

ADDENDUM NO. 4  
TO  
CITY OF FRESNO  
PUBLIC WORKS STANDARD SPECIFICATIONS  
ADOPTED MARCH 4, 1970  
RESOLUTION NO. 70-36  
UPDATED VERSION APPROVED JANUARY, 2013

This addendum is attached to and made a part of the above-entitled standard specifications.

The following City Standard Drawings have been amended as indicated below:

- |      |   |
|------|---|
| P-41 | Added location in right-of-way for Recycled Water Main. |
| P-42 | Added location in right-of-way for Recycled Water Main. |

The following City Standard Drawings are new as indicated below:

- |       |   |
|-------|---|
| RW-1  | Recycled Water Main Identification                              |
| RW-2  | Recycled water Valve and Valve Box                              |
| RW-3  | Recycled Water Valve Extension                                  |
| RW-4  | 1" Service Connection & Meter Box Installation                  |
| RW-5  | 1-1/2" & 2" Service Connection & Meter Box Installation         |
| RW-6  | 4" Recycled Water Service                                       |
| RW-7  | Temporary 2" Recycled Water Blow-Off                            |
| RW-8  | Recycled Water Blow-Off Assembly                                |
| RW-9  | Recycled Water 1" or 2" Air Release/Vacuum Breaker Station      |
| RW-10 | Recycled Water 4" Air Release/Vacuum Breaker Station            |
| RW-11 | 1" or 2" Air Release/Vacuum Breaker Valve Enclosure             |
| RW-12 | Recycled Water Main Separation Requirements                     |
| RW-13 | Recycled Water Irrigation Information Sign                      |
| RW-14 | Recycled Water Remote Control Irrigation valve Identification   |
| RW-15 | Recycled Water Backflow Preventer Identification                |
| RW-16 | Recycled Water Irrigation Box Cover Markings                    |
| RW-17 | Recycled Water Irrigation System Clock Marking                  |
| RW-18 | General Recycled Water Identification Tag                       |
| RW-19 | Recycled Water Landscape Irrigation Head Identification         |
| RW-20 | Quick Coupling Valve  |
| RW-21 | Cross Connection Control Test Station                           |
| RW-22 | Temporary Potable Water Supply To On-Site Recycled Water System |
| RW-23 | Temporary Potable Water Supply To Recycled Water System         |

In addition to the standard drawings, Section 34 and Section 35 are new to the Standard Specifications as indicated below:

## **SECTION 33 – RECYCLED WATER FACILITIES DESIGN CRITERIA**


<b>PART I</b>	<b>DEFINITIONS</b>
Section 33.1	Definitions
Section 33.2	Other Requirements
<b>PART II</b>	<b>GENERAL PROVISIONS</b>
Section 33.3	Other Requirements
Section 33.4	Enforcements
<b>PART III</b>	<b>DESIGN CRITERIA</b>
Section 33.5	Recycled Water Main Pressures, Capacities and Sizes
Section 33.6	Location of Air release Valve Assemblies
Section 33.7	Location of Blow-Off Assemblies
Section 33.8	Recycled Water Main Locations
Section 33.9	Criteria for the Separation
Section 33.10	Alternate Criteria for Construction
Section 33.11	Procedure for Water, Recycled Water and Sewer System Installations in Subdivisions
Section 33.12	Easements
Section 33.13	Depth of Recycled Water Mains
Section 33.14	Structural Requirements
Section 33.15	Design Criteria for Recycled Water Meters
<b>PART IV</b>	<b>MATERIALS</b>
Section 33.16	Requirements
Section 33.17	Pipe Materials
Section 33.18	Valves
Section 33.19	Appurtenances

## **SECTION 34 – RECYCLED WATER FACILITIES**

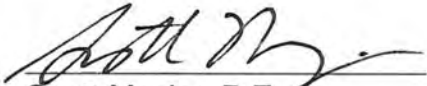
Section 34.1	Scope
Section 34.2	General
Section 34.3	Polyvinyl Chloride (PVC) Pressure Pipe and Fittings Installation
Section 34.4	Ductile Iron Pressure Pipe and Fittings Installation
Section 34.5	Valve Casing and Lid Installation
Section 34.6	Earthwork for Ductile Iron and PVC Pipe Installation
Section 34.7	Backfilling and Tamping
Section 34.8	Testing and Sterilization

Section 34.9      Signage  
Section 34.10    Abandonment

Reviewed and Approved:

  
Andrew Benelli, P.E.  
City Engineer

Oct. 15, 2014  
Date

  
Scott Mozier, P.E.  
Public Works Director

Oct. 15, 2014  
Date

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## WATER STANDARD DRAWINGS

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<input type="checkbox"/> W-13	Automatic Air Release and Vacuum Valve
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<input type="checkbox"/> W-18	Detector Check Requirements Related to Fire Service Improvements Greater Than 2"
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<input type="checkbox"/> W-33	PVC Pipe Restraints
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<input type="checkbox"/> S-7	Installation of Sewer Pipe in Jacked and Non-jacked Steel Casing
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<input type="checkbox"/> S-10	Sewer Main Trench, Bedding, and Backfill Detail
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<b>NO.</b>	<b>TITLE OF DRAWING</b>
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<input type="checkbox"/> E-3	Streetlight-Local Street Overhead Service – Wood Pole
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<input type="checkbox"/> E-5	Streetlight-Connection Diagram
<input type="checkbox"/> E-6	Streetlight Layout
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<input type="checkbox"/> E-8	Streetlight-Placement Collector Street
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<input type="checkbox"/> API-3	Modified Street Improvement Standards
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<input type="checkbox"/> API-7	Minnewawa Avenue – Fancher Creek to California Avenue
<input type="checkbox"/> API-8	Minnewawa Avenue – California Ave. to Butler Ave.
<input type="checkbox"/> API-9	Minnewawa Avenue – Butler Ave. to Tulare Ave.

## INTELLIGENT TRANSPORTATION SYSTEM STANDARD DRAWINGS

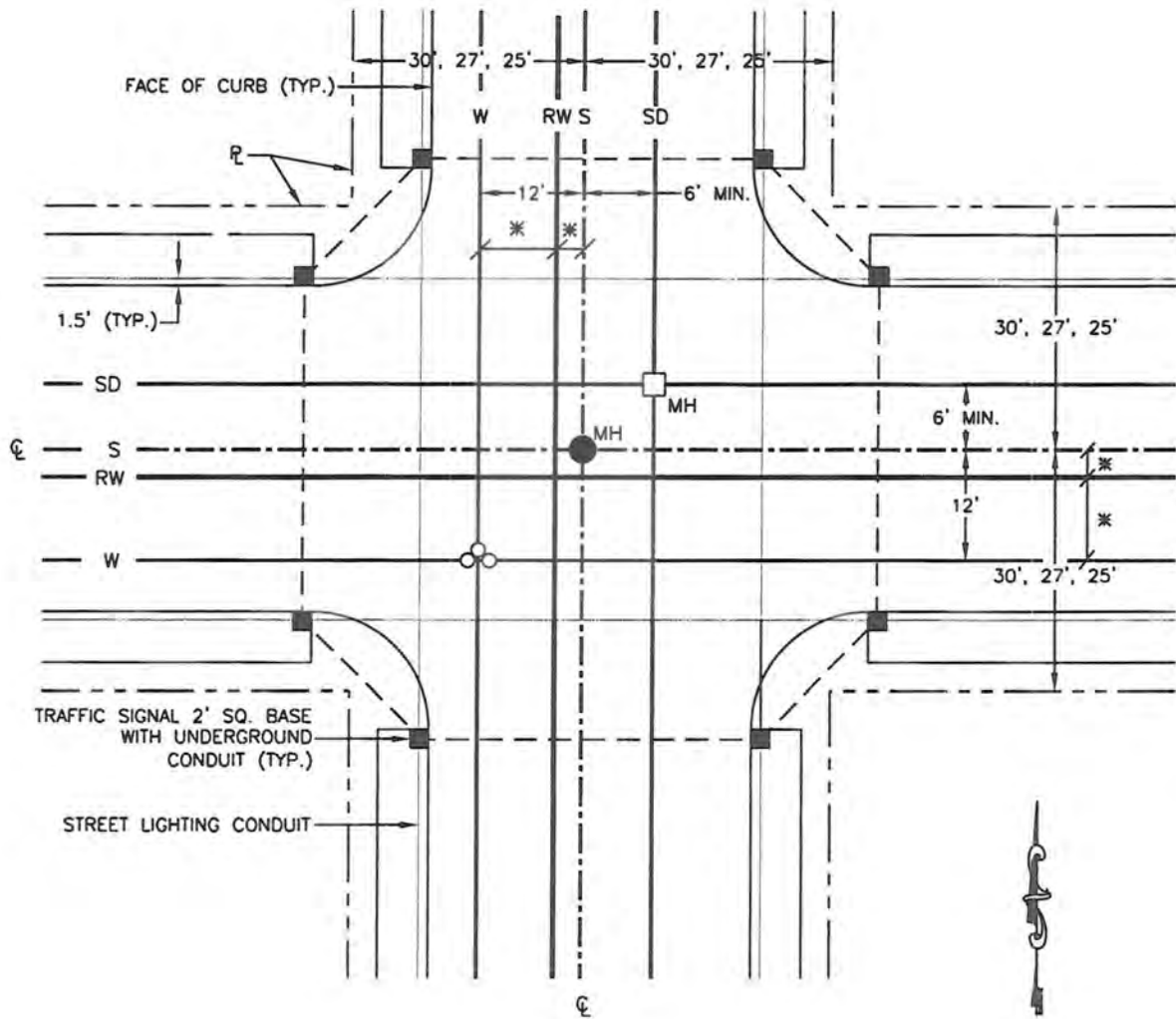
<b>NO.</b>	<b>TITLE OF DRAWING</b>
<input type="checkbox"/> ITS-1	Typical ITS Corridor Layout
<input type="checkbox"/> ITS-2	Typical ITS Intersection Layout
<input type="checkbox"/> ITS-3	Typical ITS Intersection Conduit Run Layout
<input type="checkbox"/> ITS-3A	Typical ITS Intersection Conduit Run Layout with Hub
<input type="checkbox"/> ITS-4	ITS Conduit Trench Detail No. 1
<input type="checkbox"/> ITS-5	ITS Conduit Trench Detail No. 2
<input type="checkbox"/> ITS-6	ITS Conduit Trench Layout No. 1
<input type="checkbox"/> ITS-7	ITS Conduit Trench Layout No. 2
<input type="checkbox"/> ITS-8	ITS Conduit Trench Layout No. 3
<input type="checkbox"/> ITS-9	ITS Conduit Trench Layout No. 4
<input type="checkbox"/> ITS-10	ITS Conduit Trench Layout No. 5
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<input type="checkbox"/> ITS-21	Communication Cabinet Wiring Diagram
<input type="checkbox"/> ITS-21A	Model 336 Communication Cabinet Wiring Diagram
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<input type="checkbox"/> ITS-22	Hub Foundation Grounding Details
<input type="checkbox"/> ITS-23	Hub Cabinet Foundation Detail
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## RECYCLED WATER STANDARD DRAWINGS

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<input type="checkbox"/> RW-2	Recycled Water Valve and valve Box
<input type="checkbox"/> RW-3	Recycled Water Valve Stem Extension
<input type="checkbox"/> RW-4	1" Service Connection & Meter Box Installation
<input type="checkbox"/> RW-5	1-1/2" & 2" Service Connection & Meter Box Installation
<input type="checkbox"/> RW-6	4" Recycled Water Service
<input type="checkbox"/> RW-7	Temporary 2" Recycled Water Blow-off
<input type="checkbox"/> RW-8	Recycled Water Blow-off Assembly
<input type="checkbox"/> RW-9	Recycled Water 1" or 2" Air Release/Vacuum Breaker Station
<input type="checkbox"/> RW-10	Recycled Water 4" Air Release/Vacuum Breaker Station
<input type="checkbox"/> RW-11	1" or 2" Air Release/Vacuum Breaker Valve Enclosure
<input type="checkbox"/> RW-12	Recycled Water Main Separation Requirements
<input type="checkbox"/> RW-13	Recycled Water Irrigation Information Sign
<input type="checkbox"/> RW-14	Recycled Water Remote Control Irrigation valve Identification
<input type="checkbox"/> RW-15	Recycled Water Backflow Preventer Identification
<input type="checkbox"/> RW-16	Recycled Water Irrigation Box Cover Markings
<input type="checkbox"/> RW-17	Recycled Water Irrigation System Clock Marking
<input type="checkbox"/> RW-18	General Recycled Water Identification Tag
<input type="checkbox"/> RW-19	Recycled Water Landscape Irrigation Head Identification
<input type="checkbox"/> RW-20	Quick Coupling Valve
<input type="checkbox"/> RW-21	Cross Connection Control Test Station
<input type="checkbox"/> RW-22	Temporary Potable Water Supply to On-site Recycled Water System
<input type="checkbox"/> RW-23	Temporary Potable Water Supply to Recycled Water System

**LEGEND**

- S - SANITARY SEWER
- SD - STORM SEWER
- W - WATER MAIN
- RW - RECYCLED WATER
- MH - MANHOLE
- $\mathcal{C}$  - CENTERLINE OF PROPOSED STREET
- $\mathcal{P}$  - PROPERTY LINE



**NOTES:**

1. THIS "STANDARD" IS A GUIDE ONLY AND DEVIATIONS WILL BE ACCEPTABLE WHERE CONDITIONS DICTATE.
2. DIMENSIONS SHOWN ARE DESIRABLE, BUT DO NOT GOVERN. THE INTENTION IS TO SHOW THE RELATIVE POSITION OF ALL UTILITIES.

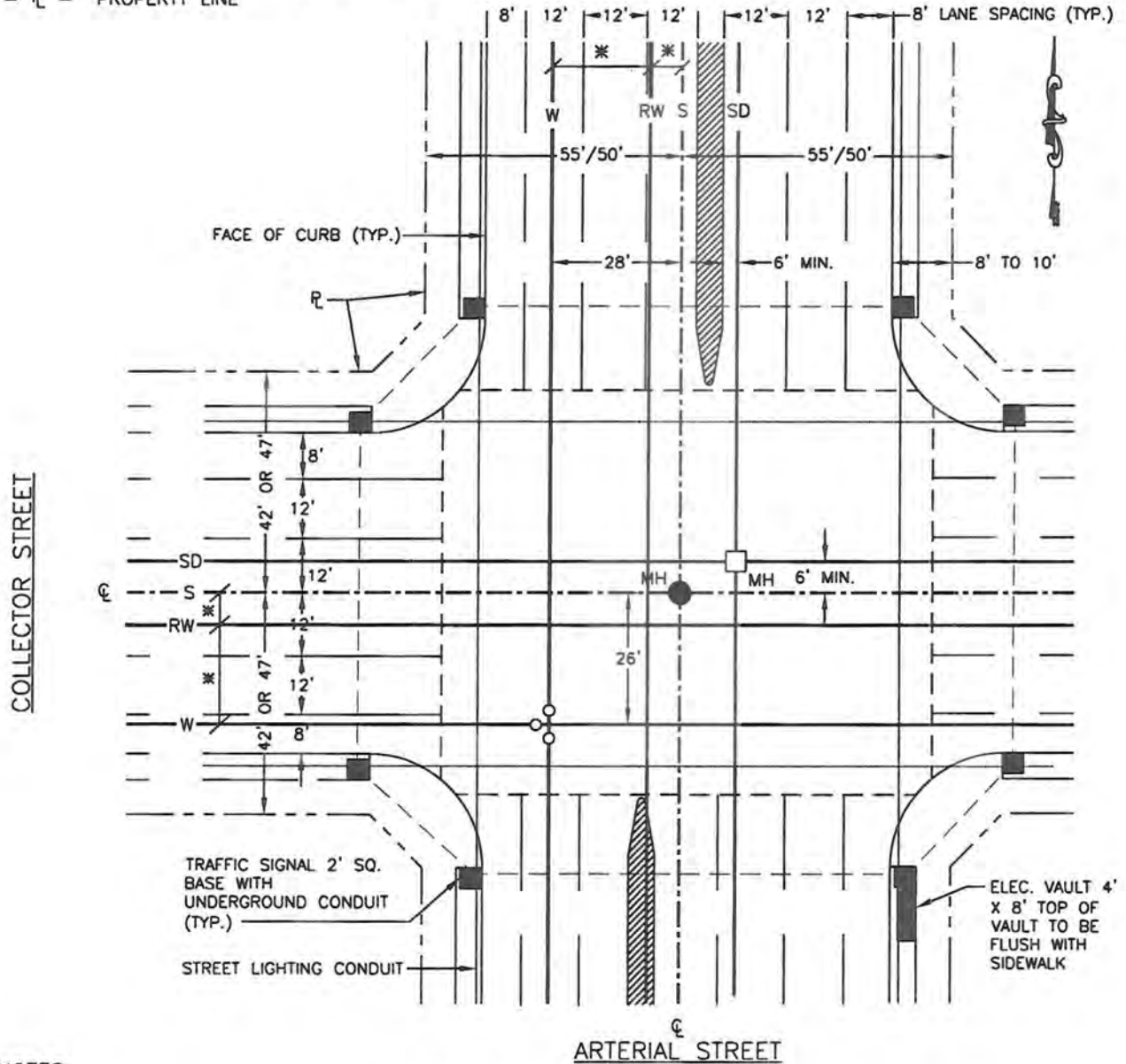
APPROVED BY SUBSTRUCTURE COMMITTEE.

