being set. Testing of the backflow devices may be completed after the installation of the meter.
2. Contact Utility Cross-Connection Specialist (Backflow Prevention) at (623) 445-2411 for approved assembly list, inspections and testing.

3. Use only a University Of Southern California Foundation For Cross-Connection Control and Hydraulic Research (USC) APPROVED assembly.
4. Backflow prevention assemblies shall have a certificate of approval issued by USC-FCCCHR, or other approved third-party certifying entity unrelated to the product manufacturer or vendor, in accordance with AAC R18-4-215. All assemblies shall be installed in accordance with EPCOR standard details. No assembly shall be placed in service unless it has been tested and is functioning as designed. A certified test must be submitted to EPCOR Cross Connection Specialist (Backflow Prevention) for approval. Approval of water facilities will not be granted prior to backflow prevention approval.
5. Locate assembly within 36 inches of water meter unless otherwise directed by Utility's Cross-Connection Specialist.
6. All Pressure Vacuum Breaker Assemblies shall be installed a minimum of 12 inches above all downstream piping and outlets.
7. Use lead free solder only.
8. CLEARANCES:
 - a. Wall or structure: Minimum 36"
 - b. Above finish grade: Minimum 12" – Maximum 24"
9. Fire Lines: provide usage-tamper switches & wiring to alarm system where required by fire department. Note: Fire Lines longer than 75' require backflow assembly at property line or EPCOR approved location. Such Fire Lines must have backflow prevention assemblies with a metered bypass.

APPROVAL PROCESS FOR BACKFLOW PREVENTION ASSEMBLIES:

1. All new backflow prevention assemblies (BPAs) shall be tested and functioning as designed prior to Approval in accordance with AAC R18-4-215.
2. Developer/Contractor/Customer shall forward passing test report with required BPA information to EPCOR Cross Connection Specialist, marked pending approval.
3. EPCOR Cross Connection Specialist (Backflow Prevention) will notify Developer Services that an approved backflow prevention assembly test has been received, and this project is ready for an approval inspection.
4. A Construction Inspector then schedules an Approval Inspection with the Developer/Contractor/Customer.
5. EPCOR Construction Inspector confirms presence of BPA, and confirms proper installation guidelines have been followed.
6. Backflow Prevention approval process complete.
7. Approval may be granted provided all other required Operation Inspection items have no deficiencies.

100-1 & 2.DWG 07/30/20 - 03:42pm

DATE: July '20		2355 W Pinnacle Peak Rd, Ste 300 Phoenix, AZ 85027 P 623.445.2400 F 623.587.1044	GENERAL NOTES (CONTINUED) BACKFLOW PREVENTION GENERAL NOTES BACKFLOW PREVENTION APPROVAL PROCESS NOTES	DETAIL NO. 100-2
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WATER SYSTEM MATERIAL SPECIFICATION

DISTRIBUTION PIPING

- C900 Polyvinyl Chloride (PVC): In accordance with American Water Works Association (AWWA) Standard C900 for pipe diameters thru 12": DR=14, elastomeric-gasket bell-end.
- Ductile Iron Pipe, mortar-lined (DIP) shall be used for pipe diameters greater than 12".
- Ductile Iron Pipe, mortar-lined (DIP): In accordance AWWA Standards C150 & C151 Mortar lining shall be in accordance with AWWA C104. All Ductile Iron Pipe shall be polyethylene wrapped for the entire length in accordance with MAG SEC. 610.6. 6" through 14" diameter must be Pressure Class 350 minimum: 16" through 24" must be Pressure Class 250 Minimum, 30" and larger must be Pressure Class 150 minimum.
- In Paradise Valley and Chaparral (Fountain Hills) Districts, Ductile Iron Pipe only. PVC is not permitted.
- Concrete Pressure Pipe, Steel Cylinder Type: In accordance with AWWA Standard C303 and MAG SEC. 758 for pipe diameters greater than 24". Manufacturer's technical data sheets shall be submitted to EPCOR for review and approval. Service taps are not permitted on concrete pressure pipe.

DISTRIBUTION FITTING

- Push-on or mechanical joint in accordance with AWWA C111 and MAG SEC. 750.4. Joint restraints, where required, shall be Mechanical Restrained Joint with product approved by EPCOR or flanged joint for lengths in accordance with MAG STD. DET. 303-2. Field lock gaskets are not allowed.

WATER LINE VALVE

- Mueller, Clow, Kennedy, or M&H resilient wedge seated Gate Valve in accordance with MAG SEC. 630.3 with valve box and cover in accordance with MAG STD. DET. 391-1 Type "C" minimum lid weight of 16lbs. Valves installed outside the pavement or in the flow line of a roadway shall have a debris cap installed per MAG STD. DET. 392. Butterfly valves are not allowed without EPCOR Approval.

CONTROL VALVES (MOHAVE COUNTY ONLY)

- The external tubing needs to be stainless steel, not copper. CLA-VAL is the only acceptable manufacturer.

TAPPING SLEEVE & VALVE

- Stainless Steel - Approved manufacturers are Cascade, JCM, and Smith-Blair.
- Paradise Valley District may require a bypass on valves on 12" or larger pipe. Contact EPCOR for approval on a case-by-case basis.

WATER SERVICE

- For taps, pipe and fittings for water services through 2", the size shall be in accordance with EPCOR's STD. DET. 342-2. Requests for larger sizes must be submitted for review and approval. Minimum water service line size diameter shall be 1".
- Tubac District requires meter setters on all projects.
- 2" meter setters are required for critical service developments in Paradise Valley and Anthem Districts.
- Approved Saddles, all Iron Pipe Thread Tap and bronze strap: For PVC, Jones J-995, Jones J-996, Mueller H-13000 Series; For Ductile Iron Pipe, Ford 202B, Jones J-979, Mueller BR2B Series, Mueller BR2S Series.
- All brass fittings must be manufactured by Ford, Mueller, or James Jones. All angle meter stops must include locking wings.
- All corp stops and angle valves must be ball style. All fittings must be "pac-joint" type.
- All brass must be lead free.

FIRE HYDRANTS

- All hydrants will be Wet Barrel (unless Dry Barrel hydrants are required by local jurisdiction) and be manufactured by Clow or Jones. Break-off check valve shall be Clow.
- All hydrants shall be equipped with national standard hose threads.

TRACER WIRE

- See EPCOR's STD. DET. 350-1. Tracer wire must be used for all water lines.

DIP SECTIONS

- All dip sections shall be constructed of restrained ductile iron pipe (DIP) per EPCOR's STD. DET. 370-1. All dip sections shall be joint restrained DIP with polyethylene wrap for the entire length per MAG SEC. 610.6. Joint restrained lengths will follow MAG STD. DET. 303-1 and 303-2. Anchor blocks/thrust blocks must be installed for vertical bends per MAG STD. DET. 381.

MARKING TAPE

- See EPCOR's STD. DET. 350-1. Marking tape must be used for all water lines and services.

MARKING POSTS

- Carsonite marking posts are required for all water valves located outside of ROW and outside of paved areas, installed with concrete collar.

ALL OTHER ITEMS

- In accordance with MAG Specifications.
- Where MAG standards are specified, those standards are applicable.

100-3 & 4 & 5.DWG 07/30/20 - 03:42pm

DATE:

July '20



2355 W Pinnacle Peak Rd, Ste 300
Phoenix, AZ 85027
P 623.445.2400 F 623.587.1044

WATER SYSTEM
MATERIAL SPECIFICATION

DETAIL NO.

100-3

SEWER SYSTEM MATERIAL SPECIFICATION

COLLECTION MAINS

- SDR35 PVC sewer pipe in accordance with MAG Specifications, ASTM D-3034, and ASTM F-679 or US Pipe Protecto 401 ceramic epoxy ductile iron pipe. All Ductile iron pipe shall be polyethylene wrapped for the entire length in accordance with MAG SEC. 610.6

SEWER SERVICE

- SDR35 PVC sewer pipe in accordance with MAG Specifications, including Marker Ball and ASTM D-3034.

MANHOLES

- Precast Concrete in accordance with MAG Specifications, except that no steps shall be installed in any manholes. Each manhole shall be treated with "Insecta" insect treatment as soon as that manhole is raised to grade, after lining is complete and prior to final acceptance. All sewer manholes shall be lined, including the base, with one of the following products, as applied by a certified applicator:

- NeoPoxy NPR-5300 Series epoxy
- Raven 405/A10
- Sauereisen 210
- Sewer Shield 100

As a minimum, lining is required under the following conditions:

- Manholes for sewers that are 10" in diameter, or larger
- Manholes for sewers that are 10' in depth, or greater
- Manholes that receive wastewater from force mains
- Drop manholes
- Manholes deemed necessary by EPCOR

MANHOLE COVER

- Cast Iron in accordance with MAG Specifications. All manholes shall have a 30" frame and cover, Neenah R-1743. Lid to be stamped "Sanitary Sewer" in accordance with MAG Detail 424. No agency identification shall be added. See EPCOR's STD. DET. 100-2 for information on water tight manhole covers.

ALL OTHER ITEMS

- In accordance with MAG Specifications.

FORCE MAINS

- PVC pressure pipe in accordance with AWWA C900 or C905, Griffin H2Sewer Safe or US Pipe Protecto 401 Ductile Iron Pipe, min. pressure class 150. All ductile iron pipe shall be polyethylene wrapped for the entire length in accordance with MAG SEC. 610.6.

SEWER SYSTEM MATERIAL SPECIFICATION (CONTINUED)

MARKING POSTS

- Carsonite marking posts are required for all sewer mains outside of ROW and outside of paved areas, and are required for force mains greater than 16 inches in diameter.

TRACER WIRE

- See EPCOR's STD. DET. 350-1. Tracer wire must be used for all sewer force mains.

MARKING TAPE

- See EPCOR's STD. DET. 350-1. Marking tape must be used for all sewer lines and services.

ALL OTHER ITEMS

- In accordance with MAG Specifications.
- Where MAG standards are specified, those standards are applicable regardless of project location.

07/30/20 - 03:42pm

100-3 & 4 & 5.DWG

DATE:
July '20



2355 W Pinnacle Peak Rd, Ste 300
Phoenix, AZ 85027
P 623.445.2400 F 623.587.1044

SEWER SYSTEM
MATERIAL SPECIFICATION

DETAIL NO.
100-4

RECLAIMED WATER SYSTEM MATERIAL SPECIFICATION

DISTRIBUTION PIPING

- C900 Polyvinyl Chloride (PVC): In accordance with American Water Works Association (AWWA) Standard C900 for pipe diameters up to 12"; DR=18, elastomeric-gasket bell-end.
- In Mohave County, all PVC must be DR14 only. DR18 is not permitted.
- C905 Polyvinyl Chloride (PVC): In accordance AWWA Standard C905 for pipe diameters greater 12"; DR=18, elastomeric-gasket bell end.
- Ductile Iron Pipe (DIP): In accordance with AWWA Standards C150 & C151. Motar lining shall be in accordance with AWWA C104. All Ductile Iron Pipe shall be polyethylene wrapped for the entire length in accordance with MAG SEC. 610.6. 6" through 14" diameter must be Pressure Class 350 minimum; 16" through 24" must be Pressure Class 250 minimum, 30" and larger must be Pressure Class 150 minimum.
- All pipe shall be appropriately identified through integral coloring and wording of the pipe, stenciling of the pipe, or pipe sleeving (pipe socks) in accordance with MAG SEC. 616. Marking tape shall be installed in accordance with EPCOR's STD. DET. 350-1.

FITTINGS

- Push-on or mechanical joint in accordance with MAG SEC. 750. Joint restraints, where required, shall be Mechanical Restraint Joint with product approved by the Utility for lengths in accordance with MAG STD. DET. 303-2.

VALVES

- Mueller, Clow, Kennedy, or M&H resilient wedge seated Gate Valve in accordance with MAG SEC. 630.3 with valve box and cover in accordance with MAG Detail 391-1 Type "C" minimum lid weight of 16lbs.
- Valve riser pipes shall be painted purple (Seymour Safety Purple) inside and out. Debris caps with identification tag shall be installed in accordance with MAG STD. DET. 392, MAG SEC. 616, and EPCOR's STD. DET. 600-1.

SERVICES

- Taps, pipe and fittings for water services 1-1/2" and 2" size shall be in accordance with EPCOR's STD. DET. 610-1. Larger sizes to be submitted for approval. No services smaller than 1-1/2" will be approved by EPCOR.

RECLAIMED WATER SYSTEM MATERIAL SPECIFICATION (CONT'D)

DIP SECTIONS

- All dip sections shall be constructed of restrained ductile iron pipe (DIP) per EPCOR's STD. DET. 370-1. All dip sections shall be joint restrained DIP with polyethylene wrap for the entire length per MAG SEC. 610.6. Joint restrained lengths will follow MAD STD. DET. 303-1 and 303-2 and appropriately identified in accordance with MAG SEC. 616. Anchor blocks/thrust blocks must be installed for vertical bends per MAG STD. DET. 381.

MARKING TAPE

- Wording per MAG SEC. 616 to be used on all reclaimed water mains. The marking tape shall be printed "Caution: Reclaimed Water Line" on Purple Tape for reclaimed water lines.

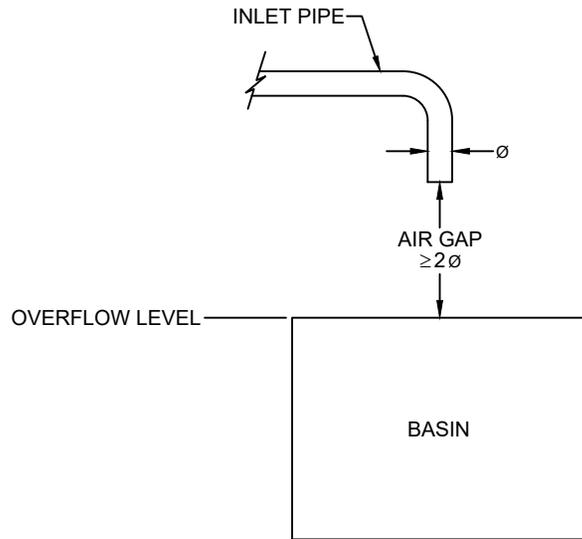
ALL OTHER ITEMS

- In accordance with MAG Specifications.
- Where MAG standards are specified, those standards are applicable regardless of project location.

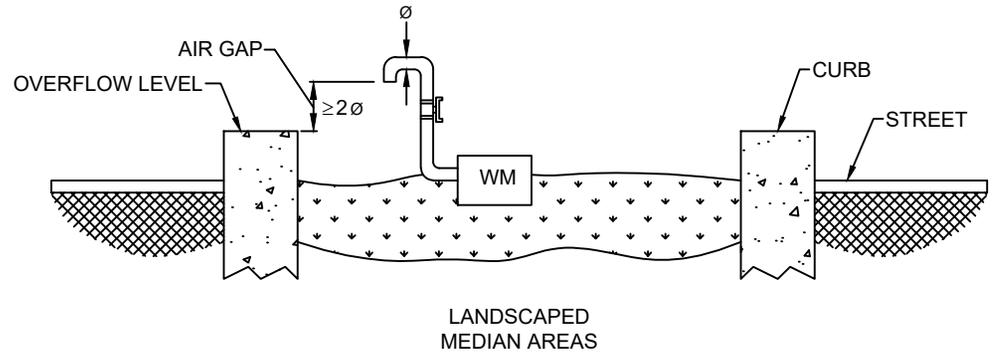
100-3 & 4 & 5.DWG 07/30/20 - 03:42pm

DATE: July '20		2355 W Pinnacle Peak Rd, Ste 300 Phoenix, AZ 85027 P 623.445.2400 F 623.587.1044	RECLAIMED WATER SYSTEM MATERIAL SPECIFICATION	DETAIL NO. 100-5
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TYPICAL BASIN STYLE AIR GAP



TYPICAL FLOOD IRRIGATION STYLE AIR GAP



NOTES:

1. AN AIR GAP IS A PHYSICAL SEPARATION BETWEEN THE END OF A POSSIBLE WATER SUPPLY PIPE AND THE OVERFLOW LEVEL OF AN OPEN OR NON-PRESSURIZED BASIN.
2. AIR GAP DISTANCE TO BE MEASURED FROM BOTTOM OF PIPE TO OVERFLOW LEVEL
3. AIR GAP DISTANCE TO ALWAYS BE AT LEAST TWICE THE INLET PIPE DIAMETER, AND IN NO CASES LESS THAN 1".
4. CONTACT EPCOR CROSS CONNECTION SPECIALIST (BACKFLOW PREVENTION) @ 623-587-5202 FOR APPROVED ASSEMBLY LIST, INSPECTIONS AND TESTING.
5. SEE EPCOR'S STD. DET. 100-2 FOR MORE INFORMATION.

