

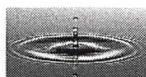
CITY OF PHOENIX

STANDARDS FOR WATER FACILITIES

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# TABLE OF CONTENTS

## SECTION I

### CONDITIONS OF ACKNOWLEDGMENT AND AGREEMENT

## SECTION II

### GENERAL REQUIREMENTS

1.	General .....	1
2.	Plan Submittal .....	1
3.	Plan Details.....	2
	a. Vicinity Map.....	2
	b. Plan View.....	2
	c. Profile View.....	2
	d. Main Sizes .....	2
	e. Separations .....	3
	f. Main Locations .....	3
	g. Main Depth .....	4
	h. Valves .....	4
	i. Air Valves .....	5
	j. Fire Hydrants .....	5
	k. Service Lines and Meter Boxes .....	5
	l. Poly Pigs .....	6
4.	General Notes .....	6
5.	Construction .....	7
6.	Approval of Contractor and Pipeline Installer .....	8
7.	Easements .....	8
8.	Completion .....	8

## SECTION III

### GENERAL SPECIFICATIONS

1.	Scope of Work .....	1
2.	Control of Work .....	1
3.	Inspection .....	1
4.	Materials .....	1
5.	Permits .....	2
6.	Coordination of Plans, Standard Specification .....	2
7.	Lines and Grades .....	2
8.	Safety .....	2

## SECTION IV

### STANDARD SPECIFICATIONS

## SECTION V

### STANDARD DETAIL DRAWING

APPENDIX "A" EASEMENT (sample for corporations)

APPENDIX "B" EASEMENT (sample for individuals)

APPENDIX "C" PROCEDURES CHECKLIST

SECTION I

**The following conditions apply to the Statement of Acknowledgement and pre-development agreement signed by the developer for any given project.**

1. All utility/entity appurtenances and routing locations will be shown, coordinated and signed off on the cover sheet of the plans. The required procedure for this coordination will be through a UTILITY PRE-DESIGN meeting with all utilities/entities (power, telephone, natural gas, cable TV, engineer, architect, surveyor, water district, irrigation district, owner, developer, public works departments, etc.) including the City of Phoenix and the Phoenix Fire Department. FIRE HYDRANTS, WATER METERS AND OTHER WATER RELATED ITEMS WILL BE LOCATED ON PLANS SUCH THAT THERE ARE NO CONFLICTS WITH OTHER UTILITY APPURTENANCES OR DRIVEWAYS. PLEASE NOTE THAT THE CITY STANDARD IS FIVE FOOT CLEAR FROM WATER FACILITY TO APPURTENANCES. SINGLE AND NOT-STANDARD DOUBLE WATER METERS WILL BE STATIONED OR DIMENSIONED ON PLANS FOR CONSTRUCTION STAKING AND INSPECTION VERIFICATION. THE RESPONSIBILITY FOR THE OUTCOME OF THIS PRE-DESIGN MEETING AND CONFLICT FREE APPURTENANCE LOCATIONS IS THAT OF THE DEVELOPER AND THEIR DESIGN ENGINEER.
2. The developer and engineer will understand that the standards and regulations imposed by the City of Phoenix are minimum requirements and that it will be the design engineer's responsibility to guarantee the safety and performance of their design beyond these requirements. It is also a requirement the registered engineer that stamps the plans submitted for approvals be responsible not only for the adequacy of design but proper implementation of the design throughout the project. This includes proper surveying, staking, inspection, providing of record information AND solving problems that may occur during construction. The City realizes that some of these duties may be assigned to others; however, the City will look to the registered design professional engineer for responsibility of conformance to plans and design performance.
3. **The estimated cost for plan checks includes, but is not limited to, such things as plan review, pre-construction meeting, temporary services when needed, valve operation, City public works crew, inspection, flushing, testing, disinfection, dechlorination, sampling, bacteriological tests, project finalization, fire hydrant painting, minor materials and records drawings. The contractor provides all the pipeline and material appurtenances (unless otherwise noted), excavation, installation of the pipeline, backfill and surfacing.** The contractor is responsible for contacting the appropriate departments of all other jurisdictional agencies and for obtaining all required permits.
4. Please keep in mind that this is an estimate and if additional work is incurred, it will be charged to the customer. If the work is not as extensive, a refund will be made to the customer. The customer is the one who pays the initial estimated cost. The developer will be completely responsible for ensuring prompt payment of all additional costs incurred whether they paid the initial estimated cost or not. The final billing statement could be delayed after actual completion of the water related project because of reasons beyond the control of the City. This charge or refund is not processed until the project is final with the City which includes final paving of finished surfaces (can take four to six weeks).
5. Conflicts with unknown existing facilities encountered may cause additional work and added costs to the project of which the developer will be completely responsible for to ensure proper construction to current City standards.
6. All estimates, fees and charges must be paid prior to any work being done by the City. This payment begins daily project inspection charges; therefore, it is important to proceed with diligence.

7. Water mains and appurtenances, if installed across private property, must be provided with a written easement dedicated to the City by the owner. These easements do not allow building of any structures over them now or in the future. All signed (by owner) and notarized easements on City standard forms are required prior to approval of construction plans. If the easements are shown on the final recorded plat, the written ones are not required.
8. All water pipe used will be Class 54 ductile Iron conforming to current City standards and AWWA specifications.
9. The following items should be noted:
  - a) The developer's representative, engineer and/or contractors will arrange a pre-construction conference on the site with the City at least 48 hours prior to start of the project. Please note that during the busy construction seasons it may be necessary to abide by and allow this lead time notice as well as the time requirements for scheduling noted elsewhere in this document. **ABSOLUTELY NO WORK WILL BE DISCUSSED, SCHEDULED OR ACCOMPLISHED BY THE CITY UNTIL THIS CONFERENCE IS HELD. PLEASE DO NOT CONTACT ANY OTHER DEPARTMENT OF THE CITY EXCEPT THE CITY ENGINEER (535-5531) IN ARRANGING THIS.** All phases of construction will require inspection and approval by the City before covering up or backfilling.
  - b) The contractor will be pre-qualified with the City.
  - c) The final stamped "approved" construction plans and City of Phoenix Standards will be available at the project at all times.
  - d) The owner must supply the City with a statement of actual construction costs of the water facilities and must sign a form for *Dedication and Declaration of Acceptance of Water Systems Facilities* at the end of the project. The one-year warranty on the water facilities guaranteed by the owner does not start until this dedication is signed.
  - e) BE AWARE THAT water service may not be allowed until the project is completely final by the City and any water systems repairs are made. This includes, but is not limited to, all types of project construction that may affect the water system facilities (i.e. power and other utility trenches, paving, any outstanding or remaining billings to be paid and delivery of the dedication of the water system to the City).
  - f) **Planning and timing for service crew work performed by City personnel (i.e., sleeves, taps, testing, disinfection, dechlorination, services, air valves, etc.)** must be scheduled ahead of time and preferably with a minimum of two weeks lead time. Some material supplied by the City may have long lead times in ordering and preparing for this project. This means that all items needed to allow this project to proceed, especially payment of required fees, must be done as soon as possible.

It is the developer's responsibility to provide these items as soon as possible and the contractor's responsibility to schedule service work with the inspector ahead of time as noted.

All service work shall be scheduled through the inspector and if the contractor is not prepared at the time of scheduling, then the work goes to the bottom of the list and is rescheduled.

At the time of pre-construction meeting the inspector will reiterate the scheduling requirements, the level of contractor work to be done ahead of time and the flow of information during construction.

- g) Record drawing (as built) locations of all water related appurtenances by global positioning system (GPS) or State accepted standard surveying practices will be required to be submitted in State Plane Coordinates. Horizontal datum shall be submitted in NAD 83 International Survey Feet. The elevation datum shall be submitted in NGVD 1929. Only licensed surveyors will be allowed to submit the data points. The points will be required in a .DWG format with annotation to each point. ASCII files will also be required.

SECTION II

1. General

- a. These standards are for the purpose of establishing standard procedures for developing a design and for constructing water facilities which will become a part of the City of Phoenix water distribution system, including water districts or associations contracting with the City for service.
- b. The provisions of these requirements, specifications and special provisions shall be made, by reference and inclusion, a part of construction requirements to the extent of their applicability and shall prevail over any other specification provisions.
- c. No approval of variances from these guidelines or estimates of costs will be given prior to submittal of plans for review.
- d. Whenever the following terms are used in these requirements, specifications and special provisions, they are to be interpreted as being synonymous with the accompanying full title.

<u>TERMS</u>	<u>FULL TITLE</u>
City	City of Phoenix
City Engineer	Engineer for the City of Phoenix
Contractor	Firm or corporation contracting with the developer to perform the work; Contractor and the person installing the pipe must be prequalified
Council	City Council of Phoenix, Oregon
County	County of Jackson
Developer	Individual, partnership, firm or corporation proposing construction of water facilities which are a planned extension to the existing City of Phoenix system
Engineer	Consulting engineer for the developer
Inspector	Inspector for the City of Phoenix
State	State of Oregon
Surveyor	Surveyor for the developer

2. Plan Submittal

- a. The developer shall submit one (1) print of the proposed installation.
- b. The City Engineer will check the drawings, estimate its charges for plan check, work to be performed by the City (such as tapping, inspection, flushing, testing, disinfection, sampling and record drawings, etc.) and notify the developer of the amount to be deposited.



- c. The developer will incorporate the necessary corrections and furnish the City with an electronic disk of the final drawings using a CD, AUTOCAD Release DWG format and five (5) printed sets of final drawings along with the original check set.
- d. The owner will be requested at this point to sign a pre-development agreement, acknowledging those responsibilities required of them for finalization of acceptance of the water facilities and provide any required easements or other agency approvals.
- e. Upon receipt of the above, the City will initiate a work order and return two (2) sets of drawings marked "Approved" to the contractor at a pre-construction meeting.

3. Plan Details

The following standards are outlined for general use in preparing plan-profile drawings of water facilities for the City.

- a. Vicinity Map  
Project map shall be provided showing proposed installations in relation to nearest cross streets.

- b. Plan View  
Sizes of water mains are to be shown in plan views as near as practicable to valve or fitting assemblies together with identification of all valves and fittings and ties to existing water facilities.

Street centerline stations shall be used as reference stationing for water mains, fire hydrants, valves, fittings and water service connections. Where water mains cannot be referenced to or deviate from street centerline stationing, dimensions for length shall be indicated on the plan view.

- c. Profile View  
Profiles of pipeline invert are to be plotted directly below the plan views with other utility crossings shown.

Sizes of water mains, types of classes of pipes and backfill classifications are to be shown in the profile view.

- d. Main Sizes  
Required water main sizes shall be as follows or as dictated by the City Engineer.

<u>Main Size</u>	<u>Requirements</u>
4"	For permanently dead-end mains not to exceed 400 feet in length and when no fire hydrants are supplied
6"	Standard sized lateral water main for gridiron (looped) system
8"	Minimum size for temporary unlooped mains supplying fire hydrants and for minor trunk mains
12"	As required for trunk (feeder) mains and industrial/commercial areas

The distribution system lateral mains shall be looped wherever possible. The installation of permanent dead-end mains and dependence of relatively large areas of single mains is to be avoided. On new construction, the minimum size lateral main for supplying fire hydrants within public ways shall be 6-inch provided such 6-inch mains are looped. Looping shall be defined as a minimum distance of 500 feet between mainline connection points.

A lateral water main is defined as a main not exceeding eight (8) inches in diameter which is installed to provide water service and fire protection for a local area including the immediately adjacent property.

The normal size of looped lateral mains for single-family residential areas in 6-inch except that in the sole discretion of the City, 8-inch lateral mains may be required to meet the domestic service and fire protection needs of an area. Fire hydrant stub lines may not exceed 100 feet in length. Other unlooped lateral mains may not: 1) exceed 1500 feet in length, 2) be less than 8" in size and 3) be allowed without reasonable assurance of looping within two (2) years from date of installation. The line will be required to terminate with a plug and an easement (dedicated to the City) at a property line for future extension or looping. Meters may be required to be placed at the end of the unlooped main.

The normal size of lateral mains for commercial, industrial and multiple-family areas shall be twelve (12) inches except that in the sole discretion of the City, 8-inch lateral mains may be allowed if flows meet domestic service and fire protection needs of an area.

e. Separations

Separation of water mains, including service lines and sanitary sewers shall be in accordance with current Oregon State Health Division Rules and/or as modified in Section IV, Item II, C-8 of these standards **EXCEPT** in all cases running parallel with each other, there shall be a 10-foot separation (centerline to centerline).

The minimum horizontal spacing between water mains and storm sewers, gas lines and other underground utilities, excepting sanitary sewers, shall be five (5) feet horizontally centerline of trench to centerline of trench with a minimum trench wall of three(3) feet between them. The minimum horizontal spacing between water facilities (water mains, fire hydrants, air release valves, etc.) and other utilities' facilities (transformers, closures, risers, boxes, etc.) shall be five (5) feet clear. The minimum vertical spacing, as noted above, shall be six (6) inches vertically outside of water main to outside utility. In some cases, depending on size and type of facility, concrete bridging piers or supports will be required to span the water facility.

f. Main Locations

The standard location for water mains shall be within public streets and roads and shall be ten (10) feet from the centerline of such streets and roads on the south and west side of street centerlines. Multiple mainlines running parallel in the same street right-of-way for the convenience of development is not allowed. Exceptions to these requirements may be made in order to avoid conflicts with other existing underground facilities or street facilities and to permit sanitary sewers to be installed on the low sides of streets. As nearly as practical, mains shall be installed in the same relative location on a particular street with the distance from the centerline of the street being varied as little as possible. Mains shall not be installed in alleys and the installation of mains within easements across privately owned property is to be done only when absolutely necessary, such as the avoidance of dead-end connections. Such easements, when required, shall be a minimum of 10 feet in width except that the minimum width shall be 20 feet for major trunk water mains and the conditions of the easement shall include provisions that the

property included in the easement shall not be used for any purpose which would interfere with unrestricted use for water main purposes. Under no circumstances will permission for the construction of a building or structure of any type within the easement be granted. A copy of the City of Phoenix standard easements is included with this document (Appendix A and Appendix B).

g. Main Depth

All water mains and fire hydrant stubs require a minimum 36-inch cover unless otherwise approved by the City.

If the bottom of any extensive excavated sub-grade is within 18-inches of the top of an existing water line pipe barrel, the water line shall be lowered or replaced.

If the bottom of any extensive excavated sub-grade is between 18 and 30 inches of the top of an existing water line pipe barrel, the water line shall be protected during construction with original intact mounded material until such time the sub-grade area over the water line can be carefully removed, replaced and compacted.

The ideal cover, finished surface to top of the water line pipe barrel, over new water lines shall be as per current City standards of 60-inch. However, minimal cover of 24-inches will be allowed on ductile iron pipe. This minimal cover shall only be allowed under City pre-approved situations and only for a limited distance to avoid problems.

To facilitate pre-design of these conflicts, the City will, at their expense, pot hole the location of the existing water lines upon request. The developer will be responsible for payment for the required backfill and re-surfacing of these pot holes.

h. Valves

In general, the valve sizes shall be the same as the mains in which they are installed.

Valves shall open when turned to the left or counter-clockwise and shall have 2-inch square operating nuts and shall be suitable for direct burial. The ends of gate valves shall be mechanical joint when used with ductile iron pipe. The ends of butterfly valves shall be mechanical joint and used with ductile iron pipe when 12-inch and greater size.

Wherever possible, distribution system valves shall be located at the intersection of the main with street property lines (right-of-way lines). There shall be sufficient number of valves so located that not more than three (3) valves must be operated to affect any other particular shut-down and the spacing valves shall be such that the length of any one shut-down in high value areas shall not exceed 800 feet nor 1,200 feet in other areas.

The contractor is required to set all valve boxes and adjust for final grade. The lower well casing section of the valve box shall rest on the bonnet of the valve. At the time of final inspection, valve boxes shall be plumb, centered over the operating nut and the interior free of dirt and other debris. When the distance from the top of the valve operating nut to the top of the valve box exceeds 36-inches, an extension to the operating nut shall be furnished and installed by the City at the developer's expense.

All valves shall be operated through a full closed and full open position. Valves shall be checked for proper direction of operation.

Well casing shall be within eight (8) inches of finish grade.

i. Air Valves

Air valves shall be located at high points of the system, in locations where there is an abrupt change in upward slope; and on either side of a sudden change in grade (i.e. crossing under storm drain, etc.). Air valves shall be of the type and installed as shown on City of Phoenix Standard Details Nos. 106 and 107. Whenever possible, the engineer should design the water system to avoid air valves.

The contractor shall perform all excavation and backfilling and the air valve will be installed by the City upon payment of the standard fee.

Due to the critical grade requirements of air valves, it is essential that the surveyor provide horizontal and vertical control for all air valves.

j. Fire Hydrants

Hydrants shall be located at street intersections as nearly as possible. The standard location at a street intersection is 1- foot from the intersection street right-of-way line and not within a curb return. See Standards Nos. 104 and 105. The minimum length of bury shall be 3½ feet and the hydrant shall be adjusted to grade using offsets where possible.

Hydrants are to be evenly distributed. The coverage per hydrant shall vary in relation to the required fire flow. The preferred coverage will normally result in hydrant spacing in residential areas of 500 feet and 300 feet in high value districts. The Phoenix Fire Department shall specify the specific number and locations of fire hydrants to be placed.

The City will charge the developer to pay for the cost of the initial hydrant painting and numbering. This amount will be collected with other estimated costs collected on each project.

Fire hydrants shall be installed to provide proper height and setback. The ground line mark on the fire hydrant shall match finish grade. The fire hydrant shall be plumb and the nozzles and pumper connection shall face in the proper direction.

Fire hydrants shall be flow tested during final inspection and prior to acceptance by the City.

k. Service Lines and Meter Boxes

The service lines shall normally extend from the main to behind the curb or sidewalk with the meter and meter box being located at the termination of the service connection. Meters shall not be in driveways or traffic areas unless protected by 6" curbs or bollards. Single and double services shall terminate near a common lot line as indicated on Standard Detail No. 100.

Water service connections shall be installed by the City. The complete water system, mains and services will be tested, disinfected and proven bacteriologically safe by the City after all services are installed.

All service line trenches shall be bedded with three (3) inches of washed sand pass ¼ inch mesh prior to installation of service line; except that in the sole judgment of the City Inspector, the requirement for bedding may be waived when the trench bottom is already sandy loam. Sand shall be stockpiled at each meter location. Immediately after installation, the trench shall be backfilled with six (6) inches washed sand passing a ¼ - inch mesh at the pipe zone and a

minimum of one (1) foot of sand backfill will cover the angle stop. The remainder of the service line trench may be backfilled with backfill in conformance with other regulation standards.