\* SEE RW-12 DRAWING.



**LEGEND**

- S - SANITARY SEWER
- SD - STORM SEWER
- W - WATER MAIN
- RW - RECYCLED WATER
- MH - MANHOLE
- CL - CENTERLINE OF PROPOSED OFFICIAL PLAN LINE OR DIRECTOR'S DETERMINATION
- PL - PROPERTY LINE

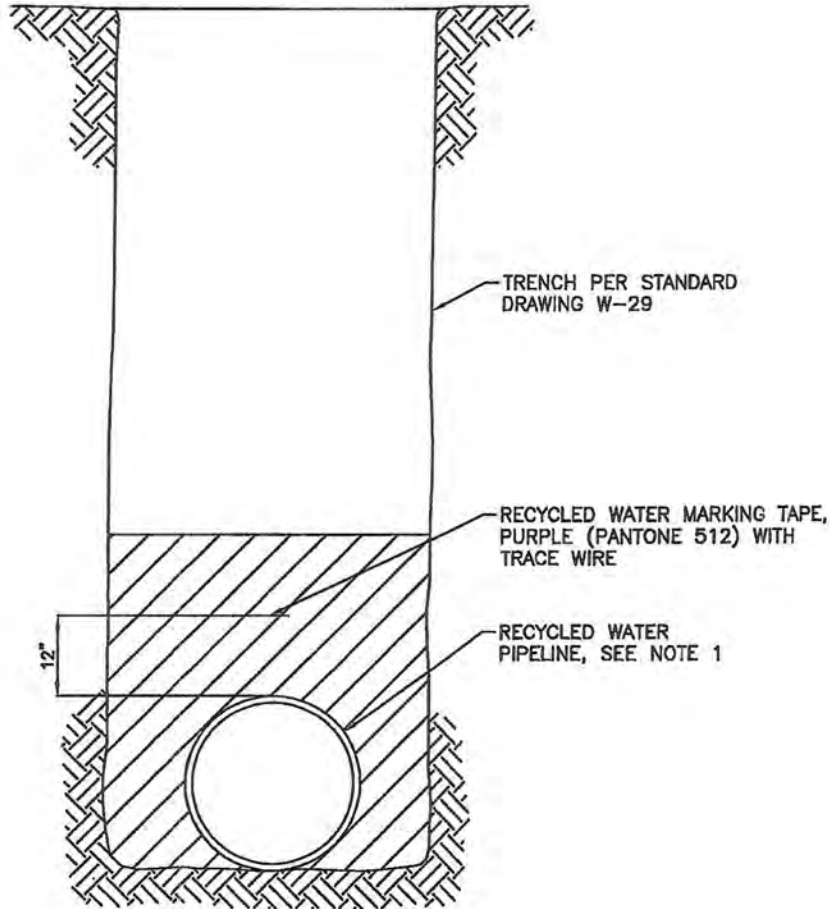


**NOTES:**

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2. DIMENSIONS SHOWN ARE DESIRABLE, BUT DO NOT GOVERN. THE INTENTION IS TO SHOW THE RELATIVE POSITION OF ALL UTILITIES.

APPROVED BY SUBSTRUCTURE COMMITTEE.

\* SEE RW-12 DRAWING.



**NOTE:**

1. RECYCLED WATER PIPELINES SHALL BE COLORED PURPLE (PANTONE 512) AND INTEGRALLY STAMPED "RECYCLED WATER - DO NOT DRINK" ON OPPOSITE SIDES OF THE PIPE. ALTERNATIVELY, NON-PVC RECYCLED WATER PIPELINES MAY BE MARKED WITH LETTERING ON PURPLE MARKING TAPE BEARING THE CONTINUOUS WORDING "RECYCLED WATER-DO NOT DRINK". THE MARKING TAPE SHALL BE A MINIMUM OF SIX INCHES WIDE AND SHALL BE SECURELY ATTACHED DIRECTLY TO THE TOP OF THE PIPELINE EVERY FIVE FEET.

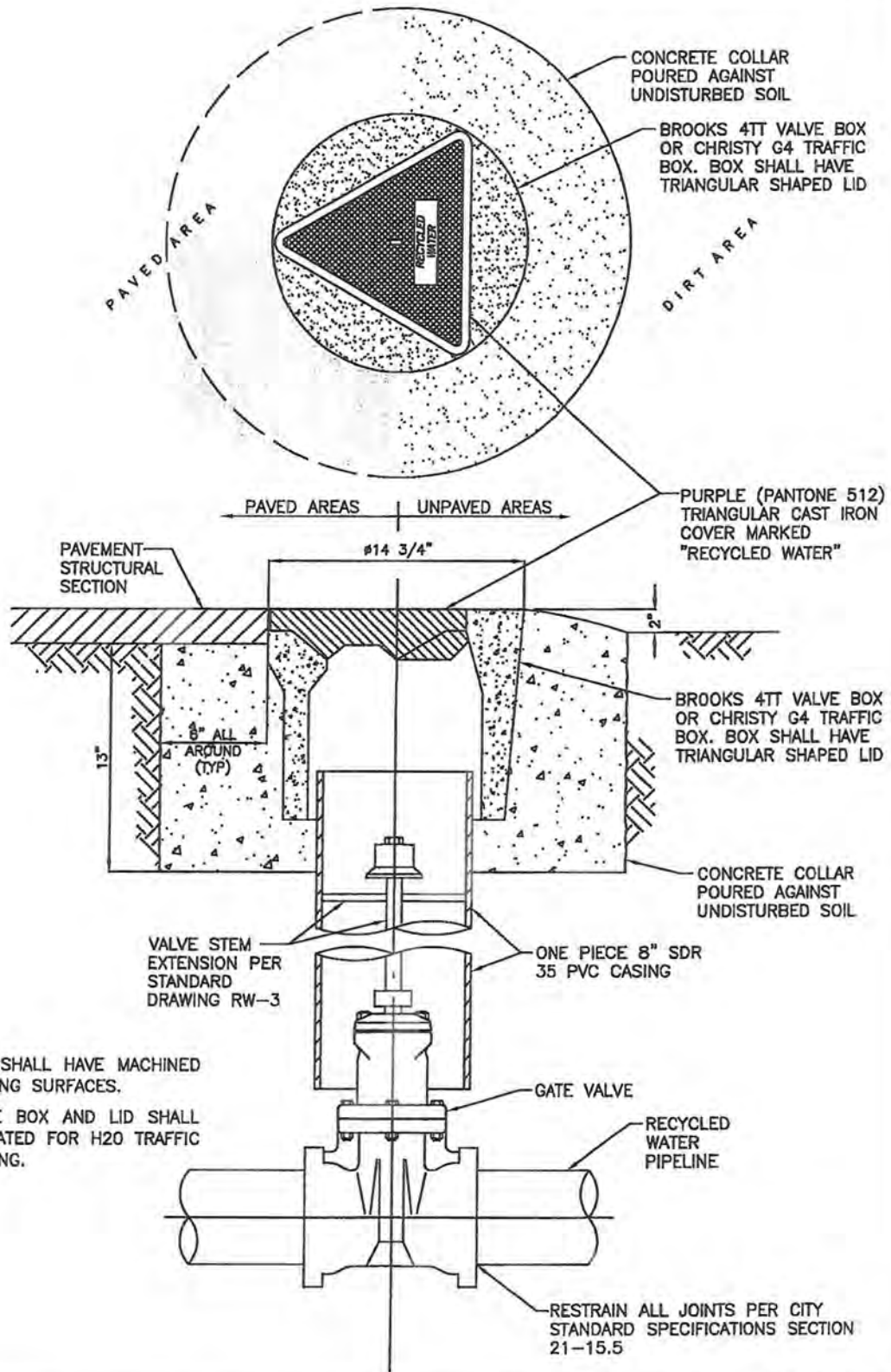
RECYCLED WATER  
MAIN IDENTIFICATION

REF. & REV.  
JUNE 2014

CITY OF FRESNO

RW-1





**NOTES:**

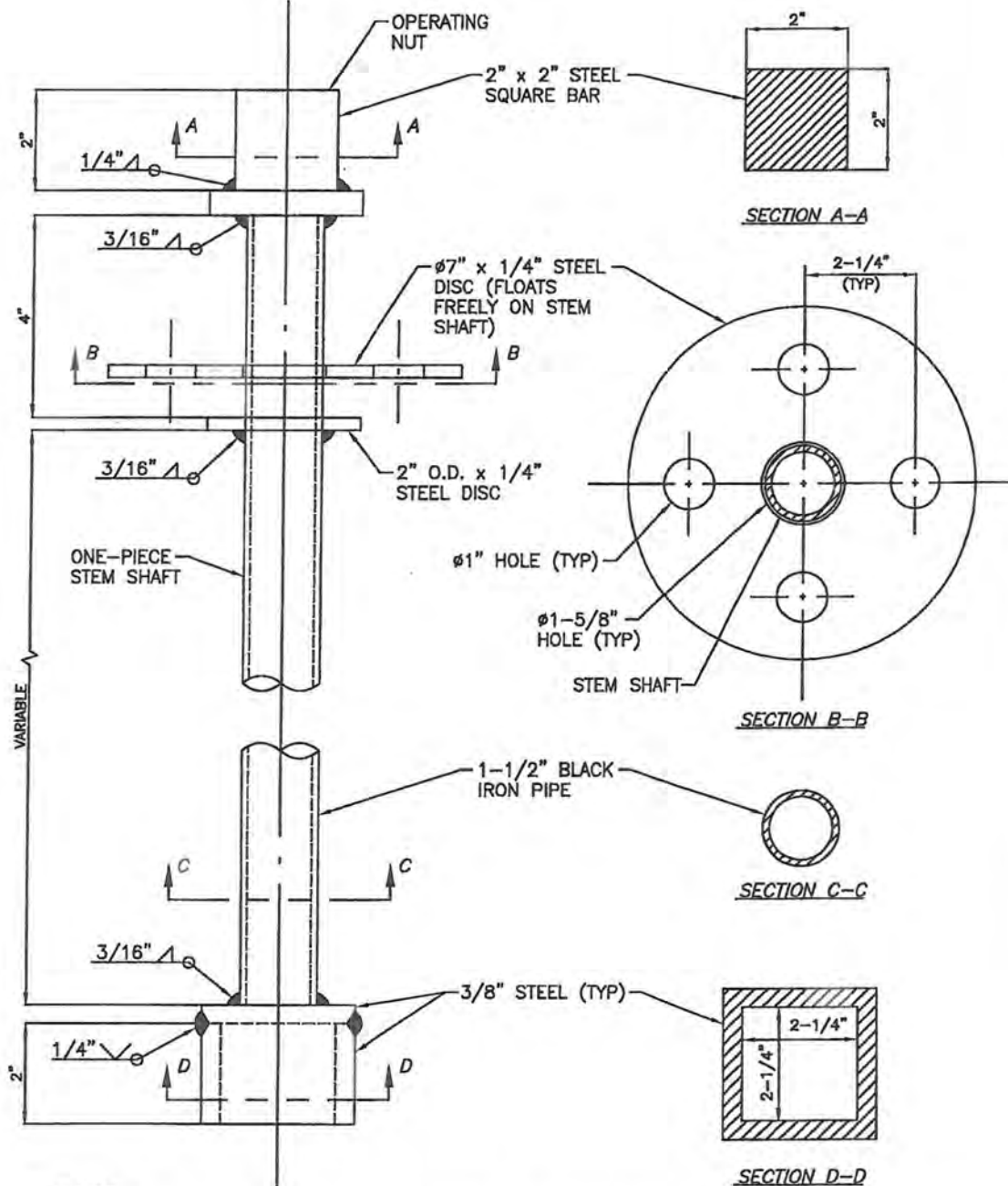
1. LIDS SHALL HAVE MACHINED COATING SURFACES.
2. VALVE BOX AND LID SHALL BE RATED FOR H2O TRAFFIC LOADING.

**RECYCLED WATER  
VALVE AND VALVE BOX**

REF. & REV.  
JUNE 2014

CITY OF FRESNO

**RW-2**



**NOTES:**

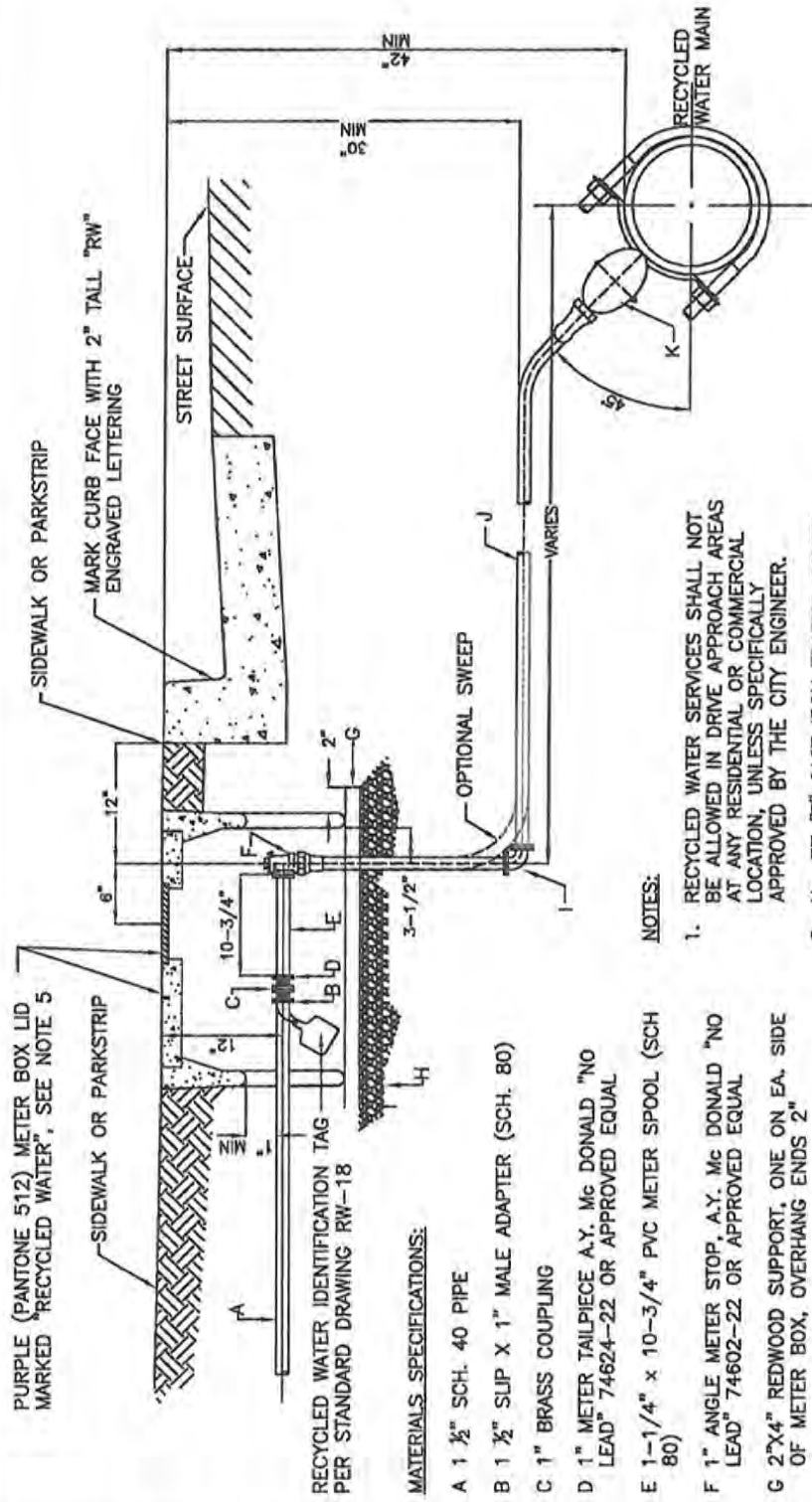
1. EXTENSION STEM SHAFT SHALL BE ROUND OR SQUARE STEEL TUBING OF ONE-PIECE DESIGN (NO PINNED CONNECTIONS OR COUPLINGS PERMITTED).
2. VALVES DEEPER THAN 5' REQUIRE A VALVE STEM EXTENSION.
3. EXTENSION STEMS SHALL NOT BE ATTACHED/BOLTED TO OPERATING NUT OF THE VALVE.
4. VALVE STEM EXTENSION SHALL BE HOT DIP GALVANIZED AFTER FABRICATION IS COMPLETE.