300-1.DWG 07/30/20 - 03:42pm

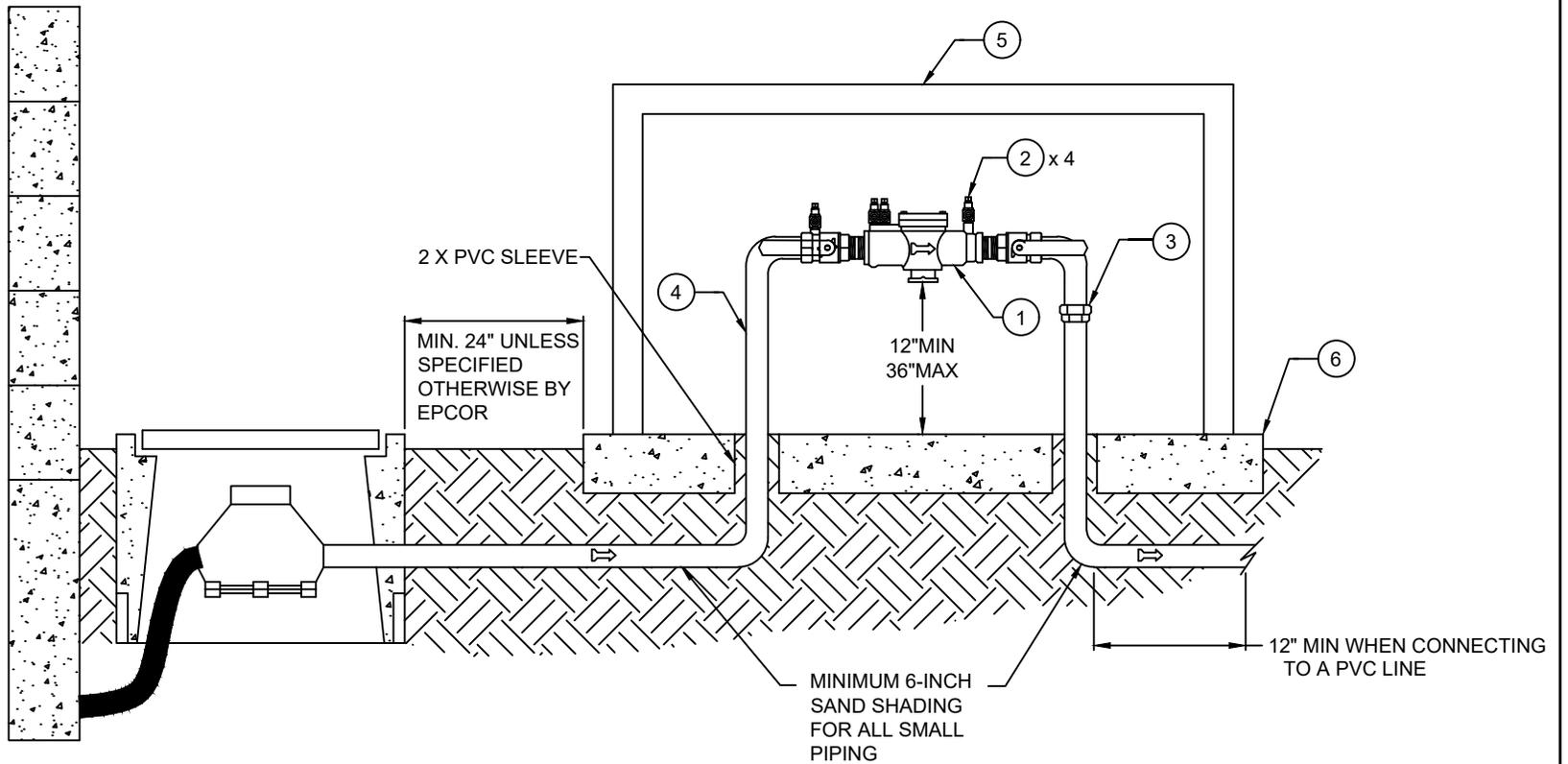
DATE:
July '20



2355 W Pinnacle Peak Rd, Ste 300
Phoenix, AZ 85027
P 623.445.2400 F 623.587.1044

AIR GAP

DETAIL NO.
300-1



NOTES:

1. SEE EPCOR'S STD. DET. 100-2 FOR BACKFLOW PREVENTION GENERAL NOTES.
2. TO CONNECT TO GALVANIZED LINES, USE A BRASS FITTING. FOR PVC LINES USE A COPPER FEMALE ADAPTER X PVC MALE ADAPTER FITTING (OR A SCH 80 PVC NIPPLE).

MATERIAL LIST:

- ①. USC APPROVED ASSEMBLY, (SUBMIT TO EPCOR FOR APPROVAL).
- ②. TEST COCKS WITH BRASS PLUGS (4).
- ③. 3 PC BRASS UNION 12" MAX FROM ASSEMBLY
- ④. ALL COPPER FITTINGS, TYPE 'K' COPPER TUBING
- ⑤. VANDALISM AND/OR FREEZE PROTECTION ENCLOSURE (OPTIONAL)
- ⑥. 4" CONCRETE SLAB W/PVC SLEEVES FOR ENCLOSURE (OPTIONAL)

310-1.DWG 07/30/20 - 03:43pm

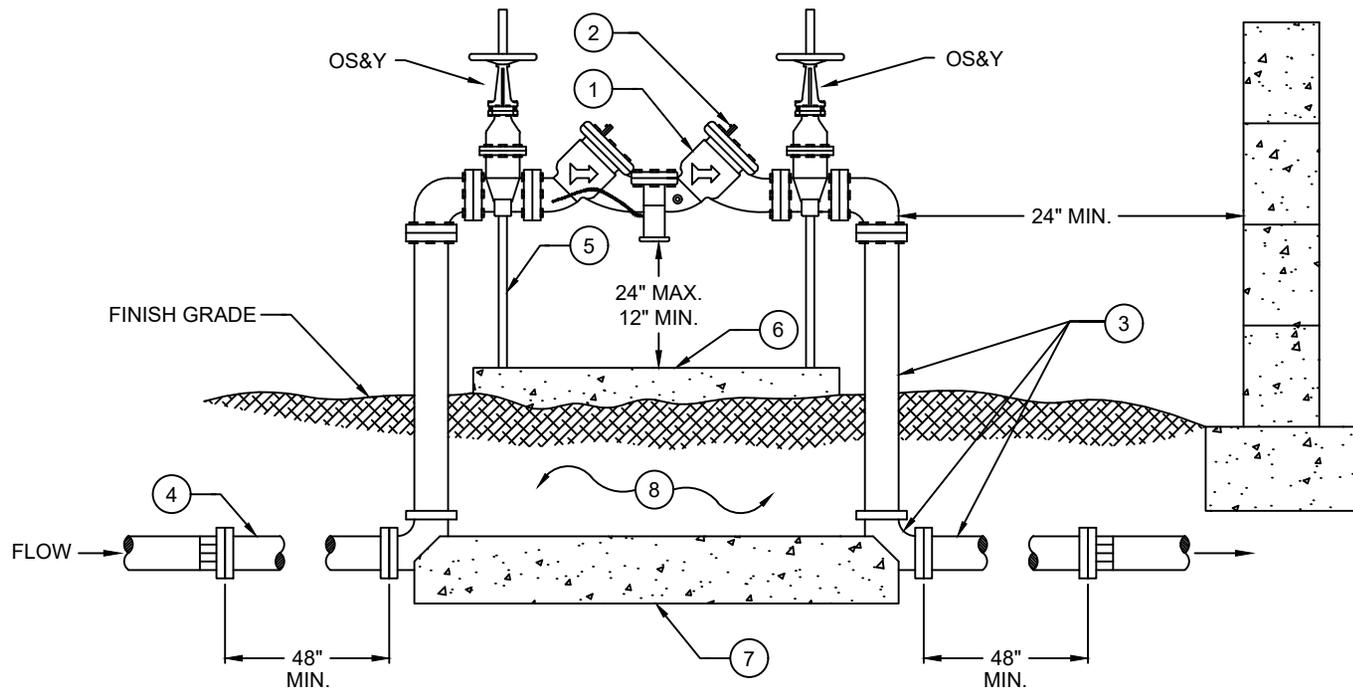
DATE:
July '20



2355 W Pinnacle Peak Rd, Ste 300
Phoenix, AZ 85027
P 623.445.2400 F 623.587.1044

1/2" - 2" REDUCED PRESSURE PRINCIPLE ASSEMBLY

DETAIL NO.
310-1



NOTES:

1. SEE EPCOR'S STD. DET. 100-2 FOR BACKFLOW PREVENTION GENERAL NOTES.
2. BACKFILL UNDER ASSEMBLY SHALL BE 95% COMPACTION
3. FOR FIRE LINE USAGE-TAMPER SWITCHES & WIRING MAY BE NEEDED BY FIRE DEPARTMENT OR DISTRICT.
4. FOR FIRE LINES, A REDUCED PRESSURE DETECTOR ASSEMBLY WITH METER IS REQUIRED. METER SHALL HAVE AN AMR REGISTER.

MATERIAL LIST:

- ① USC APPROVED ASSEMBLY, (SUBMIT TO EPCOR FOR APPROVAL).
- ② TEST COCKS WITH BRASS PLUGS (4).
- ③ USE FLANGED DUCTILE IRON FOR ABOVE GROUND PIPE & FITTINGS. RESTRAINED JOINTS SHALL BE USED BELOW GROUND.
- ④ MEGALUG M.J. FITTING-FOR AC PIPE USE FCA
- ⑤ ADJUSTABLE PIPE SUPPORTS (2)
- ⑥ CONCRETE SLAB MINIMUM 6" THICK X 24" WIDE
- ⑦ CONCRETE THRUST BLOCK-12" WIDE X 12" THICK MINIMUM TO UNDISTURBED EARTH. USE 2-3/4" ZINC COATED, THREADED RODS, BOLTED TO FLANGES, BOTH SIDES TYPICAL; (4 TOTAL).
NOTE: IN LIEU OF CONCRETE THRUST BLOCK, A 3'x3'x1/4" STEEL ANGLE, AS SHOWN IN EPCOR STD. DET. 345-2, MAY BE USED.
- ⑧ JOINT RESTRAINTS PER M.A.G. STD. DET. 303-1 AND 303-2

310-2.DWG 07/30/20 - 03:43pm

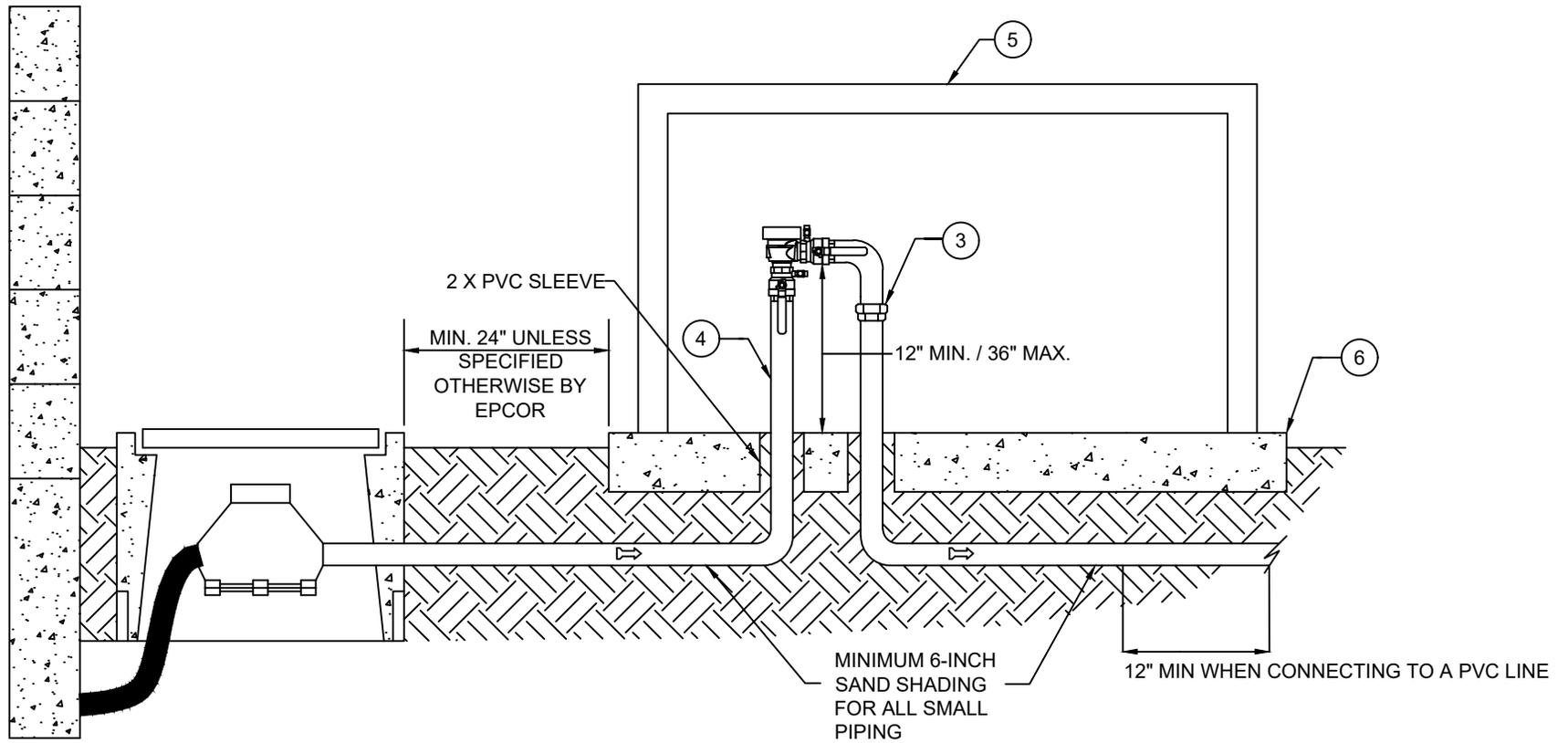
DATE:
July '20



2355 W Pinnacle Peak Rd, Ste 300
Phoenix, AZ 85027
P 623.445.2400 F 623.587.1044

**3" - 10" REDUCED PRESSURE PRINCIPLE ASSEMBLY
RP2 EXCEPT F/L**

DETAIL NO.
310-2



NOTES:

1. SEE EPCOR'S STD. DET. 100-2 FOR BACKFLOW PREVENTION GENERAL NOTES.
2. TO CONNECT TO GALVANIZED LINES, USE A BRASS FITTING. FOR PVC LINES USE A COPPER FEMALE ADAPTER X PVC MALE ADAPTER FITTING (OR A SCH 80 PVC NIPPLE).

MATERIAL LIST:

- ①. USC APPROVED ASSEMBLY, (SUBMIT TO EPCOR FOR APPROVAL).
- ②. TEST COCKS WITH BRASS PLUGS (4).
- ③. 3 PC BRASS UNION 12" MAX FROM ASSEMBLY
- ④. ALL COPPER FITTINGS, TYPE 'K' COPPER TUBING
- ⑤. VANDALISM AND/OR FREEZE PROTECTION ENCLOSURE (OPTIONAL)
- ⑥. 4" CONCRETE SLAB W/PVC SLEEVES FOR ENCLOSURE (OPTIONAL)

310-3.DWG 07/30/20 - 03:43pm

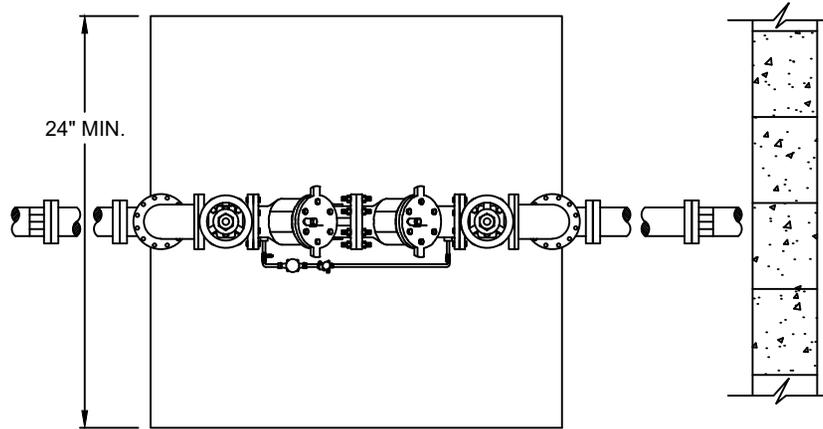
DATE:
July '20



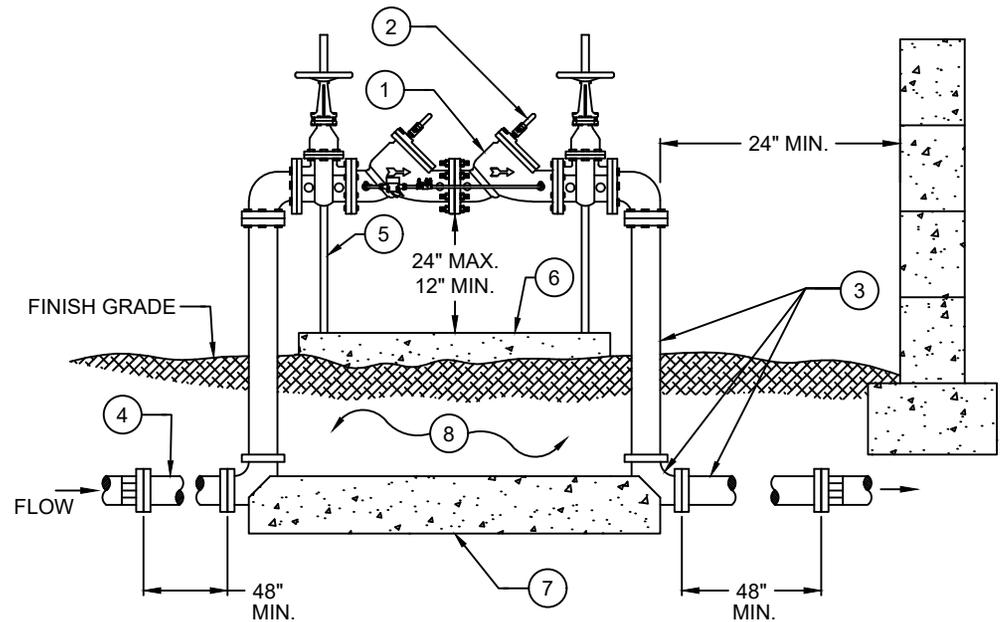
2355 W Pinnacle Peak Rd, Ste 300
Phoenix, AZ 85027
P 623.445.2400 F 623.587.1044

1/2" - 2" PRESSURE VACUUM BREAKER ASSEMBLY

DETAIL NO.
310-3



PLAN VIEW



SECTION VIEW

MATERIAL LIST:

- ① U.S.C. (ALSO UL/FM FOR FIRELINES) APPROVED ASSEMBLY, (SUBMIT TO EPCOR FOR APPROVAL).
- ② TEST COCKS WITH BRASS PLUGS (4).
- ③ FLANGED DUCTILE IRON PIPE & FITTINGS ABOVE GROUND MEGALUG RECOMMENDED BELOW GROUND.
- ④ MEGALUG M.J. FITTING-FOR AC PIPE USE F.C.A.
- ⑤ ADJUSTABLE PIPE SUPPORTS (2)
- ⑥ CONCRETE SLAB MINIMUM 6" THICK x 24" WIDE
- ⑦ CONCRETE THRUST BLOCK-12" WIDE x 12" THICK MINIMUM TO UNDISTURBED EARTH. USE 2-3/4" ZINC COATED, THREADED RODS, BOLTED TO FLANGES, BOTH SIDES TYPICAL; (4 TOTAL).
NOTE: IN LIEU OF CONCRETE THRUST BLOCK, A 3"x3"x1/4" STEEL ANGLE, AS SHOWN IN EPCOR STD. DET. 345-2, MAY BE USED.
- ⑧ JOINT RESTRAINTS PER M.A.G. STD. DET. 303-1 & 303-2.