The procedure for staking water service locations will be to set an offset hub for horizontal and vertical control, with a cut stake to finish grade elevation for each service in the location indicated on Standard Detail No. 100. The stakes must be free of excavated material so that the required measurements can be obtained.

Stub water service connections are to be located and installed at right angles to the main and shall be installed as shown in the Standard Detail No. 100.

1. Poly Pigs

All newly laid waterlines shall use “poly pigs” as an internal pipeline cleaner. “Poly pigs” shall be installed in the line during pipeline installation at locations determined by the City.

All newly laid lines shall be pre-loaded with water, when possible, ahead of the “poly pig”. The method and approved procedure will be decided by the City’s Inspector. “Poly pigs” shall be moved by water pressure and then removed from the pipeline by City personnel during flushing operations. All used “poly pigs” become the property of the City and their reuse determined by the inspector.

4. General Notes

a. The following general note shall appear on all plans:

*“All water works shall be done in accordance with the current requirements of the City of Phoenix.”*

b. The following notes should appear plans, but in any case apply to all projects:

- 1) Service connections are to be installed for each parcel per Standard Nos. 100 and 101.
- 2) Cover over existing mains shall not be changed without written authorization of the City.
- 3) New mains are to be pressure tested, disinfected and proven to be bacteriologically safe prior to placing new mains in service by the City of Phoenix. Pressure testing shall not be done until all excavation and subgrade has been established.
- 4) Initial backfill to top of water mains and fire hydrant runs shall be compacted in accordance with Standard Specifications for Trench Excavation and Backfill.
- 5) Water mains and fire hydrants are to be installed with reference to alignment and grade and status and only upon notification of the City Inspector.
- 6) Water mains are to be installed after sewers.
- 7) Fire hydrant runs are to be installed before curbs and gutters. In the event a water main is installed larger than eight (8) inches or if the main has more than three (3) feet of cover, the contractor will be required to install an offset similar to Standard Drawing 105 to permit use of a standard 3’-6’ bury fire hydrant.

- 8) Stub service runs shall be installed prior to curb and gutter construction and after PUE's are graded to curb levels.
- 9) Approved plans and specifications shall be available at site of construction at all times during construction of water facilities.
- 10) Copies of City of Phoenix Standard Specifications should be obtained at the City of Phoenix Public Works Department, 1000 South "B" Street.
- 11) Separation of water mains, including service lines and sanitary sewers, shall be in accordance with current Oregon State Health Division Rules and/or as modified in Section IV, Item II, C-8 of these Standards except in all cases running parallel with each other, there shall be a 10 foot separation center line to center line.
- 12) No above-ground appurtenances or physical structures of any kind shall be within five (5) feet of any water facility when running parallel or approximately parallel to the water facility. This distance shall be ten (10) feet when water and sanitary sewer facilities are concerned.
- 13) No below-ground utility lines or other services of any kind shall be within six (6) inches of any water facility when running perpendicular or approximately perpendicular to the water facility. This distance shall be 18 inches when water and sanitary sewer facilities are concerned.
- 14) Blasting or explosive work will not be allowed within 30 feet of existing water facilities and only then using proper industry standards and through a permit process with the Fire Department.
- 15) The City of Phoenix requires "Poly Pigs" to be used on all newly laid water lines.

## 5. Construction

- a. All materials and workmanship utilized in the construction of facilities that the City assumes ownership of shall be in accordance with the attached "Standard Specifications for Trench Excavation and Backfill" and for "Ductile Iron Pipe, Polyvinyl Chloride, Cast Iron Fittings, Valves and Fire Hydrants".
- b. Facilities shall be installed in strict accordance with plans.
- c. The City shall be notified 48 hours in advance of construction.
- d. All materials and workmanship utilized in the construction of facilities that the City assumes ownership of shall be guaranteed for a period of one year following date of acceptance by the City.
- e. Approved plans shall be available at the site of construction at all times during construction.
- f. Prior to backfilling operations, water facilities installation shall be inspected by the City Inspector to ensure compliance with the plans and specifications.

- g. It shall be the contractor's responsibility to arrange for inspections prior to backfilling operations.
- h. Work activities on water projects shall be confined to normal working hours (8:00am to 4:30pm – Monday through Friday).

6. Approval of Contractor and Pipeline Installer

- a. The contractor and person installing the pipe and water facilities shall be approved by the City of Phoenix.

The Contractor must supply to the City previous work related to ductile iron pipe and/or PVC pipe installation or other items related to particular projects, with references and telephone numbers.

The Contractor may be required to attend a meeting with City personnel with their service truck and explain their planned approach to the project as well as knowledge of our printed standards. Determination of Prequalification may be based solely on this information.

It must be understood that the City inspects waterline work for acceptance into the public system but does not teach the techniques for proper installation. Having the knowledge of techniques for proper installation is the responsibility of the contractor to already possess. New persons wanting to learn the process should work under an experienced contractor and then apply for Prequalification keeping in mind their first few jobs will necessitate increased inspection time until a sense of confidence is achieved by the City.

Work performed by other than approved contractors and people installing the pipe will not be accepted.

- b. Prior to accepting bids or awarding a contract, the developer is advised to verify prequalified contractors with the City of Phoenix.

7. Easements

Water facilities shall not be constructed outside dedicated streets until all necessary easements have been granted to the City. The developer shall provide all necessary descriptions so that grants of easements may be executed. A copy of City of Phoenix Standard Easement form is enclosed herein (see Appendix "A" and "B").

8. Completion

- a. Upon completion of the project, the contractor will notify the City 48 hours in advance of desired final inspection.
- b. The City will in turn furnish a **Dedication and Declaration of Acceptance of Water System Facilities** form to be executed by the owner and the City. The owner's Dedication provides for a one (1) year guarantee from the date of acceptance in which the owner agrees to indemnify and save harmless the City of Phoenix from any and all defects appearing or developing in the workmanship or materials performed or furnished in the construction of the described water system facilities.

- c. The contractor is required to supply a statement of actual cost of the project on the “Dedication and Declaration” form.



SECTION III

1. Scope of Work

- a. It is the developer's responsibility to have all work done in accordance with approved plans and special provisions.
- b. Any change or alteration in approved plans will require written consent of the City Engineer.
- c. The City will assist in marking and locating City facilities through the Oregon Utility Notification Center system.

2. Control of Work

- a. The City Engineer will decide all questions which may arise as to the quality of acceptability of materials furnished and work performed. The City Engineer will have the authority to decide on the acceptable fulfillment of all phases of work.
- b. Finished construction shall conform with grades and dimensions shown on approved plans. Deviations from approved plans, as may be required by the necessities of construction, will be determined in all cases by the City Engineer and significant deviations must first be authorized in writing.
- c. Construction not included as part of the original plans must first be given written approval by the City Engineer.
- d. Failure to comply with the aforementioned requirements will be cause for rejection of the work.

Inspection

- a. The City's Inspector shall at all reasonable times have access to the work during construction and shall be furnished every reasonable facility for ascertaining full knowledge regarding adherence to plans, workmanship and type and quality of materials used in the work.
- b. Work which is defective in its construction or deficient in any of the specified requirements shall be removed and replaced to the satisfaction of the City.
- c. Failure to comply with any part of the plans may be sufficient cause to reject the work. Deviations will be called to the attention of the developer or contractor at the time it is noted. Failure to comply by making the necessary corrections will result in the sending of a written notification to both the contractor and the developer and the work thereafter will not be accepted until after corrections have been made to the satisfaction of the City.

4. Materials

- a. All materials shall be new and meet the specified requirements. No other materials will be accepted.
- b. The City will refuse to accept for use any materials which are defective or damaged. Installation of any such materials will result in rejection and subsequent request for removal and replacement before acceptance.

5. Permits

It is the obligation of the developer or contractor to obtain whatever permits may be legally required prior to the start of construction.

6. Coordination of Plans, Standard Specifications and Special Provisions

Standard specifications, plans and special provisions are essential parts of the work. They are intended to be cooperative, descriptive and provide for complete work. Requirements occurring in one shall be considered as occurring in all. Plans shall govern over Standard Specifications and special provisions shall govern over both Standard Specifications and plans.

7. Lines and Grades

a. Construction shall be conducted with the aid of alignment and grade stakes.

b. Finished grade shall be established prior to service lines, meter box and fire hydrant installation.

8. Safety

It is the contractor's responsibility to conform to all OSHA or other safety regulations. The City Inspector is not responsible for patrolling safety issues.

SECTION IV

# **STANDARD SPECIFICATIONS**

## **TABLE OF CONTENTS**

- I Standard Specifications for Trench Excavation and Backfill
- II Standard Specifications for Ductile Iron Pipe, Polyvinyl Chloride Pipe,  
Cast Iron Fittings, Valves and Fire Hydrants
- III Standard Specifications for Water Service

STANDARD SPECIFICATIONS FOR  
TRENCH EXCAVATION AND BACKFILL

# STANDARD SPECIFICATIONS FOR TRENCH EXCAVATION AND BACKFILL

## INDEX

A.	<u>MATERIALS</u> .....	1
A-1	Gravel for Backfill .....	1
A-2	Selected Backfill Material.....	1
A-3	Gravel Surfacing Material .....	1
A-4	Sand .....	1
A-5	Sand Slurry .....	1
B.	<u>WORKMANSHIP</u> .....	1
B-1	Progress of Construction .....	1
B-2	Trench Width .....	1
B-3	Grade .....	2
B-3.1	Bedding .....	2
B-3.2	Pipe Zone .....	2
B-4	Rock Excavation .....	2
B-4.1	Depth of Rock Excavation .....	2
B-4.2	Use of Explosives .....	2
B-4.3	Repair of Damage .....	3
B-5	Shoring, Sheet piling and Bracing Trenches .....	3
B-6	Piling of Excavated Material .....	4
B-7	Removal of Water .....	4
B-8	Trench Backfill .....	4
B-8.1	Class "A" Backfill .....	4
B-8.2	Class "B" Backfill .....	4
B-8.3	Class "C" Backfill .....	4
B-8.4	Class "D" Backfill .....	5
B-8.5	Class "E" Backfill .....	5
B-8.6	Class "F" Backfill .....	5
B-8.7	Class "G" Backfill .....	5
B-8.8	Compaction .....	5
B-9	Excess Excavated Material .....	5
B-10	Roads, Streets and Driveways .....	5
B-11	Permits and easements .....	6
B-12	Interfering Structures and Utilities .....	6
B-13	Field Relocation .....	7
B-14	Obstructions .....	7
B-15	Excavation Across Cultivated Land .....	7
B-16	Clearing the Right-of-Way .....	7
B-17	Pavement Removal .....	7

A Materials

A-1 Gravel for Backfill

Gravel for backfill shall be clean, creek run gravel with maximum size of four (4) inches or 3/4-inch minus crushed rock, uniformly graded from coarse to fine.

A-2 Selected Backfill Material

Selected backfill material may contain pieces of material of a size up to four (4) inch in diameter provided that such material shall have a sufficient gradation to permit reasonable compaction.

A-3 Gravel Surfacing Material

Unless otherwise indicated in the Detail Specifications, gravel surfacing material for use with Class "A", "C" or "E" Backfill shall be 3/4-inch minus crushed rock uniformly graded from coarse to fine.

A-4 Sand

Shall be uniformly graded coarse sand with a maximum particle size of 1/4-inch.

A-5 Sand Slurry

One sack non-compressible mix consisting of sand, water and a quantity of Portland Cement ranging 90 to 100 pounds per cubic yard of slurry mix. A slump of at least six (6) inches, but not more than eight (8) inches, shall be used.

B. Workmanship

B-1 Progress of Construction

It is the intent of these Contract Documents that the progress of the work shall be in a systematic manner so that as little inconvenience as possible will result to the public in the course of construction. It is necessary, therefore, that the contractor confine his operations to as small a length of work as is feasible. Except by permission of the City of Phoenix, at no time shall the trenching equipment be farther than 200 ft ahead of each pipe laying crew. Backfill of the trench shall be accomplished so that no section of approved pipe shall be left open longer than 48-hours except by permission of the City of Phoenix. Complete backfill and clean-up shall progress as each section of pipe has been inspected and approved. The contractor shall repair and regrade all existing drainage ditches, natural drainage courses and all other drainage facilities including culverts damaged or removed during the construction.

The contractor shall give prompt consideration for reopening streets, roads and driveways to the public after the line has been installed past these points. No traffic-way shall be closed while work is suspended over weekends or holidays and closures during work days shall be as brief as practical. Where private accesses are to be closed, the property owner shall be notified by the contractor at least 24 hours in advance of the closure. Access for fire and emergency equipment for the protection of buildings, lives and property shall be maintained at all times.

B-2 Trench Width

Minimum width of unsheeted trenches in which pipe is laid shall be 18 inches greater than the inside diameter of the pipe for the 24-inch and larger pipe and 12 inches for less than 24-inch diameter pipe except in cases where excess width of excavation would cause damage to adjacent structures, or where the Detail Specifications or the Plans limit the clear width at the top of the pipe failure due to excessive external load. Trench width in blasted trenches shall be a minimum of 24 inches.



B-3 Grade

The bottom of the trench shall be carried to the lines and grades shown on the plans or as established by the engineer with proper allowance for pipe thickness and bedding. Any over-excavation shall be corrected with approved material thoroughly compacted. The depth of trenches shall be as shown on the Plans or as specified in the Detail Specifications. The grade shown on the plan and profile is the pipe invert.

B-3.1 Bedding

Three (3) inches of material specified in B-3 hereof shall be placed in the bottom of the trench to provide a means of uniform pipe support. Bell holes shall be dug to properly support the full length of the pipe in the bedding. If the native material is dry and uniformly graded AND the contractor's installation practices provide uniform pipe support, this MAY BE waived upon prior City approval.

B-3.2 Pipe Zone

Pipe zone shall be defined as the area of the trench from the top of the bedding to six (6) inches over the top of the pipe. Material specified in B-3 hereof shall be placed in the pipe zone of all trenches.

B-4 Rock Excavation

Unless otherwise defined in the Detail Specifications, the term "rock" shall be understood to mean solid sandstone, limestone, granite, basalt or other solid rock of equal hardness in ledges, bedded deposits or unstratified masses that, in the City's opinion, will require the use of systematic drilling and blasting for removal and, in fact, did require systematic drilling and blasting for removal except that when mutually agreed upon by the City and the contractor or their representative prior to removal, "rock" may be removed by the power-operated hand tools such as pneumatic pavement breakers. Boulders less than one-half cubic yard in volume will not be classified as rock. Cemented gravel (conglomerate), shale, clay and other sedimentary materials will be classified as rock only when, in the City's opinion, systematic drilling and blasting is required for removal and, in fact, did require systematic drilling and blasting or power operated hand tools for removal. Loam, sand, gravel, clay and other such material stratified between the layers of rock will not be classified as rock.

It shall be the contractor's responsibility, when directed by the City Engineer, to remove all loam, sand, gravel, clay or other such material above the rock and clean off and expose the rock surface in a satisfactory manner so that the City may examine the surface and obtain any measurements required. Measurement will include only the actual volume of the rock to be removed.

Unless otherwise specified in the Detail Specifications, the quantity of rock shall be measured by the City Engineer and the contractor or their representative prior to backfilling the trench and the amount of rock determined, agreed upon, and made a matter of record by both parties.

B-4.1 Depth of Rock Excavation

Where rock is encountered, it shall be excavated to a depth three (3) inches greater than the required grade when ductile iron is to be installed. The trench shall then be backfilled with selected backfill material, thoroughly compacted, to establish the proper grad for the pipe.

B-4.2 Use of Explosives

When the use of explosives is necessary for the prosecution of the work, the contractor shall use the utmost care so as not to endanger life or property, cause slides or disturb materials outside the neat lines of the trenches or excavations.

The developer and contractor are advised to obtain a specialist's recommendation as to the clearance to be maintained from City of Phoenix facilities. The liability of damaged facilities, lost water and revenue from such rests with the developer and his contractor. Absolutely no blasting will be allowed within dedicated easements of the City of Phoenix.

All explosives shall be stored in a safe, secure manner in compliance with local laws and ordinances and all such storage places shall be marked clearly "Dangerous Explosives". No explosives shall be left in an unprotected manner along or adjacent to any highway, street, alley or other area where such explosives could endanger persons or property. Storage of explosives shall be in accordance with the requirements of the State of Oregon Workmen's Compensation Board or similar appropriate body having the jurisdiction in such matters in the state in which work is performed.

Only persons experienced in the handling of explosives shall be allowed to use them on the work. Where state or local laws require that explosives be handled only by licensed personnel, it shall be the contractor's responsibility to see that this requirement is met.

The contractor shall provide all necessary approved types of tools and devices required for loading and using explosives, blasting caps and accessories. The contractor shall conform his acts to and shall obey all Federal, State and local laws that may be imposed by any public authority or directions that may be given from time to time by the City of Phoenix relative to the handling, placing and firing of explosives. No blasting shall be done adjacent to any portion of exposed work or structures unless proper precautions are taken to insure that the structures and materials surrounding and supporting the same will not be damaged by the blasting. When blasting rock in trenches, the contractor shall cover the area to be shot with blasting mats or other approved type of protective material that will prevent the scattering of rock fragments outside of the excavation. The contractor shall give ample warning to all persons within the vicinity prior to blasting and shall station men and provide signals of danger in suitable places to warn people and vehicles before firing any blasts. Unless otherwise approved by the City of Phoenix, all blasts shall be fired with an electric blasting machine. After a blast has been fired, the blaster shall make a minute inspection to determine if all charges have exploded before employees are allowed to return to the operation.

Misfires shall be corrected in accordance with the requirements of the applicable portions of the State or local Safety Code for blasting. The contractor shall be responsible for any and all damages to property or injury to persons resulting from blasting or accidental or premature explosions that may occur in connection with his use of explosives.

#### B-4.4 Repair of Damage

In case injury from blasting occurs to any portion of the work or to the material surrounding or supporting the same, the contractor, at his own expense, shall remove such injured work, repair the work and replace the material surrounding or supporting the same or shall furnish such material and perform work or repair or replacement as the City shall order. Any damage whatever to any existing structure due to blasting shall be promptly, completely and satisfactorily repaired by the contractor at his/her own expense.

#### B-5 Shoring, Sheeting and Bracing Trenches

Where sheeting and bracing are used, trench widths shall be increased accordingly. Trench sheeting shall remain in place until the pipe had been placed, tested for defects and repaired, if necessary, and the earth around the pipe compacted to a depth of four (4) inches over the top of the pipe.

B-6 Piling of Excavated Material

All excavated material shall be piled in a manner that will not endanger the work and that will avoid obstructing sidewalks and driveways. Hydrants under pressure, valve boxes, meter boxes or other utility controls shall be left unobstructed and accessible until the work is complete. Gutters shall be left clear or other satisfactory provisions made for street drainage and natural water courses shall not be obstructed.