**RECYCLED WATER VALVE  
STEM EXTENSION**

REF. & REV.  
JUNE 2014

CITY OF FRESNO

**RW-3**



PURPLE (PANTONE 512) METER BOX LID MARKED "RECYCLED WATER", SEE NOTE 5

SIDEWALK OR PARKSTRIP

MARK CURB FACE WITH 2" TALL "RW" ENGRAVED LETTERING

STREET SURFACE

OPTIONAL SWEEP

VARIES

RECYCLED WATER MAIN

RECYCLED WATER IDENTIFICATION TAG PER STANDARD DRAWING RW-18

MATERIALS SPECIFICATIONS:

A 1 1/2" SCH. 40 PIPE

B 1 1/2" SLIP X 1" MALE ADAPTER (SCH. 80)

C 1" BRASS COUPLING

D 1" METER TAILPIECE A.Y. Mc DONALD "NO LEAD" 74624-22 OR APPROVED EQUAL

E 1-1/4" x 10-3/4" PVC METER SPOOL (SCH 80)

F 1" ANGLE METER STOP, A.Y. Mc DONALD "NO LEAD" 74602-22 OR APPROVED EQUAL

G 2"x4" REDWOOD SUPPORT, ONE ON EA. SIDE OF METER BOX, OVERHANG ENDS 2"

H 6" THICK 3/4" CRUSHED ROCK WHEN BOX IS PLACED IN ALLEYS WITH TRASH PICK UP ONLY. ALL BOXES IN ALLEYS SHALL BE PLACED PARALLEL TO ALLEY

I COMP X COMP 90° ELL, A.Y. Mc DONALD "NO LEAD" 74761-22 OR APPROVED EQUAL

J TYPE "K" SOFT DRAWN COPPER TUBING CONTINUOUSLY WRAPPED IN PURPLE MARKING TAPE OR PURPLE (PANTONE 512) POLYETHYLENE CTS SDR-9 PE 3408. USE COMPRESSION JOINTS WITH STAILESS STEEL INSERT

K 1" CORPORATION STOP A.Y. Mc DONALD "NO LEAD" 74701-22 OR APPROVED EQUAL

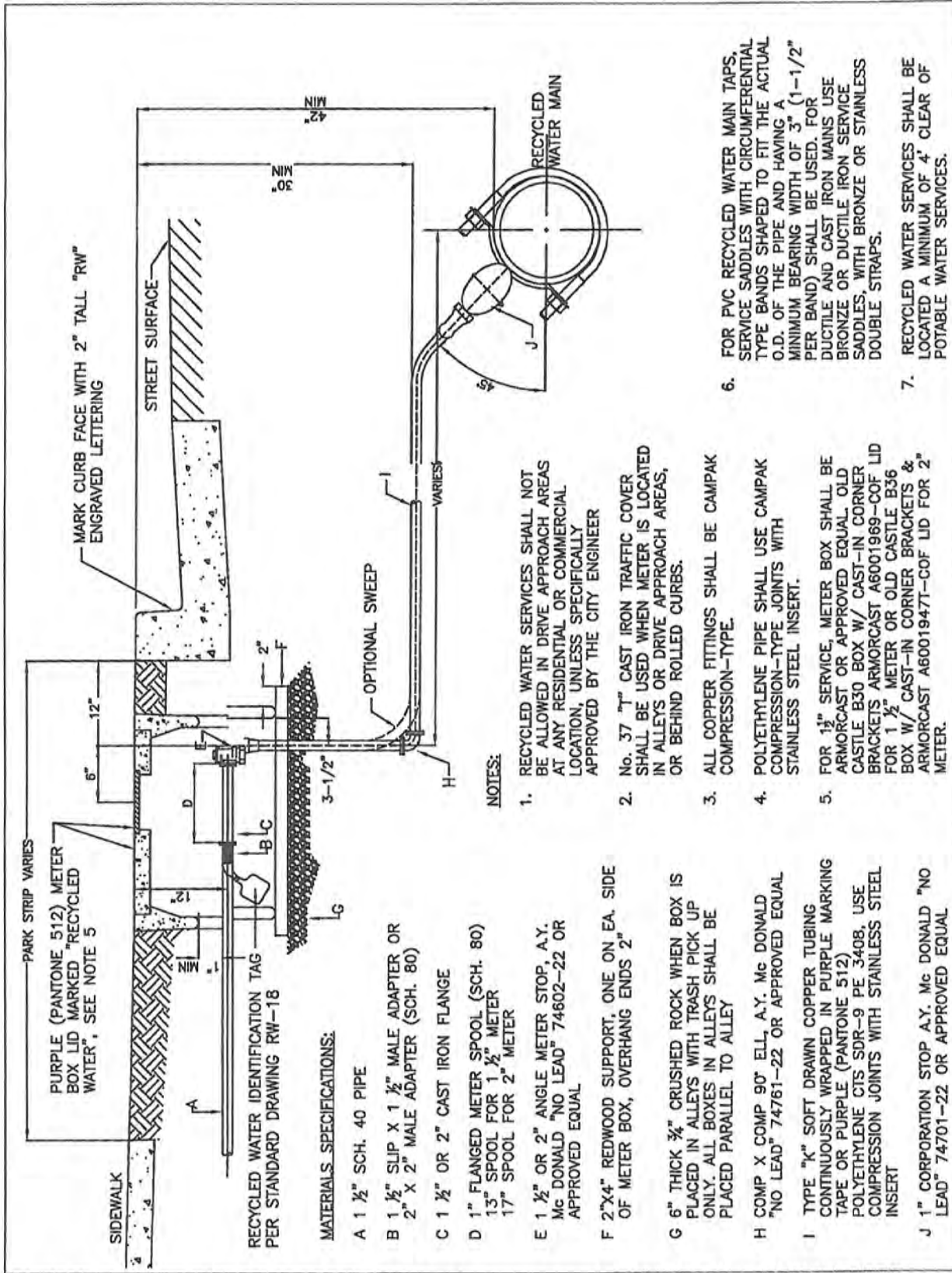
NOTES:

- RECYCLED WATER SERVICES SHALL NOT BE ALLOWED IN DRIVE APPROACH AREAS AT ANY RESIDENTIAL OR COMMERCIAL LOCATION, UNLESS SPECIFICALLY APPROVED BY THE CITY ENGINEER.
- No. 37 "T" CAST IRON TRAFFIC COVER SHALL BE USED WHEN METER IS LOCATED IN ALLEYS OR DRIVE APPROACH AREAS, OR BEHIND ROLLED CURBS.
- ALL COPPER FITTINGS SHALL BE CAMPKAK COMPRESSION-TYPE.
- FOR PVC RECYCLED WATER MAIN TAPS, SERVICE SADDLES WITH CIRCUMFERENTIAL TYPE BANDS SHAPED TO FIT THE ACTUAL O.D. OF THE PIPE AND HAVING A MINIMUM BEARING WIDTH OF 3" (1-1/2" PER BAND) SHALL BE USED. FOR DUCTILE AND CAST IRON MAINS USE BRONZE OR DUCTILE IRON SERVICE SADDLES, WITH BRONZE OR STAINLESS DOUBLE STRAPS.
- METER BOX SHALL BE OLD CASTLE B16 OR N16 BOX WITH CAST-IN CORNER BRACKETS. USE ARMORCAST A6000489T-COF LID
- RECYCLED WATER SERVICES SHALL BE LOCATED A MINIMUM OF 4' CLEAR OF POTABLE WATER SERVICES.

1" SERVICE CONNECTION & METER BOX INSTALLATION

REF. & REV. JUNE 2014

CITY OF FRESNO RW-4



**NOTES:**

- RECYCLED WATER SERVICES SHALL NOT BE ALLOWED IN DRIVE APPROACH AREAS AT ANY RESIDENTIAL OR COMMERCIAL LOCATION, UNLESS SPECIFICALLY APPROVED BY THE CITY ENGINEER
- No. 37 "T" CAST IRON TRAFFIC COVER SHALL BE USED WHEN METER IS LOCATED IN ALLEYS OR DRIVE APPROACH AREAS, OR BEHIND ROLLED CURBS.
- ALL COPPER FITTINGS SHALL BE CAMPAK COMPRESSION-TYPE.
- POLYETHYLENE PIPE SHALL USE CAMPAK COMPRESSION-TYPE JOINTS WITH STAINLESS STEEL INSERT.
- FOR 1 1/2" SERVICE, METER BOX SHALL BE ARMORCAST OR APPROVED EQUAL. OLD CASTLE B30 BOX W/ CAST-IN CORNER BRACKETS ARMORCAST A6001969-COF LID FOR 1 1/2" METER OR OLD CASTLE B36 BOX W/ CAST-IN CORNER BRACKETS & ARMORCAST A60019471-COF LID FOR 2" METER.
- FOR PVC RECYCLED WATER MAIN TAPS, SERVICE SADDLES WITH CIRCUMFERENTIAL TYPE BANDS SHAPED TO FIT THE ACTUAL O.D. OF THE PIPE AND HAVING A MINIMUM BEARING WIDTH OF 3" (1-1/2" PER BAND) SHALL BE USED. FOR DUCTILE AND CAST IRON MAINS USE BRONZE OR DUCTILE IRON SERVICE SADDLES WITH BRONZE OR STAINLESS DOUBLE STRAPS.
- RECYCLED WATER SERVICES SHALL BE LOCATED A MINIMUM OF 4' CLEAR OF POTABLE WATER SERVICES.

**MATERIALS SPECIFICATIONS:**

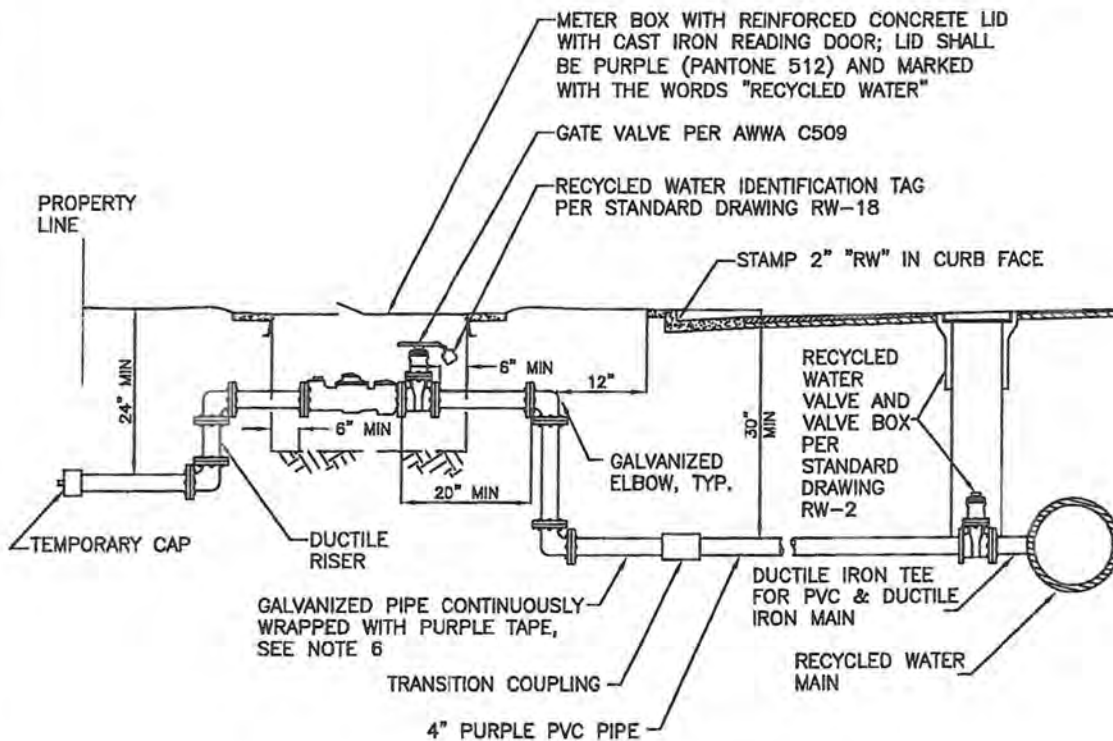
- A 1 1/2" SCH. 40 PIPE
- B 1 1/2" SLIP X 1 1/2" MALE ADAPTER OR 2" X 2" MALE ADAPTER (SCH. 80)
- C 1 1/2" OR 2" CAST IRON FLANGE
- D 1" FLANGED METER SPOOL (SCH. 80) 13" SPOOL FOR 1 1/2" METER 17" SPOOL FOR 2" METER
- E 1 1/2" OR 2" ANGLE METER STOP, A.Y. Mc DONALD "NO LEAD" 74602-22 OR APPROVED EQUAL
- F 2"x4" REDWOOD SUPPORT, ONE ON EA. SIDE OF METER BOX, OVERHANG ENDS 2"
- G 6" THICK 3/4" CRUSHED ROCK WHEN BOX IS PLACED IN ALLEYS WITH TRASH PICK UP ONLY. ALL BOXES IN ALLEYS SHALL BE PLACED PARALLEL TO ALLEY
- H COMP X COMP 90° ELL, A.Y. Mc DONALD "NO LEAD" 74761-22 OR APPROVED EQUAL
- I TYPE "K" SOFT DRAWN COPPER TUBING CONTINUOUSLY WRAPPED IN PURPLE MARKING TAPE OR PURPLE (PANTONE 512) POLYETHYLENE CTS. SDR-9 PE 3/4" O.D. USE COMPRESSION JOINTS WITH STAINLESS STEEL INSERT
- J 1" CORPORATION STOP A.Y. Mc DONALD "NO LEAD" 74701-22 OR APPROVED EQUAL

**1-1/2" & 2" SERVICE CONNECTION & METER BOX INSTALLATION**

REF. & REV. JUNE 2014

CITY OF FRESNO  
**RW-5**





**NOTES:**

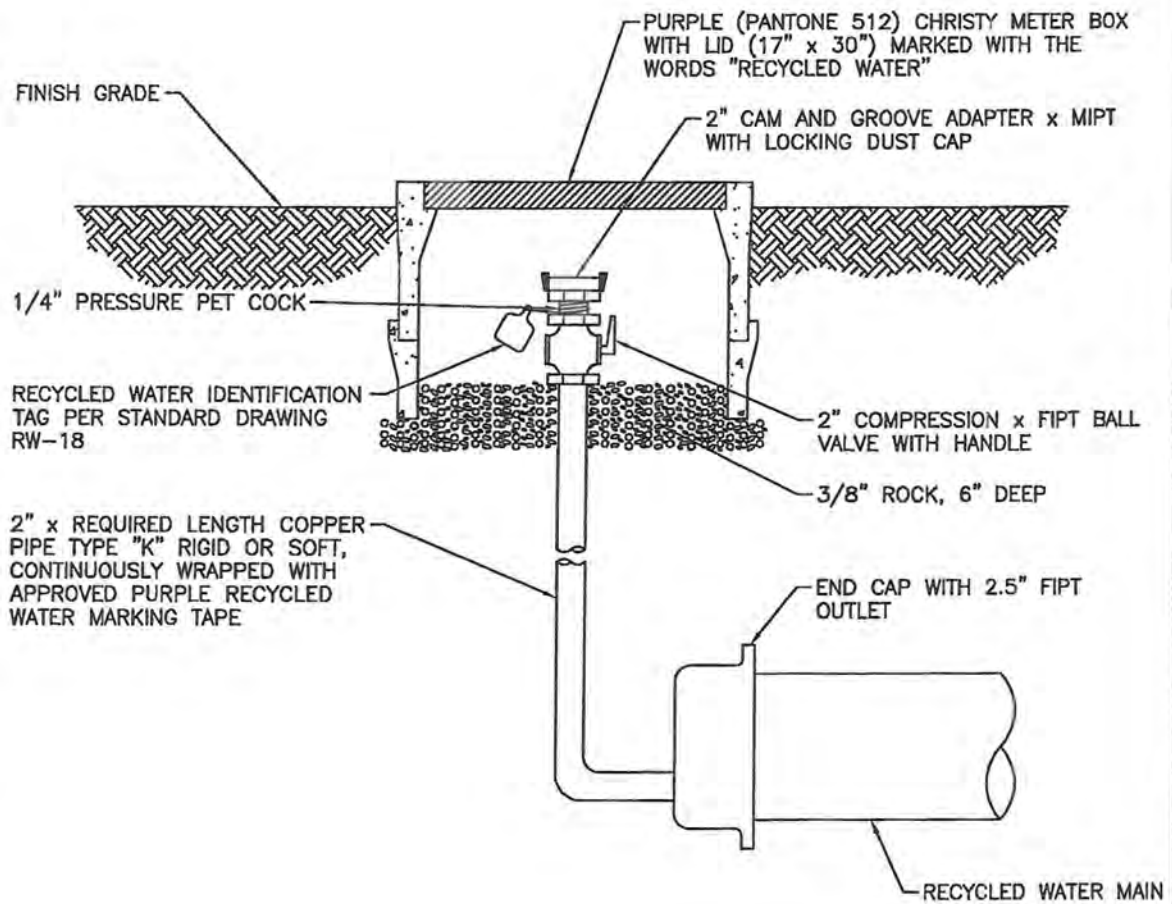
1. RECYCLED WATER SERVICE AND METER BOX INSTALLATION SHALL BE INSPECTED AND APPROVED BY CITY PRIOR TO SIDEWALK INSTALLATION.
2. RECYCLED WATER SERVICES SHALL BE LOCATED A MINIMUM OF 4' CLEAR OF POTABLE WATER SERVICES.
3. ALL MATERIALS SHALL BE AS NOTED OR CITY-APPROVED EQUAL.
4. ALL METER BOXES IN DIRT OR LANDSCAPE AREAS SHALL BE SET IN A CONCRETE SLAB MEASURING AT LEAST 1' BEYOND METER BOX ON ALL SIDES.
5. METER BOXES SHALL BE CLEARED OF ALL OTHER FACILITIES.
6. ALL GALVANIZED PIPE AND FITTINGS SHALL BE CONTINUOUSLY WRAPPED WITH APPROVED PURPLE RECYCLED WATER MARKING TAPE.
7. RESTRAIN ALL JOINTS PER CITY STANDARD SPECIFICATIONS SECTION 21-15.5
8. RECYCLED WATER SERVICES SHALL NOT BE ALLOWED IN DRIVEWAY APPROACH AREAS AT ANY RESIDENTIAL OR COMMERCIAL LOCATION.