NOTES:

1. SEE EPCOR'S STD. DET. 100-2 FOR BACKFLOW PREVENTION GENERAL NOTES.
2. FOR FIRE LINES, A REDUCED PRESSURE DETECTOR ASSEMBLY WITH METER IS REQUIRED. METER SHALL HAVE AN AMR REGISTER.

320-1.DWG 07/30/20 - 03:43pm

DATE:
July '20



2355 W Pinnacle Peak Rd, Ste 300
Phoenix, AZ 85027
P 623.445.2400 F 623.587.1044

1" - 10" DOUBLE CHECK DETECTOR ASSEMBLY

DETAIL NO.
320-1

POTABLE WATER
SYSTEM FIRE
HYDRANT

REDUCED PRESSURE
BACKFLOW ASSEMBLY
(SUPPLIED BY
CONTRACTOR)

WATER METER

2" GATE VALVE
W/ NIPPLE; FOR
CHAPARRAL
DISTRICT
(FOUNTAIN
HILLS) THIS
MUST BE A 3"
GATE VALVE

SUPPORTS (2 EA.)
SUPPLIED BY
CONTRACTOR

NOTES:

1. PROPER BACKFLOW PROTECTION REQUIRED BY EPCOR.
2. USER MUST INSTALL A REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTION ASSEMBLY ON EACH HYDRANT METER BEFORE USING WATER.
3. BACKFLOW ASSEMBLY MUST BE TESTED BY A RECOGNIZED, CERTIFIED BACKFLOW ASSEMBLY TESTER BEFORE USING AND ALSO EACH TIME METER IS MOVED.
4. USER MUST REMOVE BACKFLOW ASSEMBLY WHEN HYDRANT METER IS REMOVED OR RELOCATED.
5. USER IS LIABLE FOR ANY DAMAGE TO HYDRANT METER AND FITTINGS.
6. USER MUST USE GATE VALVE TO CONTROL FLOW OF WATER.

330.DWG 07/30/20 - 03:43pm

DATE:
July '20

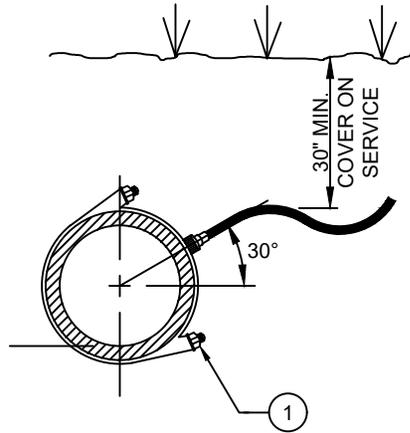


2355 W Pinnacle Peak Rd, Ste 300
Phoenix, AZ 85027
P 623.445.2400 F 623.587.1044

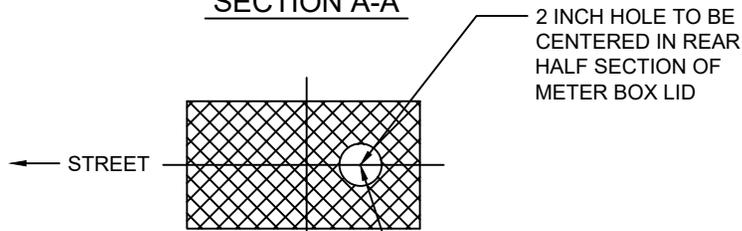
REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTION
ASSEMBLY
FOR TEMPORARY USE ON HYDRANT METERS

DETAIL NO.
330

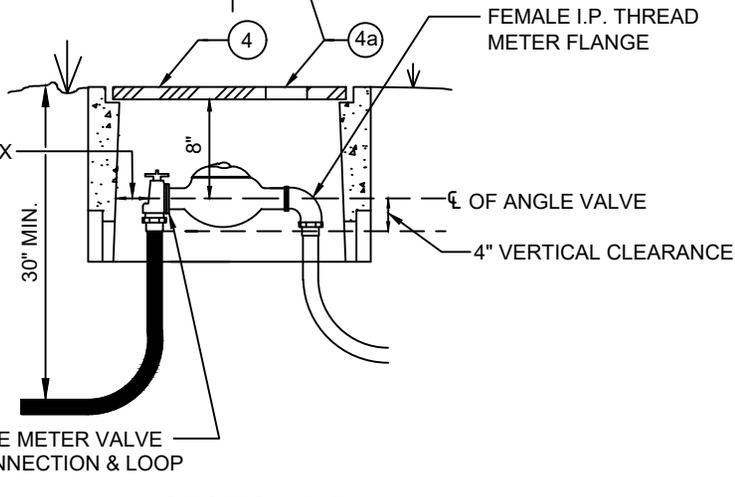
ALL SERVICES



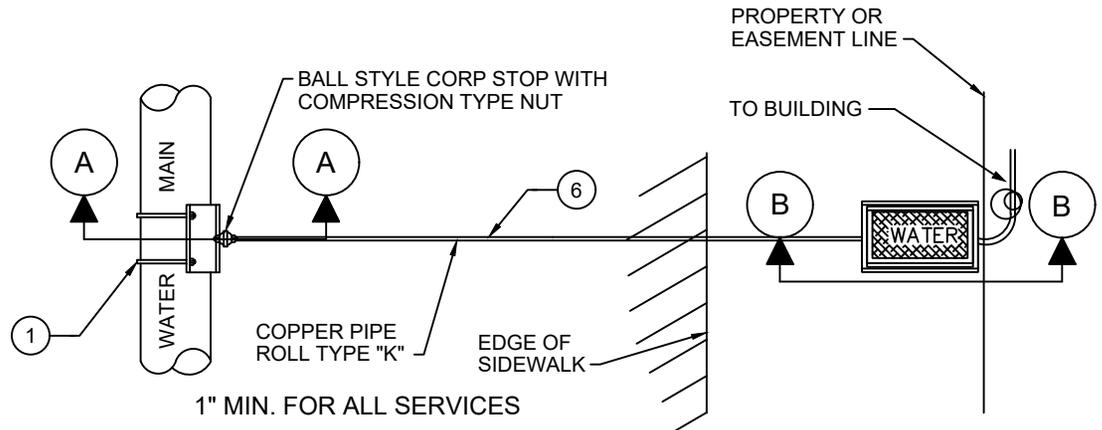
SECTION A-A



2 INCH HOLE TO BE CENTERED IN REAR HALF SECTION OF METER BOX LID



SECTION B-B



PLAN VIEW

NOTES:

1. SEE EPCOR'S WATER SYSTEM MATERIAL SPECIFICATIONS FOR APPROVED SADDLES.
2. AMR METER (ONLY) TO BE SET BY EPCOR UPON PAYMENT OF FEES.
3. MINIMUM #4 BOX ON 1-1/2 INCH OR LARGER - #2 BOX FOR ALL SERVICES UP TO 1 INCH.
4. CONCRETE METER BOX PER M.A.G. STD. DET. 320 BOX NO. 2 OR 4 W/ STEEL LID TO BE SET PERPENDICULAR TO BACK OF WALK OR CURB. BOX TO MATCH SLOPE OF FINISH GRADE AND SET 1" ABOVE FINISH GRADE OR BACK OF WALK OR CURB. (4a) 2 INCH DIAMETER OPENING
5. NO BOXES IN DRIVEWAYS OR SIDEWALKS.
6. 6 INCH SAND SHADING AND BEDDING ON SERVICE.
7. CAL WESTERN INC TYPE CAL102 BLUE POLY SLEEVE REQUIRED IN MOHAVE COUNTY ONLY. TRACER WIRE REQUIRED ON TOP OF SLEEVE.
8. MOHAVE COUNTY REQUIRES A COMPRESSION PINCH NUT AT THE SADDLE.
9. AAC R14-2-405.B.3 STATES, "WHERE SERVICE IS BEING PROVIDED FOR THE FIRST TIME, THE CUSTOMER SHALL PROVIDE AND MAINTAIN A PRIVATE CUTOFF VALVE WITHIN 18 INCHES OF THE METER ON THE CUSTOMER'S SIDE OF THE METER."

342.DWG 07/30/20 - 03:43pm

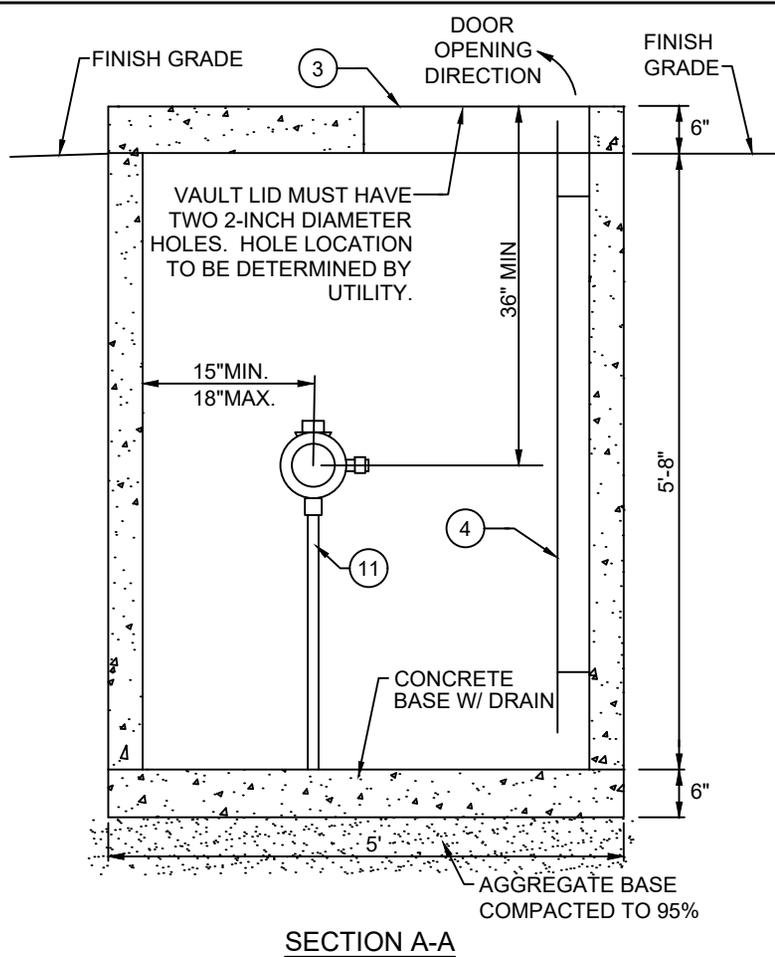
DATE:
July '20



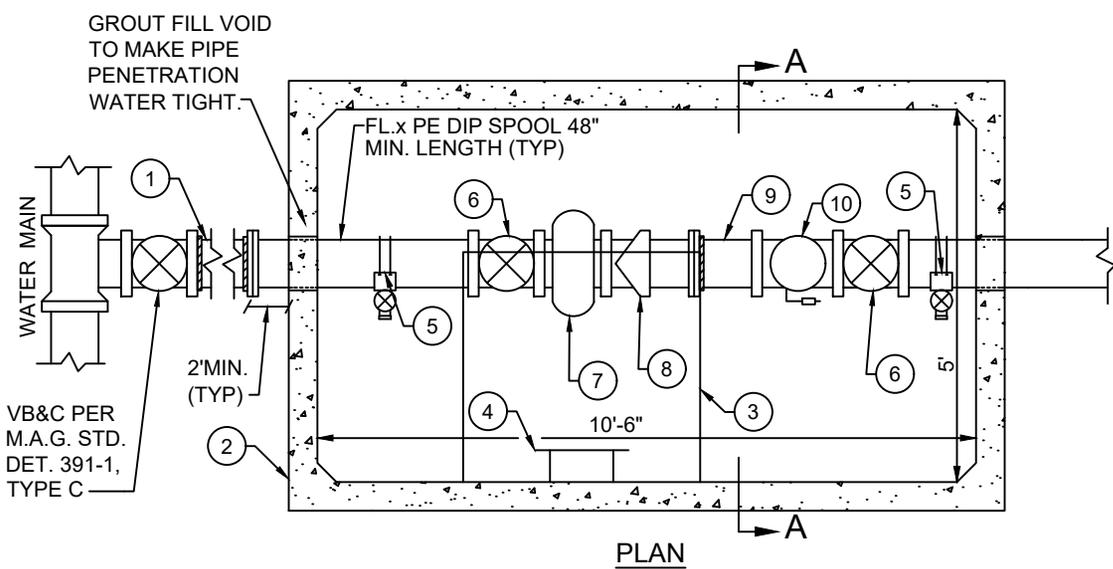
2355 W Pinnacle Peak Rd, Ste 300
Phoenix, AZ 85027
P 623.445.2400 F 623.587.1044

POTABLE WATER SERVICE CONNECTION
1" THRU 2" SERVICE W/ CORRESPONDING METER

DETAIL NO.
342



SECTION A-A



PLAN

MATERIALS LIST:

- ① ALL PIPING TO BE JOINT RESTRAINED, MIN. PRESSURE CLASS 150, DIP. JOINT RESTRAINTS TO BE FLANGED OR MEGALUG.
- ② PRE-CAST VAULT, OLD CASTLE 5106-WA OR EPCOR APPROVED EQUAL.
- ③ 6' x 4' ALUMINUM ACCESS DOOR WITH SPRING ASSIST RATED FOR H-20 LOADING. HALLIDAY PRODUCTS H2R7248 OR EPCOR APPROVED EQUAL. VAULT DOOR SYSTEM WILL HAVE 2" DIAMETER TO ALLOW FOR ANTENNAE. THE HOLE SHOULD BE IN A LOCATION THAT ALLOWS EASE OF INSTALLATION, ALLOW VAULT DOORS TO OPEN FULLY, AND HAVE ENOUGH CABLE TO NOT BIND.

- ④ ALUMINUM BOLT ON LADDER WITH SAFETY EXTENSION, HALLIDAY PRODUCTS LIB AND LIE OR EPCOR APPROVED EQUAL.
- ⑤ 2" DOUBLE STRAP BRONZE SADDLES PER EPCOR'S STD. DET. 342-2 AND A 2" LOCKABLE BALL VALVE.
- ⑥ MUELLER OR CLOW RESILIENT SEATED FLANGED NRS GATE VALVE WITH HAND WHEEL IN ACCORDANCE WITH M.A.G. SECTION 630.3.
- ⑦ STRAINER REQUIRED WITH INSTALLATION OF METER.
- ⑧ ALL METERS THAT ARE 3 INCHES OR LARGER MUST BE COMPOUND METERS. EPCOR WILL PROVIDE ALL COMPOUND METERS. CONTRACTOR WILL NEED TO COORDINATE PICK-UP AND INSTALLATION WITH EPCOR STAFF
- ⑨ FLANGED X FCA DIP SPOOL, MINIMUM 3 PIPE DIAMETERS LENGTH.
- ⑩ EPCOR APPROVED CHECK VALVE.
- ⑪ ADJUSTABLE PIPE SUPPORTS (2)

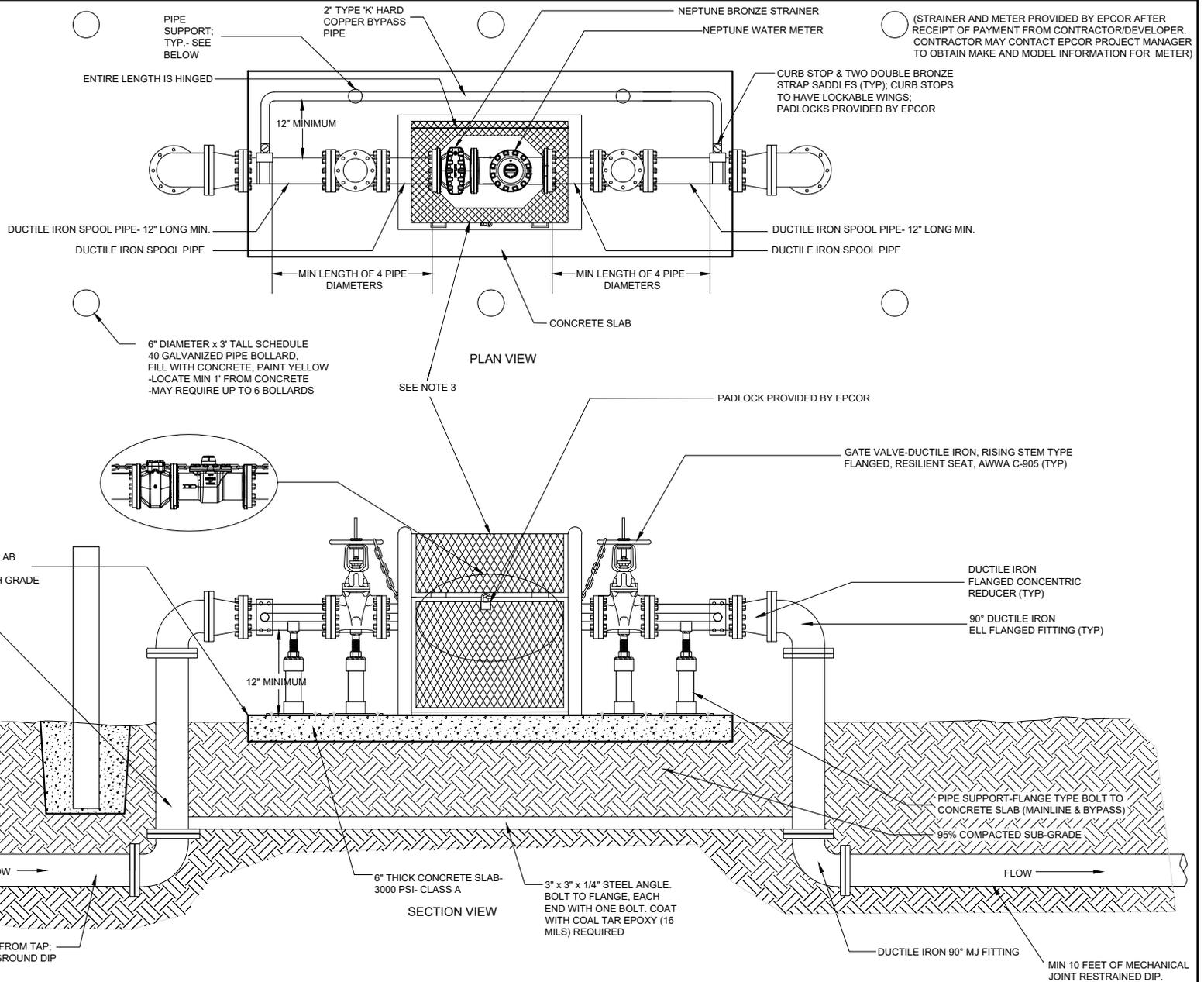
NOTE:
LARGER METER VAULTS REQUIRE SPECIAL DESIGN AND EPCOR APPROVAL.