B-7 Removal of Water

The contractor shall provide and maintain ample means and devices with which to promptly remove and dispose of all water entering the trench excavation during the time that the trench is being prepared for the pipe laying, during the pipe laying and for such additional time as may be required for the setting or hardening of joint materials, during the time that the backfill is being placed and at such other times as may be specified in the Detail Specifications. The contractor shall dispose of the water in a suitable manner without damage to adjacent property.

B-8 Trench Backfill

B-8.1 Class "A" Backfill

The entire depth of the trench shall be backfilled with material as specified in Item A-3 hereof (**3/4 minus crushed rock**). This material shall be placed in layers not exceeding 12 inches in loose depth and each layer thoroughly compacted with a **vibratory compactor** that compacts granular material by a combination of weight, vibration and impact. A minimum of two (2) passes over each layer at a speed not exceeding 60 linear feet per minute shall be made with a vibratory compactor. It shall, however, remain the contractor's responsibility to determine the amount of compaction in excess of the minimum required to prevent subsequent settlement of the backfill. Any subsequent settlement of the finished surfacing during the one (1) year warranty period shall be the contractor's responsibility and shall be promptly repaired by the contractor at no cost to the City. This item shall include the removal and disposal from the work site of all excavated material by the contractor at his expense.

B-8.2 Class "B" Backfill

The entire depth of the trench shall be backfilled with material as specified in Item A-1 hereof (**4" minus creek run gravel**).

This material shall be placed in the manner specified in Item B-8.6 hereof (**wheel-rolled**). This item shall include the removal and disposal of all of the excavated material by the contractor at his/her expense.

B-8.3 Class "C" Backfill

The trench shall be backfilled with materials as specified in Item A-4 hereof (**sand**) to a compacted depth of six (6) inches below the ground surface and the remaining six (6) inches of trench shall be filled with material conforming to Item A-3 hereof. The backfill shall be **water settled** by the "Flooding" or "Jetting" method.

Ample water shall be added by the flooding method to completely saturate the backfill. The jetting method utilizes a hose and long pipe nozzle. The nozzle shall be inserted at such spacing as necessary to completely saturate the backfill. Caution should be exercised to insure that excess water is not used. In the event of too much water, the contractor will be required to pump out all excess at the contractor's expense. Care shall be taken to prevent compaction of the top of the backfill by mechanical backfill equipment or street traffic prior to water settling of the backfill. This item shall include the removal and disposal from the work site of all excess excavated material by the contractor at his expense.

B-8.4 Class "D" Backfill

The trench shall be backfilled with **excavated material** in the manner specified in item C-8.6 hereof. This material shall be **water settled** as specified in item C-8.3 hereof. Excess material shall be windrowed directly over the trench.

B-8.5 Class "E" Backfill

The trench shall be backfilled with **excavated material** and **water settled** in the manner specified in item C-8.4, except that the top of the water settled excavated material which has been backfilled shall be left 6 inches below the ground surface and the remaining 6 inches of trench shall be filled with material conforming to item B-3 hereof. The final backfilled surface shall be at the same level as the original surface. This item shall include the replacement of all gravel surfacing removed or disturbed by any of the construction operations whether within or outside the actual trench area. This item shall include the removal and disposal from the work site of all excess excavated material by the contractor at his expense.

B-8.6 Class "F" Backfill

The **excavated material** may be pushed back into the trench by mechanical means except that no rocks larger than 4-inches in any dimension shall be backfilled. Where this method of backfill is allowed, the earth shall be pushed first onto the slope of the backfill previously placed and allowed to roll down into the trench. Under no circumstances shall sharp, heavy pieces of material be allowed to drop directly onto the pipe. Excavated material to be **wheel rolled** compacted and excess material to be windrowed directly over the trench, except that rocks larger than 4-inches in any dimension shall be removed from the work site and disposed of by the contractor at his expense.

B-8.7 Class "G" Backfill

The trench shall be backfilled with 3/4 minus crushed rock to six (6) inches above the top of the pipe. Place **slurry** of one sack of cement per cubic yard of sand slurry mix backfill to the top of the required pavement replacement. Allow the slurry to set and then remove to pavement depth. This item shall include the removal and disposal from the work site of the excavated material by the contractor at his expense.

B-8.8 Compaction

All classes of trench backfill shall be compacted to the controlling agency standard and is the responsibility of the contractor. Certified testing of compaction efforts shall be done by the contractor at his cost when requested by City of Phoenix personnel.

B-9 Excess Excavated Material

All excess or unsuitable excavated materials shall be hauled or disposed of by the contractor at approved locations outlined in the Detail Specifications or as designated by the City of Phoenix.

B-10 Roads, Street and Driveway Crossings

The contractor shall obey all rules and regulations of the County, City and State authorities regarding the closing of public streets or highways to the use of public traffic.

The work shall be carried out so as to cause a minimum of dislocation of normal commercial pursuits. Traffic must be kept open on those roads and streets where no detour is possible. The contractor shall, without further or other order, provide, erect and maintain at all times during the progress or temporary suspension of the work, suitable barricades, fences, signs or other adequate protection and shall provide, keep and maintain such danger lights, signals and a minimum of two flagmen, unless approved otherwise by the City, to ensure the safety of the public as well as those engaged in connection with the work. All barricades and obstructions

shall be protected by signal lights which shall be suitably distributed across and along the roadway and shall be kept burning from one (1) hour before sunset until one (1) hour after sunrise and at such other times as vision is obscured by fog, smoke or dust. All barricades shall be of substantial construction.

B-11 Permits and Easements

Where the trench is to be dug within a right-of-way obtained by permit or easement, the contractor shall acquaint himself with the requirements of the permit or easement, shall confine his operations to the area within the permit or easement and shall obtain from the permit or easement grantor at the completion of the construction a release indicating that the work has been satisfactorily completed in accordance with the terms of the permit or easement. Should it be found impossible for the contractor to obtain any of the required releases either because of the absence of the grantor or because of impractical demands by the grantor, then the City may waive this requirement, if, in the City's opinion, the contractor has fulfilled his obligations. The contractor shall notify the owners of these properties 48 hours in advance of the time when construction will be started.

B-12 Interfering Structures and Utilities

The contractor shall exercise all possible caution to prevent damage to existing structures and utilities whether above ground or underground. An attempt has been made to show these structures and utilities on the Plans or to indicate their presence in the Detail Specifications. While the information has been compiled from the best possible sources, its completeness and accuracy cannot be guaranteed and it is presented simply as a guide to possible difficulties. The contractor shall notify all utility offices concerned at least 48 hours in advance of construction operations in which a utility's facilities may be involved. This shall include, but not be limited to, irrigation, sewer, telephone, electric, oil, gas, water and television services.

It shall be the contractor's responsibility to locate and expose all existing underground structures and utilities in advance of the trench excavation. Any structures or utilities damaged by the work shall be repaired or replaced in a condition equal to, or better than, the condition prior to the damage. Such repair or replacement shall be accomplished at the contractor's expense without additional compensation from the City.

The Contractor shall remove and replace such small miscellaneous structures as culverts, fences, mail boxes and sign post at his own expense without additional compensation from the City. The contractor shall repair structures in a condition as good as, or better than, their original condition.

If interfering power poles, telephone poles, guy wires or anchors are encountered, the contractor shall notify the City at least 12 days in advance of construction to permit arrangements with the utility company for protection or relocation of the power poles, telephone poles, guy wires or anchors.

If the contractor encounters existing structures which will prevent the construction of the pipe line and which are not properly shown on the Plans, he shall notify the City of Phoenix before continuing with the construction in order that they may make such field revisions as necessary to avoid conflict with the existing structures. If the contractor shall fail to so notify when an existing structure is encountered, but shall proceed with the construction despite this interference, he shall do so at his own risk. When the location of the pipe line as shown on the plans will prohibit the restoration of an existing structure to its original condition, he shall notify the City of Phoenix in order that a field location may be made to avoid the conflict.

B-13 Field Relocation

During the progress of construction, it is expected that minor relocations of the line will be necessary. Such relocations shall be made only by direction of the City of Phoenix. Unforeseen obstructions encountered as a result of such relocations will not be subject for claims for additional compensation by the contractor to any greater extent than would have been the case had the obstruction been encountered along the original location.

B-14 Obstructions

This item shall refer to obstructions which may be removed and do not require replacement. Obstructions to the construction of the trench such as, but not limited to tree roots, stumps, abandoned piling, abandoned concrete structures, logs and debris of all types shall be removed by the contractor at his own expense without additional compensation from the City of Phoenix. The City of Phoenix will, if requested by the contractor, make changes in alignment to avoid major obstructions if such alignment changes can be made without adversely affecting the intended functioning of the facility. The contractor shall pay all costs resulting from such alignment changes.

B-15 Excavation Across Cultivated Land

When excavating through cultivated land, the topsoil shall be removed and stockpiled on one side of the trench and the subsoil piled on the other. When the trench is to be backfilled with the excavated materials, care shall be taken to avoid mixing the excavated subsoil with the topsoil. If the contractor cannot avoid mixing of the materials, he shall, at his own expense, import approved top-soil for backfill to a depth equal to the surrounding area, but not less than 12 inches. Backfill shall be such that the finished surface of the trench and surrounding area will be as nearly as practicable to its original condition.

B-16 Clearing the Right-of-way

Clearing of the entire right-of-way shall be completed prior to the start of the trenching and/or installations. Trees and brush shall be cut as near to the surface of the ground as practicable and piled for disposal. Disposal shall be by removal unless otherwise approved by the City of Phoenix. Under no condition shall excavated materials be permitted to cover brush or trees prior to clearing.

B-17 Pavement Removal

Unless otherwise noted in the Detail Specifications, where trenches are to be dug through paved streets or driveways, the pavement shall be cut to a straight line on each side of the trench with a pavement saw or other approved equipment. The width of the pavement cutout shall be 12 inches greater than the minimum width required for the installation of the pipe. The contractor shall so conduct the pavement removal operations as to cause the minimum damage possible to the adjacent pavement. After the trench has been backfilled, the pavement cut shall be filled with gravel or cold mix (depending on surface approval agency) and shall be maintained level with the adjoining pavement without bumps or chuck holes until the pavement is finally patched.

STANDARD SPECIFICATIONS FOR DUCTILE IRON PIPE,  
POLYVINYL CHLORIDE PIPE, CAST IRON FITTINGS  
VALVES AND FIRE HYDRANTS

STANDARD SPECIFICATIONS FOR DUCTILE IRON PIPE, POLYVINYL  
CHLORIDE PIPE, CAST IRON FITTINGS, VALVES AND FIRE HYDRANTS

INDEX

A.	<u>SCOPE</u> .....	1
B.	<u>MATERIALS</u> .....	1
	B-1 Ductile Iron Fittings .....	1
	B-1.1 Flanged Fittings .....	1
	B-2 Ductile Iron Fittings (Compact).....	1
	B-2.1 Mechanical Joint Fittings .....	1
	B-3 Ductile Iron Pipe .....	1
	B-3.1 Mechanical Joint Pipe .....	1
	B-3.2 Push-on Joint Pipe .....	1
	B-3.3 Flanged Joint Pipe .....	2
	B-3.4 Restrained Joint Pipe .....	2
	B-3.5 Push-on Joint Pipe .....	2
	B-3.6 Poly Pigs .....	2
	B-4 Polyvinyl Chloride (PVC) Pipe .....	2
	B-5 Butterfly Valves – 12” and Larger .....	2
	B-6 Gate Valve and Tapping Valves .....	3
	B-6.1 4” – 12” Valves .....	3
	B-7 Valve Boxes .....	3
	B-8 Fire Hydrant Assemblies .....	3
	B-8.1 Fire Hydrants .....	3
	B-8.2 Auxiliary Valves .....	3
	B-8.3 Joint Restraint Glands .....	3
	B-8.4 Tapping Sleeves .....	4
	B-8.5.1 Tapping Sleeves – 4 through 12 inches .....	4
	B-8.5.2 Tapping Sleeves, Tapping Saddles – 14 inch and larger .....	4
	B-9 Couplings .....	4
C.	<u>WORKMANSHIP</u> .....	4
	C-1 Preparation of Trenches .....	4
	C-1.1 Grade .....	4
	C-1.2 Bell Joint Holes .....	4
	C-1.3 Removal of Water .....	4
	C-2 Laying .....	5
	C-2.1 Distributing Pipe .....	5
	C-2.2 Handling Material .....	5
	C-2.3 Cleaning of Pipe and Fittings .....	5
	C-2.4 Placing of Pipe in the Trench .....	5
	C-2.5 Number of Pipes Laid Before Jointing .....	5
	C-2.5.1 Mechanical Joint and Push-on Joint .....	5
	C-2.6 Preventing Trench Water from Entering Pipe .....	5
	C-2.7 Cutting Pipe .....	5
	C-2.8 Bell End to Face Direction of Laying .....	6
	C-2.9 Permissible Deflection at Joints .....	6
	C-2.10 Alignment .....	6



C-2.11	Unsuitable Conditions for Laying Pipe .....	6
C-3	Jointing of Pipe .....	6
C-3.1	Jointing Mechanical Joint Pipe.....	6
C-3.2	Jointing Push-on Joint & Restrained Joint Pipe .....	7
C-3.3	Jointed Flanged Pipe & Fittings .....	7
C-4	Setting Valves, Fittings and Couplings .....	7
C-4.1	General .....	7
C-4.2	Location of Valves .....	7
C-4.3	Valve Boxes .....	7
C-4.4	Use of Steel Material .....	7
C-5	Setting Hydrants .....	7
C-5.1	Locations .....	8
C-5.2	Position .....	8
C-6	Anchorage .....	8
C-6.1	Limiting Pipe Diameter and Degree of Bend .....	8
C-6.2	Thrust Blocking .....	8
C-6.3	Mechanical Joint Restraint Glands .....	8
C-6.4	Special Restrained Joints .....	8
C-6.5	Anchorage of Hydrants .....	8
C-7	Flushing .....	8
C-8	Sewer Crossings .....	9
C-9	Hydrostatic Tests .....	9
C-9.1	Duration .....	10
C-9.2	Expelling Air .....	10
C-9.3	Procedure .....	10
C-9.4	Leakage .....	10
C-9.5	Correction of Excessive Leakage .....	10
C-9.6	Visible Leaks .....	10
C-10	Installation of Poly Pigs .....	10

A

Scope

These specifications shall cover all ductile iron pipe, polyvinyl chloride pipe, cast iron fitting, valves and fire hydrants.

Materials

B-1

Ductile Iron Fittings

B-1.1

Flanged Fittings

Flanged cast or ductile iron fittings shall conform to AWWA C110. Flanges shall have bolt circles and bolt holes matching those ANSI B16.1. Unless otherwise noted in the Detail Specifications, the pressure rating shall be 250 psi. Bolts for joining cast iron flanges shall be carbon steel of at least Grade 3 with American Standard Regular unfinished hexagon heads and the nuts shall be of steel with American Standard Regular hexagon dimensions, all specified in American Standard for Wrench Head Bolts and Nuts (ANSI B18.2). Bolts and nuts shall be Cadmium plated in sized to and including 7/8 diameter. All bolts and nuts shall be threaded in accordance with American Standard for Screw Threads (ANSI B1.1), Coarse Thread Series, Class 2A and 2B fit. Gaskets shall be rubber Flange Tye as manufactured by the United States Pipe & Foundry Company or approved equal. Cement-mortar lining is required on all fittings. Fittings shall be as manufactured by Tyler, Trinity Valley, U.S. Pipe, Pacific States Pipe, American, Griffen, Union Foundry or an approved equal.

B-2

Ductile iron Fittings (Compact)

B-2.1

Mechanical Joint Fittings

Mechanical joint ductile iron compact fittings shall conform to AWWA C153. Joints shall conform to AWWA C111. Joint accessories shall be furnished with the fittings. Bolts shall be low-alloy steel or ductile iron in accordance with AWWA C111. The pressure rating shall be 350 psi. Fittings must be cement-mortar lined in accordance to AWWA C104. Fittings shall be as manufactured by Tyler, U.S. Pipe, Pacific States Pipe, American, Griffen, Union Foundry or an approved equal.

B-3

Ductile Iron Pipe

B-3.1

Mechanical Joint Pipe

Mechanical joint ductile iron pipe shall conform to AWWA C151 and shall be minimum thickness Class 50. The pipe shall be standard thickness cement-mortar lined conforming to the requirements of AWWA C104 and shall be as manufactured by United States Pipe & Foundry Company and by Pacific States Cast Iron Pipe Company or approved equal. Joints shall conform to AWWA C111. United States Pipe & Foundry Company MJ/TJ pipe joints are approved. Joint accessories shall be furnished with the pipe. Bolts shall be low-alloy steel or ductile iron in accordance with AWWA C111.

B-3.2

Push-on Joint Pipe

Push-on ductile iron pipe shall conform to AWWA C151 and shall be minimum thickness Class 50. The pipe shall be cement-mortar lined conforming to the requirements of AWWA C104 and shall be as manufactured by United States Pipe & Foundry Company and by Pacific States Cast Iron Pipe Company or approved equal. United States Pipe & Foundry Company MJ/TJ pipe joints are an approved equal. The rubber ring gasket shall be suitable for the specified pipe sizes and shall be supplied in sufficient quantities for installing the pipe furnished. A non-toxic vegetable soap lubricant shall be supplied in sufficient quantities for installing the pipe furnished. Fast-tite gasket pipe as manufactured by the Griffen Company may be substituted for "Tyton" joint pipe on contractor supplied and installed projects.

B-3.3. Flanged Joint Pipe  
Flanged ductile iron pipe shall conform to AWWA C115 and shall have a minimum thickness Class 50. The pipe shall be cement-mortar lined conforming to the requirements of AWWA C104 and shall be as manufactured by United States Pipe and Foundry Company and by Pacific States Cast Iron Pipe Company or approved equal. Bolts, gaskets and installation shall be in accordance with the Appendix of AWWA C115. Flanges shall be ductile iron unless otherwise noted in the Detail Specifications.

B-3.4. Restrained Joint Pipe  
Restrained joint ductile iron pipe shall conform to AWWA C151 and shall be thickness Class 50. The pipe shall be cement-mortar lined conforming to the requirements of AWWA C104 and shall be as manufactured by United States Pipe and Foundry Company and by Pacific States Cast Iron Pipe Company or approved equal. The pipe shall be furnished with spigot ends and push-on joint bells suitable for transmitting the thrust created by a dead-end condition based on pipe diameter and a pressure of 150 psi. Restrained push-on joints shall be TR Flex joint as manufactured by the United States Pipe and Foundry Company, Perma-Lock as manufactured by Pacific States Cast Iron Pipe Company or approved equal. All restraint ears, locking rings, etc. shall be installed. Restrained mechanical joints shall use joint restraint glands as specified in Section B-7.4. of these Specifications.