4" RECYCLED WATER SERVICE

REF. & REV.  
JUNE 2014

CITY OF FRESNO

RW-6



**NOTES:**

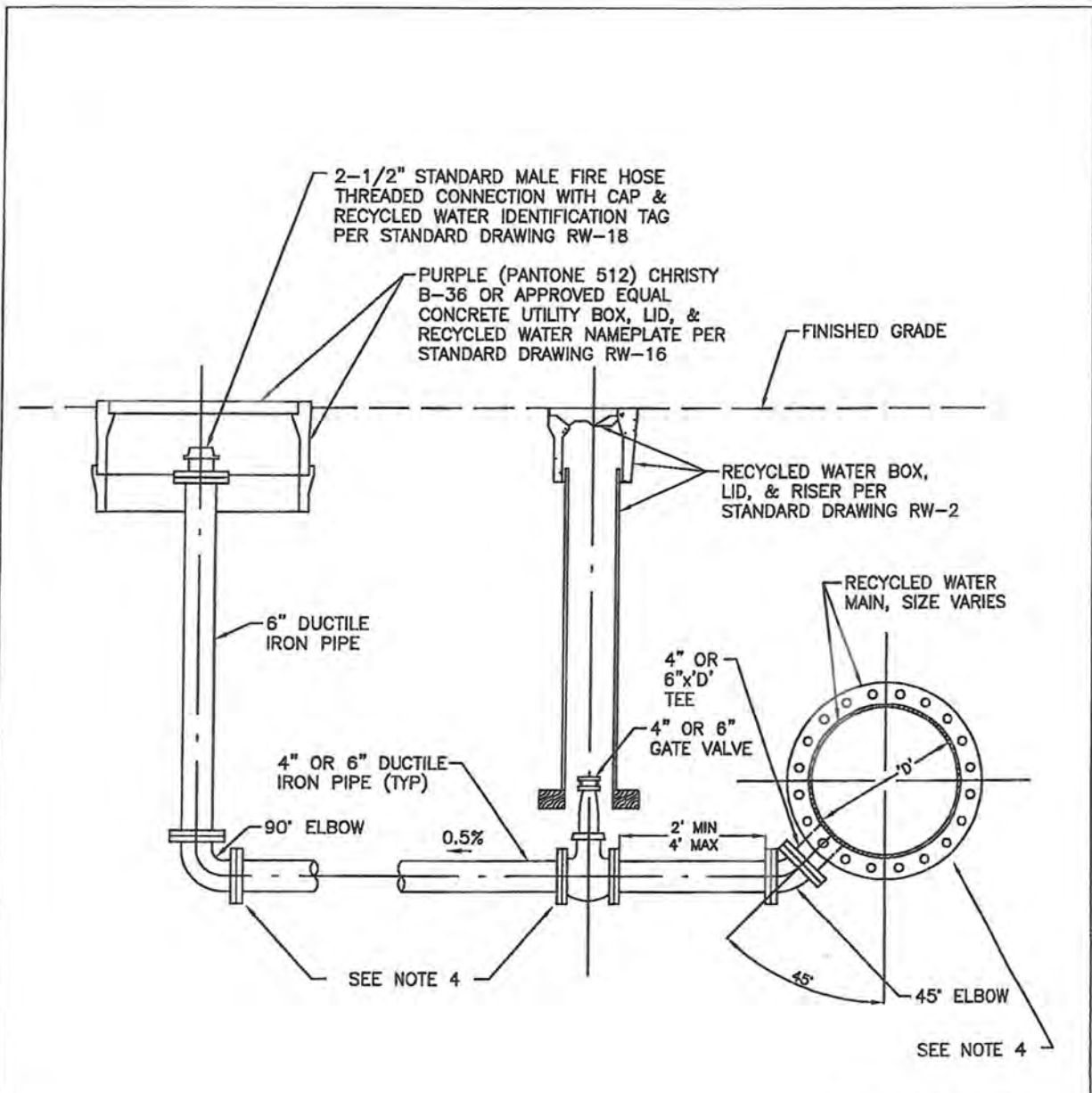
1. SET TOP OF METER BOX 2" ABOVE FINISH GRADE.
2. THE CONSTRUCTION OF A TEMPORARY BLOW-OFF FOR THE USE OF TESTING AND FLUSHING OF NEW RECYCLED WATER MAINS ONLY.
3. RESTRAIN ALL JOINTS PER CITY STANDARD SPECIFICATIONS SECTION 21-15.5

TEMPORARY 2" RECYCLED  
WATER BLOW-OFF

REF. & REV.  
JUNE 2014

CITY OF FRESNO

RW-7

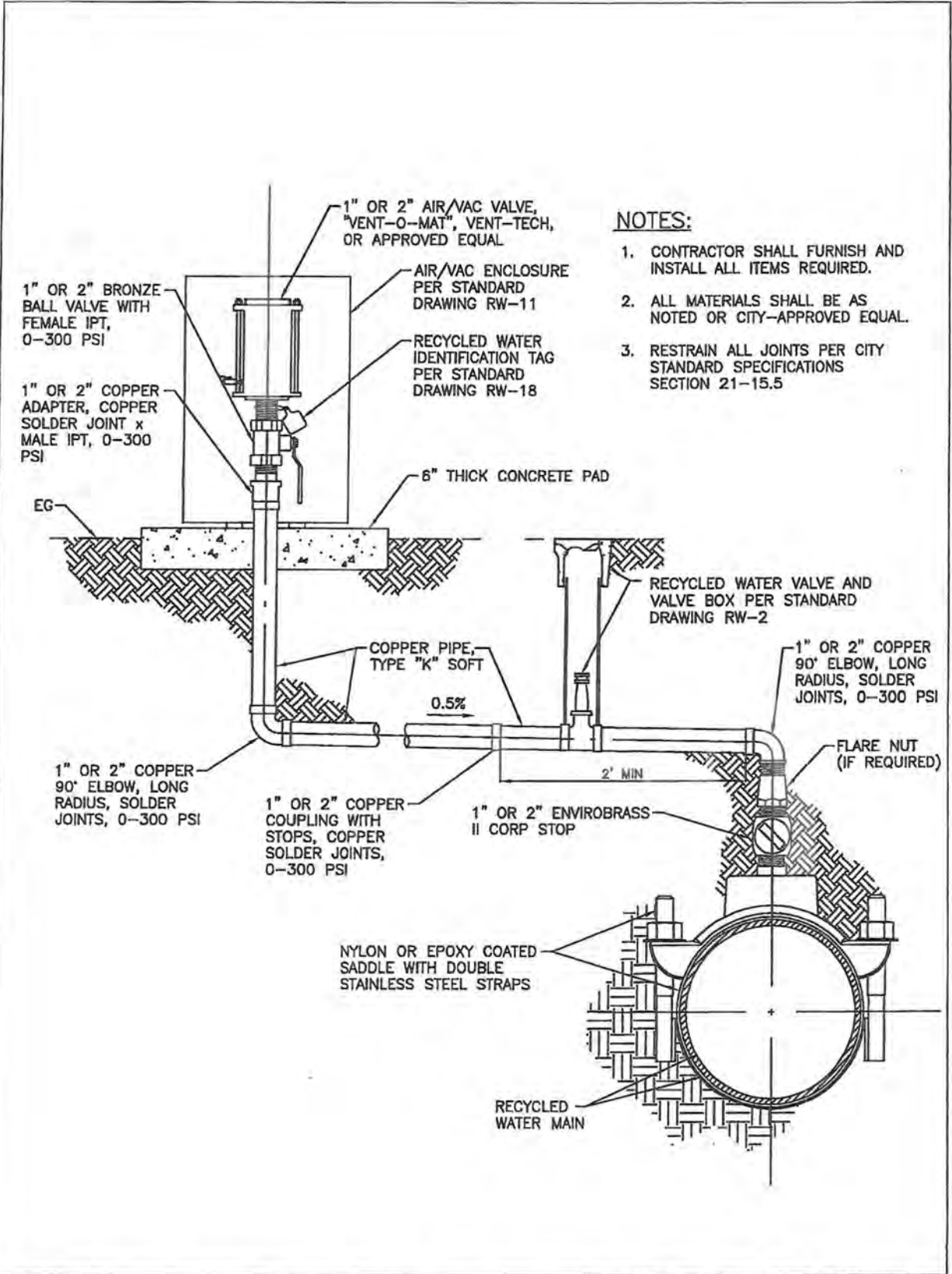


**NOTES:**

1. ALL FITTINGS SHALL BE SECURED WITH FLANGE CONNECTION, HARNESSSES OR TIE-RODS AS APPLICABLE.
2. PLACE VALVES AND BLOW-OFFS OUTSIDE SIDEWALK AND DRIVEWAY AREAS.
3. ALL RISERS SHALL BE FLANGED, 6" DIAMETER.
4. RESTRAIN ALL JOINTS PER CITY STANDARD SPECIFICATIONS SECTION 21-15.5

BLOW-OFF PIPE SIZE SCHEDULE	
MAIN	BLOW-OFF
6"	4"
8"	4"
10"	4"
12"	6"
14"	6"
16"	6"
18"	6"
24"	6"
30"	6"





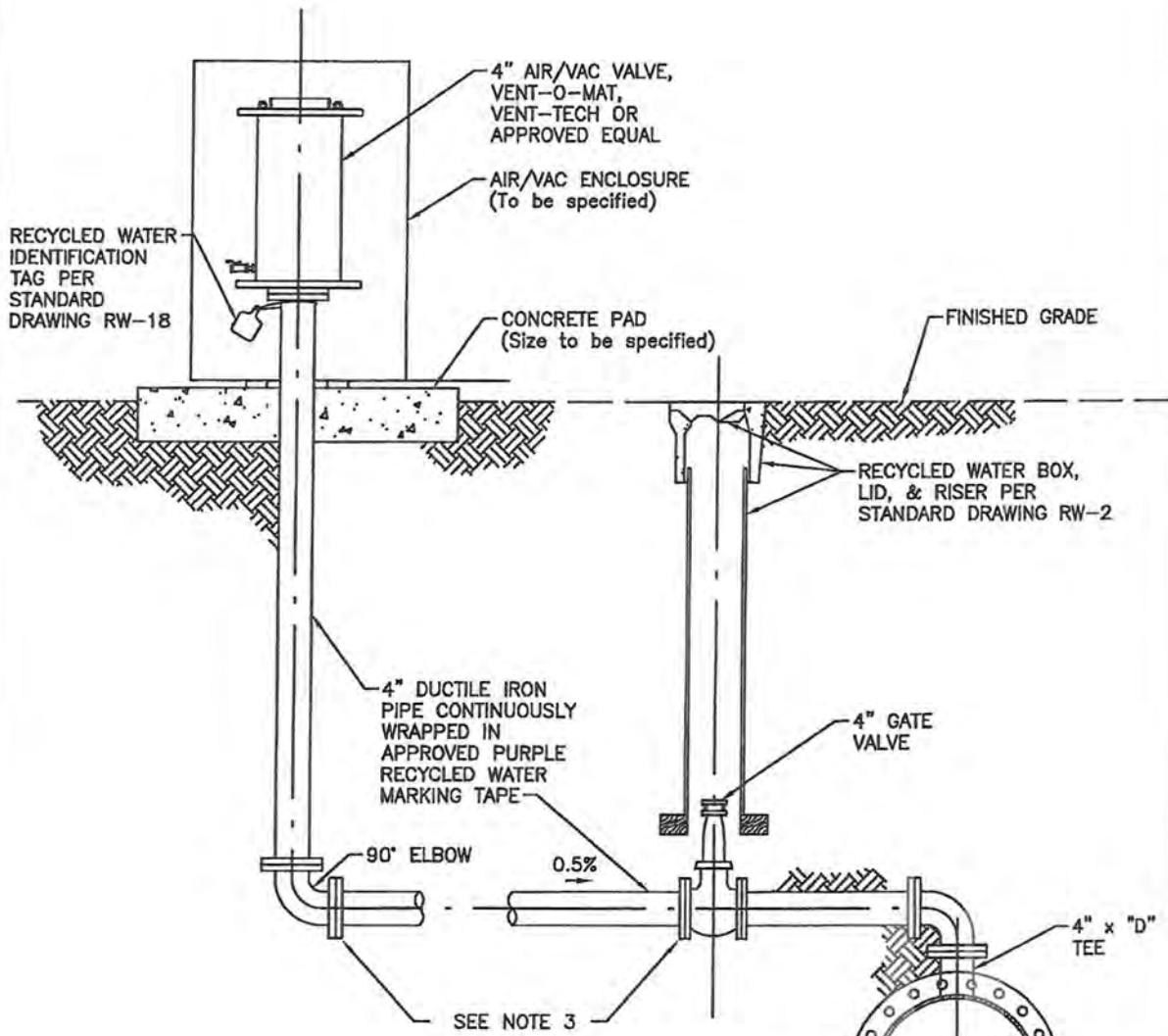
**NOTES:**

1. CONTRACTOR SHALL FURNISH AND INSTALL ALL ITEMS REQUIRED.
2. ALL MATERIALS SHALL BE AS NOTED OR CITY-APPROVED EQUAL.
3. RESTRAIN ALL JOINTS PER CITY STANDARD SPECIFICATIONS SECTION 21-15.5

**RECYCLED WATER 1" OR 2" AIR  
RELEASE/VACUUM BREAKER STATION**

REF. & REV.  
JUNE 2014

CITY OF FRESNO  
**RW-9**



**NOTES:**

1. CONTRACTOR SHALL FURNISH AND INSTALL ALL ITEMS REQUIRED.
2. ALL MATERIALS SHALL BE AS NOTED OR CITY-APPROVED EQUAL.
3. RESTRAIN ALL JOINTS PER CITY STANDARD SPECIFICATIONS SECTION 21-15.5