345-1.DWG 07/30/20 - 03:43pm

DATE: July '20		2355 W Pinnacle Peak Rd, Ste 300 Phoenix, AZ 85027 P 623.445.2400 F 623.587.1044	3", 4", & 6" POTABLE WATER METER VAULT	DETAIL NO. 345-1
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NOTES:

1. AN EPCOR APPROVED BACKFLOW PREVENTION ASSEMBLY IS REQUIRED DOWNSTREAM OF THE METER.
2. ALL ABOVE GROUND PIPING/VALVES SHALL BE PAINTED DESERT SAND TO MATCH COLOR OF CAGE ENCLOSURE.
3. METER & STRAINER TO BE PROTECTED WITH A LOCKABLE HINGED CLAMHELL ENCLOSURE; TOP PORTION IS HINGED AND HAS HANDLES TO ALLOW TOP PORTION TO BE LIFTED OPEN TO ALLOW FULL ACCESS TO METER AND STRAINER; WHEN OPENED, TOP PORTION SHALL STAY IN OPEN POSITION WITHOUT ASSISTANCE; METAL ENCLOSURE SHALL BE CAPABLE OF WITHSTANDING A MINIMUM OF 200 POUNDS PER SQUARE FOOT WITHOUT ANY PERMANENT DEFLECTION OR DISTORTION; POWDERCOATED WITH EPCOR APPROVED COLOR, DESERT SAND; MAKE & MODEL OF ENCLOSURE SHALL BE APPROVED BY EPCOR PRIOR TO INSTALLATION; ENCLOSURE SHALL BE BOLTED TO CONCRETE SLAB; SIDE OF ENCLOSURE ABOVE PIPE SHALL BE ENCLOSED AND BELOW PIPE MAY BE OPEN



(STRAINER AND METER PROVIDED BY EPCOR AFTER RECEIPT OF PAYMENT FROM CONTRACTOR/DEVELOPER. CONTRACTOR MAY CONTACT EPCOR PROJECT MANAGER TO OBTAIN MAKE AND MODEL INFORMATION FOR METER)

* METER ASSEMBLIES 8" AND LARGER ARE TO BE DESIGNED BY DEVELOPER'S ENGINEER AND APPROVED BY EPCOR

345-2.DWG 07/30/20 - 03:43pm

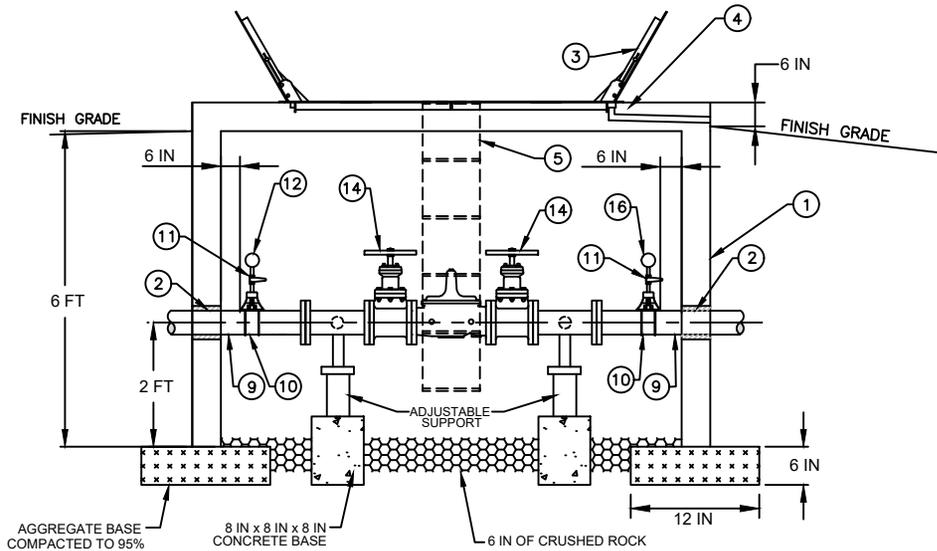
DATE:
July '20



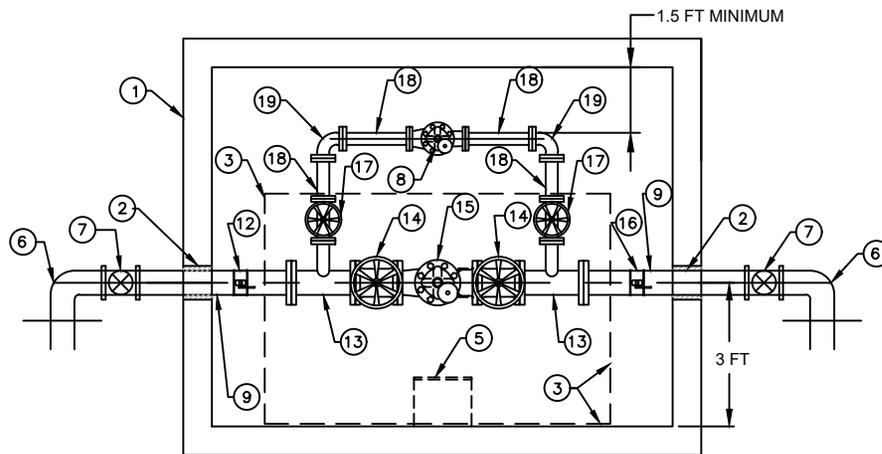
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P 623.445.2400 F 623.587.1044

**ABOVE GROUND POTABLE WATER METER
(3", 4" & 6")**

DETAIL NO.
345-2



TYPICAL WATER UTILITY VAULT (SIDE VIEW)
SCALE: NONE



TYPICAL WATER UTILITY VAULT (PLAN VIEW)
SCALE: NONE

KEYED NOTES:

- ① PRECAST CONCRETE WATER UTILITY VAULT, PER MAG STD DET 321 & 345-1, 6" MIN DEPTH OF CRUSHED ROCK FLOOR, 8" X 8" X 8" CONCRETE BASES FOR PIPE SUPPORTS ON COMPACTED NATIVE SOIL.
 - ② INSTALL ELASTONERIC GASKET AROUND PIPE. GROUT ALL PROTRUSIONS.
 - ③ 6'X4' ALUMINUM ACCESS DOOR WITH SPRING ASSIST RATED FOR H-20 LOADING. HALLIDAY PRODUCTS H2R7248 OR EPCOR APPROVED EQUAL.
 - ④ 1.5" THREADED DRAIN INCLUDED WITH ACCESS HATCH TO PREVENT RAINFALL FROM ACCUMULATING INSIDE VAULT. CONTRACTOR TO PROVIDE PVC PIPE TO DRAIN WATER AWAY FROM ACCESS HATCH CHANNEL.
 - ⑤ ALUMINUM BOLT ON LADDER WITH SAFETY EXTENSION. HALLIDAY PRODUCTS L1B AND L1E OR EPCOR APPROVED EQUAL.
 - ⑥ 90 DEGREE BEND, FLG X MJ WITH THRUST BLOCKS.
 - ⑦ GATE VALVE, MJ X FLG WITH BOX & COVER.
 - ⑧ **PRV FLxFL (4" CLAY-VAL 90-01 PRV, WITH THE FOLLOWING OPTIONS: A, B, C, D, S, Y, & VALVE POSITION INDICATOR-X101)
 - ⑨ DIP SPOOL FLxFL
 - ⑩ FORD SERVICE SADDLE OR APPROVED EQUAL.
 - ⑪ 1" BALL VALVE 2-1" BRASS NIPPLES. 1-1"-1/4" BUSHING ALL FITTINGS TO BE THREADED.
 - ⑫ PRESSURE GAUGE (LIQUID FILLED), 150 PSI RANGE
 - ⑬ TEE FLxFL (8"x6"x4") WITH PIPE SUPPORT ON 8"x8"x8" CONCRETE BASE ON COMPACTED SOIL.
 - ⑭ GATE VALVE FLxFL (NON-RISING STEM)
 - ⑮ **PRV, FLxFL (6" CLA-VAL 90-01 PRV, WITH THE FOLLOWING OPTIONS: A, B, C, D, S, Y & VALVE POSITION INDICATOR-X101)
 - ⑯ PRESSURE GAUGE (LIQUID FILLED) 200 PSI RANGE.
 - ⑰ GATE VALVE FLxFL (NON-RISING STEM)
 - ⑱ DIP SPOOL FLxFL
 - ⑲ 90° BEND FLxFL
- * THE SIZES OF THE TEES, SPOOLS, VALVES, BENDS ETC. ARE CONTINGENT UPON PRV SIZING.
- ** IN CHAPARRAL BERMAD CONTROL VALVES WITH HIGH SENSITIVITY PILOTS ARE TO BE USED IN PLACE OF CLA-VAL.

BACKFILL

- IN NON-SAW CUT AREAS TO BE NATIVE MATERIAL SCREENED AT 4" OR LESS
- IN SAW CUT AREAS TO BE ONE SACK ABC SLURRY OR AS SPECIFIED BY R.O.W. AGENCY.

TRACER WIRE #12 GAUGE COPPER WIRE. WIRE NUTS NEED TO BE DRY SPLICE WATER-PROOF GEL PACKS.

PIPE ZONE

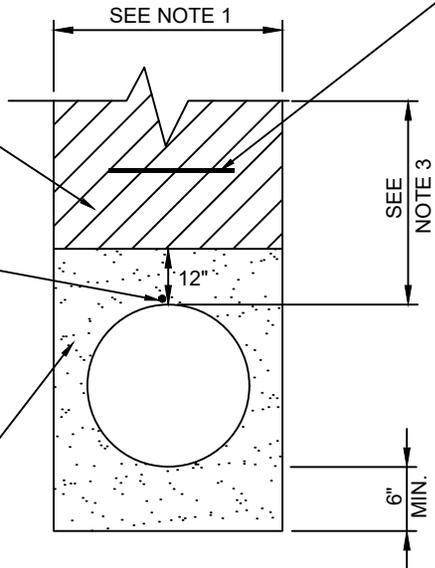
FROM MIN. 6" BELOW BOTTOM OF PIPE TO MIN. 12" ABOVE TOP OF PIPE BACKFILL WITH THE FOLLOWING PER NOTE 4:

- A. WATER LINES
 - MARICOPA & SANTA CRUZ COUNTIES = ABC
 - MOHAVE COUNTY = SAND PER M.A.G. 701.3
- B. RECLAIMED WATER LINES
 - MARICOPA & SANTA CRUZ COUNTIES = ABC
 - MOHAVE COUNTY = SAND PER M.A.G. 701.3
- C. SEWER FORCE MAIN
 - MARICOPA & SANTA CRUZ COUNTIES = ABC
 - MOHAVE COUNTY = SAND PER M.A.G. 701.3
- D. GRAVITY SEWER LINES
 - ALL SERVICE AREAS = 3/8" CRUSHED WASHED ROCK (NO REJECTS)

WATER AND SEWER SERVICES

(all Utility service areas)

MINIMUM 6" SAND BEDDING AND 6" SAND SHADING. BACKFILL AS PER DETAIL.



PIPE MARKING TAPE

MARKING TAPE SHALL BE LOCATED 18 INCHES BELOW GROUND SURFACE.

WORDING PER M.A.G. SEC. 616 TO BE USED FOR ALL WATER, & RECLAIMED WATER LINES AND SERVICES. THE MARKING TAPE SHALL BE PRINTED ON STANDARD COLORED NON-DETECTABLE TAPE. LETTERING SHALL BE BLACK, 1-1/2" HEIGHT MINIMUM.

RECLAIMED WATER LINES SHALL USE PURPLE TAPE & SHALL READ "CAUTION: RECLAIMED WATER LINE" POTABLE WATER LINES SHALL USE BLUE TAPE & SHALL READ "CAUTION: POTABLE WATER LINE"

RAW & NON-POTABLE WATER LINES SHALL USE YELLOW TAPE & SHALL READ "RAW WATER MAINS" AND/OR "NON-POTABLE WATER MAINS".

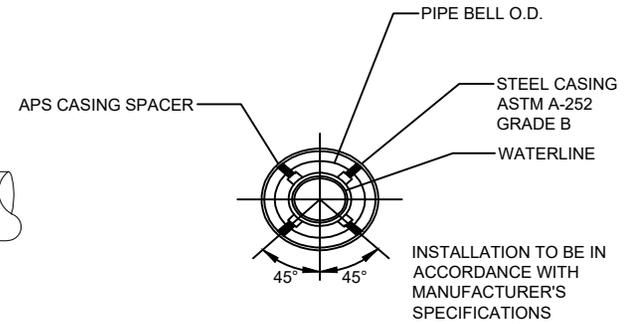
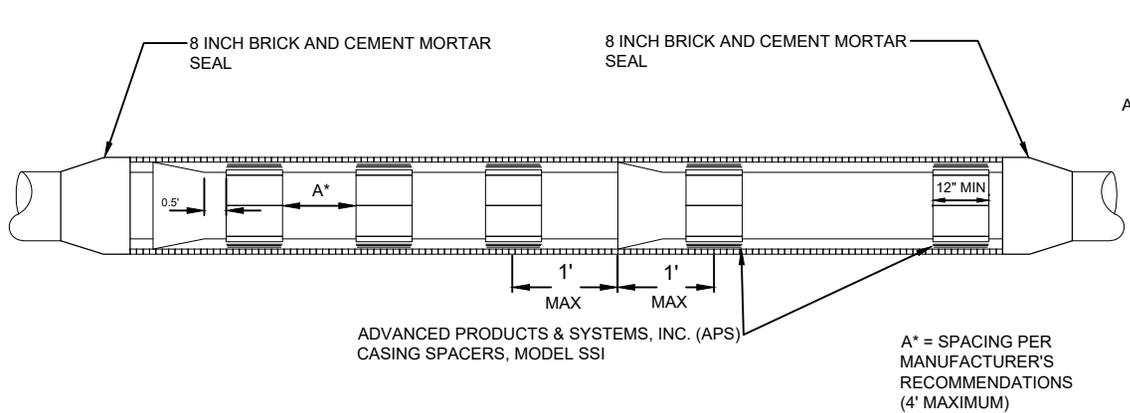
SEWER AND SERVICE LINES SHALL USE GREEN TAPE & SHALL READ "CAUTION: SEWER LINE".

NOTES:

1. TRENCH WILL BE IN ACCORDANCE WITH M.A.G. SECTION 601.
2. ONE SACK ABC SLURRY (CLSM) TO BE IN ACCORDANCE WITH M.A.G. SECTION 728.
3. DEPTH OF BURY TO BE MIN. 48" IN ALL STREETS. DEPTH OF BURY FOR WATER LINES IN OTHER AREAS TO BE AS FOLLOWS:
 - A) 36" MIN. FOR MAINS 8" DIAMETER AND SMALLER.
 - B) 48" MIN. FOR MAINS 10" DIAMETER AND LARGER.
4. WASHED CRUSHED ROCK TO BE IN ACCORDANCE WITH M.A.G. SECTION 716.2 AND TABLE 716-2. SAND TO BE IN ACCORDANCE WITH M.A.G. SECTION 701.3. ABC TO BE IN ACCORDANCE WITH M.A.G. SECTION 702.2 AND TABLE 702-1.
5. TRACER WIRE IS TO BE BROUGHT UP TO GRADE AT EACH FIRE HYDRANT TO GROUND / VALVE BOX. FOR LONG RUNS, THE TRACER WIRE IS TO BE BROUGHT UP AT LEAST EVERY 300 FEET INSIDE A TRACER BOX SUCH AS A SNAKEPIT MAGNETIZED TRACER BOX BY COPPERHEAD INDUSTRIES OR APPROVED EQUAL.