B-3.5. Push on Joint Pipe with 5 Degree Deflection  
Where required by the Plans, push-on joint pipe in sizes 20" and larger as specified in item B-3.2. shall have sockets and spigots to permit a deflection of 5 degrees in the joint. Such pipe shall be suitable marked to distinguish it from other push-on joint pipe.

B-3.6 Poly Pigs  
"Poly Pigs" shall be constructed of flexible open cell polyurethane foam. They shall be able to pass through reductions of up to 60% of cross sectional area of nominal pipe. They shall have the ability to negotiate short radius bends, ells, tees, crosses, wyes, gate valves, ball valves, multi-dimensional piping and reduced port valves. "Poly Pigs" shall be a municipal series, bare type, 5-7 lbs. per cubic foot density and generally be for a light cleaning or gauging application.

B-4 Polyvinyl Chloride (PVC) Pipe  
PVC pipe shall conform to Oregon 2002, APWA Standard Specifications for Construction Section 01140 – Potable Water Pipe.

PVC pipe shall not be allowed in streets designated as collectors and arterials without the Public Works Director and Engineering approval.

B-5 Butterfly Valves – 12" and larger  
Butterfly valves shall be short bodied flanged or wafer type or mechanical joint ends when placed underground as approved and noted on construction plans. They shall be epoxy coated and lined, rubber seated type and shall conform to AWWA C504, Class 150B, unless otherwise noted in the Detail Specifications. Butterfly valves shall be suitable for direct burial and shall have direct burial, totally enclosed, integral manual operators which shall be fully gasketed and grease-packed and designed to withstand submersion in water to a pressure of 10psi. The valves shall open with a counter-clockwise rotation of a 2-inch nut. THE MINIMUM NUMBER OF TURNS FROM CLOSED TO OPEN WITH A COUNTER-CLOCKWISE POSITION SHALL BE NOT LESS THAN TWO TURNS PER INCH OF VALVE SIZE.

Only the following valves will be accepted:

M& H	Henry Pratt
Mueller	Kennedy

B-6 Gate Valves and Tapping Valves

B-6.1 4" – 12" Valves

Gate valves shall open when turned counter-clockwise. All valves with mechanical joint connection shall be furnished with ductile iron nuts, bolts, glands and gaskets for mechanical joint connections. All valves shall have the manufacturer and date cast on the body. Gate valves shall conform to AWWA C509 Standards.

B-7 Valve Boxes

Valve boxes shall be the three piece sliding adjustable made in the U.S.A. "Medford" type consisting of a top section, cover and extension. The top section and cover shall be of ductile iron and shall be an approved equal to the No. 931 box with No. 133 lid as manufactured by Varicast Manufacturing Co. in Portland, Oregon. The cover shall be labeled "Water" and shall fit the valve box snugly and shall not rock on its seat. The valve box extension shall be 6-inch outside diameter steel pipe with 12-gauge or heavier wall thickness or approved equal. The extension shall be within 8 inches of finished grade.

B-8 Fire Hydrant Assemblies

Fire hydrant assemblies shall include the fire hydrant, auxiliary gate valve, valve box and materials for anchorage such as mechanical joint restraint glands and shall be as follows or as otherwise specified in the Detail Specifications.

B-8.1 Fire Hydrants

Fire hydrants shall be of the compression type conforming to AWWA C502 and shall have 5-inch valve opening with 6-inch mechanical joint and connection. The hydrant shall open when turned counter-clockwise and shall have two 2 ½" hose nozzles and one 4 ½" pumper nozzle. The nozzles and operating nut shall be National Standard. The hydrants shall be painted a chrome-yellow color and shall be equipped with a safety break flange located above the ground line. All hydrants shall have corrosion resistance protection on the interior of the hydrant shoe; coating shall conform to AWWA C-550. The depth of bury of the hydrants shall be such that when the hydrant is set at the grade indicated on the plans that the ground line marked on the hydrant shall be at the sidewalk or ground surface. Only the following hydrants manufactured by the Mueller Company and Kennedy Valve Company will be accepted:

Mueller Centurion (A423)

Kennedy/Guardian (K-81)

B-8.2 Auxiliary Valves

The fire hydrant auxiliary valves shall have mechanical joint ends and shall be gate valves conforming to the above item B-5. The auxiliary valve shall be located adjacent to the hydrant branch tee which shall have a swivel branch.

B-8.3 Joint Restraint Glands

Joint restraint glands used for thrust anchorage in place of regular cast iron mechanical joint glands shall be ductile iron mechanical joint Megalug, as manufactured by EBAA Iron, Roma Grip by Romac, Ford 1400 Series Restraint Gland, or approved equal. The minimum number of set screws by size of gland shall be as follows:

4" – 2	14" – 10
6" – 3	16" – 12
8" – 4	18" – 12
10" – 6	20" – 14
12" – 8	24" – 16

B-8.4 Tapping Sleeves

B-8.4.1 Tapping Sleeves – 4 through 12 Inches

Tapping sleeves for pipe sizes 4-inch through 12-inch shall be Kennedy valve square seal; Mueller Outlet sealed; U.S. Pipe T-28 dual-compression seal tapping sleeve; FTS-420 Romac; 622 Smith Blair; JCM 412 or approved equal. All tapping sleeves shall have a test plug.

When tapping an existing cast iron waterline, the tapping sleeve shall be mechanical joint type manufactured by the Mueller Co., M&H, Clow, Smith Blair 623 or approved equal.

B-8.4.2 Tapping Sleeves, Tapping Saddles – 14-inch and larger

Tapping saddles for 14-inch pipe and larger shall be U.S. Pipe ductile iron saddle castings conforming to ANSI A21.20 or as manufactured by the American Cast Iron Pipe Company. The saddle straps, including threaded ends and nuts, shall be U.S. alloy, having a minimum yield of 45,000 psi.

Tapping sleeves for 14-inch pipe and larger shall be Romac FTS420, Smith Blair 622, Ford FTS or approved equal. Fabricated steel tapping sleeves shall be coated with a minimum of 8 to 12 mils of fusion bonded epoxy. Fabricated steel sleeves shall be furnished with grade 304 stainless steel bolts and nuts. All sleeves and saddles shall have a test plug.

All connections to a cement-lined and coated pipe will be made by the City with cooperation and assistance from the Contractor on excavation, backfill, temporary plating and traffic control.

B-9 Couplings

All couplings shall meet current AWWA Standards. All center and end rings shall be ductile iron on 4-inch and larger pipe and meet acceptable ASTM Standards except where specifically stated otherwise. Gaskets shall be made of materials compounded for water service. Nuts and bolts shall be corrosion resistant, high strength, low-alloy steel with heavy hex nuts, meeting requirements of AWWA C-111. Couplings shall be as manufactured by Smith Blair, Romac 501, Ford or approved equal.

C Workmanship

C-1 Preparation of Trenches

C-1.1 Grade

The bottom of the trench shall be excavated to the line and grade to which the pipe is to be laid, with proper allowance for pipe thickness and for gravel bedding as specified. The trench bottom shall form a continuous and uniform bearing and support for the pipe on bedding material at every point between bell holes, except that for a maximum distance of 18" near the center of the pipe, the bedding may be disturbed for the removal of lifting tackle. Where the trench is excavated in rock it is especially important that a minimum of three (3) inches of bedding material be used to obtain uniform bearing and support of the pipe.

C-1.2 Bell (Joint) Holes

At the location of each joint, bell (joint) holes of ample dimensions shall be dug in the bedding as necessary to permit the joint to be made properly and to permit easy visual inspection of the entire joint.

C-1.3 Removal of Water

The contractor shall at all times provide and maintain ample means and devices to remove and dispose of all water entering the trench excavation during the process of laying the pipe.

C-2 Laying

C-2.1 Distributing Pipe

Material shall be distributed on the job no faster than can be used to good advantage. In general, no more than one week's supply of material shall be distributed in advance of the laying unless otherwise specified.

C-2.2 Handling Material

Proper implements, tools and facilities satisfactory to the City shall be provided and used by the contractor for the safe and convenient prosecution of the work. All pipe, fittings, valves and hydrants shall be carefully lowered into the trench, piece by piece, by means of a crane or other suitable equipment, in such a manner as to prevent damage to the pipeline materials and protective coatings and linings. Under no circumstances shall pipeline materials be dropped or dumped into the trench.

Raising of pipe to make connections of pipe joints will not be allowed. Mechanical joint solid sleeves shall be used to make connections to existing lines.

C-2.3 Cleaning of Pipe and Fittings

All lumps, blisters and excess coating shall be removed from the bell and spigot ends of each pipe. The outside of the spigot and the inside of the bell shall be wiped clean and dry and free from dirt, grease and foreign matter before the pipe is laid.

C-2.4 Placing of Pipe in the Trench

Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the line. If the pipe laying crew cannot put the pipe into the trench and in place without getting earth into it, the City may require that, before lowering the pipe into the trench, a heavy, tightly woven canvas bag of suitable size shall be placed over each end and left there until the connection is to be made to the adjacent pipe. During the laying operations, no debris, tools, clothing or other materials shall be placed in the pipe.

C-2.5. Number of Pipes Laid Before Jointing

C-2.5.1. Mechanical Joint and Push-On Joint Pipe

Mechanical joint pipe and push-on pipe shall be connected as hereinafter specified as soon as they are placed in the trench.

C-2.6. Preventing Trench Water From Entering Pipe

At times when pipe laying is not in progress, the open ends of pipe shall be closed by a water-tight plug or other means approved by the Engineering Division, and no trench water shall be permitted to enter the pipe. These provisions shall apply during the noon hour as well as overnight. If water is in the trench, the seal shall remain in place until the trench is pumped completely dry.

C-2.7. Cutting Pipe

The cutting of pipe for inserting valves, fittings or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe or lining and so as to leave a smooth end at right angles to the axis of the pipe.

Acceptable methods of cutting cast iron pipe are sawing with a band or powered hack saw or with a portable, gasoline engine driven abrasive saw. Cast iron pipe may also be cut with a lathe or portable milling saw. When approved by the City, cast iron pipe may also be cut by breaking with the use of rolling pipe cutters, hydraulically actuated cutters such as "Wheeler" cutters or with the use of a sledge and cold cutter.

Acceptable methods of cutting ductile iron pipe are only those done by sawing or milling. The flame cutting of cast iron or ductile iron pipe by means of an oxyacetylene torch shall not be allowed.

When mechanical joint or push-on pipe is cut in the field, it shall be cut as recommended by the pipe manufacturer and the cut end shall be reconditioned so that it may be used for the next joint. On push-on joint pipe, the outside of the cut shall be ground back or dressed as recommended by the pipe manufacturer and approved by the City.

C-2.8. Bell End to Face Direction of Laying

Unless otherwise directed, pipe shall be laid with bell end facing in the direction of the laying; and for lines on an appreciable slope, bells shall (at the direction City) face upgrade.

C-2.9. Permissible Deflection at Joints

Wherever it is necessary to deflect pipe from a straight line, either in the vertical or horizontal plane, to avoid obstructions or plumb stems or where long-radius curves are permitted, the amount of deflection allowed shall not exceed that approved by the City. Maximum permitted deflections are indicated hereinafter in Tables I and II (on next page) except that deflection up to 5 degrees may be obtained in special 5 degree deflection push-on pipe specified in Item B-3.5

TABLE 1			
MAXIMUM DEFLECTION OF MECHANICAL JOINT PIPE			
Safe Deflection for 150 lbs pressure*			
Size of Pipe in Inches	Maximum Joint Deflection in Degrees	Deflection Inches with Pipe Length in Feet – 18'	Approximate Radius in Curve Produced By Succession of Joints Length in Feet – 18'
8	5	19	195
10	5	19	195
12	5	19	195
14	4	15	285
16	4	15	285
18	3	11	340
20	3	11	340
24	3	11	340
30	3	11	340
36	3	11	340

\* For pressure above 150 lbs, reduce the tabulated deflection by 10% for each 150 lbs added pressure

TABLE 2			
MAXIMUM PERMISSIBLE DEFLECTION IN LAYING PUSH-ON JOINT PIPE			
DEFLECTION IN INCHES			
Size of Pipe in Inches	Maximum Joint Deflection in Degrees	18 FEET	20 FEET
8	5	19	21
10	5	19	21
12	5	19	21
14	4	15	17
16	4	15	17
18	3	11	12
20	3	11	12
24	3	11	12
30	3	11	12
36	3	11	12

C-2.10 Alignment

Pipe lines intended to be straight shall be so laid, and in no case shall a deviation from the straight line at any joint exceed one (1) inch.

C-2.11 Unsuitable Conditions for Laying Pipe

No pipe shall be laid in water or when, in the opinion of the City, trench conditions are unsuitable.

C-3 Jointing of Pipe

C-3.1 Jointing Mechanical Joint Pipe

Mechanical joint ductile iron pipe shall be installed in accordance with manufacturer's recommendations as approved by the City. In general, the procedure shall be as hereinafter specified. The ends of the pipe shall be cleaned of all dirt, mud and foreign matter by washing with water and scrubbing vigorously with a wire brush, after which the gland and gasket shall be slipped on the

plain end. The ends of ductile iron pipes 16-inches and larger and the rubber gaskets shall be lubricated with gasket lubricant of the type used for push-on joints. The end of the pipe shall then be guided carefully into the bell of the pipe previously laid. The spigot shall be centrally located in the bell, the gasket placed in position and the bolts inserted in the holes.

When tightening bolts, the gland should be brought up toward the flange evenly, maintaining approximately the same distance between the gland and the face of the flange at all points around the socket. This shall be done by partially tightening the bottom bolt first, then the top bolt, next the bolts at either side, and last, the remaining bolts. This cycle should be repeated until all bolts are within the required range of torque. (In larger sizes, 24-inch through 48-inch, as many as 5 repetitions may be required.) If effective sealing is not attained at the maximum torque, the joint shall be disassembled and reassembled after thorough cleaning. Over stressing of bolts to compensate for poor installation practice shall be avoided.

C-3.2. Joining Push-on Joint & Restrained Joint Pipe

Ductile iron pipe with push-on type joints shall be laid and jointed in strict accordance with the manufacturer's recommendations as approved by the City and in accordance with the requirements of the Detail Specifications. The contractor shall provide all special tools and devices such as special jacks, chokers and similar items required for the installation. Lubricant for the pipe gaskets shall be furnished by the pipe manufacturer and no substitutions will be permitted under any circumstances.

C-3.3 Jointed Flanged Pipe & Fittings

The jointing of flanged pipe and fittings shall be in accordance with the Appendix of AWWA C115. Care shall be taken to evenly tighten all bolts and to avoid overstressing the bolts or flanges.

C-4 Setting Valves, Fittings and Couplings

C-4.1. General

Valves, fittings, plugs, couplings and caps shall be set and jointed to pipe in the manner hereinafter specified for cleaning, laying and jointing pipes.

C-4.2. Location of Valves

Valves in water mains shall, where possible, be located on the street property lines extended unless otherwise shown on the plans.

C-4.3. Valve Boxes

A valve box shall be provided for every valve unless otherwise noted in the Detail Specifications. Valve box extensions shall be cut to proper length so that the valve box does not ride on the extension when set at finish grade and that the top section will slide over the extension for a minimum distance of 8 inches. The valve box shall be centered and plumb over the valve wrench nut with the box cover flush with the finish surface. When valve boxes are set in paved streets, particular care shall be given to the placing of asphaltic concrete around the box to assure compaction of the paving materials under the shoulder of the box.

C-4.4. Use of Steel Material

All steel coupling, tapping sleeves or other steel product, must be wrapped with 8 mil thick polyethylene film in accordance with AWW C-105 or powder coat as determined by the City of Phoenix prior to backfill. Caution must be exercised to insure this coating is not damaged during the backfill operation.

C-5 Setting Hydrants



- C-5.1. Locations  
Hydrants shall be located as shown on the plans or as directed by the City in a manner to provide complete accessibility and to minimize the possibility of damage from vehicles or injury to pedestrians.
- C-5.2. Position  
All hydrants shall stand plumb and shall have the pumper nozzle facing the curb or center of the street. All chains shall be removed from hydrants. Hydrants shall be set with the ground line marked on the hydrant at finish grade or as directed by the City.
- C-6 Anchorage
- C-6.1 Limiting Pipe Diameter and Degree of Bend  
On all pipelines 4 inches in diameter or larger, all tees, plugs, caps, bends and other locations where unbalanced forces exist shall be securely anchored by suitable thrust blocking. No vertical bend thrust blocking will be allowed but must be anchored with MJ pipe and restrained joints.
- C-6.2 Thrust Blocking  
Reaction or thrust blocking shall consist of concrete of a mix not leaner than five sacks of cement per cubic yard of concrete and having a comprehensive strength of not less than 2,500 pounds per square inch. Thrust blocks shall not be backfilled for 12 hours unless authorized by the City. Blocking shall be placed between the undisturbed ground and the fittings to be anchored. Concrete blocking shall be formed with plywood and bear against solid undisturbed earth of the sides and bottom of the trench excavation. The quantity of concrete and the area of bearing for the pipe shall be as shown on the plans or as directed by the City. Drawing 109 in the Appendix show the typical thrust block diagrams and the minimum bearing area. Caution must be exercised by the contractor to be sure the bearing capacity of the soil is at least 1500 psf before using the table. The blocking shall be so placed that, unless specifically shown otherwise on the plans, the pipe and fitting joints will be accessible to repairs. Eight (8) mil plastic shall be placed between all concrete and fitting or pipe.
- C-6.3 Mechanical Joint Restraint Glands  
With suitable conditions, anchorage may be obtained with the use of ductile iron mechanical joint restraint glands with set screws as specified in item B-7.4 in place of the follower glands normally furnished for pipe and fittings. The installation of the glands shall be in accordance with the manufacturer's recommendations. Care shall be taken to see that the mechanical joint bolts are completely tightened and that there will be no further deflection before tightening the set screws.
- C-6.4 Special Restrained Joints  
With suitable conditions and with approval of the City for each installation, cast iron or ductile pipe fittings with special restraining mechanical or push-on joints which permit tension through the joints thus developing anchorage with opposing forces of pipe to backfill friction may be used.
- C-6.5 Anchorage of Hydrants  
Hydrants shall be anchored by means of mechanical joint restraint glands as specified in Item C-6.4 above unless otherwise directed by the City.
- C-7 Flushing  
As soon as the pipe is laid, service taps made, and before it is connected to the distribution system at more than one point, it shall be flushed through an open end of the pipe and at all blow-offs and fire hydrants. The contractor shall provide sufficient trench pumping capacity to pump out the water flushed from the open end and shall provide labor to assist the City's representative in flushing operations.