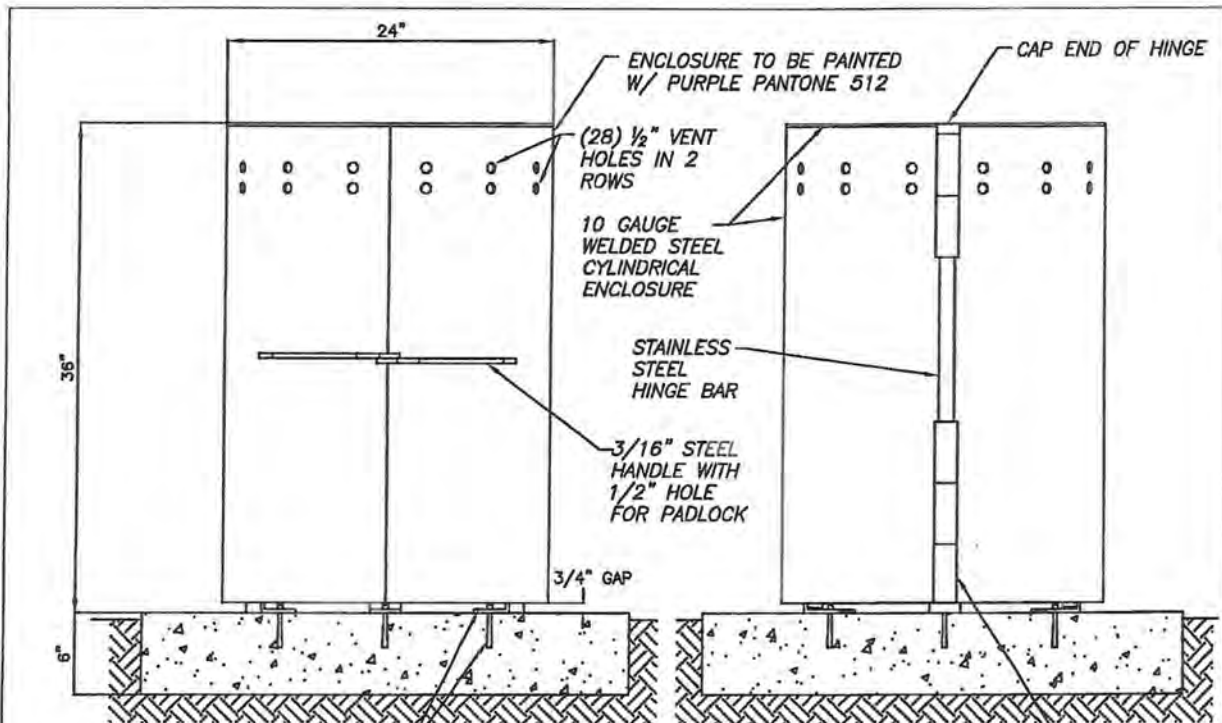
RECYCLED WATER MAIN, SIZE VARIES

SEE NOTE 3

**RECYCLED WATER 4" AIR RELEASE/  
VACUUM BREAKER STATION**

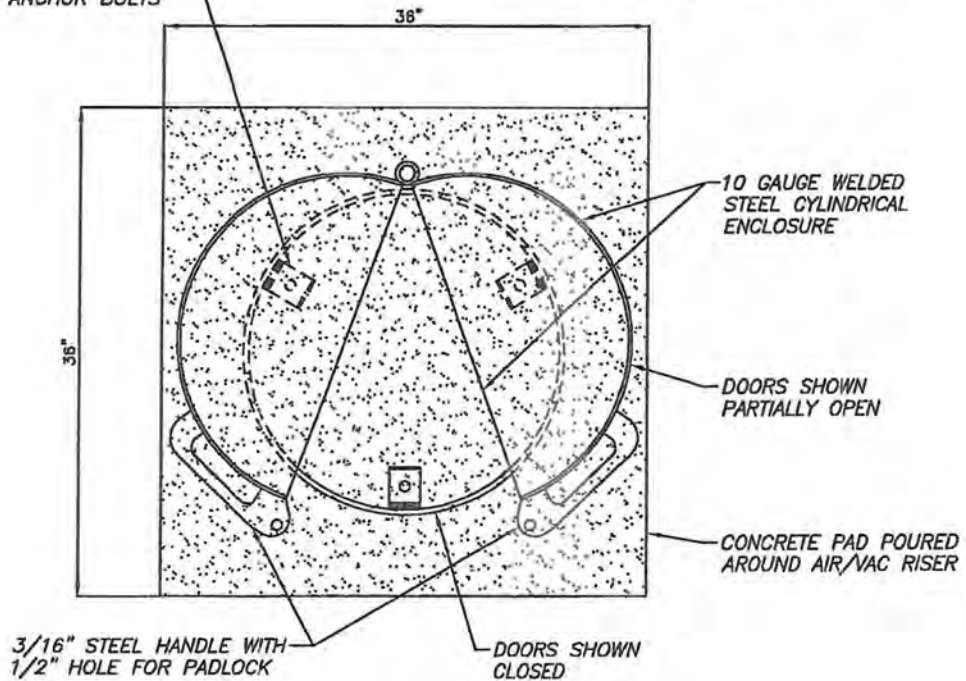
REF. & REV.  
JUNE 2014

CITY OF FRESNO  
**RW-10**



2"x2"x1/4"x2" LONG STAINLESS STEEL ANGLE IRON MOUNTING BRACKETS AND 3"x3/8" STAINLESS STEEL ANCHOR BOLTS (3 REQ'D)

STAINLESS STEEL SLEEVE WELDED TO STIFFENING RING AND TO HINGE BAR

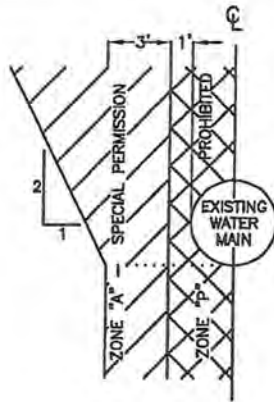


1" OR 2" AIR RELEASE/ VACUUM BREAKER VALVE ENCLOSURE

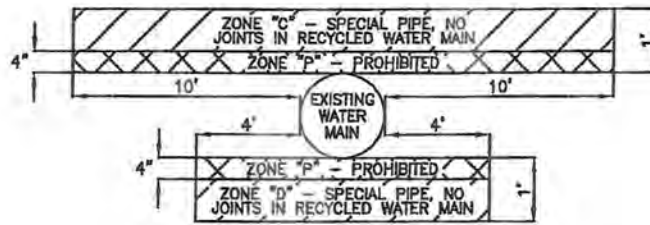
REF. & REV.  
JUNE 2014

CITY OF FRESNO

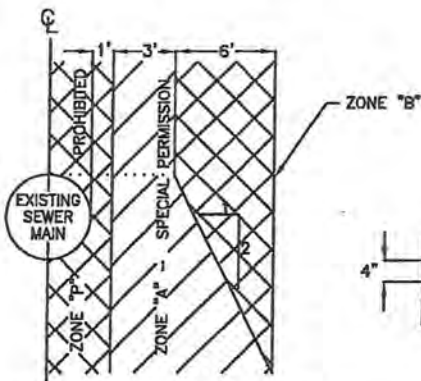
RW-11



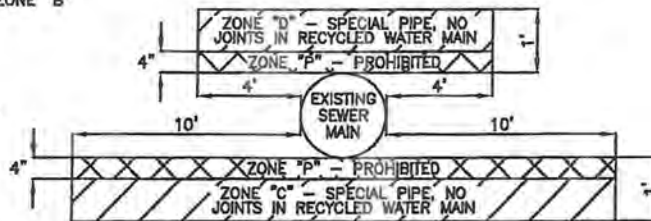
RECYCLED WATER MAIN PARALLEL TO POTABLE WATER MAINS



RECYCLED WATER MAIN CROSSING POTABLE WATER MAINS



RECYCLED WATER MAIN PARALLEL TO SEWER MAINS



RECYCLED WATER MAIN CROSSING SEWER MAINS

**SPECIAL CONSTRUCTION REQUIRED FOR RECYCLED WATER**

**ZONE:**

"A" NO RECYCLED WATER LINES PARALLEL TO WATER MAINS SHALL BE PERMITTED IN THIS ZONE WITHOUT PRIOR WRITTEN APPROVAL FROM COUNTY, CALIFORNIA DEPARTMENT OF PUBLIC HEALTH AND THE CITY.

"B" RECYCLED WATER MAIN SHALL BE CONSTRUCTED OF:  
 1. DUCTILE IRON PIPE WITH HOT DIP BITUMINOUS COATING.  
 2. DIPPED AND WRAPPED 1/4" THICK WELDED STEEL PIPE.  
 3. CLASS 305 PRESSURE RATED PLASTIC WATER PIPE (DR 14 PER AWWA C900) OR EQUIVALENT.  
 4. REINFORCED CONCRETE PRESSURE PIPE, STEEL CYLINDER TYPE, PER AWWA (C300 OR C302 OR C303).

"C" A RECYCLED WATER MAIN SHALL BE CONSTRUCTED OF:  
 1. DUCTILE IRON PIPE WITH HOT DIP BITUMINOUS COATING.  
 2. DIPPED AND WRAPPED 1/4" THICK WELDED STEEL PIPE.  
 3. CLASS 305 PRESSURE RATED PLASTIC WATER PIPE (DR 14 PER AWWA C900) OR EQUIVALENT.  
 4. REINFORCED CONCRETE PRESSURE PIPE, STEEL CYLINDER TYPE PER AWWA (C300 OR C302 OR C303).

"D" A RECYCLED WATER MAIN SHALL BE CONSTRUCTED OF:  
 1. DUCTILE IRON PIPE WITH HOT DIP BITUMINOUS COATING.  
 2. DIPPED AND WRAPPED 1/4" WELDED STEEL PIPE.  
 3. CLASS 200 PRESSURE RATED PLASTIC WATER PIPE (DR 14 PER AWWA C900) OR EQUIVALENT.  
 4. REINFORCED CONCRETE PRESSURE PIPE STEEL CYLINDER TYPE, PER AWWA (C300 OR C302 OR C303).

"P" NO RECYCLED WATER MAIN SHALL BE CONSTRUCTED

**BASIC SEPARATION STANDARDS**

1. SEPARATION DISTANCE SHALL BE MEASURED FROM THE NEAREST OUTSIDE EDGE OF PIPE.
2. WATER MAINS AND SUPPLY LINES OF 24" DIAMETER OR GREATER MAY CREATE SPECIAL HAZARDS BECAUSE OF THE LARGE VOLUMES OF FLOW. INSTALLATIONS OF WATER MAINS AND SUPPLY LINES 24" DIAMETER OR LARGER MUST BE REVIEWED AND APPROVED BY THE HEALTH AGENCY AND CITY ENGINEER PRIOR TO CONSTRUCTION.

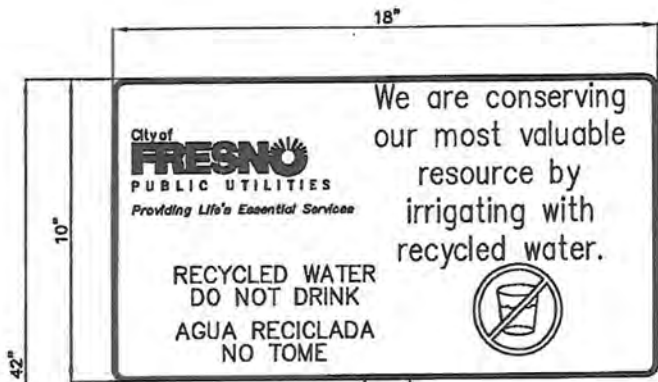
**RECYCLED WATER MAIN SEPARATION REQUIREMENTS**

REF. & REV. JUNE 2014

CITY OF FRESNO

RW-12



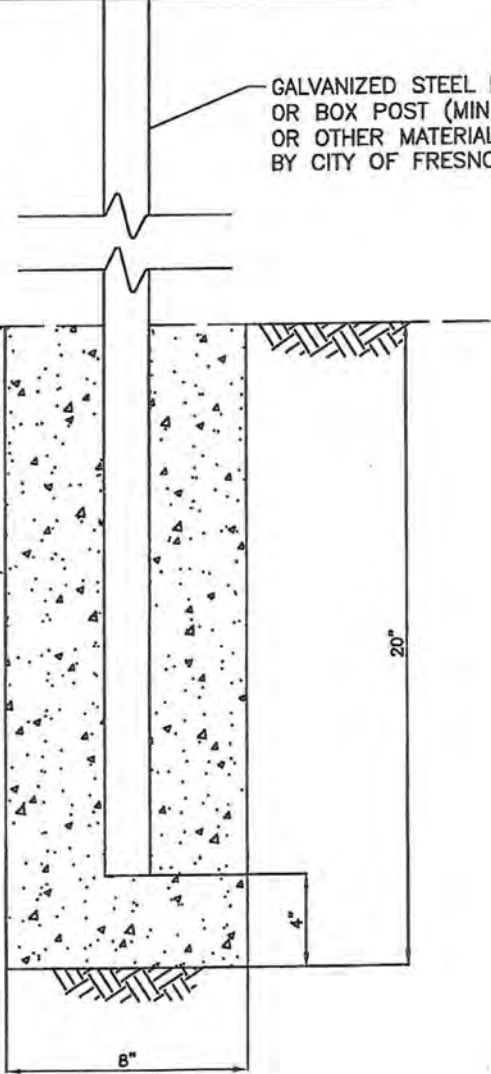


GALVANIZED STEEL POST, U-CHANNEL, OR BOX POST (MIN 1-1/2" WIDE), OR OTHER MATERIALS AS APPROVED BY CITY OF FRESNO

CLASS 3 CONCRETE

**NOTES:**

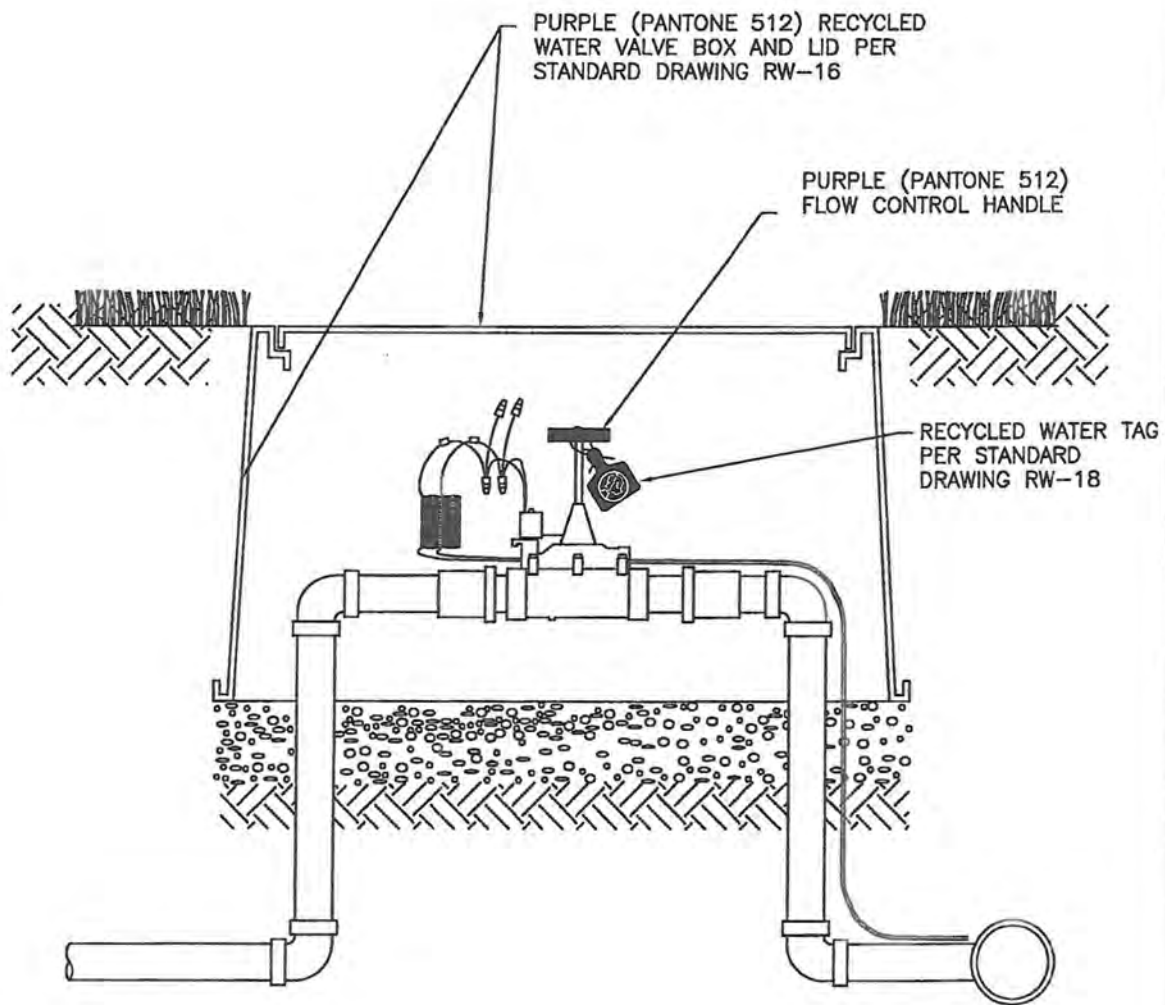
1. ALL AREAS WHERE RECYCLED WATER IS USED THAT ARE ACCESSIBLE TO THE PUBLIC SHALL BE POSTED WITH ONE OR MORE INFORMATION SIGNS IN CONSPICUOUS LOCATIONS THAT ARE VISIBLE TO THE PUBLIC.
2. INFORMATION SIGNS SHALL BE CONSTRUCTED OF 0.032" THICK ALUMINUM AND REINFORCEMENT FRAME WITH A PURPLE BACKGROUND AND WHITE LETTERING.
3. SECURE SIGN TO POST WITH VANDAL PROOF HARDWARE.