350-1.DWG 07/30/20 - 03:43pm

DATE: July '20		2355 W Pinnacle Peak Rd, Ste 300 Phoenix, AZ 85027 P 623.445.2400 F 623.587.1044	PIPE TRENCH DETAIL	DETAIL NO. 350-1
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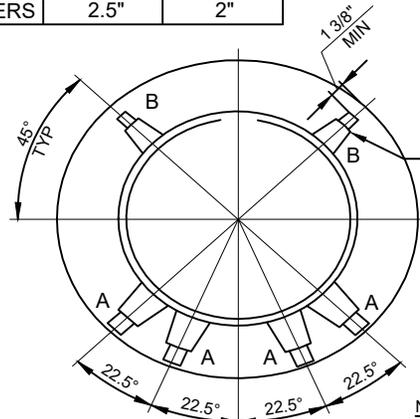


ADVANCED PRODUCTS & SYSTEMS, INC. (APS)
CASING SPACERS, MODEL SSI

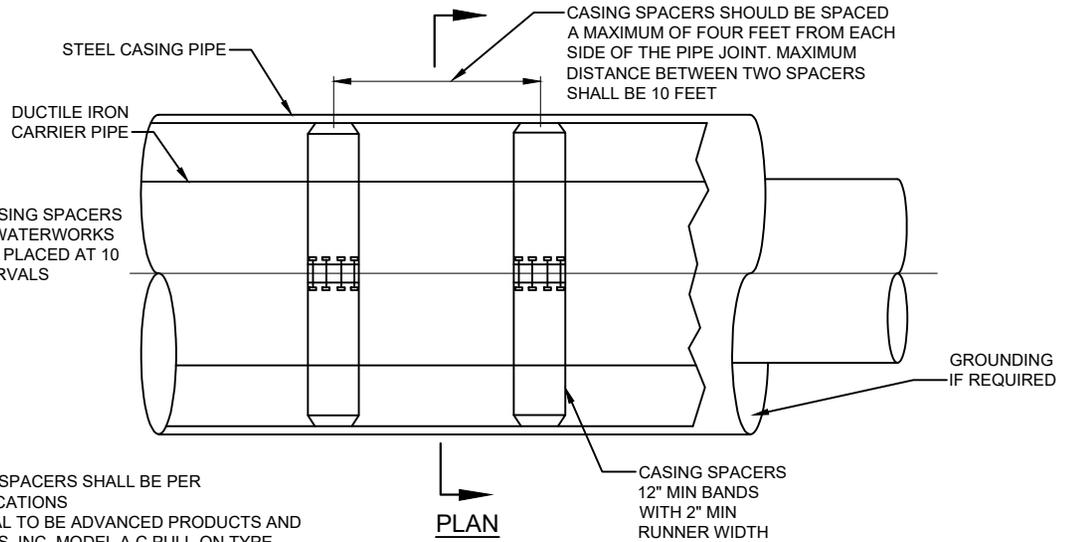
A* = SPACING PER
MANUFACTURER'S
RECOMMENDATIONS
(4' MAXIMUM)

SLEEVE DETAIL

	A	B
RISER	5"	4"
RUNNERS	2.5"	2"



SECTION



PLAN

NOTES:

1. CASING SPACERS SHALL BE PER SPECIFICATIONS
2. END SEAL TO BE ADVANCED PRODUCTS AND SYSTEMS, INC. MODEL A C PULL-ON TYPE
3. NO FILL IN ANNULAR SPACE
4. MINIMUM CASING SIZE SHALL BE 12 INCHES LARGER OUTSIDE DIAMETER OF CARRIER PIPE
5. A CASING SPACER MUST BE PLACED WITHIN 2 FEET OF EACH END OF THE CASING PIPE

350-2.DWG 07/30/20 - 03:43pm

DATE:
July '20



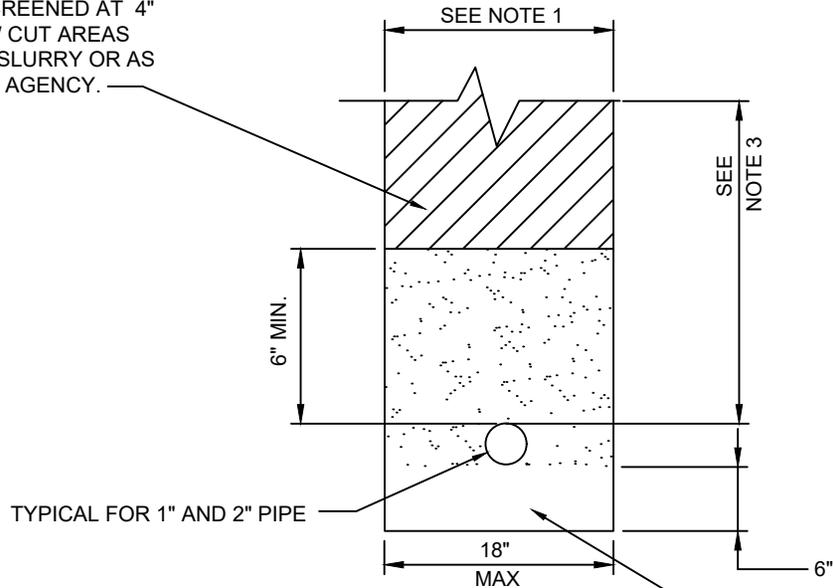
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STEEL CASING

DETAIL NO.
350-2

BACKFILL

IN NON-SAW CUT AREAS TO BE NATIVE MATERIAL SCREENED AT 4" OR LESS AND IN SAW CUT AREAS TO BE 1/2 SACK ABC SLURRY OR AS SPECIFIED BY R.O.W. AGENCY.



BEDDING

WATER AND SEWER SERVICES

MINIMUM 6" SAND BEDDING AND 6" SAND SHADING. BACKFILL AS PER ABOVE.

NOTES:

1. TRENCH WILL BE IN ACCORDANCE WITH M.A.G. SECTION 601.
2. ONE-HALF SACK ABC SLURRY (CLSM) TO BE IN ACCORDANCE WITH M.A.G. SECTION 728.
3. DEPTH OF BURY TO BE MIN. 36" IN STREETS.
4. SAND TO BE IN ACCORDANCE WITH M.A.G. SECTION 701.3.

350-3.DWG 07/30/20 - 03:43pm

DATE:

July '20

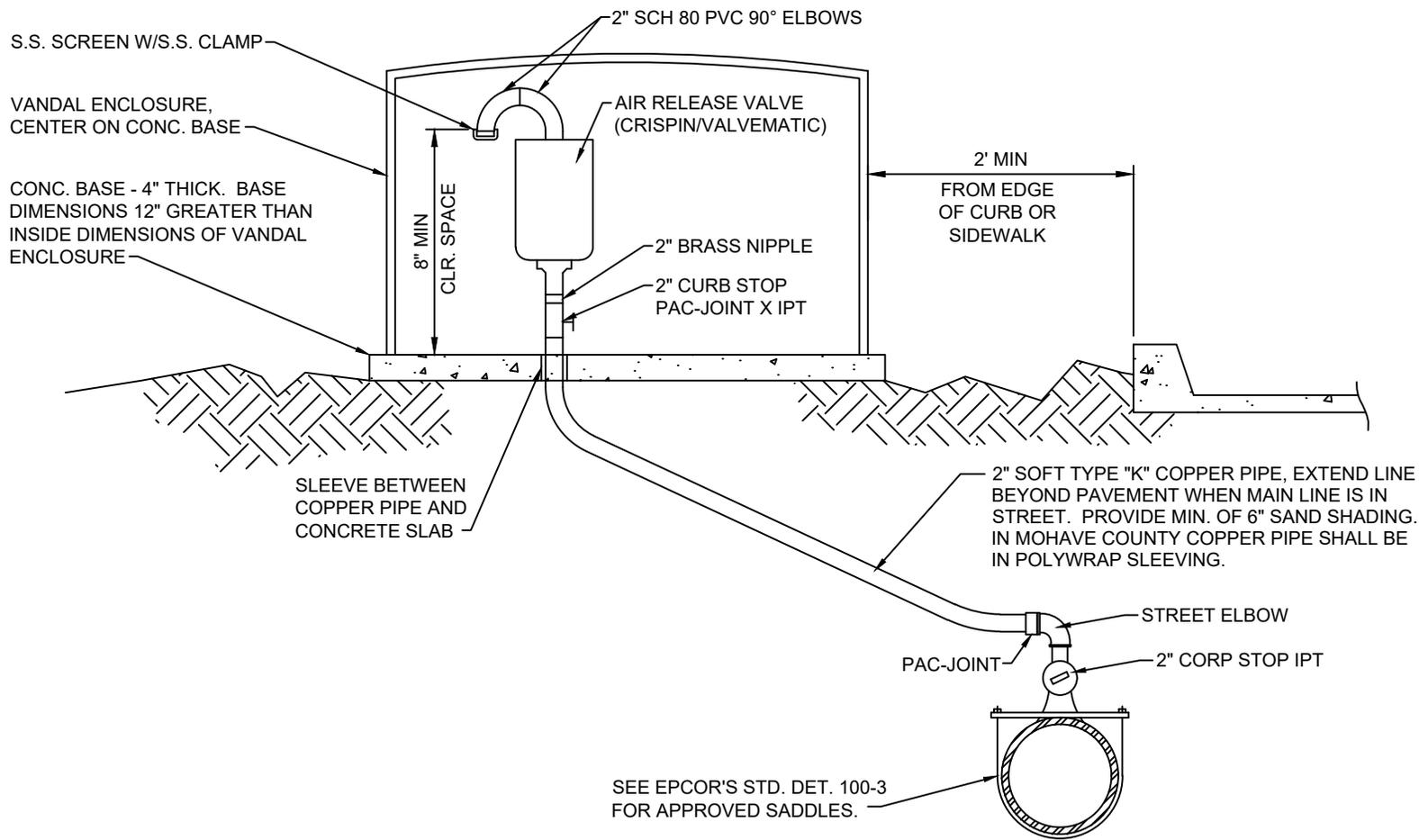


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PIPE TRENCH DETAIL FOR SERVICES

DETAIL NO.

350-3

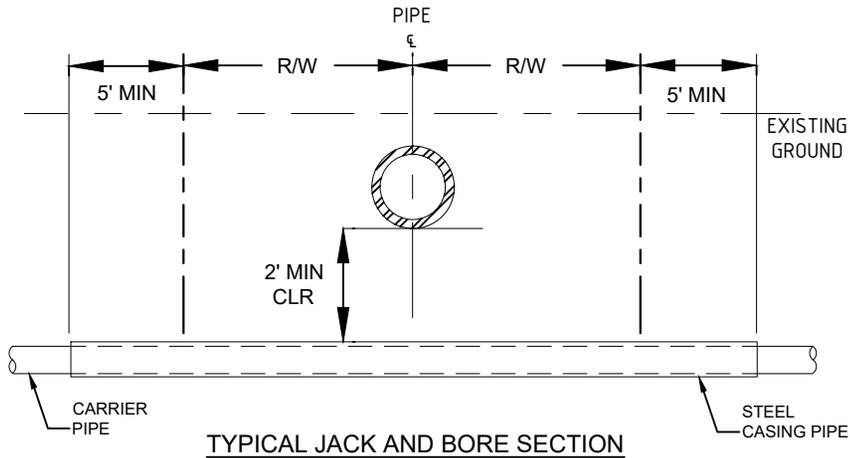


NOTES:

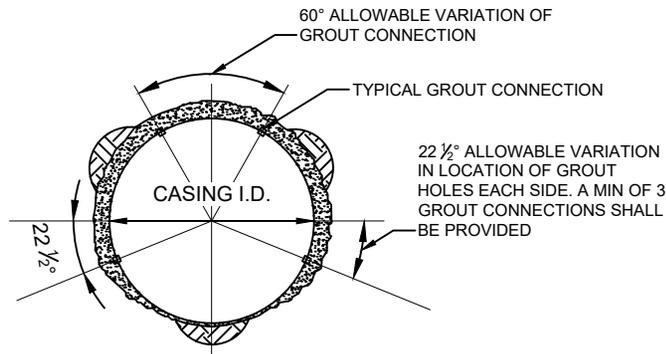
1. VANDAL ENCLOSURE TO BE "QEM 1 GUARDSHACK" OR EPCOR APPROVED EQUAL.
2. COPPER LINE FROM MAIN TO AIR RELEASE VALVE TO BE INSTALLED WITH POSITIVE SLOPE TO PREVENT BLOCKAGE.
3. PROVIDE PER EPCOR'S WATER SPECIFICATIONS APPROVED MATERIALS LIST.
4. MAG STD. DET. 140-1 PROTECTION BOLLARDS IN TRAFFIC AREAS.
5. ALL ABOVE GROUND AIR RELEASE VALVES MUST BE PRE-APPROVED BY EPCOR. UNDERGROUND AIR RELEASE VALVES PER EPCOR'S STD. DET. 351-3.

351-1.DWG 07/30/20 - 03:43pm

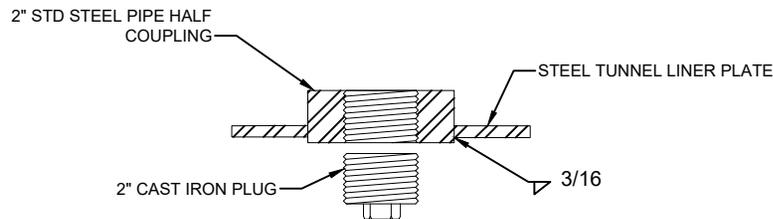
DATE: July '20		2355 W Pinnacle Peak Rd, Ste 300 Phoenix, AZ 85027 P 623.445.2400 F 623.587.1044	POTABLE AIR RELEASE VALVE	DETAIL NO. 351-1
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TYPICAL JACK AND BORE SECTION



CASING PIPE GROUTING DETAIL



TYPICAL GROUT CONNECTION DETAIL

NOTES:

1. ALL WORK ON JACK AND BORE SHALL CONFORM TO MAG STANDARD SPECIFICATIONS SECTION 602 UNLESS OTHERWISE NOTED.
2. CASING SHALL EXTEND A MINIMUM OF FIVE FEET BEYOND THE RIGHT-OF-WAY.
3. FOR CASING PIPE 36 INCHES OR LARGER, GROUT CONNECTIONS SHALL BE INSTALLED. GROUT CONNECTIONS SHALL BE PROVIDED AT A MAXIMUM SPACING OF 10 FEET.
4. CARRIER PIPE SHALL BE PLACED IN ACCORDANCE WITH MAG STANDARD SPECIFICATIONS. JOINT RESTRAINTS SHALL BE INSTALLED FOR THE SECTION OF CARRIER PIPE INSIDE THE CASING PIPE.
5. THE REQUIREMENTS FOR THE TYPE OF SOIL AND LEVEL OF COMPACTION OF THE PIPE EMBEDMENT MUST BE FOLLOWED UP TO THE ENDS OF THE PIPE CASING.
6. IF THERE IS WATER IN THE PIPE AT THE TIME OF INSTALLATION, SEEPAGE OF WATER IS POSSIBLE AND RUNNING GROUNDS CONDITIONS MAY BE ANTICIPATED. WHERE THESE CONDITIONS EXIST, THE CUTTING HEAD SHALL BE SHIELDED TO AVOID LOSS OF SUPPORT FOR THE PIPE.
7. DURING ANY DIRECTIONAL BORING OPERATIONS, PRECAUTIONS SHALL BE TAKEN TO ENSURE STORM WATER RUNOFF WILL NOT FLOW INTO THE JACKING PITS.
8. TRENCHLESS CONSTRUCTION DRIVING AND RECEIVING PITS FOR CONSTRUCTIONAL SAFETY SHALL BE IN ACCORDANCE WITH OSHA REQUIREMENTS.
9. CONTRACTOR TO NOTIFY INSPECTOR 48 HOURS IN ADVANCE PRIOR TO BORING.
10. CASING PIPE SHALL BE WELDED STEEL ASTM A-252 GRADE B.
11. CARRIER PIPE SHALL BE DUCTILE IRON WITH MEGA-LUG JOINT RESTRAINTS, SERIES 1100.
12. FOR RAILROAD CROSSINGS, REFER TO RAILROAD OWNER REQUIREMENTS.

Carrier Pipe Diameter (inches)	Water		Sewer	
	Minimum Casing Pipe Diameter (inches)	Minimum Casing Pipe Wall Thickness (inch)	Minimum Casing Pipe Diameter (inches)	Minimum Casing Pipe Wall Thickness (inch)
4	24	3/8	30	3/8
6	24	3/8	30	3/8
8	30	3/8	36	3/8
10	30	3/8	36	3/8
12	36	3/8	42	1/2
14	36	3/8	42	1/2
15	36	3/8	42	1/2
16	36	3/8	42	1/2
18	42	1/2	48	1/2
20	42	1/2	48	1/2
21	42	1/2	48	1/2
24	48	1/2	54	5/8
27	48	1/2	54	5/8
30	60	5/8	66	3/4
36	60	5/8	66	3/4
42	72	3/4	78	3/4
48	80	1	86	1

352-1.DWG 07/30/20 - 03:43pm

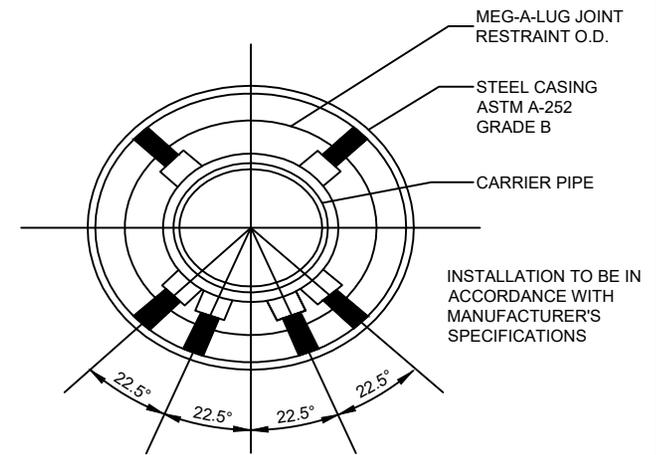
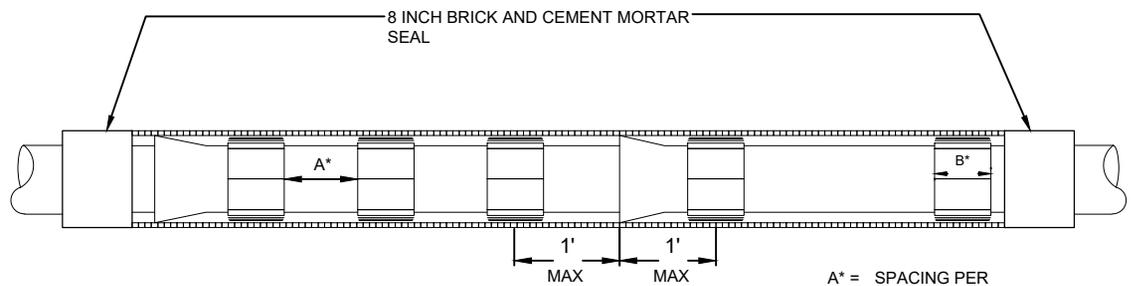
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CASING JACK-AND-BORE DETAIL

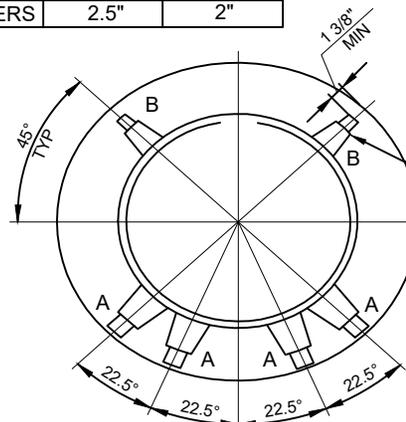
DETAIL NO.
352-1



A* = SPACING PER MANUFACTURER'S RECOMMENDATIONS (6' MAXIMUM)
 B* = 8" MINIMUM ON 36" AND SMALLER DIAMETER CARRIER PIPE
 12" MINIMUM FOR GREATER THAN 36" DIAMETER CARRIER PIPE.