After the pipe has been completely laid and connected to the distribution system, and after testing and disinfection has been completed, a complete flushing through all hydrants and dead-ends, accessible to City of Phoenix personnel and vehicles.

C-8

#### Sewer Crossings

Sewer crossings shall be as per current Oregon Health Division Public Water Systems/Oregon Administrative Rules, Chapter 333 unless modified by this section. In situations where a water line or service line and a sanitary sewer main or sewer lateral cross, the separation between the two shall be as follows:

- a) Wherever possible, the bottom of the water line shall be 1.5 feet or more above the top of the sewer line and one full length of the water line shall be centered at the crossing:
- b) Where the water line crosses over the sewer line but with a clearance of less than 1.5 feet, the sewer line shall be exposed to the sewer line joints on both sides of the crossing to permit examination of the sewer pipe. If the sewer pipe is in good condition and there is no evidence of leakage from the sewer line, the 1.5 foot separation may be reduced to 8 inches. The contractor must center one length of water line at the crossing. If the City of Phoenix determines that the conditions are not favorable or finds evidence of leakage from the sewer line, the sewer line shall be replaced with a full length of pipe centered at the crossing point of PVC pressure pipe (AWWA Standard C-900) or ductile-iron class 50 (AWWA C-51).
- c) Where the water line crosses under the sewer line, the sewer line shall be exposed and examined as indicated in b) of this section. If conditions are favorable and there is no evidence of leakage from the sewer line, the sewer line may be left in place, but must be supported with a reinforced concrete beam for preventing settlement when it spans the water line trench and special precautions must be taken to assure that the backfill material over the water line in the vicinity of the crossing is thoroughly tamped in order to prevent settlement which could result in the leakage of sewage. In this situation, the contractor must center one length of the water line at the crossing. If the City determines that conditions are not favorable or finds evidence of leakage from the sewer line, the provisions of b) of this section apply.

Whenever a sanitary sewer is uncovered and the sewer pipe leaks or is broken, then ductile iron water pipe (not cast iron soil pipe) or PVC water pipe conforming to AWWA Standard C900 must be used to replace the sewer pipe. One full length of the ductile iron pipe or PVC pipe shall be centered at the water pipeline crossing so that the joints of both pipes shall be at least 9 feet from the crossing centerline. Care must be taken to ensure smooth invert at the new sewer joints. The contractor shall make the repair at his own expense, including pipe trenching, backfill and asphaltic pavement cutting and replacing necessary to install the 18-foot length of ductile iron pipe or 20-foot length of PVC pipe.

C-9

#### Hydrostatic Tests

NO TESTING OF WATER MAINS WILL BE DONE UNLESS THERE IS A MINIMUM OF 18 INCHES OF COVER OVER THE PIPE.

Pressure and leakage tests shall be made on all newly-laid pipe or any valved section of it, or both, unless otherwise specified. Pressure and leakage tests will be arranged for by the City at the developer's expense.

The tests shall be conducted after the trench has been backfilled sufficiently to prevent movement of the pipe during testing and flushing. The joints may be left exposed for inspection. Where any

section of pipe is provided with concrete reaction blocking, the pressure test shall not be made until at least five (5) days have elapsed after the concrete reaction blocking is installed. If high early cement is used for the concrete thrust blocking, the time may be cut to two (2) days instead of five (5) as previously specified.

The pressure test shall be conducted in the following manner, unless otherwise specified. After the pipe has been backfilled or partially backfilled as hereinto specified, the pipe shall be filled with water. Unless stated otherwise, the test pressure shall be 1 ½ times the normal static pressure, but not less than 150 pounds per square inch.

C-9.1 Duration

The duration of each pressure tests shall be 60 minutes unless otherwise stated or authorized by the City.

C-9.2 Expelling Air

Before applying the specified test pressure, all air shall be expelled from the pipe.

C-9.3 Procedure

Each valved section of pipe shall be slowly filled with water to replace any lost; and the specified test pressure, measured at the point of lowest elevation, shall be applied by means of a pump connected to the pipe in satisfactory manner.

The pump shall then be valved off and the pressure shall be held in the line for the test period. At the end of the test period, the pump shall be operated until the test pressure is again attained. The pump suction shall be in a bucket, barrel or similar device so that the amount of water required to restore the test pressure may be measured accurately.

C-9.4 Leakage

Leakage shall be defined as the quantity of water necessary to restore the specified test pressure at the end of the test period. No pipe installation will be accepted until the leakage is less than the number of gallons per hour as determined by the following formula:

$$L = \frac{ND}{7400} (P)^{1/2}$$

in which: L = allowable leakage in gallons per hour  
N = number joints in the length of pipe tested  
D = nominal diameter of pipe in inches  
P = average test pressure during the leakage test in pounds per square inch

C-9.5 Correction of Excessive Leakage

Should any test of pipe laid disclose leakage greater than that allowed under Item C-9.4 above, the contractor shall, at his own expense, locate and repair the defective joints or pipe until the leakage is within the specified allowance.

C-9.6 Visible Leaks

All visible leaks and known leaks revealed by the test shall be repaired regardless of the total amount of leakage shown by the test.

C-10 Installation of Poly Pigs

“Poly pigs” shall be supplied and installed by the contractor during installation of the pipeline. Number, sizes and locations shall be as determined by the City. The “poly pigs” shall be moved through the pipeline system by the use of water pressure during flushing operations performed by

City personnel, but after service taps have been made. All “poly pigs” shall be removed from the pipeline system by the City of prior to testing and disinfection. Used “poly pigs” become the property of the City and their reuse determined by City staff.

STANDARD SPECIFICATIONS FOR WATER SERVICE

STANDARD SPECIFICATIONS FOR  
WATER SERVICE

**I N D E X**

A.	<u>SCOPE</u> .....	1
B.	<u>MATERIALS</u> .....	1
B-1	Copper Tubing .....	1
B-2	Corporation Stop .....	1
B-3	Angle Meter Valve .....	1
B-4	Meter Yoke .....	1
B-5	Meter Yoke Expansion Connection .....	1
B-6	Meter Box and Lid .....	1
B-7	Customer Meter Valve .....	1
C.	<u>WORKMANSHIP</u> .....	2
C-1	Preparation of Trench and Backfill .....	2
C-2	Tapping Main and Installing Corporation .....	2
C-3	Installing Copper Tubing .....	2
C-4	Installing Meter Setting .....	2
C-5	Flushing Service Lines .....	3
C-6	Testing and Inspection of Services .....	3

Reference herein is made to standards, tests, methods and specifications of research and technical organizations as follows:

ASTM American Society for Testing Materials  
AWWA American Water Works Association  
ANSI American National Standards Institute

A. SCOPE

This standard specifications shall cover the materials and installation of 1-inch water services and 5/8"x3/4" meter settings.

B. MATERIALS

B-1. Copper Tubing

Copper tubing for all services shall be Type "K" soft domestic made with a minimum pressure rating of 150 psi and conform to AWWA C-800-84 Appendix A specifications.

B-2 Corporation Stop

The corporation stop for services shall be as follows:

1-inch corporation stop (CCTH x C-Comp)  
Mueller B-25008  
Fork Quick Joint FB1000-Y-Q

B-3 Angle Meter Valve

The meter valve for all services shall be as follows:

1" x 3/4" angle meter valve (C-Comp x Yoke)  
Mueller B-24258 (360 degree rotation)

B-4 Meter Yoke

Meter yokes for all 1" services shall be as follows:

Ford Y-502  
Meuller H5020  
A Y McDonald 14-2

B-5 Meter Yoke Expansion Connection

Meter yoke expansion connections shall be as follows:

Ford EC-23  
Mueller H-14234  
A Y McDonald 14-2e

B-6 Meter Box and Lid

Meter Boxes and lids shall be as follows:

1" meter box – Christy B-12 or approved equal  
1" meter box lid – Christy B-12g or approved equal

B-7 Customer Meter Valve

The customer meter valves shall be a 3/4" x 1" meter valve (yoke x F.I.P.) as manufactured by Ford B91-324W/HH-34 or A Y McDonald 6010Y w/Ford HH-34 handle.

C. WORKMANSHIP

C-1.1. Preparation of Trench and Backfill

Trenches shall be prepared in accordance to Standards Detail No. 100 included in these specifications. The trench shall be backfilled with reject sand. Care must be exercised when backfilling to be sure no rocks, mud or other foreign material is allowed to contaminate the backfill material.

The trench shall be backfilled with a minimum of 4" of approved material prior to installing the copper tubing. Backfill shall be installed and compacted in accordance to the specifications of the City of Phoenix when in the right-of-way. Care must be exercised in the bottom 12" of the trench if mechanical compaction is used. Water jetting is the preferred method of compaction when allowed.

Parallel utilities to the water service (other sanitary sewer which requires ten [10] feet) shall have a minimum of five (5) feet centerline to centerline separation. Under no circumstance shall common trenches be allowed.

C-2. Tapping Main and Installing Corporation Stops

The corporation stop is normally direct tapped on all ductile iron lines. All existing mains normally are when the system is under pressure. Under no circumstance shall the system be de-watered when tapping. Approved tapping equipment with bits and machine in good working order shall be used. The tapping operation is a vital link in the installation of any service and it must be in accordance to manufacturer's recommendation.

The corporation stop shall be tapped at 45 degree angel as shown on the Standard Installation drawing No. 101. After the tapping operation, the curb stop must be further tightened by hand and turned so that the operating keyway is pointed up.

C-3 Installation of Copper Tubing

The copper tube must be fully seated in the compression fitting. Tighten compression nut until it makes contact with the shoulder of compression fitting. Tighten compression nut until it makes contact with the shoulder of compression fitting.

If construction occurs around the copper tube which breaks the service line, the whole length must be replaced.

C-4 Installation Meter Setting

The correct finished grade and location of the meter setting are essential. This can only be accomplished through proper construction staking. The City must see that the construction site is properly staked in accordance to City Standard Detail No. 100. After the copper tube and angle meter valve is placed, the meter yoke and its appurtenances shall be installed. The yoke must be installed level and at a 90 degree angle from the curb or sidewalk. The final operation of the meter setting shall be the installation of the meter box and lid. The box must be centered squarely over the yoke, installed level and have eight (8) inches of clearance between the top of the angle meter valve and the top of the meter box lid. It is essential that the finished grade of the box be compatible with the finished grade of the right-of-way. After the project is completed and all site grading is accomplished, any meter setting which is not compatible with the finished grade will be required to be adjusted accordingly. Caution must be exercised when setting the service since any major adjustment of the box will require adjustment in the meter yoke and meter valve.



C-5

Flushing Service Lines

All tapping machines used in the system must be equipped with a flush point in order to remove metal fragments and shavings from the tap prior to installation of the corporation stop if taps are made after the line has been flushed.

After the total service is installed, it shall be flushed thoroughly to remove any foreign objects from the service line.

C-6

Testing & Inspection of Services

Prior to any service line being covered by any backfill, it must be visually inspected by Public Works personnel. The contractor may bury the copper service line after the inspection.

After all services have been installed, the main and services will be required to conform to a hydrostatic test as defined under Section C-9 of the "Standard Specifications for Ductile Iron Pipe, Cast Iron Fittings, Valves and Fire Hydrants".

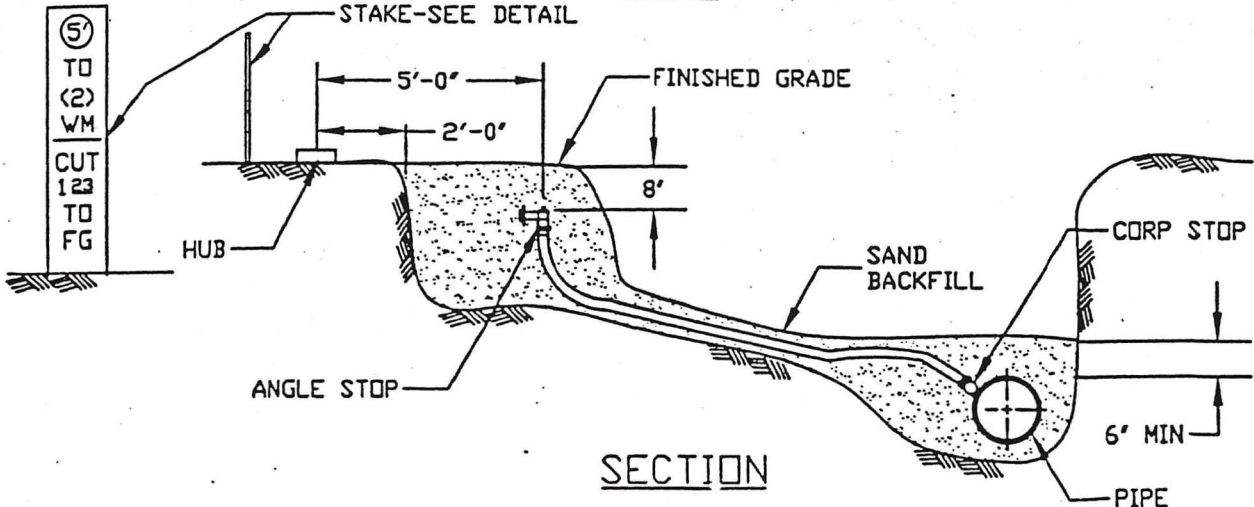
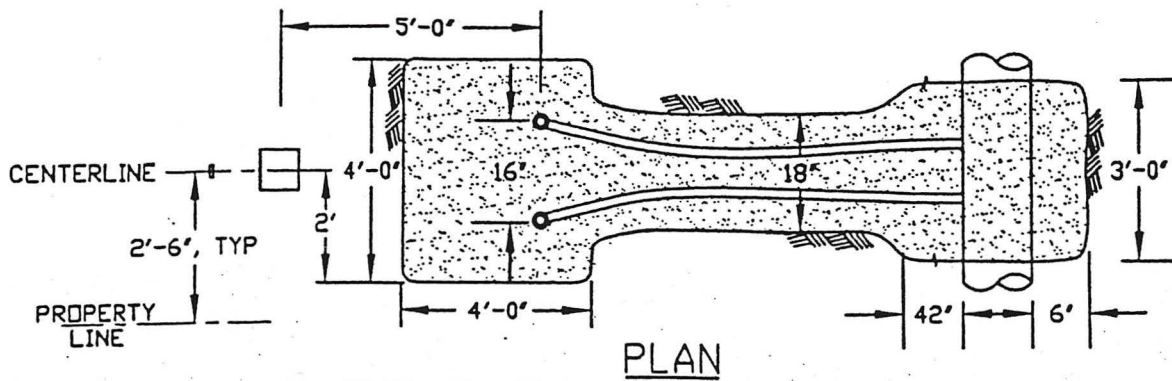
All service connection points at the main shall be left open until after the pressure test has been made and passed.

STANDARD DETAIL DRAWINGS

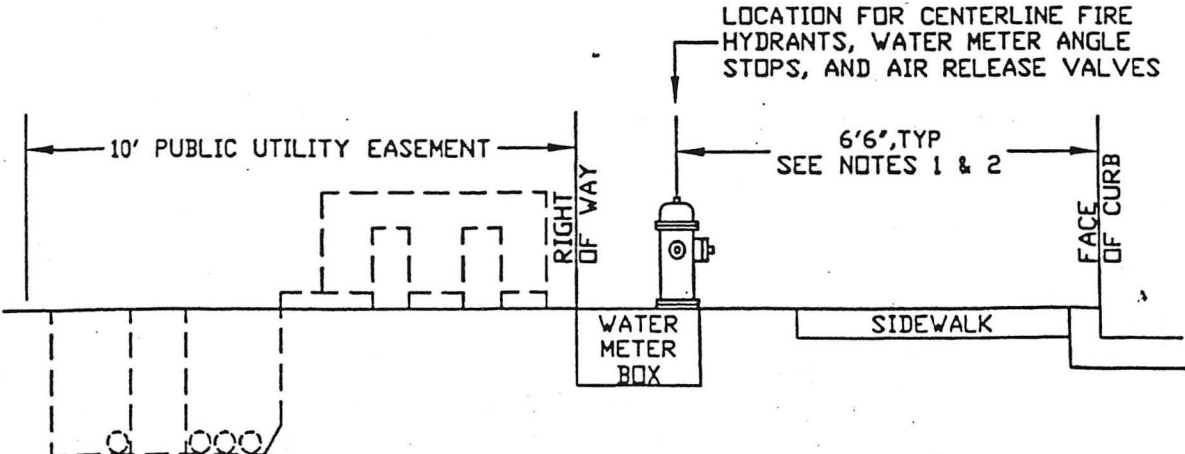
## STANDARD DETAIL DRAWINGS

### TABLE OF CONTENTS

<u>Standard Detail No.</u>	<u>Description</u>
100	Meter Installation and Location
102	Pressure Test, Chlorination and Disinfection Tree with End Drain
103	Full Size Flush Point
104	Hydrant Installation for Existing Main, 14-inch and Smaller
105	Hydrant Installation for Main, 16-inch and larger
106	1-inch Air Valve
107	2-inch Air Valve
108	Mainline Blowoff Assembly
109	Thrust Blocks
110	Cut-in Sleeve
111	Typical Trench Detail
112	Hydrant Bollard Detail
113	Support Pier Detail
114	Utility Design Coordination



- NOTES:**
1. DEPTH OF COVER SHALL BE 3 FEET AT MAIN AND 2 FEET AT METER PAD.
  2. WATER METER STAKE INFORMATION SHALL INCLUDE 1) OFFSET DISTANCE, 2) NUMBER OF SERVICE METERS, AND 3) CUT OR FILL TO FINISHED GRADE.