**RECYCLED WATER  
IRRIGATION INFORMATION SIGN**

REF. & REV.  
JUNE 2014

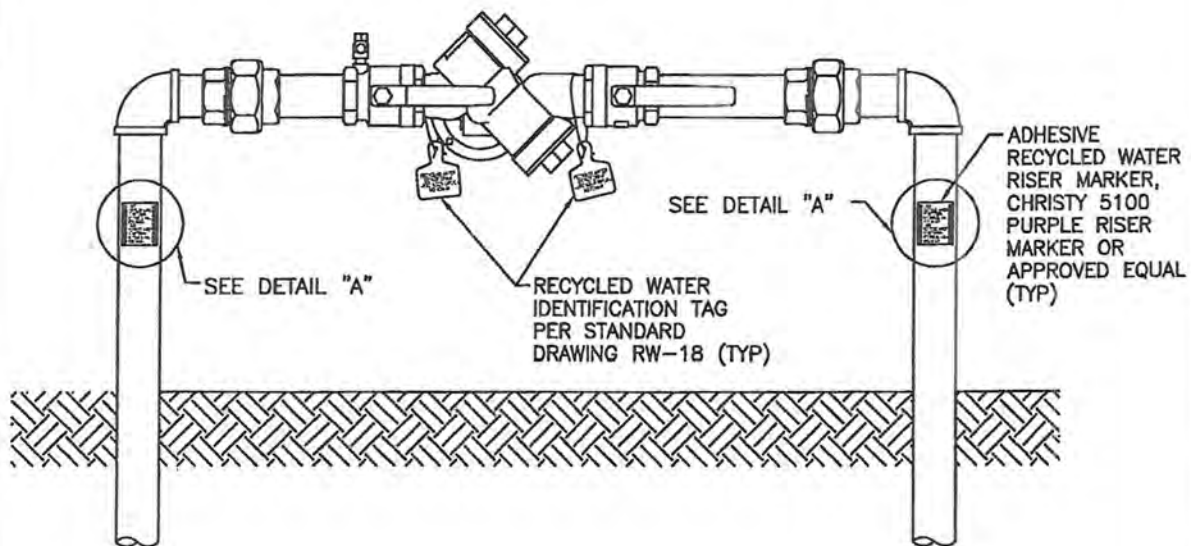
CITY OF FRESNO  
**RW-13**



RECYCLED WATER REMOTE CONTROL  
IRRIGATION VALVE IDENTIFICATION

REF. & REV.  
JUNE 2014

CITY OF FRESNO  
RW-14



DETAIL "A"

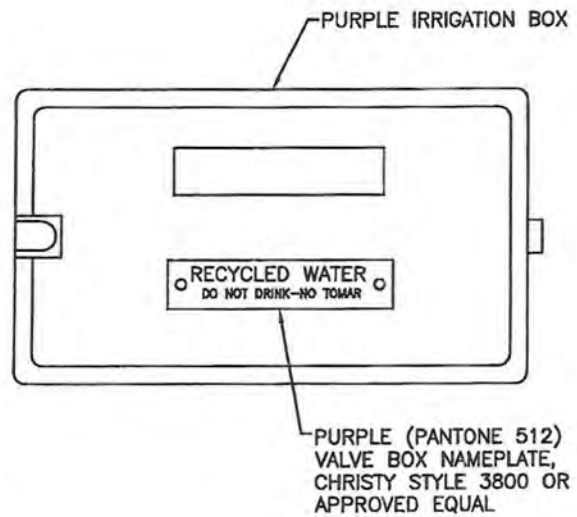
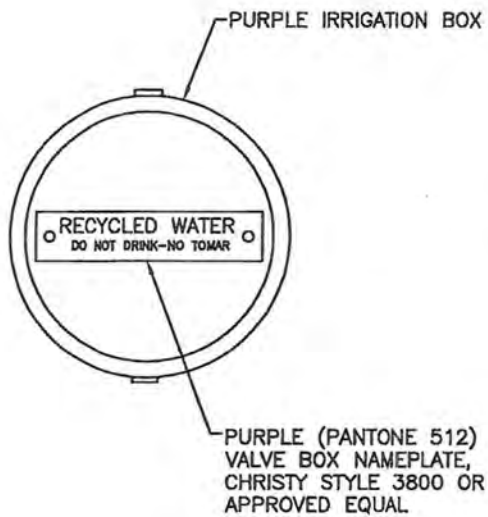
RECYCLED WATER BACKFLOW  
PREVENTER IDENTIFICATION

REF. & REV.  
JUNE 2014

CITY OF FRESNO

RW-15





NOTES:

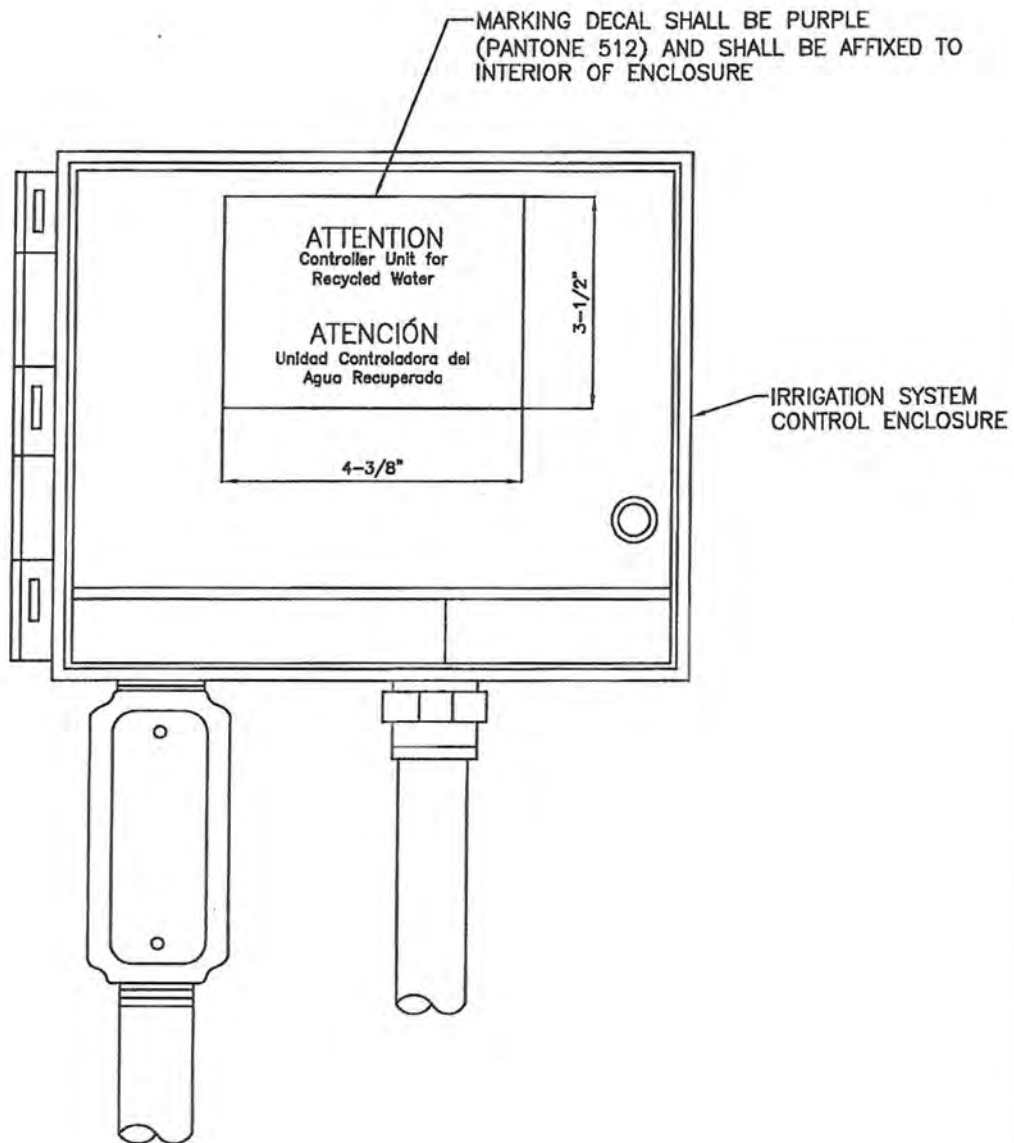
1. ALL RECYCLED WATER IRRIGATION BOXES AND LIDS SHALL BE COLORED PURPLE (PANTONE 512).
2. NAMEPLATE SHALL BE 5.75" LONG AND 1.25" WIDE AND SHALL BE MANUFACTURED IN PURPLE, WITH A UV RESISTANT CO-POLYMER PLASTIC.
3. NAMEPLATE SHALL BE ATTACHED TO VALVE BOX WITH TWO TAMPER-PROOF RIVETS.

RECYCLED WATER IRRIGATION BOX  
COVER MARKINGS

REF. & REV.  
JUNE 2014

CITY OF FRESNO

RW-16



**NOTES:**

1. ALL RECYCLED WATER IRRIGATION CONTROL ENCLOSURES SHALL BE IDENTIFIED WITH A MARKING DECAL.
2. MARKING DECAL SHALL BE BACKED WITH A PERMANENT ACRYLIC ADHESIVE.
3. MARKING DECAL SHALL BE CHRISTY STYLE 4100, OR APPROVED EQUAL.

RECYCLED WATER  
IRRIGATION SYSTEM CLOCK MARKING

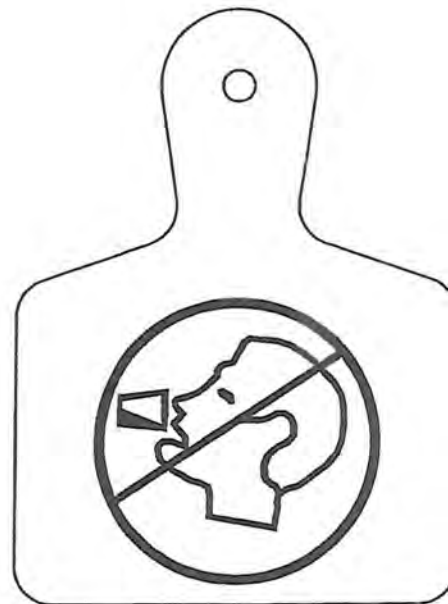
REF. & REV.  
JUNE 2014

CITY OF FRESNO

RW-17



FRONT



BACK

NOTES:

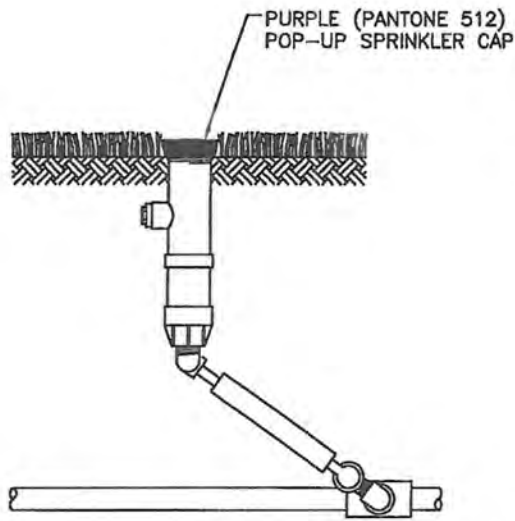
1. IDENTIFICATION TAGS SHALL INCORPORATE AN INTEGRAL ATTACHMENT NECK AND REINFORCED ATTACHMENT HOLE AND SHALL BE CAPABLE OF WITHSTANDING 180 LBS. OF PULL OUT RESISTANCE.
2. ALL LETTERING SHALL BE HOT-STAMPED IN BLACK AND APPROPRIATE FOR OUTDOOR USAGE.
3. IDENTIFICATION TAG COLOR SHALL BE PURPLE.
4. IDENTIFICATION TAG SHALL BE CHRISTY STYLE #007, OR APPROVED EQUAL.
5. IDENTIFICATION TAGS SHALL BE ATTACHED TO GATE VALVES, BALL VALVES, ANGLE STOPS, AND ALL OTHER VALVES IN RECYCLED WATER SERVICE.
6. ATTACH WITH UV RESISTANT ZIP TIES WITH A MINIMUM PULL STRENGTH OF 50 POUNDS.