CASING PIPE DETAIL

	A	B
RISER	5"	4"
RUNNERS	2.5"	2"

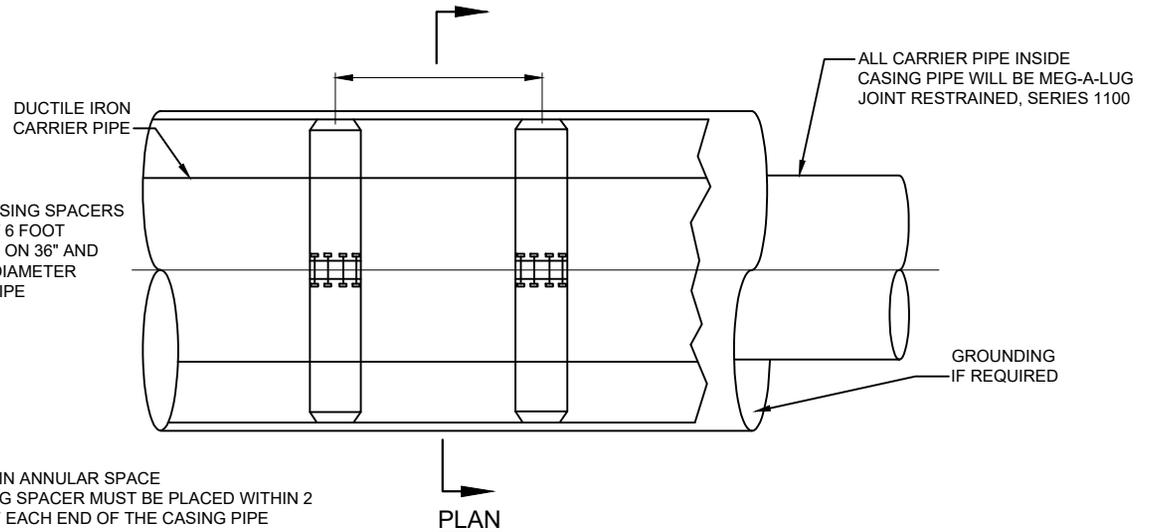


SECTION

8" WIDE CASING SPACERS PLACED AT 6 FOOT INTERVALS ON 36" AND SMALLER DIAMETER CARRIER PIPE

NOTES:

1. NO FILL IN ANNULAR SPACE
2. A CASING SPACER MUST BE PLACED WITHIN 2 FEET OF EACH END OF THE CASING PIPE
3. CASING SPACERS SHALL BE APS (SSI) OR CASCADE TYPE (CCS)



PLAN

352-2.DWG 07/30/20 - 03:43pm

DATE:
July '20

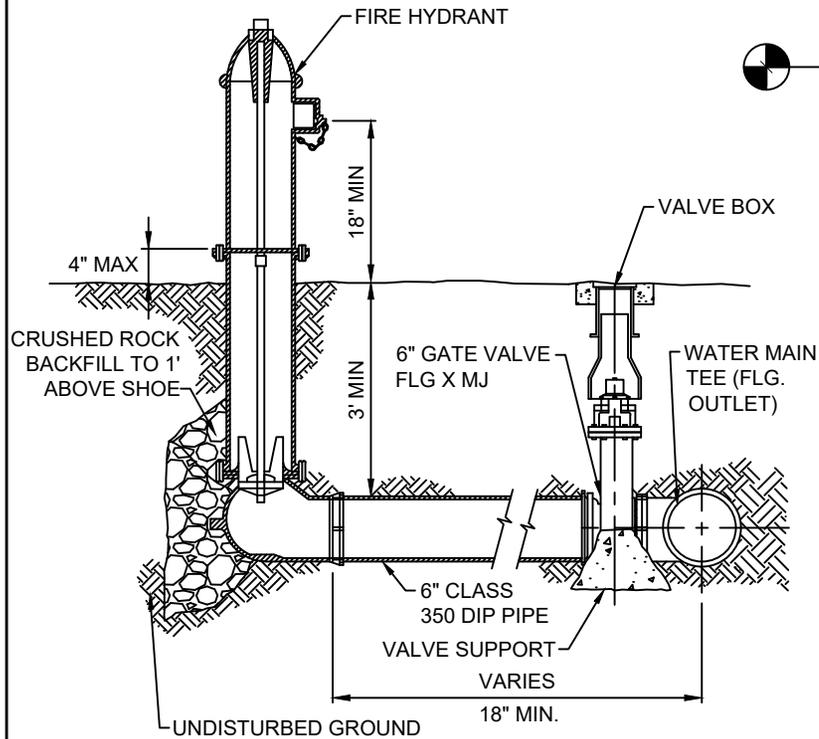


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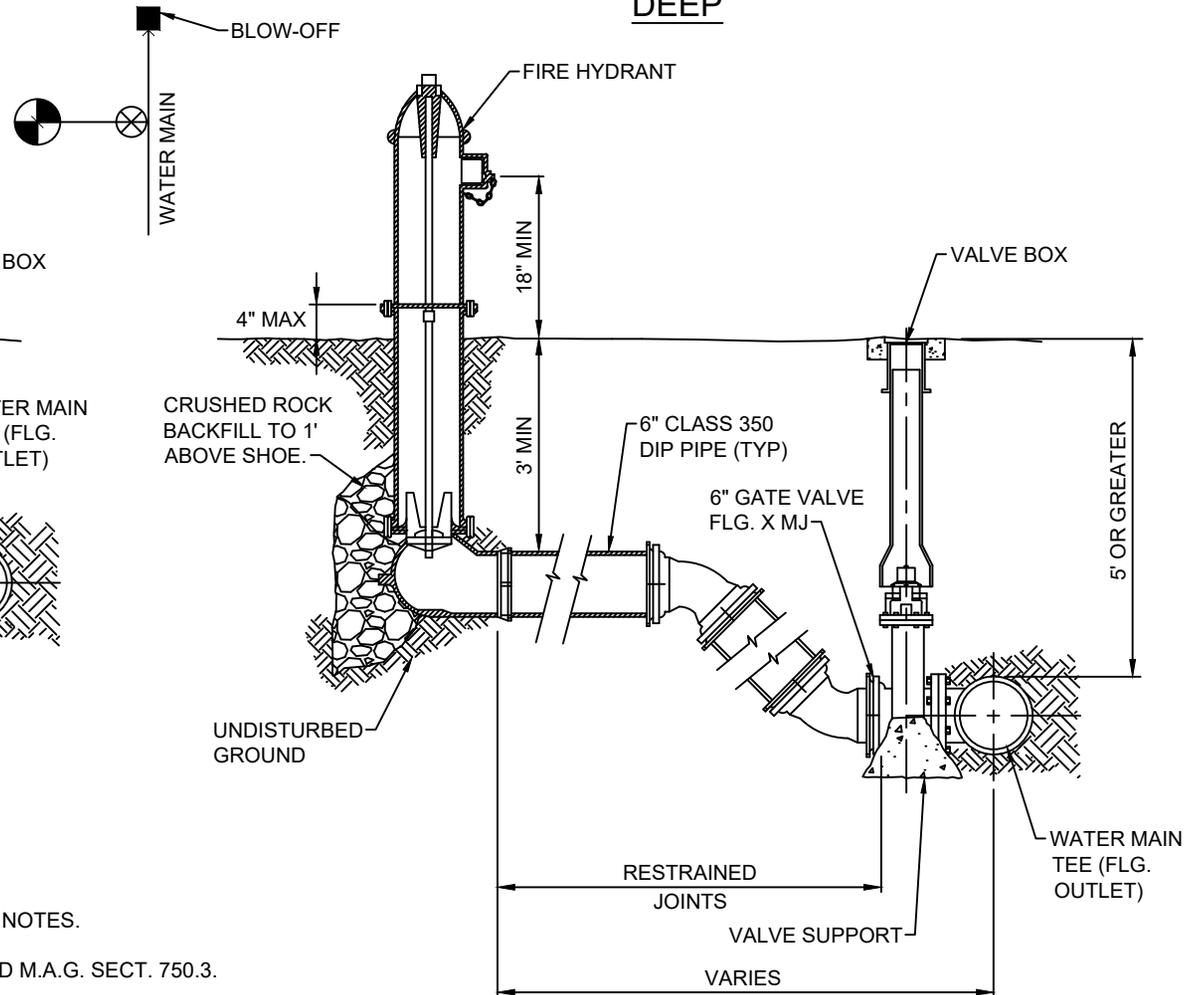
CASING SPACER DETAIL

DETAIL NO.
352-2

STANDARD



DEEP



NOTES:

1. SEE EPCOR STD. DET. 100-1 FOR FIRE HYDRANT GENERAL NOTES.
2. ALL JOINT RESTRAINTS PER M.A.G. STD. DET. 303- 1 & 2 AND M.A.G. SECT. 750.3.
3. VALVE BOX PER M.A.G. STD. DET. 391-1-C.
4. ALL VALVE OPERATING NUTS SHALL BE A MAX OF 36 INCHES BELOW GROUND SURFACE.
5. DRY BARREL HYDRANTS SHALL BE MUELLER "CENTURION", CLOW "MEDALLION", OR KENNEDY "K81D", WITH NATIONAL STANDARD HOSE THREADS. NO APPROVED EQUALS WILL BE ACCEPTED.
6. PROVIDED A MINIMUM 3 FOOT DIAMETER CLEARANCE AROUND HYDRANT.

360-1.DWG 07/30/20 - 03:43pm

DATE:

July '20

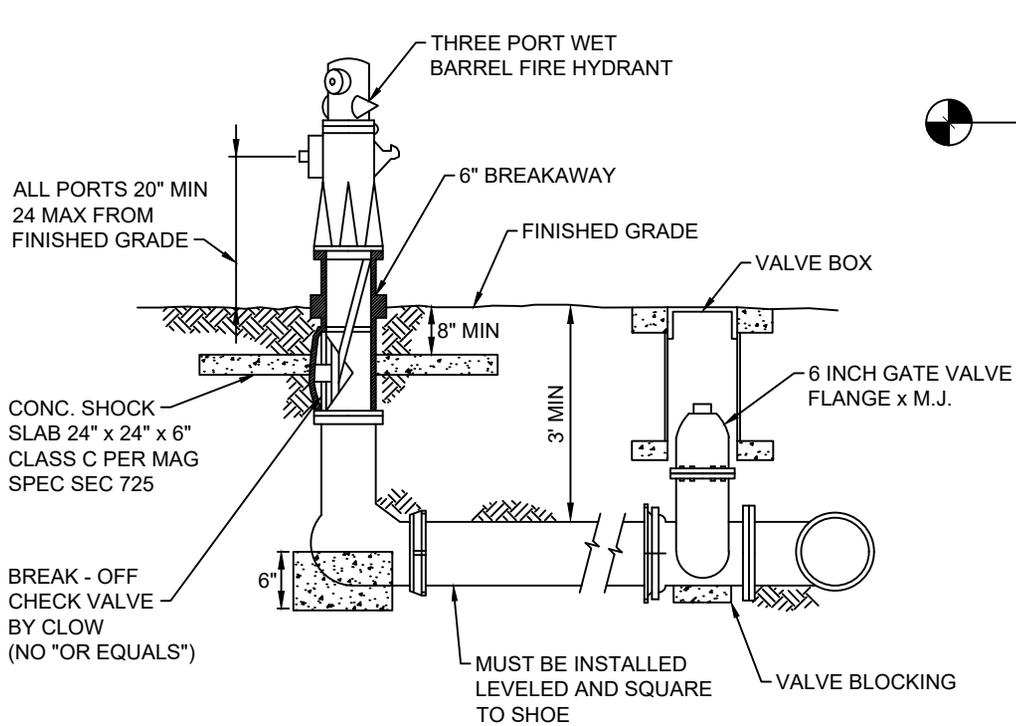


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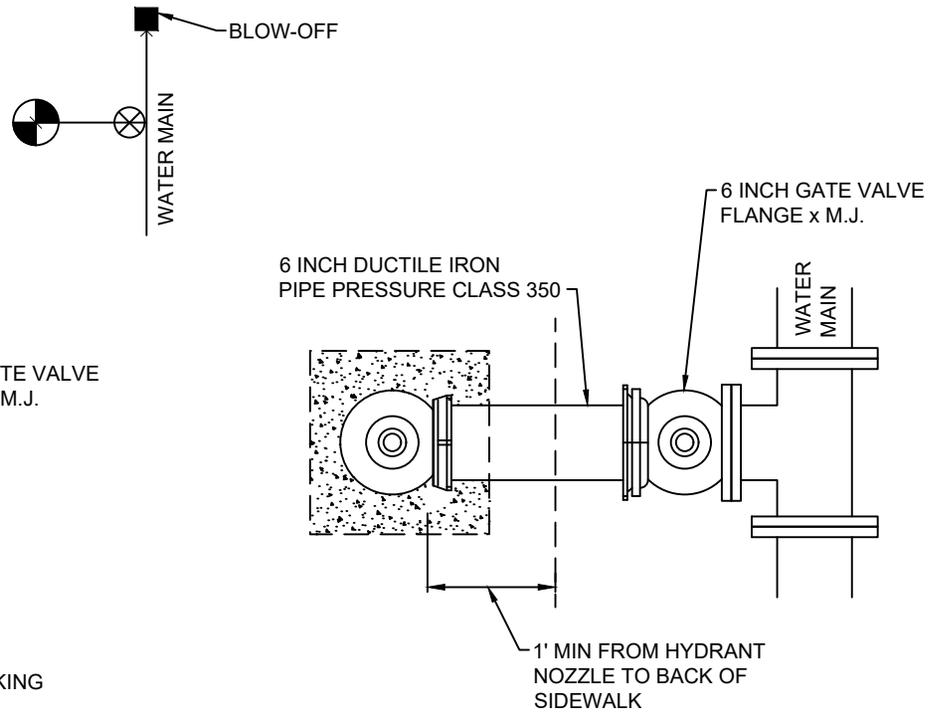
DRY BARREL FIRE HYDRANT INSTALLATION

DETAIL NO.

360-1



SECTION



PLAN VIEW

NOTES:

1. SEE EPCOR STD. DET. 100-1 FOR FIRE HYDRANT GENERAL NOTES.
2. ALL JOINT RESTRAINTS PER M.A.G. STD. DET. 303- 1 & 2 AND M.A.G. SECT. 750.3.
3. ALL JOINTS SHALL BE RESTRAINED, INCLUDING MAIN AT TEE ENDS.
4. APPROVED HYDRANTS INCLUDE: CLOW* AND JONES (*CLOW HYDRANTS SHALL BE MODEL 860 WITH 2 1/2" FEMALE NPT ON TOP OF HYDRANT TO ALLOW FOR PRESSURE MONITORING).
5. THE 6 INCH GATE VALVE SHALL BE FLANGED BY MECHANICAL JOINT.
6. PROVIDE A MINIMUM 3 FOOT DIAMETER CLEARANCE AROUND HYDRANT.
7. THE HYDRANT SHALL HAVE 2 - 2 1/2" PORTS, AND 1 - 4 1/2" PORT.
8. ALL HYDRANTS SHALL HAVE NATIONAL STANDARD HOSE THREADS.
9. VALVE BOX PER M.A.G. STD. DET. 391-1-C.

360-2.DWG 07/30/20 - 03:43pm

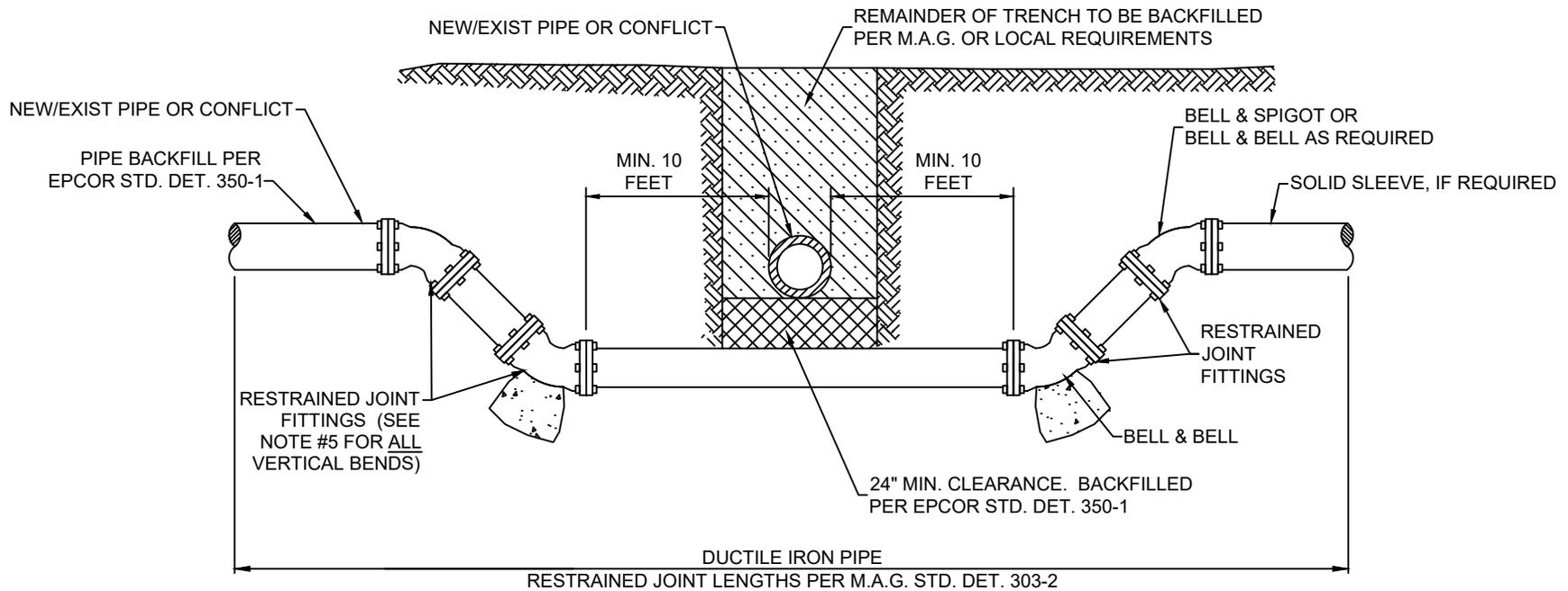
DATE:
July '20



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WET BARREL FIRE HYDRANT INSTALLATION