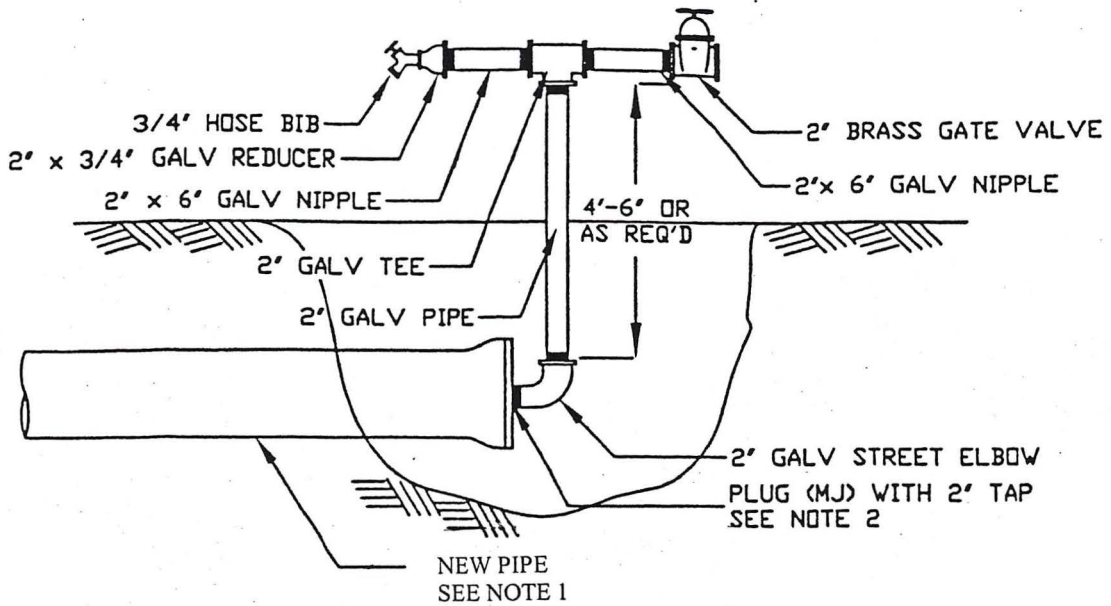


- NOTES**
1. IF PARKWAY SITUATION, THEN LOCATE 2' FROM FRONT EDGE OF SIDEWALK.
  2. IF RIGHT-OF-WAY/STREET WIDTHS PRECLUDE FIRE HYDRANTS, WATER METERS, AND AIR RELEASE VALVES FROM BEING WITHIN RIGHT-OF-WAY, THEN DESIGN ENGINEER/SURVEYOR/DEVELOPER SHALL CONFIRM LOCATIONS WITHIN CITY.

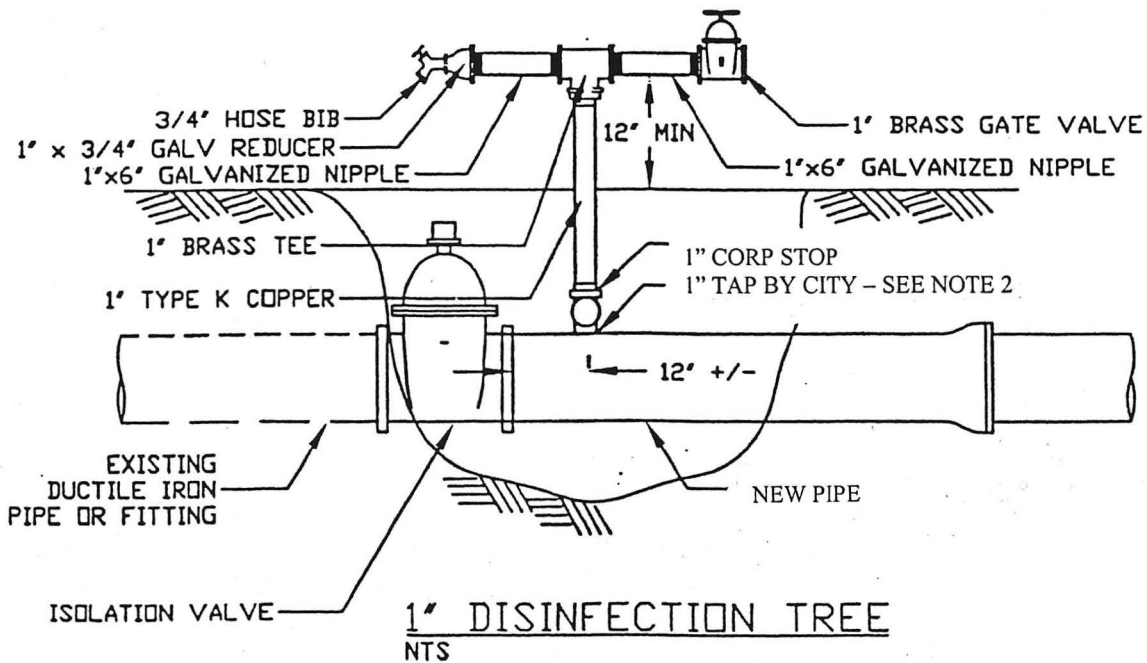


METER INSTALLATION AND LOCATION

STANDARD DETAIL NO. 100



**2" SAMPLE TREE**  
NTS



**1" DISINFECTION TREE**  
NTS

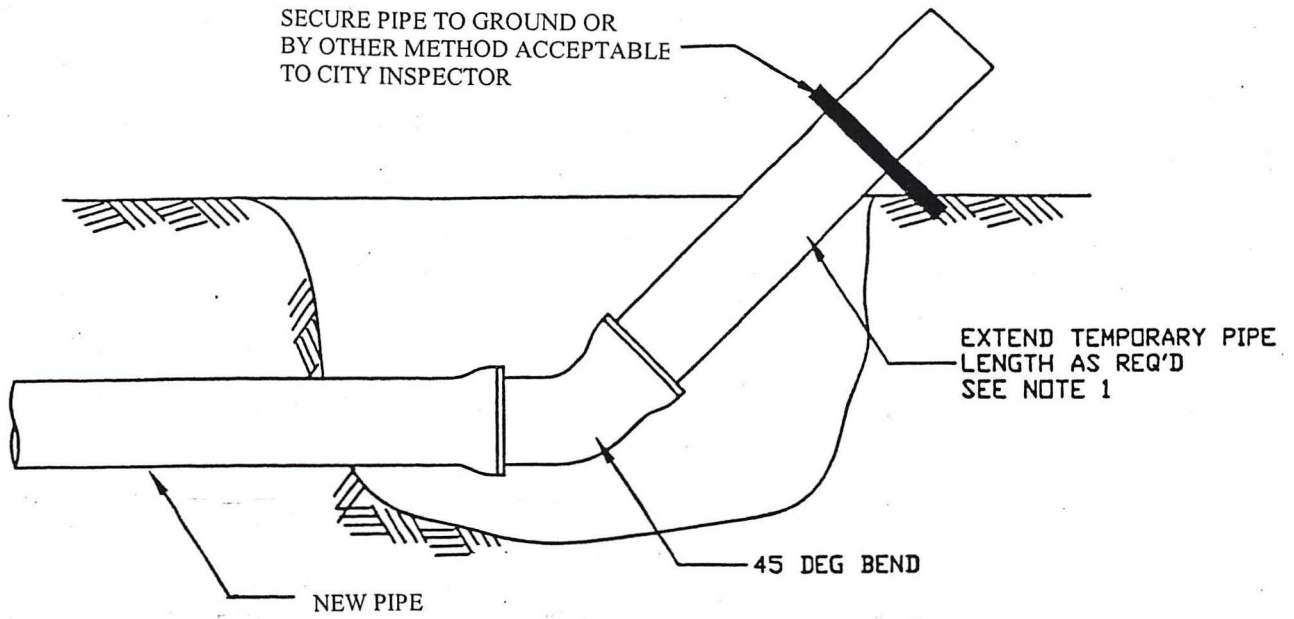
**NOTES**

1. AT A MINIMUM, RESTRAIN THE LAST THREE FULL PIPE LENGTHS FOR 4', 6' AND 8' PIPE. RESTRAIN THE LAST FIVE FULL PIPE LENGTHS FOR 12' PIPE.
2. UPON COMPLETION OF REQUIRED TESTS AND FTER CONFIRMATION OF SAMPLE RESULTS, CONTRACTOR TO REMOVE TREE ASSEMBLY IN PRESENCE OF CITY. CITY TO PROVIDE EITHER 2' GALV OR 1' BRASS PLUG.



**SAMPLE AND DISINFECTION TREES**

STANDARD DETAIL NO. 102



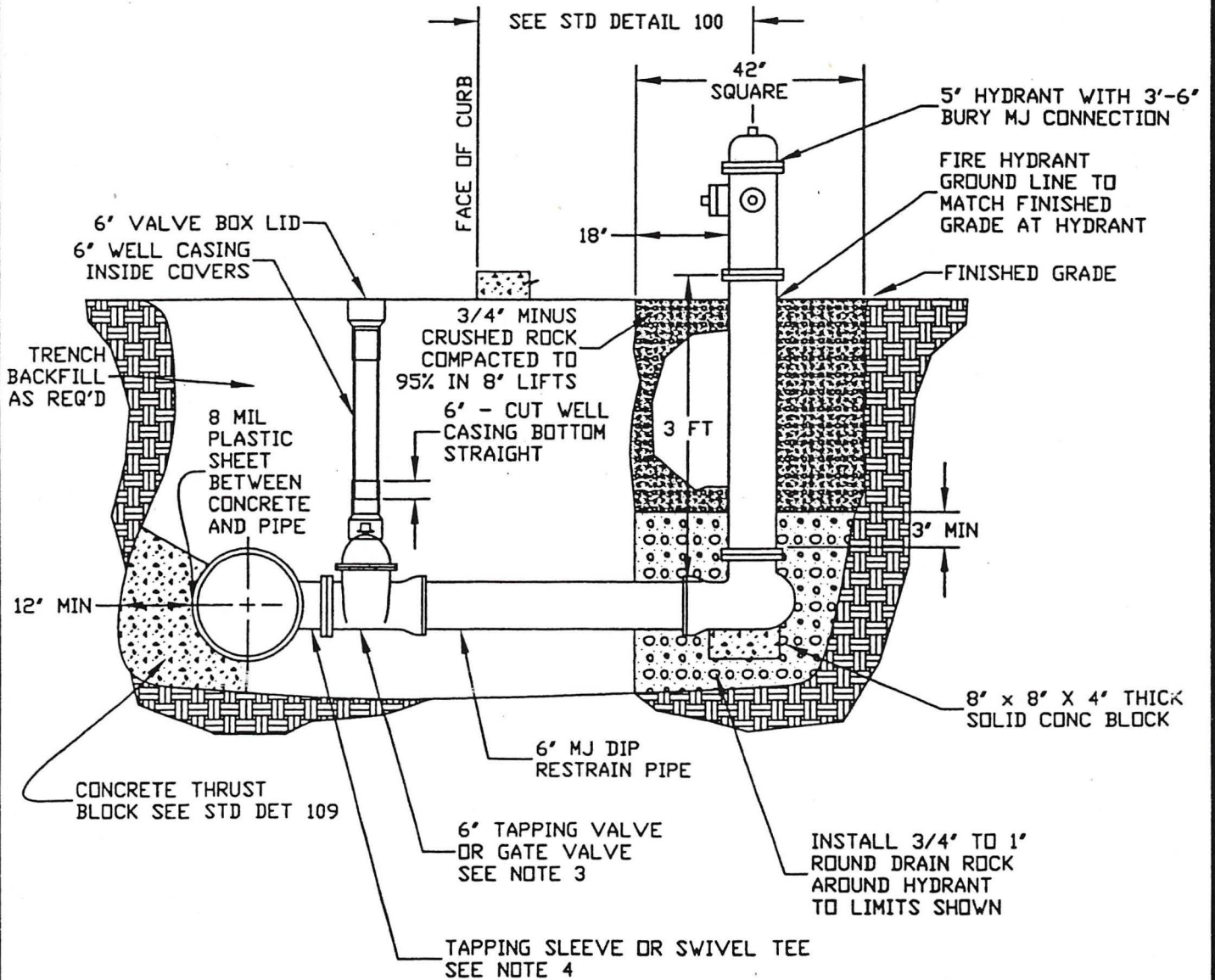
NOTES

1. TEMPORARY PIPE SHALL BE SAME SIZE AS PIPE BEING FLUSHED FOR 4" TO 12" SIZES. FOR PIPES LARGER THAN 12", CONSULT WITH CITY FOR TEMPORARY PIPE SIZE.
2. UPON COMPLETION OF FLUSHING, CONTRACTOR TO PREVENT RE-ENTERENCE OF WATER INTO PIPE.

FULL SIZE FLUSH POINT

STANDARD DETAIL NO. 103

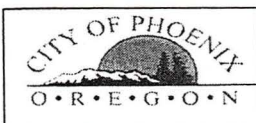




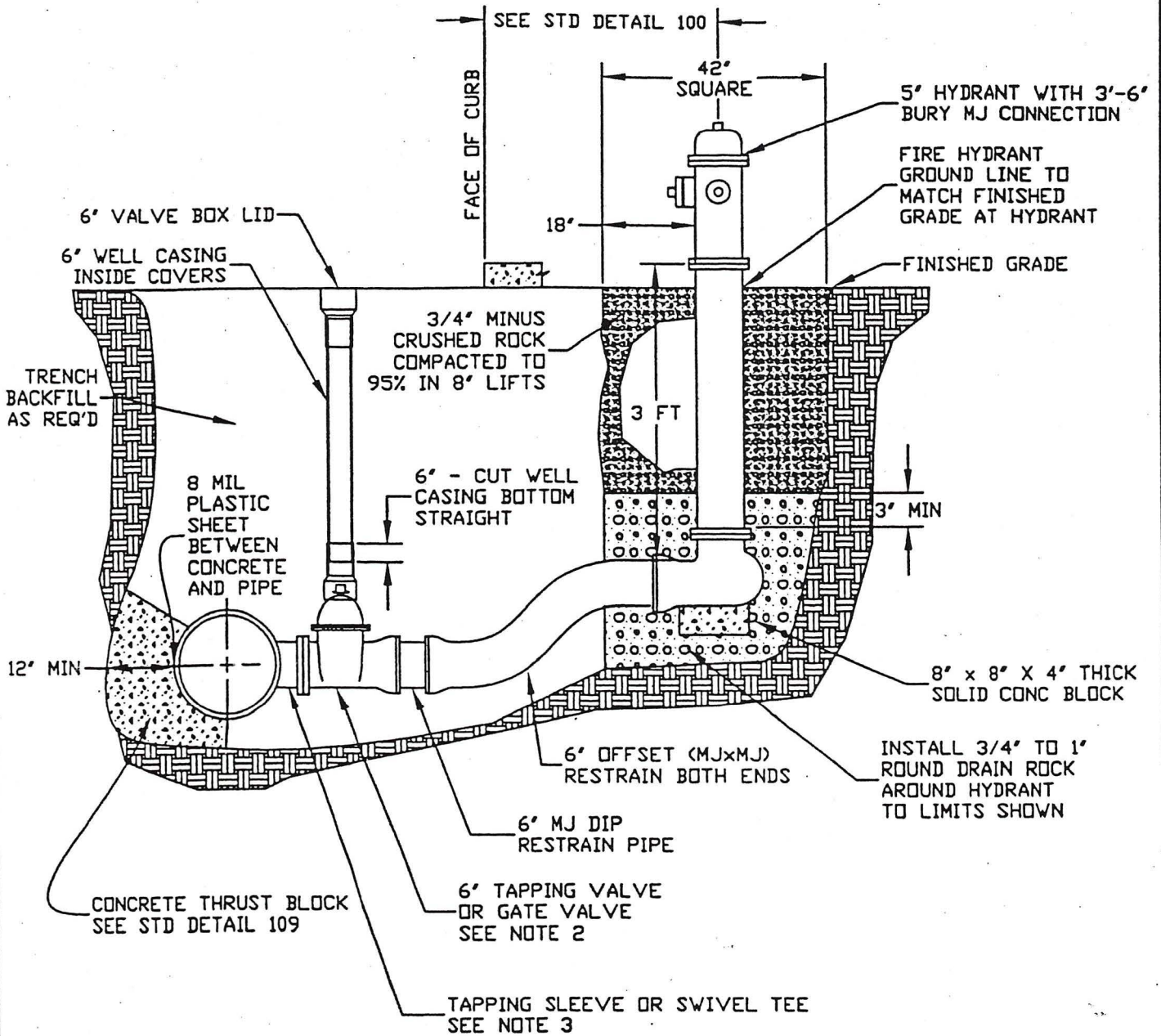
**NOTES:**

1. A MINIMUM OF 5 FEET OF CLEAR SPACE AROUND THE FIRE HYDRANT BARREL SHALL BE MAINTAINED AT ALL TIMES, INCLUDING INSIDE PLANTER AREAS.
2. AN OFFSET SIMILAR TO STD DETAIL 105 WILL BE REQUIRED TO USE A STANDARD 3'-6" BURY HYDRANT WHEN THE MAIN HAS GREATER THAN 3 FEET OF COVER.
3. FOR WET TAP, USE FLANGE x MJ TAPPING VALVE. FOR DRY CONNECTION, USE MJ X MJ GATE VALVE.
4. FOR WET TAP, USE TAPPING SLEEVE WITH FLANGE CONNECTION. FOR DRY CONNECTION, USE A MJ SWIVEL TEE.

HYDRANT INSTALLATION FOR 14" MAIN AND SMALLER



STANDARD DETAIL NO. 104

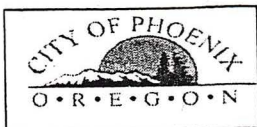


**NOTES:**

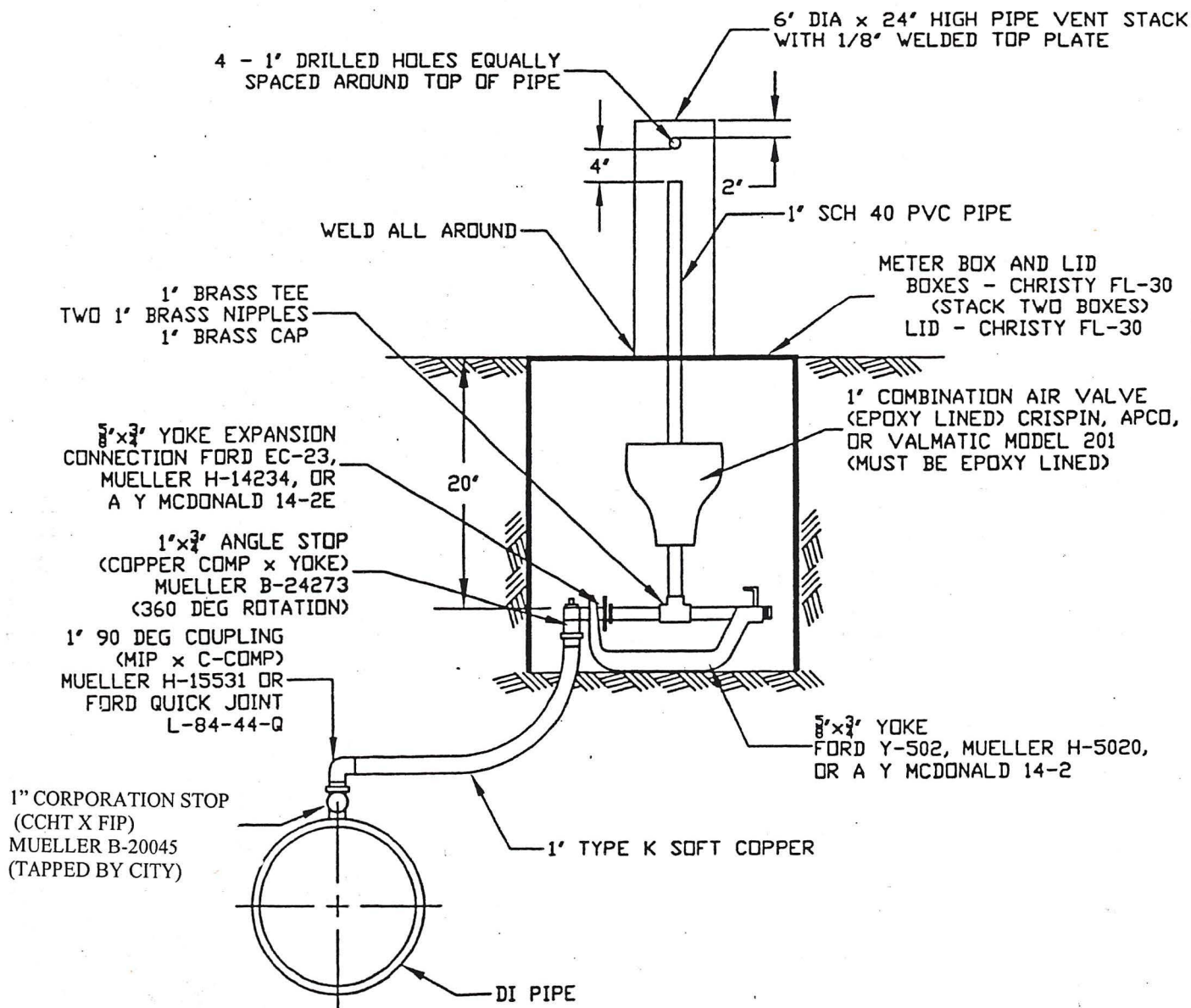
1. A MINIMUM OF 5 FEET OF CLEAR SPACE AROUND THE FIRE HYDRANT BARREL SHALL BE MAINTAINED AT ALL TIMES, INCLUDING INSIDE PLANTER AREAS.
2. FOR WET TAP, USE FLANGE x MJ TAPPING VALVE. FOR DRY CONNECTION, USE MJ X MJ GATE VALVE.
3. FOR WET TAP, USE TAPPING SLEEVE WITH FLANGE CONNECTION. FOR DRY CONNECTION, USE A MJ SWIVEL TEE.