GENERAL RECYCLED WATER  
IDENTIFICATION TAG

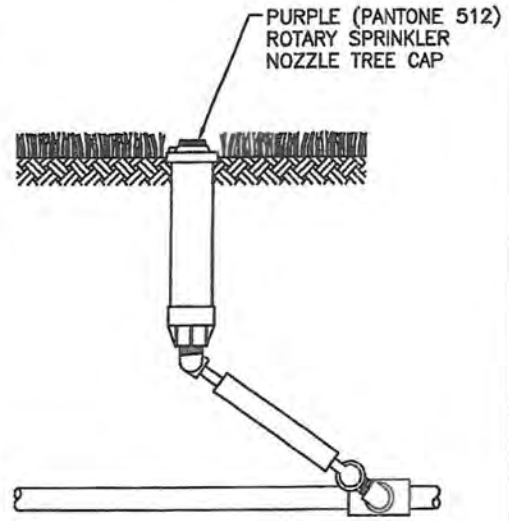
REF. & REV.  
JUNE 2014

CITY OF FRESNO

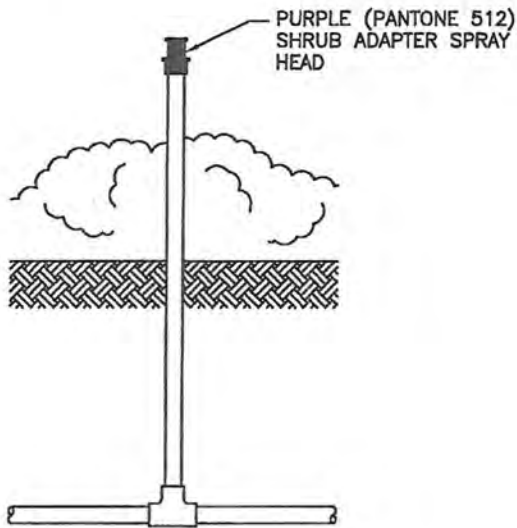
RW-18



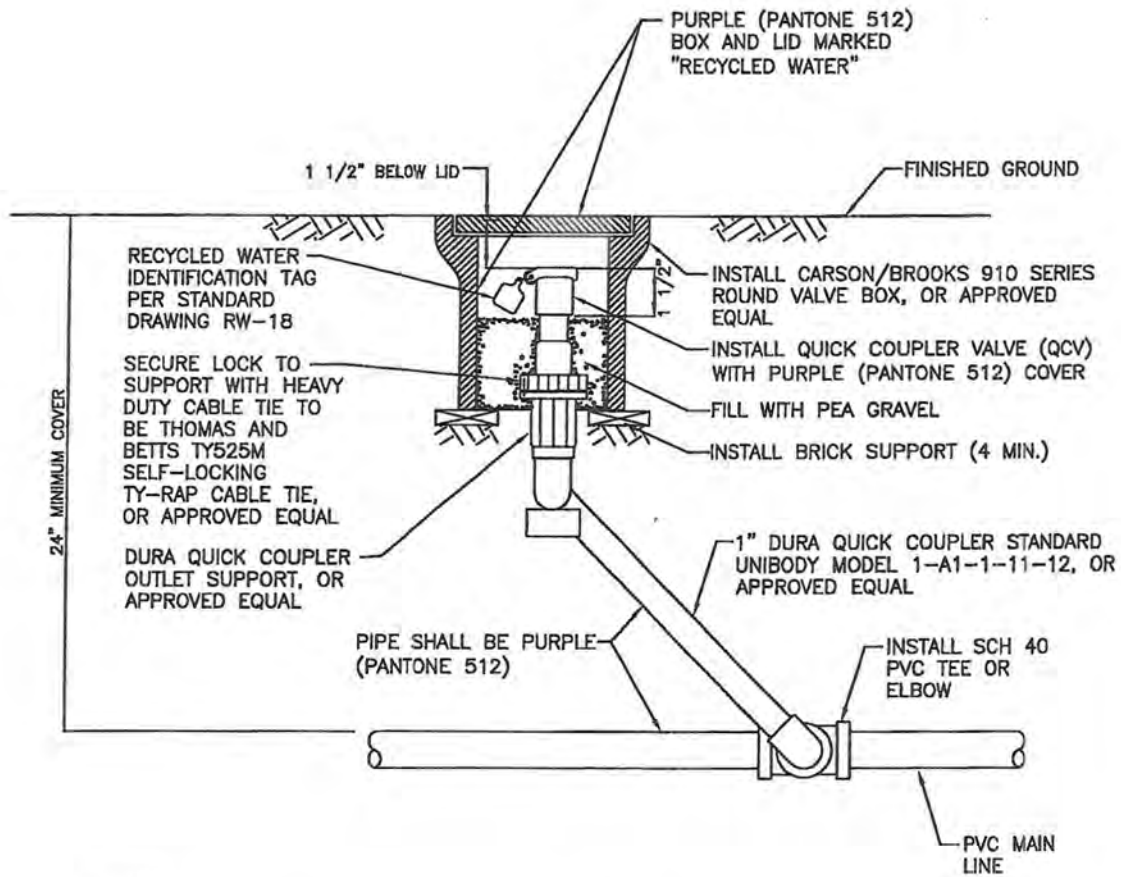
POP-UP SPRINKLER



ROTARY SPRINKLER



SHRUB RISER SPRINKLER



**NOTES:**

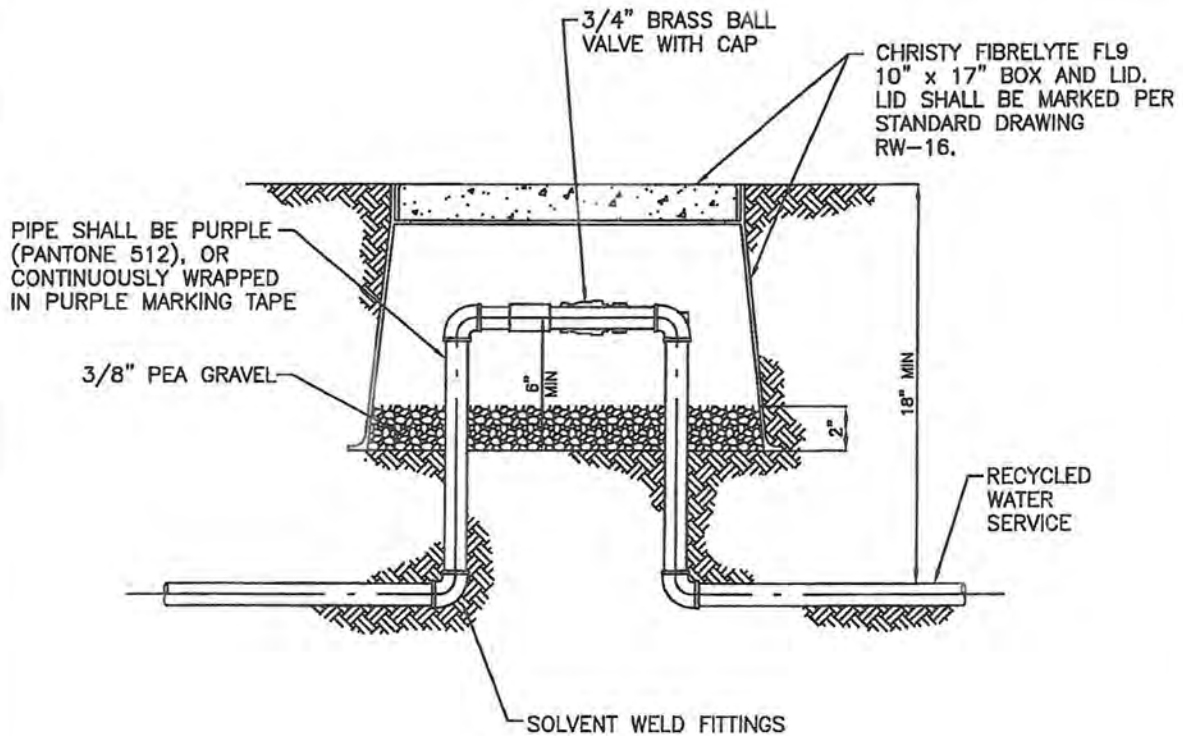
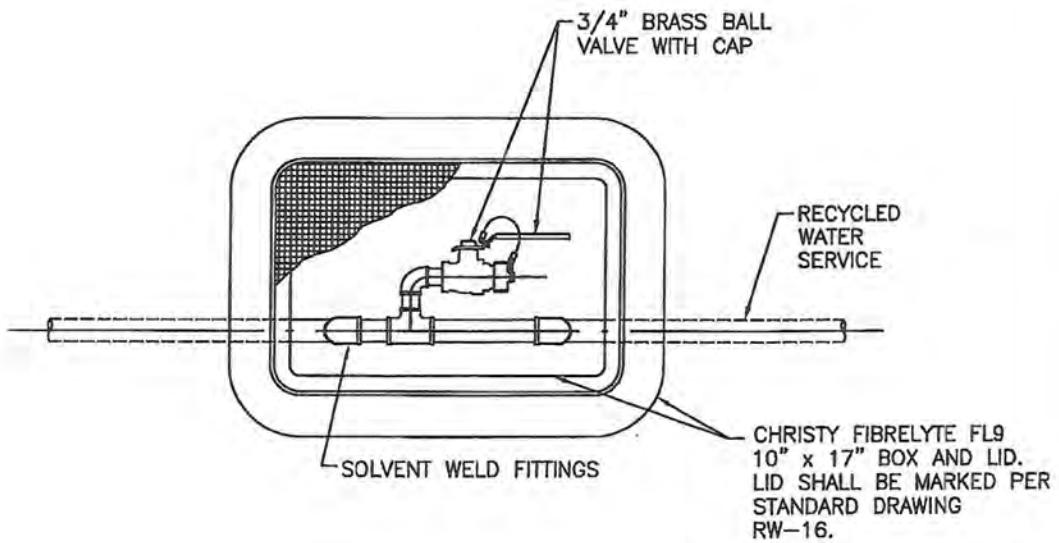
1. NEW-CONSTRUCTION - ALL QUICK COUPLING VALVES MUST HAVE NON-POTABLE LOCKING PURPLE THERMOPLASTIC RUBBER COVERS.
2. RETROFITS - REPLACE ALL EXISTING QUICK COUPLING VALVES WITH NON-POTABLE LOCKING PURPLE THERMOPLASTIC RUBBER COVERS.

QUICK COUPLING VALVE

REF. & REV.  
JUNE 2014

CITY OF FRESNO

RW-20

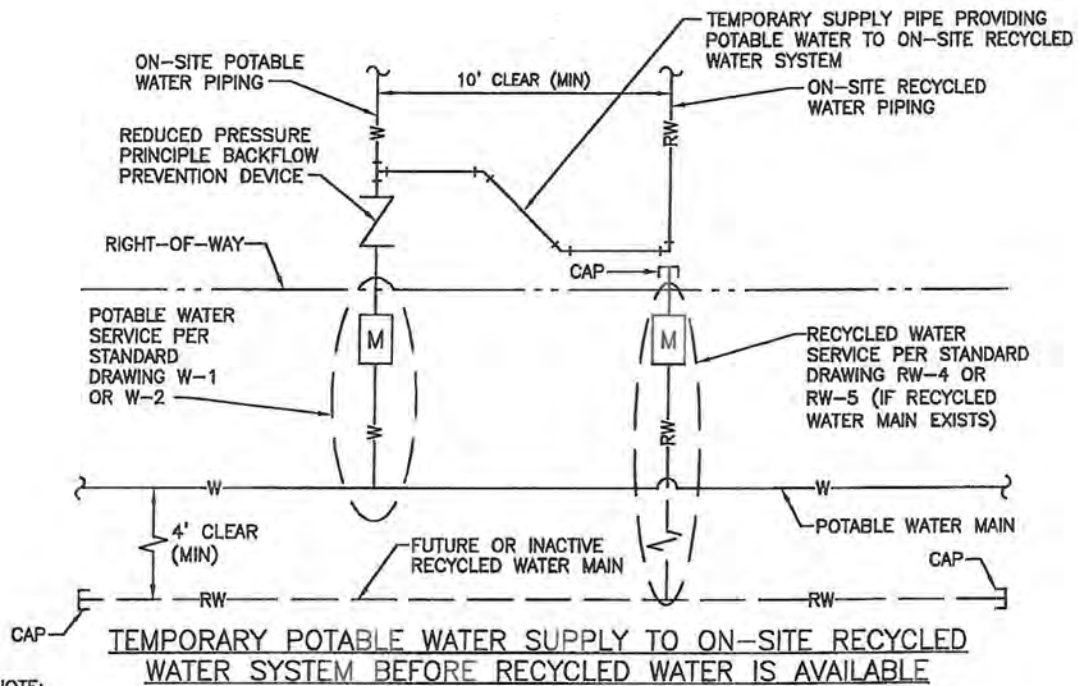


CROSS CONNECTION CONTROL  
TEST STATION

REF. & REV.  
JUNE 2014

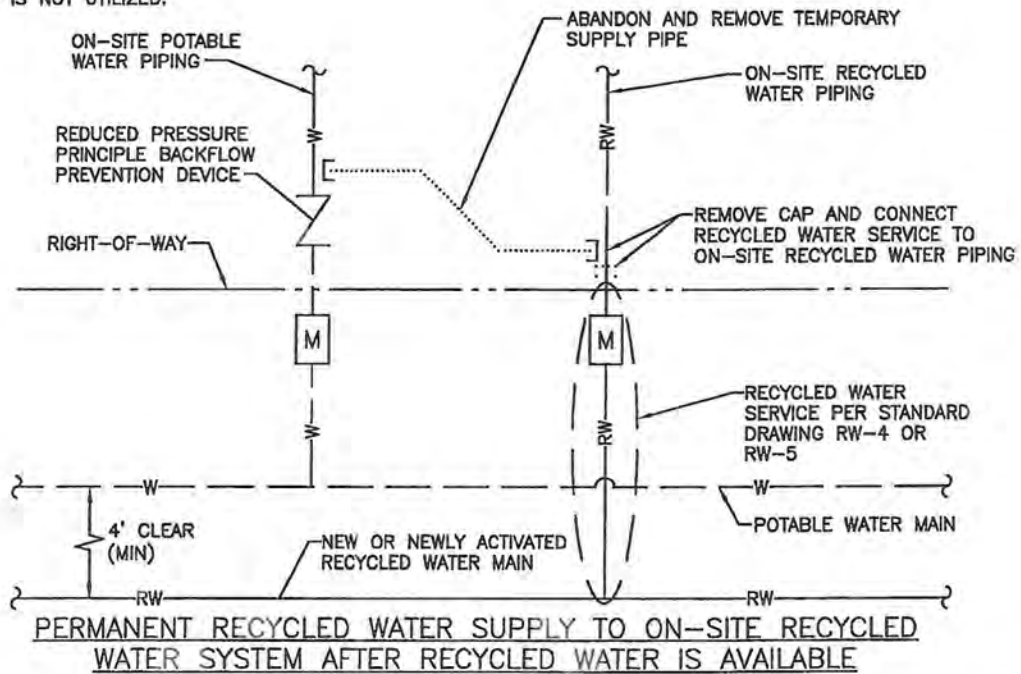
CITY OF FRESNO  
RW-21





NOTE:

THIS STANDARD DRAWING IS ONLY USED WHEN STANDARD DRAWING RW-23 IS NOT UTILIZED.



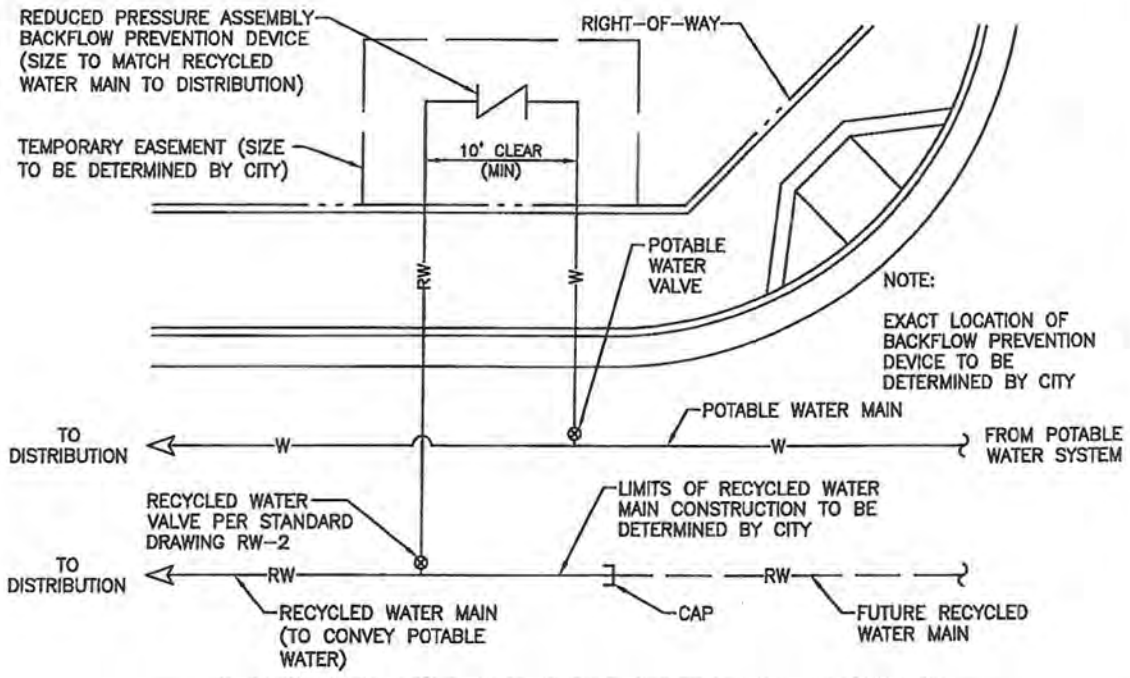
TEMPORARY POTABLE WATER SUPPLY TO ON-SITE RECYCLED WATER SYSTEM

REF. & REV. JUNE 2014

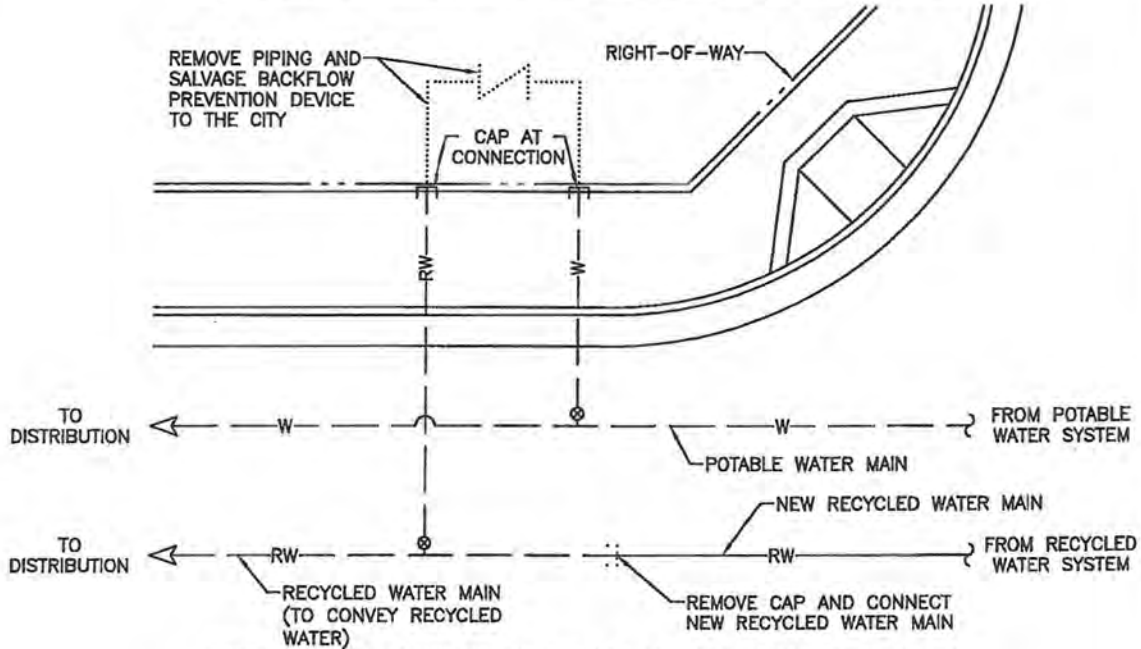
CITY OF FRESNO

RW-22





TEMPORARY POTABLE WATER SUPPLY TO RECYCLED WATER SYSTEM BEFORE RECYCLED WATER IS AVAILABLE



PERMANENT RECYCLED WATER SUPPLY TO RECYCLED WATER SYSTEM AFTER RECYCLED WATER IS AVAILABLE

TEMPORARY POTABLE WATER SUPPLY TO RECYCLED WATER SYSTEM

REF. & REV. JUNE 2014

CITY OF FRESNO

RW-23

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1-2	Definitions .....	1
1-3	General Provisions .....	4

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## **SECTION 33 – RECYCLED WATER FACILITIES DESIGN CRITERIA**

### **PART I - INTRODUCTION**

#### **33-1 DEFINITIONS**

Unless the particular provision or context otherwise requires, the definitions and provisions contained in this Section 34 shall govern the construction, meaning and application of words and phrases used in the conditions in this Section 34. The definition of each word or phrase shall constitute, to the extent applicable, the definition of each word or phrase which is derivative from it, or from which it is a derivative, as the case may be.