DETAIL NO.
360-2

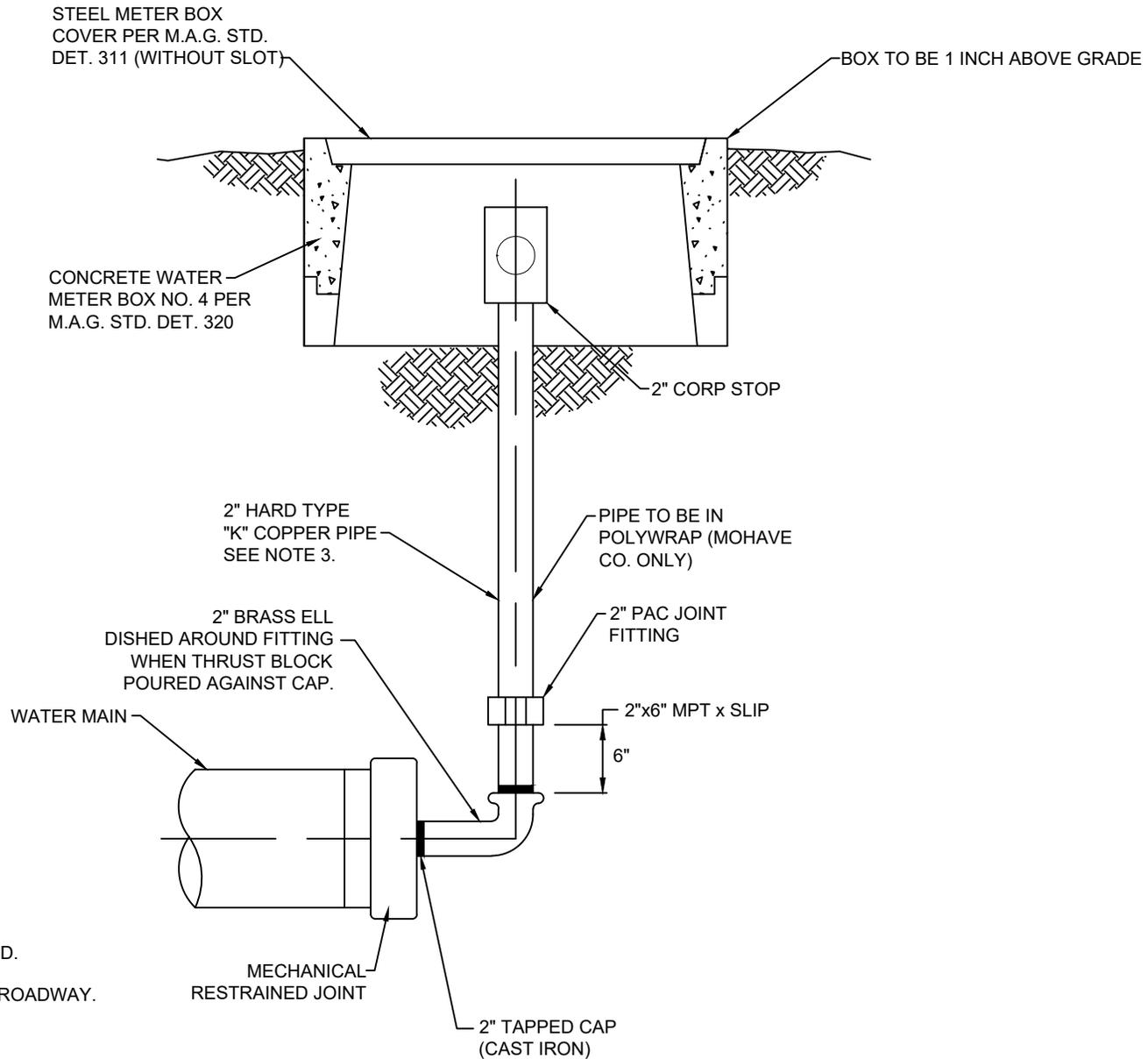


NOTES:

1. ALL JOINT RESTRAINTS ARE TO BE MEG-A-LUG, SIGMA, EEBA OR STAR, NO FIELD LOCS OR UNIFLANGE, FOR LENGTHS IN ACCORDANCE w/ M.A.G. STD. DET. 303-2
2. PIPE IS TO BE DUCTILE IRON, MINIMUM PRESSURE CLASS 150.
3. ALL DUCTILE IRON PIPE SHALL BE POLYETHYLENE WRAPPED FOR THE ENTIRE LENGTH IN ACCORDANCE WITH M.A.G. SECT. 610.6
4. BEGIN/END RESTRAINED JOINT STATIONING TO BE SHOWN ON THE APPROVED CONSTRUCTION DRAWINGS. ALL BENDS & FITTINGS SHALL HAVE STATIONING AND ELEVATION SHOWN ON THE APPROVED CONSTRUCTION DRAWINGS. THE BOTTOM ELEVATION OF THE CONFLICT AND THE TOP ELEVATION OF THE DUCTILE IRON PIPE AT THE CENTERLINE OF THE CONFLICT SHALL BE SHOWN ON THE APPROVED CONSTRUCTION DRAWINGS.
5. INSTALL ANCHOR BLOCKS/THRUST BLOCKS AT ALL VERTICAL BENDS PER M.A.G. STD. DET. 381.
6. AIR RELEASE VALVES ARE REQUIRED ON THE HIGH POINT OF VERTICAL REALIGNMENT.

370-1.DWG 07/30/20 - 03:43pm

DATE: July '20		2355 W Pinnacle Peak Rd, Ste 300 Phoenix, AZ 85027 P 623.445.2400 F 623.587.1044	VERTICAL RE-ALIGNMENT OF WATER MAINS	DETAIL NO. 370-1
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NOTES:

1. NO SOLDERED JOINTS
2. CARSONITE MARKER REQUIRED.
3. SOFT COPPER TO BE USED IN ROADWAY.

390-1.DWG 07/30/20 - 03:43pm

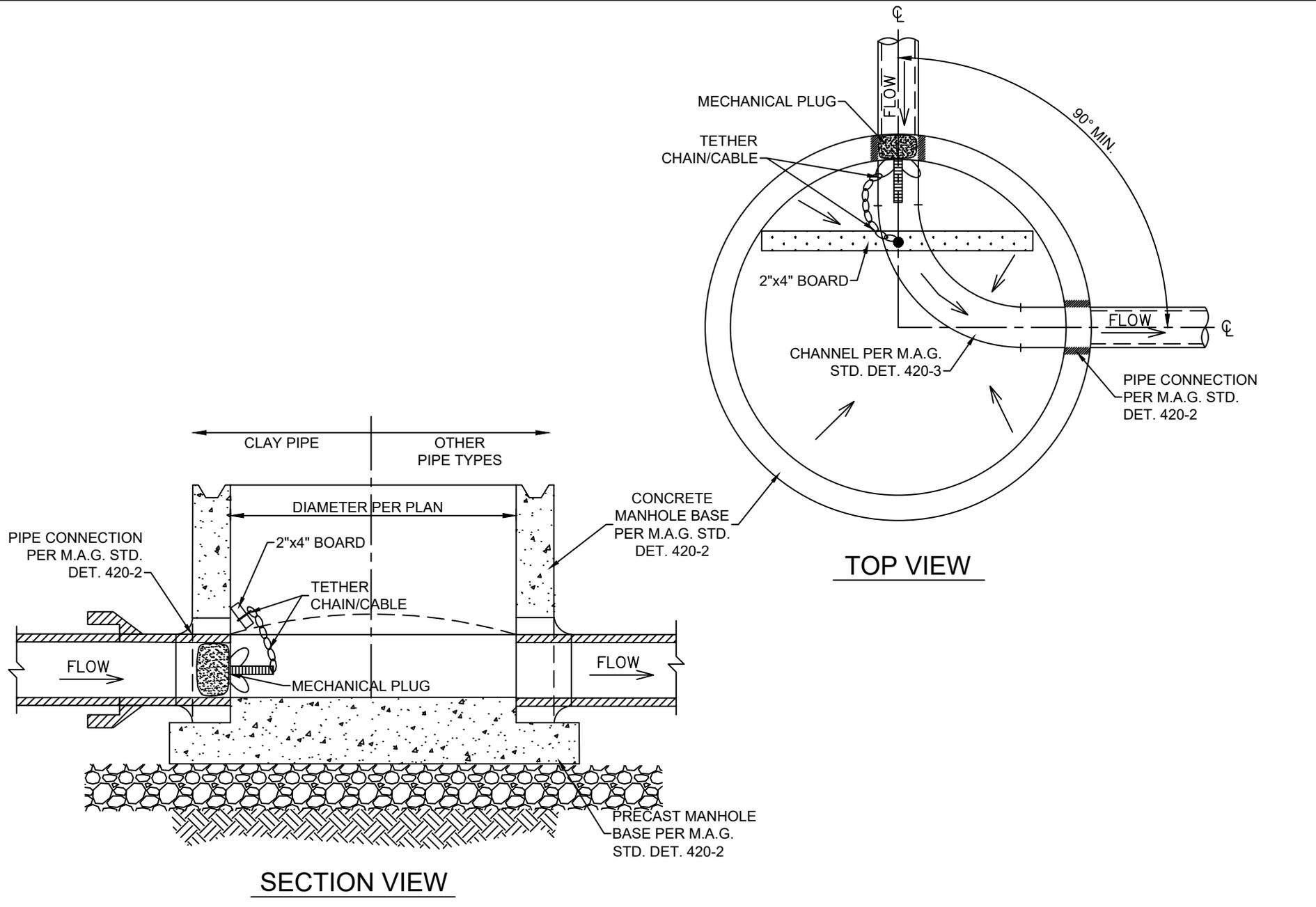
DATE:
July '20



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**POTABLE CURB STOP (BLOW OFF)
WITH FLUSHING PIPE**

DETAIL NO.
390-1



420.DWG 07/30/20 - 03:44pm

DATE:
July '20



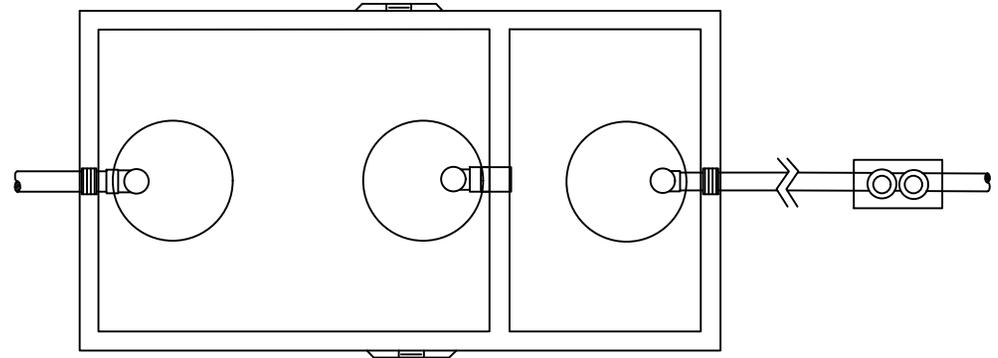
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TEMPORARY MANHOLE PLUG

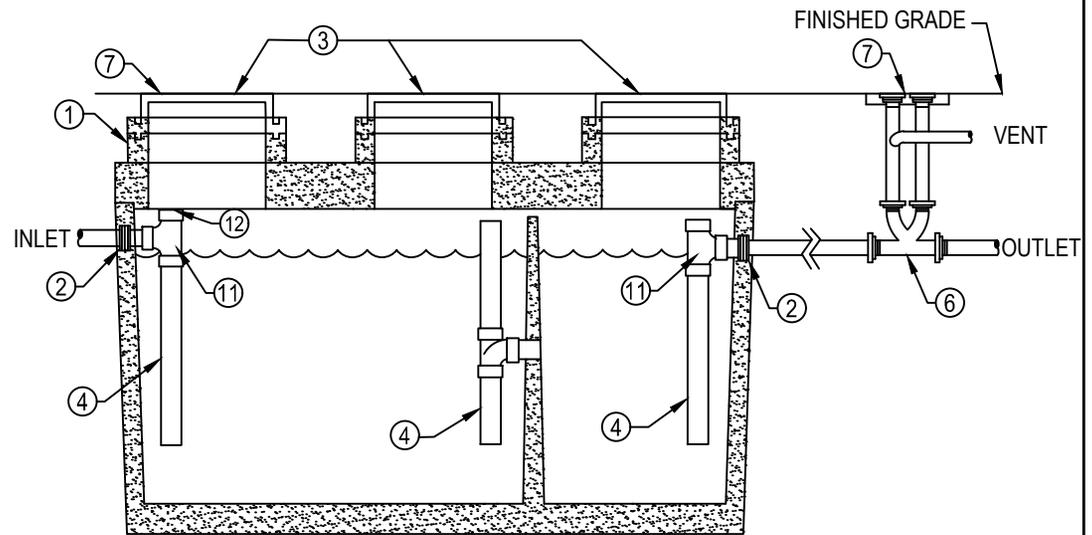
DETAIL NO.
420

NOTES:

- ① ALL GRADIENT RISERS, INCLUDING THE MANHOLE FRAME WILL HAVE THE INTERIOR SEALED WITH NON-SHRINK GROUT
- ② PIPE CONNECTIONS SHALL BE FLEXIBLE CONNECTIONS AND COMPLY WITH ASTM C923 OR ASTM C1644 FOR PRECAST INTERCEPTORS; OR SECTION 7 OF C923 OR ASTM C1644 FOR MATERIALS OTHER THAN PRECAST CONCRETE.
- ③ MANHOLE, FRAME, COVER, AND COLLAR MUST BE WATERTIGHT (GASKETED), ANCHORED, DOES NOT SLIDE, AND SUPPORTS ANTICIPATED LOADS. REFERENCE M.A.G. DETAILS 422 AND 424-1.
- ④ OUTLET AND BAFFLE PLUMBING: MUST BE OPEN TOPPED, 12" DISTANCE FROM INTERNAL FLOOR TO END OF PIPE AND EXTEND 5" ABOVE THE LIQUID LEVEL. INTERNAL PIPING SHALL BE 4" DIAMETER.
- ⑤ CONSTRUCTION & SPECIFICATIONS TO MOST CURRENT REVISIONS OF ASTM C1613/ ASTM F2649/IAPMO/ANSI Z1001
- ⑥ 2-WAY CLEANOUT ON THE OUTLET LINE. VENT INTERCEPTOR TO ROOF.
- ⑦ WATER TEST AND REPAIR: INSPECTED BY EPCOR PRETREATMENT COORDINATOR PER ASTM C1613; IAPMO Z1001 OR NPCA BEST PRACTICES GUIDELINES.
- ⑧ ACCESS: MINIMUM 2: ON LARGER SIZES EACH PLUMBING FITTING (INLET, BAFFLE AND OUTLET) SHALL HAVE THE REQUIRED AND STIPULATED ACCESS OPENING, RISERS AND COVERS.
- ⑨ SUITABLE SUB-BASE BEDDING WITH GRANULAR MATERIAL SHALL BE PREPARED TO HANDLE ANTICIPATED LOADS.
- ⑩ CONTACT EPCOR PRETREATMENT AT PRETREATMENT@EPCOR.COM FOR INSPECTION/TESTING.
- ⑪ INLET AND OUTLET PLUMBING MUST HAVE TEE'S.
- ⑫ INLET TEE MUST HAVE A CAP



TOP VIEW
(COVERS & RINGS REMOVED)



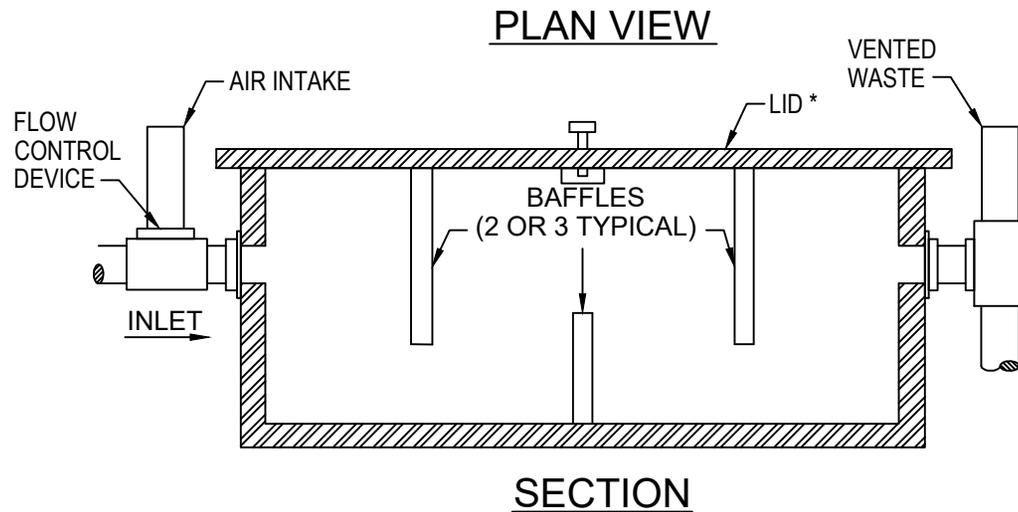
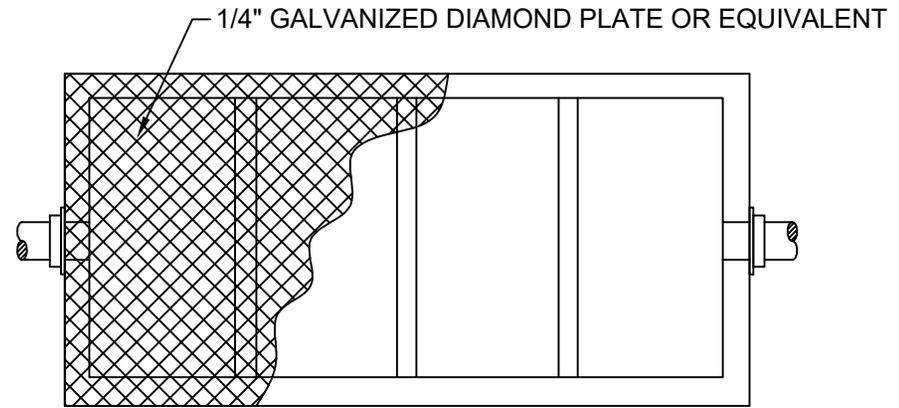
SIDE SECTION VIEW

450-1.DWG 07/30/20 - 03:44pm

DATE: July '20		2355 W Pinnacle Peak Rd, Ste 300 Phoenix, AZ 85027 P 623.445.2400 F 623.587.1044	TYPICAL GRAVITY/SOLIDS INTERCEPTOR	DETAIL NO. 450-1
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NOTES:

1. PERFORMANCE STANDARDS: MUST BE CERTIFIED PER (PDI) G-101 / ASME A112.14.3 / CSA B481 OR MOST CURRENT REVISIONS .
2. A FLOW CONTROL DEVICE MUST BE INSTALLED TO MANUFACTURES' SPECIFICATION ON THE INLET PIPE PRIOR TO ENTERING THE HYDROMECHANICAL GREASE INTERCEPTOR (HGI). FLOW CONTROL MUST BE ACCESSIBLE FOR MAINTENANCE.
3. HGI MAY BE INSTALLED ABOVE GROUND OR BELOW FLOOR GRADE.
4. HGI MUST BE EASILY ACCESSIBLE FOR INSPECTION AND MAINTENANCE.
5. FILL WITH CLEAN WATER PRIOR TO START UP.
6. HGI MUST BE INSPECTED PRIOR TO BACKFILL BY EPCOR PRETREATMENT COORDINATOR.
7. USE AND SIZE TO BE APPROVED BY EPCOR PRETREATMENT- INSPECTED BY PRETREATMENT COORDINATOR.
9. PROPER AIR CONTROL IS CRITICAL TO THE OPERATION OF AN HGI. AIR INTAKE ON THE INLET AND VENTED WASTE ON THE OUTLET.
10. CONTACT EPCOR PRETREATMENT AT PRETREATMENT@EPCOR.COM FOR SHOP DRAWING SUBMITTAL AND INSPECTION/TESTING.