HYDRANT INSTALLATION FOR 16" MAIN OR LARGER

STANDARD DETAIL NO. 105







**NOTES:**

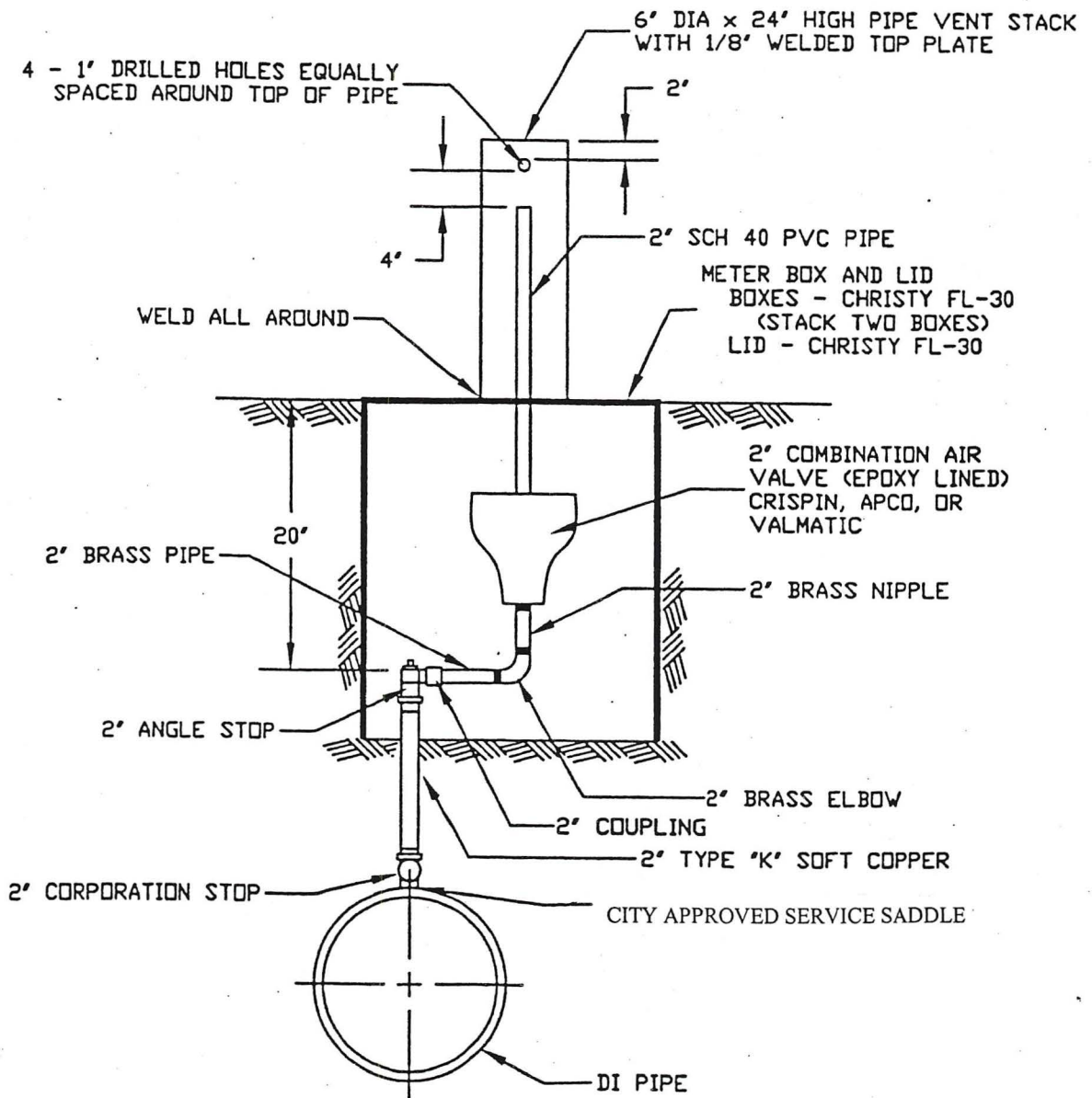
1. 1" COPPER PIPE SHALL ALWAYS BE INSTALLED WITH GRADE RISING TOWARD THE ANGLE STOP FROM THE CORP STOP.
2. ALL COPPER PIPE SHALL HAVE A MINIMUM OF 6" OF SAND SURROUNDING IT.

1" AIR VALVE

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STANDARD DETAIL NO. 106

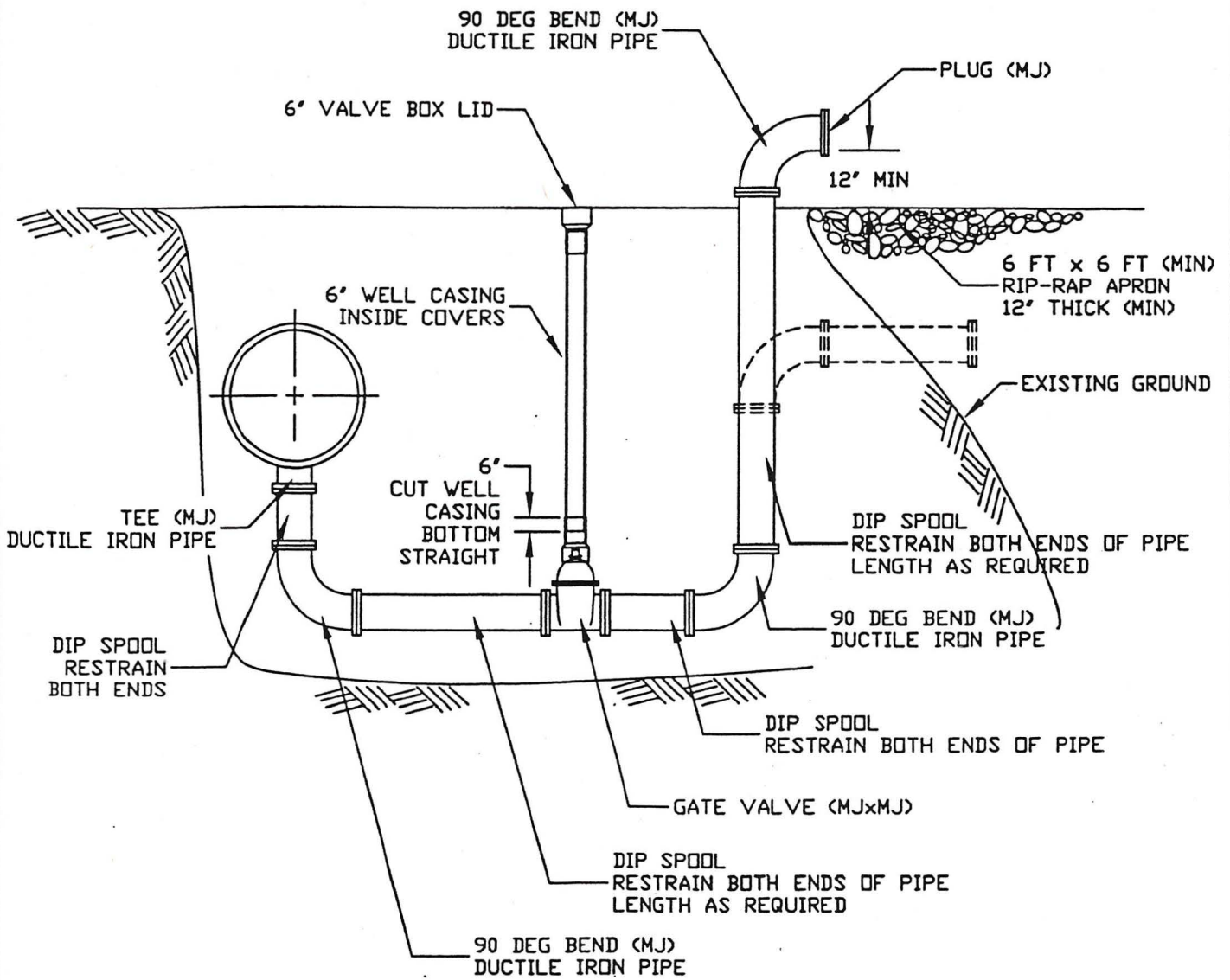




2" AIR VALVE

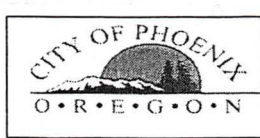
STANDARD DETAIL NO. 107

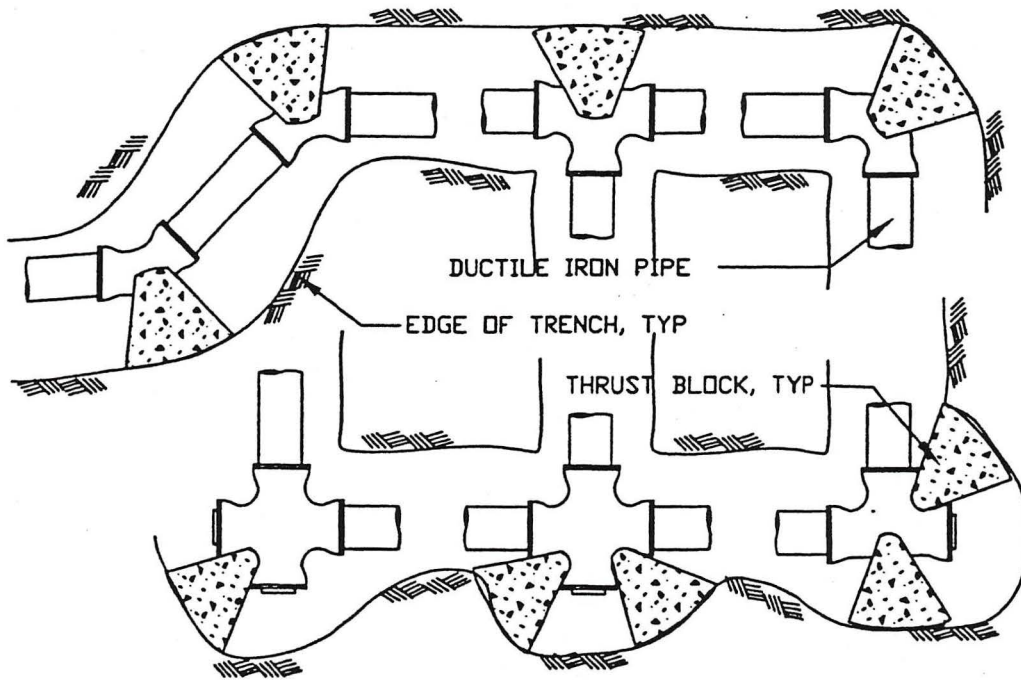




MAINLINE BLOWOFF ASSEMBLY

STANDARD DETAIL NO. 108





THRUST BLOCK SIZING TABLE

PIPE SIZE (INCHES)	90 BEND		45, 22.5, 11.25 BEND		VALVES, TEES, DEAD ENDS	
	# THRUST	BEARING AREA	# THRUST	BEARING AREA	# THRUST	BEARING AREA
4	2700	2.0	1650	1.5	1950	1.5
6	6000	4.0	3450	2.5	4350	3.0
8	10800	7.5	6150	4.5	7650	5.5
12	24000	16.0	13650	9.5	16950	11.5

**NOTE:**

THRUST CALCULATIONS ARE BASED ON TEST PRESSURE OF 150 PSI AND A SOIL BEARING CAPACITY OF 1500 PSF. DESIGNER IS CAUTIONED TO ENSURE THE BEARING CAPACITY OF THE SOIL IS AT LEAST 1500 PSF.

**NOTES:**

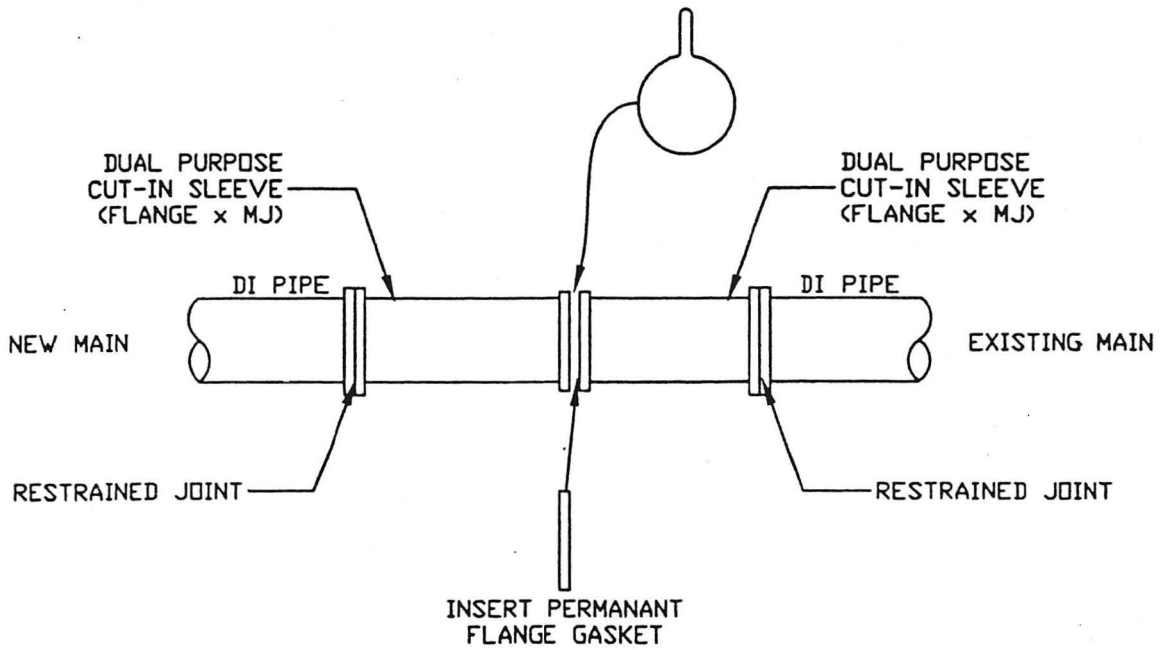
1. THE BEARING AREA SHOWN IN THE TABLE ARE MINIMUM VALUES.
2. ALL THRUST BLOCKS BEARING AREAS SHALL BE POURED AGAINST UNDISTURBED EARTH.
3. THE THRUST BLOCK THICKNESS SHALL BE A MINIMUM OF 12" OR TWICE THE PIPE DIAMETER, WHICHEVER IS GREATER.
4. AN 8 MIL SHEET OF PLASTIC SHALL BE WRAPPED AROUND PIPE AND FITTINGS WHEREVER PIPE WILL COME IN CONTACT WITH CONCRETE.
5. ENSURE ALL BOLTS ARE EXPOSED AND NOT COVERED WITH CONCRETE.