* LID MUST BE CAPABLE OF SUPPORTING ANTICIPATED LOADS

450-2.DWG 07/30/20 - 03:44pm

DATE:
July '20



2355 W Pinnacle Peak Rd, Ste 300
Phoenix, AZ 85027
P 623.445.2400 F 623.587.1044

TYPICAL HYDROMECHANICAL
GREASE INTERCEPTOR (HGI)

DETAIL NO.
450-2

RECLAIMED WATER
DO NOT DRINK
NO TOMAR

VALVE TAG:

3"x8"x $\frac{3}{16}$ " PURPLE POLYETHYLENE PLASTIC WITH MINIMUM $\frac{1}{2}$ " HIGH BLACK LETTERING IN ACCORDANCE WITH M.A.G. SECTION 616. TAG TO BE ATTACHED WITH STAINLESS STEEL WIRE.

IDENTIFICATION DECAL:

5"x16"x $\frac{3}{16}$ " PURPLE POLYETHYLENE PLASTIC WITH MINIMUM 1" HIGH BLACK LETTERING IN ACCORDANCE WITH M.A.G. SECTION 616. DECAL TO BE ATTACHED WITH AN EPOXY ADHESIVE.

600-1.DWG 07/30/20 - 03:44pm

DATE:

July '20



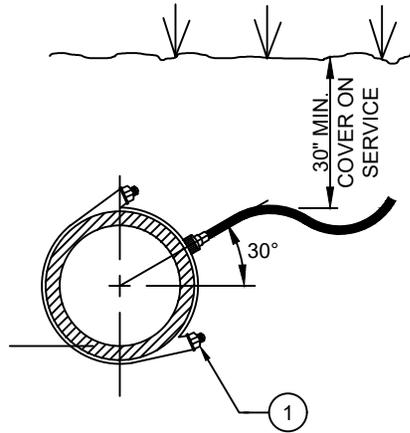
2355 W Pinnacle Peak Rd, Ste 300
Phoenix, AZ 85027
P 623.445.2400 F 623.587.1044

RECLAIMED WATER
ID TAG AND DECAL

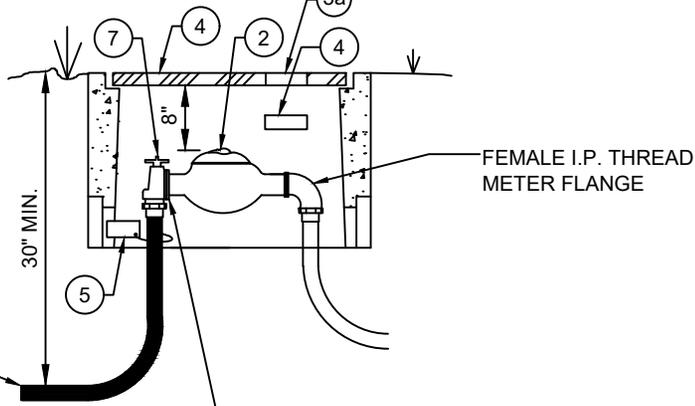
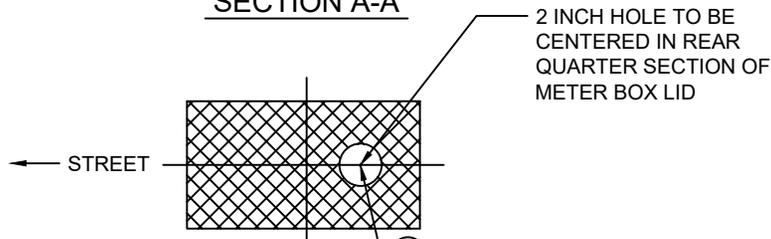
DETAIL NO.

600-1

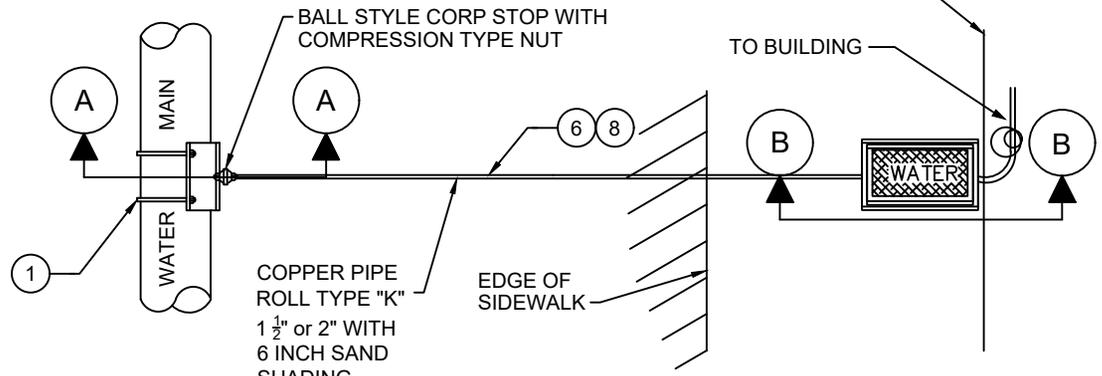
ALL SERVICES



SECTION A-A



SECTION B-B



PLAN VIEW

NOTES:

1. SEE EPCOR STD. DET. 100-3 FOR APPROVED SADDLES.
2. METER TO BE SET BY EPCOR UPON PAYMENT OF FEES.
3. CONCRETE METER BOX PER M.A.G. STD. DET. 320 BOX NO. 2 OR 4 W/ STEEL LID W/ 2 INCH DIAM. OPENING TO BE SET PERPENDICULAR TO BACK OF WALK OR CURB. BOX TO MATCH SLOPE OF FINISH GRADE AND SET 1" ABOVE FINISH GRADE OR BACK OF WALK OR CURB. (3a) 2 INCH DIAMETER OPENING.
4. IDENTIFICATION DECAL PER EPCOR STD. DET. 600-1.
5. VALVE TAG PER EPCOR STD. DET. 600-1.
6. RECLAIMED LINE COPPER PIPE TO BE WRAPPED WITH PURPLE POLYETHYLENE TAPE.
7. ANGLE BALL METER VALVE TEE HEAD TO BE STAMPED "RECLAIMED WATER".
8. CAL WESTERN INC TYPE CAL102 PURPLE POLY SLEEVE REQUIRED IN MOHAVE COUNTY ONLY. TRACER WIRE REQUIRED ON TOP OF SLEEVE.

610-1.DWG 07/30/20 - 03:44pm

DATE:
July '20



2355 W Pinnacle Peak Rd, Ste 300
Phoenix, AZ 85027
P 623.445.2400 F 623.587.1044

RECLAIMED WATER SERVICE CONNECTION

DETAIL NO.
610-1

ALL ABOVE GROUND PIPE TO BE PAINTED WITH UV RESISTANT PAINT (10 MIL MIN. THICKNESS). COLOR TO MATCH SURROUNDING LANDSCAPE WITH "RECLAIMED WATER" STENCILED ON PIPE IN ACCORDANCE WITH M.A.G. SECT. 616.

1/8" STAINLESS STEEL MESH SCREEN WITH STAINLESS STEEL CLAMPS

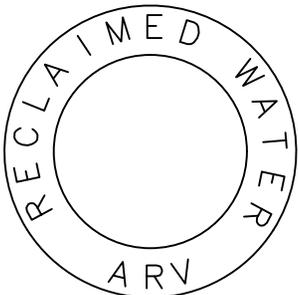
POLYWRAPPED 2" PVC 90° ELBOW (SCH. 80)

CONCRETE THRUST BLOCK PER M.A.G. STD. DET. 380

36" DIA FRP MANHOLE W/ H20 LOAD RATING & IN ACCORDANCE W/ ASTM D-3753

12" ABC BASE, 95% COMPACTION PER M.A.G. SECT. 601.4.4

MANHOLE COVER TO BE LABELED:



NOTE:

IF MULTIPLE ARV's ARE INSTALLED, EACH BOX MUST BE SEPARATED BY 3' MINIMUM.

MINIMUM CLEARANCE 6" ALL SIDES

VALVE TAG PER EPCOR STD. DET. 600-1

2" BRASS 90° ELBOW

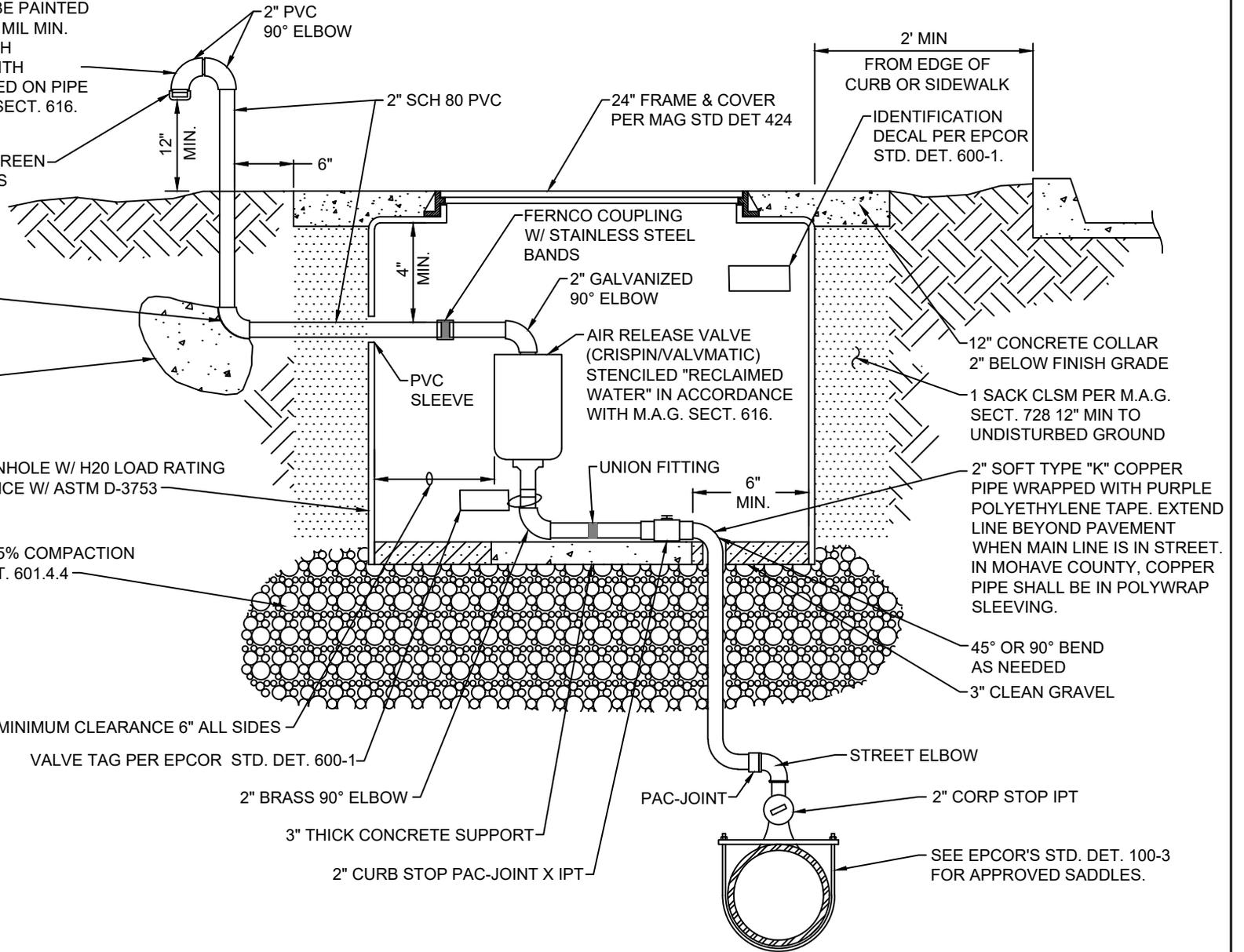
3" THICK CONCRETE SUPPORT

2" CURB STOP PAC-JOINT X IPT

STREET ELBOW

2" CORP STOP IPT

SEE EPCOR'S STD. DET. 100-3 FOR APPROVED SADDLES.



620-2.DWG 07/30/20 - 03:44pm

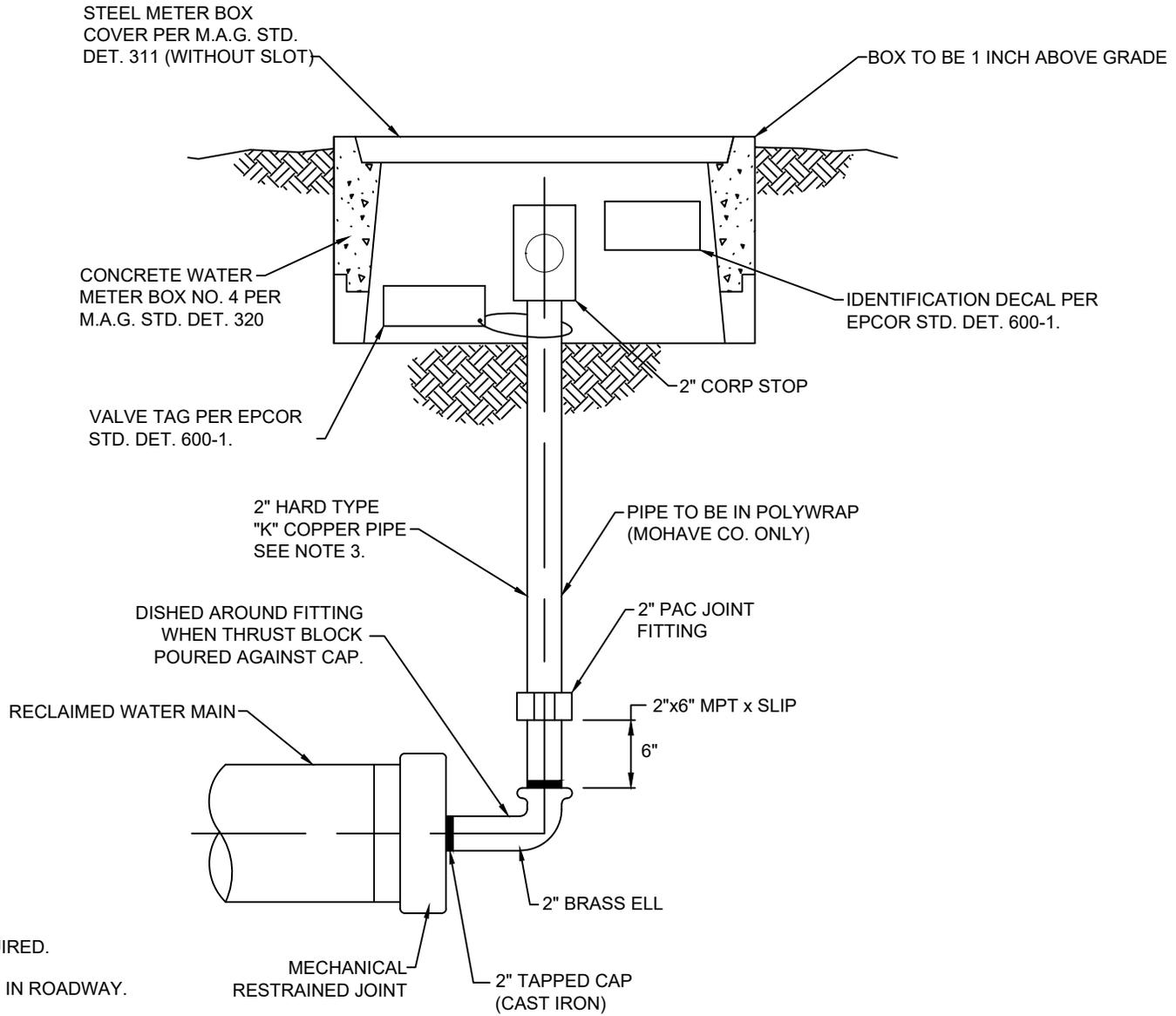
DATE:
July '20



2355 W Pinnacle Peak Rd, Ste 300
Phoenix, AZ 85027
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**RECLAIMED WATER
UNDERGROUND AIR RELEASE VALVE**

DETAIL NO.
620-2



NOTES:

- 1. NO SOLDERED JOINTS
- 2. CARSONITE MARKER REQUIRED.
- 3. SOFT COPPER TO BE USED IN ROADWAY.

630-1.DWG 07/30/20 - 03:44pm

DATE: July '20		2355 W Pinnacle Peak Rd, Ste 300 Phoenix, AZ 85027 P 623.445.2400 F 623.587.1044	RECLAIMED WATER CURB STOP (BLOW OFF) WITH FLUSHING PIPE	DETAIL NO. 630-1
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