THRUST BLOCK

STANDARD DETAIL NO. 109

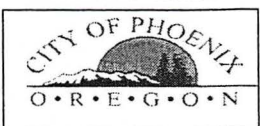


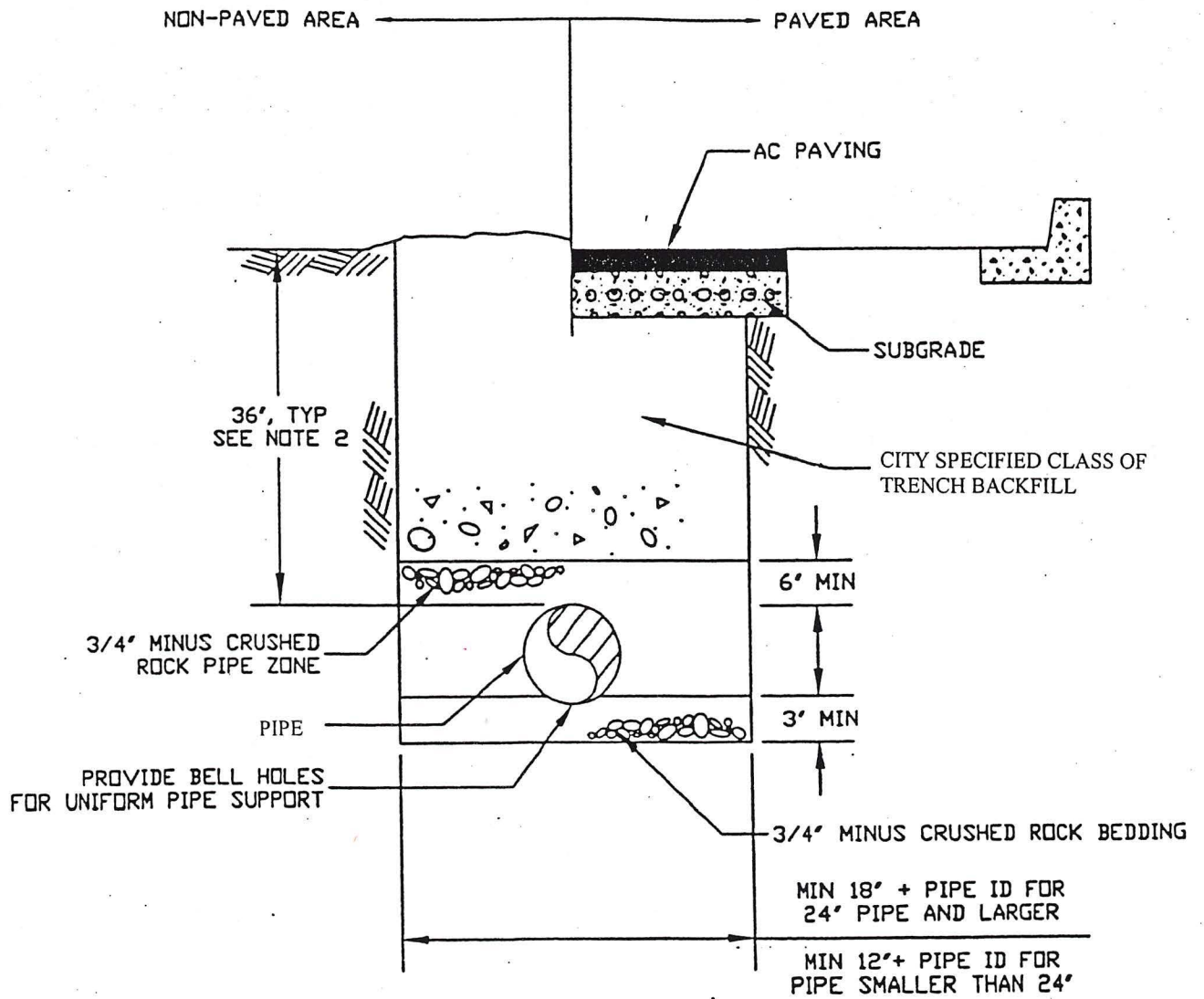
TEMPORARY BLIND FLANGE INSERT  
FOR FLUSHING, TESTING, AND DISINFECTION



CUT-IN SLEEVE

STANDARD DETAIL NO. 110





NOTES

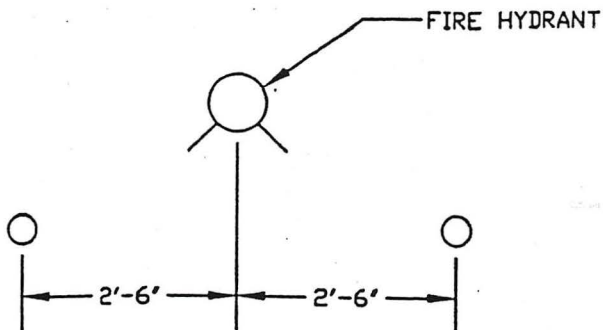
1. IF NATIVE MATERIAL IS DRY AND UNIFORMLY GRADED AND CONTRACTOR'S INSTALLATION METHODS PROVIDES UNIFORM PIPE SUPPORT, THEN THE CRUSHED ROCK BEDDING MAY BE WAIVED UPON PRIOR APPROVAL FROM THE CITY.
2. COVER OVER PIPE MAY VARY FROM 30" MIN TO 42" MAX UPON APPROVAL FROM THE CITY.

TYPICAL TRENCH DETAIL

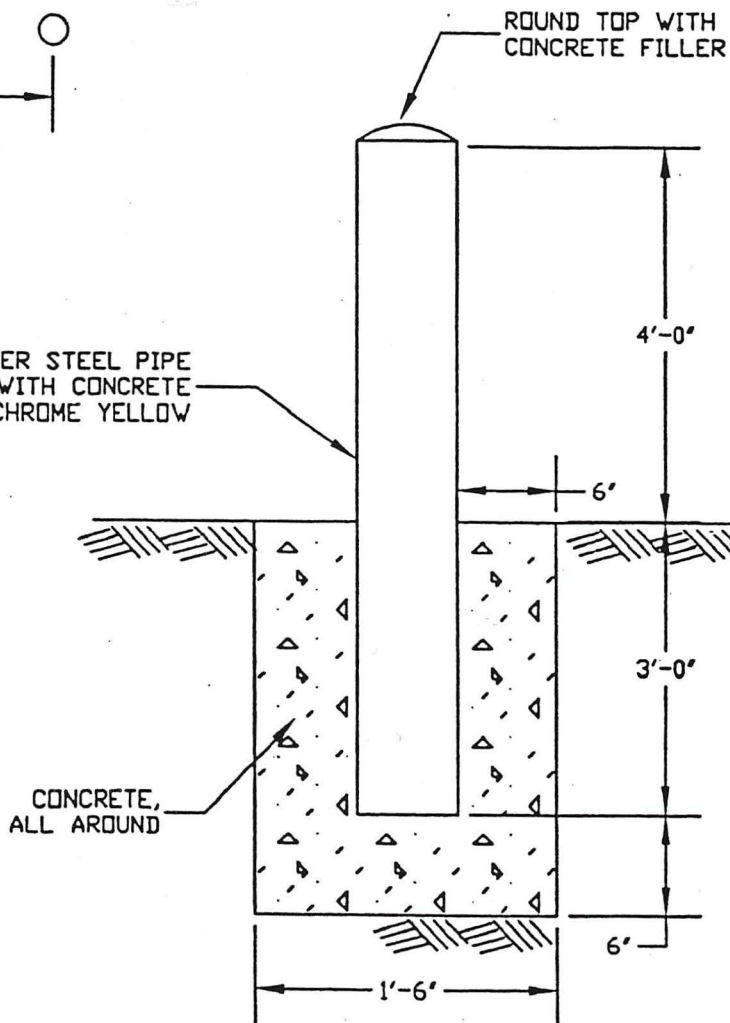
STANDARD DETAIL NO. 111



3 BOLLARDS SPACED IN A 5-FOOT  
EQUILATERAL TRIANGLE AROUND HYDRANT  
SEE DETAIL BELOW



PLAN VIEW



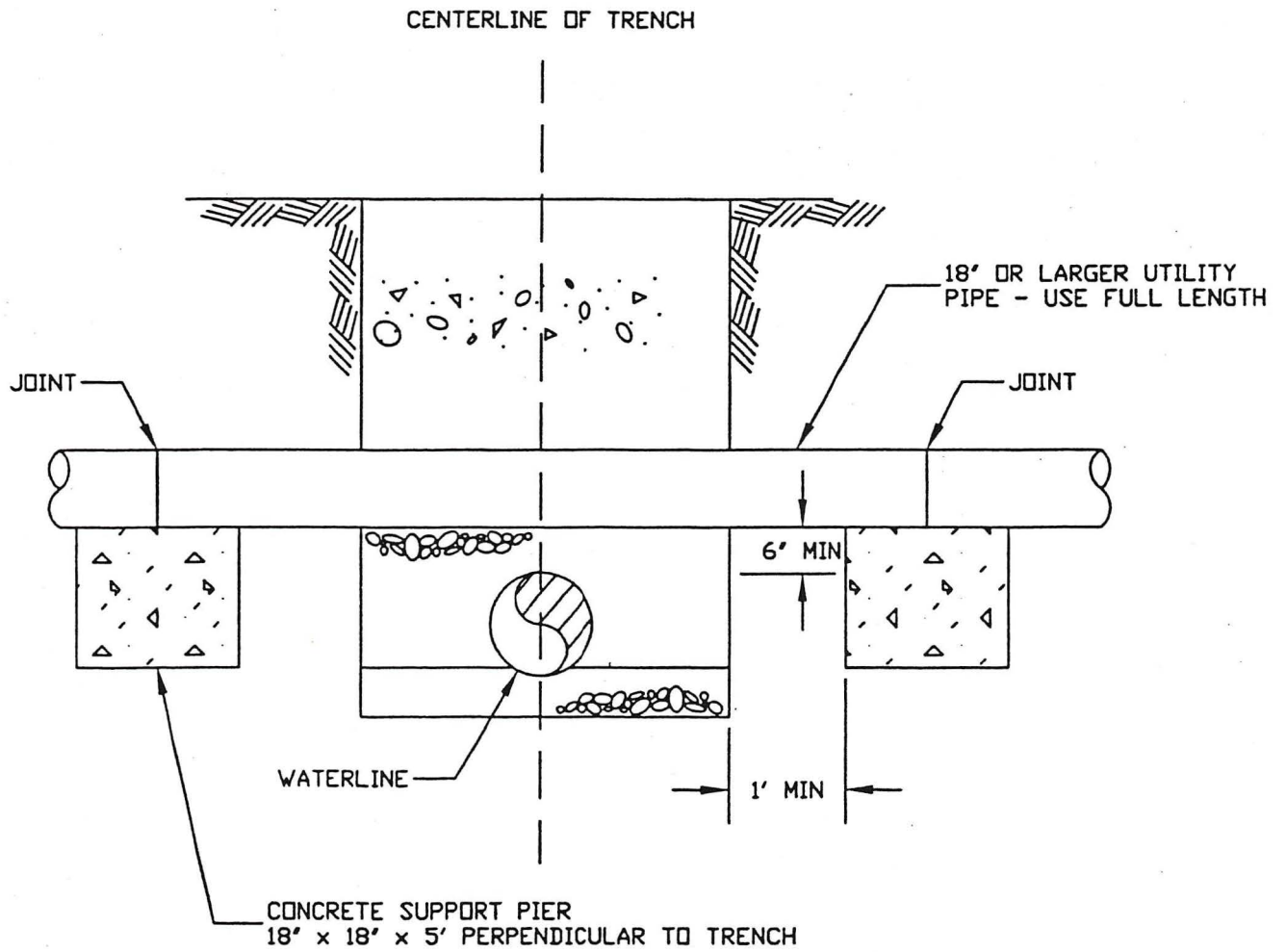
NOTES

1. FINAL APPROVAL OF QUANTITY AND LOCATION OF BOLLARDS AT DISCRETION OF THE CITY.
2. IF HYDRANT IS LOCATED IN LANDSCAPED, CURBED PLANTER WITH A MINIMUM OF 5' FROM CURB FACE TO HYDRANT IN EACH DIRECTION, THEN BOLLARDS ARE NOT REQUIRED.

HYDRANT BOLLARD DETAIL

STANDARD DETAIL NO. 112





SUPPORT PIER DETAIL

STANDARD DETAIL NO. 113





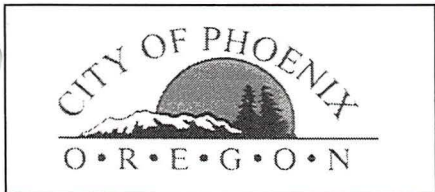
# UTILITY DESIGN COORDINATION

**Project:** \_\_\_\_\_

**Date:** \_\_\_\_\_

<u>Name</u>	<u>Company</u>	<u>Telephone</u>	<u>Signature</u>
_____	Pacific Power	776-5497	_____
_____	Avista Gas	858-4740	_____
_____	Qwest	776-8268	_____
_____	RVSS	779-4144	_____
James Wear	Phoenix Public Works	535-2226	_____
Chief Lichtenstein	Phoenix Fire Dept.	535-2883	_____
Chief Barthel	Phoenix Police Dept.	535-1113	_____
Lisa Hendrickson	Phoenix Planning Dept.	535-2050	_____
Pat DeBenedetti	Phoenix Building Dept.	535-2050	_____
Public Works Management	City Engineer	535-5531	_____

_____	Project Engineer/ Architect	_____	_____
_____	Contractor	_____	_____
_____	Owner/Developer	_____	_____
_____	Surveyor	_____	_____



**UTILITY DESIGN COORDINATION**

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**STANDARD DETAIL NO. 114**

APPENDIX

EASEMENT

\_\_\_\_\_, GRANTOR, grants to the City of Phoenix, Grantee, a perpetual easement for the installation and maintenance of water mains in the following location:

A strip of land \_\_\_\_\_ feet in width and lying \_\_\_\_\_ feet on each side of the following described line:

Said easement is for the purpose of constructing, reconstructing, maintaining, using, operating and repairing pipeline facilities of the municipal water system of Grantee together with the right to make such excavation therein as grantee may require and deem convenient for the installation, repair or maintenance of such facilities; including such reasonable right of ingress and egress to and from such easement as may be necessary to carry out its purposes. No other facility shall be placed within five (5) feet of the water main when running parallel to or within six (6) inches when crossing perpendicular to the water main except sanitary sewer which is ten (10) feet and eight (8) inches correspondingly.

Grantor reserves the right to use and possess such land within the easement as shall not interfere with Grantee's use thereof for the purposes above set forth, but Grantor shall not cause any buildings or permanent structures to be constructed over any part of the easement without Grantee's consent.

Dated this \_\_\_\_\_ day of \_\_\_\_\_, 2\_\_\_\_\_.

\_\_\_\_\_  
(Name of organization, corporation, etc.)

By \_\_\_\_\_  
(print name and title)

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Signature)

STATE OF \_\_\_\_\_ )  
 ) ss.  
County of \_\_\_\_\_ )

This instrument was acknowledged before me on the \_\_\_\_\_ day of \_\_\_\_\_, 2\_\_\_\_\_,

By \_\_\_\_\_  
(name(s) of person(s))

as \_\_\_\_\_ for \_\_\_\_\_  
(type of authority, e.g. officer, trustee, etc.) (name of party on behalf of whom instrument was executed)

\_\_\_\_\_  
Notary Public for \_\_\_\_\_

My Commission Expires: \_\_\_\_\_

EASEMENT

\_\_\_\_\_, GRANTOR, grants to the City of Phoenix, Grantee, a perpetual easement for the installation and maintenance of water mains in the following location:

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Dated this \_\_\_\_\_ day of \_\_\_\_\_, 2\_\_\_\_\_.

\_\_\_\_\_  
(Print name(s))

\_\_\_\_\_  
(Signature(s))

\_\_\_\_\_  
(Signature(s))

STATE OF \_\_\_\_\_ )  
 ) ss.  
County of \_\_\_\_\_ )

This instrument was acknowledged before me on the \_\_\_\_\_ day of \_\_\_\_\_, 2\_\_\_\_\_,

By \_\_\_\_\_  
(name(s) of person(s))

as \_\_\_\_\_ for \_\_\_\_\_  
(type of authority, e.g. officer, trustee, etc.) (name of party on behalf of whom instrument was executed)

\_\_\_\_\_  
Notary Public for \_\_\_\_\_

My Commission Expires: \_\_\_\_\_

## CITY OF PHOENIX

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### PROCEDURES CHECKLIST

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- Developer submits a copy of preliminary site plan.
- City of Phoenix provides a preliminary water line layout review.
- Developer's engineer designs water system in accordance with current City of Phoenix standards, with Plan and Profile and in engineer land scale measure units (i.e., feet).
- Developer's engineer furnishes City of Phoenix one (1) complete set of plans for checking. This set is to include a utility plan showing, if available, main utility routing (power, telephone, gas, cable T.V.), street lights, driveways, mailbox locations, transformer pads, telephone pedestals, cable T.V. closures, etc. Plans are to be done using computer-aided drafting.
- Developer's engineer, after receiving submitted plan set and a letter outlining fees and subsequent steps back from City, arranges a pre-design meeting in which all utilities coordinate their facilities. Engineer makes necessary corrections and submits four (4) sets of water plans, one (1) complete set of plans and the original correction set for approval of and prior to starting the project. City of Phoenix's conversion to a Geographic Information System requires the developer's engineer to supply coordinate data information on all waterline facilities in a form compatible with the City's system. This system shall be a CD using AUTOCAD Release 13.DWG format.
- Developer submits deposit for estimated cost of plan check work to be performed by City of Phoenix (inspection, flushing, testing, disinfection, dechlorination, sampling, air release, valves, record drawings, hydrant painting) services, system development charges, charges in lieu of assessment, etc.
- Developer submits all necessary easements. Easements must be in written form unless shown on a final recorded plat, in which case, a statement concerning construction and maintenance as worded in Appendix "A" shall be included on the plat. Water is not covered under a Public Utility Easement (P.U.E.) notation and must be stated separately.
- Developer signs a pre-development agreement acknowledging what responsibilities are required for finalization and acceptance of the water facilities.
- Developer's prequalified contractor arranges pre-construction meeting with City of Phoenix at least 48 hours prior to start of project.

- City of Phoenix returns two (2) sets of stamped approved plans to the contractor. One set must be at the job site during construction.
- DEVELOPER'S SURVEYOR SETS OFFSET HUBS FOR HORIZONTAL AND VERTICAL CONTROL WITH CUT STAKES FOR GRADE ELEVATIONS. WATER LINE GRADES SHALL BE CALCULATED FOR 36" OF COVER AND NOT TAKEN FROM PROFILE AS EXACT ELEVATIONS. WATER LINE GRADES SHALL BE CALCULATED FOR 36" OF COVER AND NOT TAKEN FROM PROFILE AS EXACT ELEVATIONS.
- Developer's prequalified contractor furnishes City of Phoenix with 48 hours notice prior to construction.
- The contractor and the person installing the pipe prequalified by City of Phoenix to install water facility.
- Water facilities installed upon notification of the City Inspector and nothing buried or concealed until the City's Inspector has viewed and approved of. All unexpected lines will be required to be uncovered in its entirety for approval and acceptance.
- Air valves installed by City of Phoenix upon payment of the standard fee and as required by City of Phoenix Standards (Standard detail Numbers 106 and 107). Contractor is to provide excavation and backfill. Finished grade stakes for exact air valve location must be supplied by the developers surveyor prior to their installation.
- Fire hydrants to be installed as required by City of Phoenix Standards (Standard Detail Numbers 104 and 105).
- Service connections installed for each parcel per City of Phoenix Standards (Standard Detail Numbers 100 and 101). Finished grade stakes for exact service connection location must be supplied by the developer's surveyor prior to their installation.
- New water mains pressure tested, disinfected and dechlorinated by City of Phoenix and proven to be bacteriologically safe prior to placing into service. The City's Inspector will decide the acceptable procedure for testing, disinfection and dechlorination.
- Developers contractor notifies the City of Phoenix 48 hours in advance of desired final inspection.
- Upon final inspection, finished surfacing and completion of any discrepancies, the City of Phoenix furnishes the developer with the *Dedication & Declaration of Acceptance of Water System Facilities* forms.

- The developer supplies the City of Phoenix a statement of actual cost of the water facilities as noted on the dedication form.
- City of Phoenix accepts water system facilities and will allow metered service to parcels within the project.
- After a one-year period, City of Phoenix releases developer from responsibility. Developers should note that until this point is reached, they carry the responsibility and liability of the water facilities even though water is provided through the system by City of Phoenix. If a leak or problem occurs during this period, the City will repair the water facilities and bill the developer. The surfacing and/or restoration of the damaged surrounding area will be the responsibility of the developer and his contractor to repair.