**“Compression Joint”**

A push-on joint that seals by means of the compression of a rubber ring or gasket between the pipe and a bell or coupling.

**“Confined”**

In areas where the hydraulic grade line is above the soffit of the Storm Drain pipe, only watertight joints are allowed and shall comply with Section 61 of the State Standard Specifications.

**“Easement”**

A recorded document in which the land owner gives the City permanent rights to construct and maintain recycled water mains and/or facilities across private property.

**“Health Agency”**

The State Department of Health Services, or the local health officer with respect to a small water system.

**“Mechanical Joint”**

A joint comprised of pipe spigot, a follower gland (ring), a mechanical joint gasket and the bell of an adjoining pipe, fitting or valve wherein the joint seal is accomplished by tightening a series of bolts and nuts that compress the gasket against the bell recess and the pipe spigot outside diameter.

**“Non-potable Water”**

Non-potable water is water that may contain objectionable pollution, contamination, minerals, or bacterial agents and is considered unsafe and/or unpalatable for drinking.

**“Pantone”**

A color standard system referenced in the American Water Works Association California-Nevada Section Guidelines for Distribution of Nonpotable Water

**“Pressure Class”**

See definition for “Rated Working Water Pressure” below.

**“Rated Working Water Pressure”**

A pipe classification system based upon internal working pressure of fluid in the pipe, type of pipe material, and the thickness of the pipe wall.

**“Recycled Water” and “Reclaimed Water”**

Non-potable water that is the treated effluent from a wastewater treatment facility. The terms are identical and any reference to reclaimed water refers to recycled water and vice versa.

**“Restrained Joints”**

A non-standard or modified push-on or Mechanical Joint that is capable of preventing internal pressures or external forces from causing the joint to separate without the use of thrust blocks.

**“Sleeve”**

A protective tube of steel with a wall thickness of not less than one fourth inch into which a pipe is inserted.

**“Vertical Separation”**

The difference in elevation between the outside bottom of the higher pipe and the outside top of the lower pipe.

**“Water Supplier”**

Any person who owns or operates a public water system.

## **33-2 OTHER REQUIREMENTS**

Ordinances, requirements, and applicable standards of governmental agencies having jurisdiction within the area served by the Department of Public Utilities shall be observed in the design and construction of recycled water mains and facilities.

Such requirements include, but are not limited to, current revision of the following:

- 33-2.1 Standard Specifications for Public Works Construction, “latest edition, including all applicable supplements, prepared and promulgated by the California Chapter of the American Public Works Assn. and the Associated General Contractors of America.”
- 33-2.2 State Health laws and regulations regulating the separation between water supply, recycled water and sewerage facilities.
- 33-2.3 State Uniform Plumbing code as adopted by the City of Fresno.

- 33-2.4 Road encroachment regulations of the City of Fresno, County, State of California, Fresno Irrigation District, and railroad permits where applicable.
- 33-2.5 American Water Works Association Standards
- 33-2.6 Titles 17 and 22 of the State Health and Safety Code regulating cross connection control and back-flow prevention and Chapter 6 of the City of Fresno Municipal Code, regulating cross connections for the City water system.

## **PART II – GENERAL PROVISIONS**

### **33-3 OTHER REQUIREMENTS**

Ordinances, requirements, and applicable standards of governmental agencies having jurisdiction within the area served by the Department of Public Utilities shall be observed in the design and construction of recycled water mains and facilities.

Such requirements include, but are not limited to, current revision of the following:

#### **33-3.1 Scope**

The design and construction of recycled water mains, facilities and other appurtenances for the City shall comply with these City Standard Specifications, or permit requirements of various governing bodies, except where specific modifications have been approved by the Engineer, in writing. A tentative plan must be submitted for comment prior to final design. All final Plans submitted by the Developer shall be signed by a registered civil engineer and all Work shall be in accordance with good engineering practice.

#### **33-3.2 Standard Criteria**

The City Standard Specifications set forth the procedure for designing and preparing Plans and Specifications for recycled water mains, facilities and appurtenances to be built within the City's recycled water service area. These standards shall include the Specifications on design and installation of ductile iron pipe and polyvinyl chloride (PVC) pressure pipe.

Whenever potable water, recycled water and sanitary sewer plans are to be designed and installed under one project, said work shall be shown on the same construction plans. In this case the Developer's engineer shall supply the City the original vellum or mylar for the final record.

## **33-4 ENFORCEMENTS**

Provisions of these design and construction standards shall be enforced by the Engineer.

## **PART III – DESIGN CRITERIA**

### **33-5 RECYCLED WATER MAIN PRESSURES, CAPACITIES, AND SIZES**

#### **33-5.1 Quantity of Recycled Water Flow**

Recycled water needs shall be determined from maximum potential population and land use of the area to be served. For design purposes, the design recycled water flow shall equal the peak hour demand. In order to determine the design recycled water flow, the following criteria shall be used, unless otherwise approved by the Engineer.

#### **33-5.2 Pressure**

Recycled water mains shall be designed so that service pressures range between 45 and 60 psi.

#### **33-5.3 Velocity**

Recycled water mains shall be designed such that the mean velocity does not exceed five (5) feet per second under Maximum Daily Demand flow conditions.

#### **33-5.4 Head Loss**

Recycled water mains shall be designed to provide a mean head loss of not more than five (5) feet per thousand feet of pipe under Maximum Daily Demand flow.

#### **33-5.5 Hazen-Williams “C”**

Pipe analysis shall be performed by assuming a value of 110 for Hazen-Williams co-efficient “C”.

#### **33-5.6 Minimum Recycled Water Main Size**

Recycled water mains shall have an inside diameter of six (6) inches or more. Four (4) inch mains may be permitted by the Engineer for cul-de-sacs that are 150 feet and shorter when the main serves less than five services.



### **33-6 LOCATION OF AIR RELEASE VALVE ASSEMBLIES**

Air release valve assemblies shall be located at all points where air pockets may form and at locations shown and/or established by the Engineer.

### **33-7 LOCATION OF BLOW-OFF ASSEMBLIES**

Blow-off assemblies shall be located at low points and dead ends, where sediment may collect. Design class shall be compatible with the pipeline working pressure.

### **33-8 RECYCLED WATER MAIN LOCATIONS**

#### **33-8.1 Recycled Water Main Location in Roads or Streets**

The centerline of recycled water mains shall be located in public Streets in accordance with Drawing P-41, P-42 and RW-12 of City Standard Drawings. A minimum of four (4) feet of clearance must be maintained between parallel sewer and recycled water lines. Recycled water line locations shall be dimensioned from property line and centerline or section line of the street.

#### **33-8.2 Curved Recycled Water Main Requirements**

In curved streets the recycled water main shall not cross the center line, but shall follow the street curvature using joint deflections or fittings or as shown on the drawings. Bending of PVC pipe barrels to accomplish horizontal and vertical curves is not permitted.

#### **33-8.3 Joint Deflection for Curved Recycled Water Main**

Deflection in joints of pipe shall be as limited by manufacturers recommendation.

#### **33-8.4 Elbows**

Elbow shall be placed at locations where coupling deflection would exceed the allowable, as limited by manufacturer's recommendation.

#### **33-8.5 Recycled Water-Water-Sewer Separation**

The provisions of State Health Codes shall be met in locating recycled water mains.

### **33-9 CRITERIA FOR THE SEPARATION**

#### **33-9.1 Basic Separation Standards**

The "California Waterworks Standards" set forth the minimum separation requirements for recycled water and water main lines. These Standards, contained in Title 22 California Code of Regulations 64572 specify:

- a) **Parallel Construction:**  
The horizontal distance between pressure water mains, recycled water lines and sewer lines shall be at least 4 feet.
- b) **Perpendicular Construction (crossing):**  
Pressure water mains shall be at least one foot above sanitary sewer and recycled water lines where these lines must cross.
- c) Separation distances specified in a) shall be measured from the nearest edges of the facilities.
- d) **Common Trench:**  
Water mains and recycled water lines must not be installed in the same trench. When water and recycled water mains are not adequately separated, the potential for contamination of the water main supply increases. Therefore, when adequate physical separation cannot be attained, an increase in the factor of safety shall be provided by increasing the structural integrity of both the pipe materials and joints.

### **33-9.2 Basic Separation Standards**

Local conditions such as available space, limited slope, existing structure, etc., may create a situation where there is no alternative but to install water mains or recycled water lines at a distance less than required by the Basic Separation Standards. In such cases, alternative construction criteria may be allowed in very special circumstances. Detail shall be submitted to City Engineer and Health Agency for approval prior to construction.

Water mains and supply lines of 24" diameter or greater may create special hazards because of the large volumes of flow. Therefore, installations of water mains and supply lines 24 inches diameter or larger shall be reviewed and approved by the Health Agency and City Engineer prior to construction.

### **33-9.3 Special Provisions**

The Basic Separation Standards are applicable under normal conditions for recycled lines and water distribution mains. More stringent requirements may be necessary if conditions, such as, high groundwater exist.

New recycled water mains and sewers shall be pressure tested where the conduits are located ten feet apart or less.

In the installation of recycled water or water mains, measures shall be taken to prevent or minimize disturbances of the existing line. Disturbance of the supporting base of this line could eventually result in failure of this existing pipe.

Special consideration shall be given to the selection of pipe materials if corrosive conditions are likely to exist. These conditions may be due to soil type and/or the nature of the fluid conveyed in the conduit.

### **33-10 ALTERNATE CRITERIA FOR CONSTRUCTION**

When new water mains, new sanitary sewer mains, or other non-potable fluid-carrying pipeline are being installed in existing developed areas, local conditions (e.g., available space, limited slope, existing structures) may create a situation in which there is no alternative but to install water mains, sanitary sewer mains, or other non-potable pipelines at a distance less than that is required by the regulations (Section 64572). In such cases, through permit action, the Engineering Department may approve alternate construction criteria. The alternate approval is allowed under Title 22 California Code of Regulations, Section 64551(c).

### **33-11 PROCEDURE FOR WATER, RECYCLED WATER AND SEWER SYSTEM INSTALLATIONS IN SUBDIVISIONS**

- a. Installation of all sewer mains, laterals and manholes and backfill.
- b. Installation of all recycled water mains, services and backfill.
- c. Installation of all water mains, services and backfill
- d. Compact all Sewer trenches.
  - d1. Make preliminary pressure test. (Optional)
  - d2. Locate and repair leaks, if any.
  - d3. Recompact if necessary.
- e. Compact all recycled water trenches.
  - e1. Make preliminary pressure test. (Optional)
  - e2. Locate and repair leaks, if any.
  - e3. Recompact if necessary.
- f. Compact all water trenches.
  - f1. Make preliminary pressure test. (Optional)
  - f2. Locate and repair leaks, if any.

- f3. Recompact if necessary.
- g. Items (d), (e) and (f) may be done simultaneously if conditions permit.
- h. All trenches shall be identified. Contractor shall also locate and mark Sewer, Water and Recycled water service laterals on curb face when constructed.
- i. Compaction tests on sewer, water and recycled water taken by City.
- j. Final air test for sewer and pressure test for water and recycled water, providing all leaks are repaired all compaction tests have been approved.
- k. Any failure of final tests would require Contractor to reinitiate sequence of work starting with Item (i).
- l. The Department of Public Utilities will construct the wet tie to connect to the City's system. This will allow the Contractor to sterilize and flush the newly constructed system. There is often an associated charge for the construction of these wet ties.
- m. Flushing recycled water mains shall not be allowed in Street area if it conflicts with sewer and water installations. Often done after compaction tests have passed. Water seeps into trenches and holds up Developer's paving while Street dries out.
- n. If storm sewers are to be installed, they shall be constructed first, unless otherwise directed.

### **33-12 EASEMENTS**

Non-metallic pipes may be allowed in Easements which are neither confined or interior Easements.

#### **33-12.1 Easements**

The minimum width of a recycled water facility Easement shall be approved by the Engineer.

#### **33-12.2 Recycled Water Main Location in Easement**

The recycled water main shall be located 5 feet north or west of the center line of the Easement except where otherwise approved by the Engineer.



### **33-12.3 Where Easements Follow Common Lot Lines**

The full Easement width shall be on one lot, in such a manner that access to lines will not be obstructed by walls, trees, or permanent improvements. Where this requirement cannot be met without interfering with existing buildings, easements may straddle lot lines, but the recycled water line shall not be located on the lot lines.

### **33-12.4 Deeds for Easements**

Deeds for Easements shall provide for restrictions of permanent construction within the Easement to provide ingress and egress for maintenance. A recent title report will be required prior to acceptance of the Easement.

### **33-12.5 Dedications**

Dedications shall be in accordance with City standard practice.

- (A) For subdivision tracts the owners of land included within the subdivision shall provide a bill of sale on a form provided by the City. This bill of sale shall be a part of the acceptance of the subdivision.
- (B) For other than subdivision tracts, the following shall be conveyed to the City:
  - (1) A deed of Easement satisfactory to the City for the operation maintenance of the recycled water facilities shall be prepared by a registered engineer or land surveyor, on City Easement forms properly executed by the owners;
  - (2) A bill of sale to the City for the recycled water mains and appurtenances.

## **33-13 DEPTH OF RECYCLED WATER MAINS**

### **33-13.1 Basic Requirements**

Recycled water mains shall be installed at a depth which shall be in accordance with the applicable ordinances, regulating the separation between water supply and sewerage facilities.

### **33-13.2 Standard Depths**

Minimum depth shall be 42 inches to top of pipe measured from Street or surface above the pipe. Where the natural ground above the pipeline trench

has been over-excavated and/or the pipeline is to be placed in the new embankment, embankment material shall be placed and compacted to an elevation of not less than 3 feet above the top of pipe prior to the trench excavation. Where 42 inches from top of curb cannot be maintained, pipe shall be installed with selected or imported bedding as approved by the Engineer or metallic pipe material shall be used.

### **33-13.3 Exceptions**

Designs not in accordance with City Standard Drawing No. RW-12 shall be submitted to the Engineer for approval together with evidence that it complies with City Standard Drawing No. RW-12.

## **33-14 STRUCTURAL REQUIREMENTS**

### **33-14.1 Buried Facilities**

All structures and pipe placed underground shall be of sufficient strength to support with an adequate factor of safety the following applicable loads: the backfill, road surfacing, H-20 truck loading with impact, high loading to be specified by the Engineer or as required by permits for crossing State highways, railroad tracks, canals, and streams. Calculations showing factor of safety may be required by the Engineer.

### **33-14.2 Other Pipes and Structures**

Recycled water lines designed to cross under other pipes or structures shall be protected from damage and shall be constructed in order not to endanger the other pipe or structure. Minimum clearance between outside of pipes or between pipes and other structures is 12 inches unless otherwise approved by the Engineer.

### **33-14.3 Flexible Joints**

Flexible joints which will allow for differential settlements or other movement of recycled water pipe, facilities, adjacent pipe and adjacent structures shall be provided where recycled water lines enter encasements or other structures. Flexible joints shall be within three feet of such structures. Any deviations from these requirements shall require approval from the Engineer.

### **33-14.4 Thrust Blocks**

The use of concrete thrust blocks may be required but will only be allowed when specifically approved in writing by the Engineer.

### **33-14.5 Mechanical Restrained Joints**

Restrained Joint fittings shall be provided at all tees, crosses, reducers, bends, caps, plugs and valves such that the pipe is fully restrained in any one given direction.

These shall meet Uni-B-13 and ASTM F 1674-96 for PVC and be UL/FM approved through 12" for both ductile iron and PVC. The restraint mechanism shall consist of individually activated gripping surfaces to maximize restraint capability. Twist-off nuts, sized the same as the tee-head bolts, shall be used to ensure proper activating of restraining devices. The gland shall be manufactured of ductile iron conforming to ASTM A536-80. The retainer-gland shall have a pressure rating equal to that of the pipe on which it is used through 14" with a minimum safety factor of 2:1. See City Standard Drawings W-31, W-32, W-33, W-34, W-35, W-36 and W-37. Gland shall be Megalug by EBAA Iron, Inc., Uni-Flange by Ford Meter Box Co. Inc., or approved equal.

**Push-on Restraint:** When it is necessary to restrain push-on joints adjacent to restrained fittings, a harness restraint device shall be used. All harnesses shall have a pressure rating equal to that of the pipe on which it is used through 14". Harness assemblies including tie bolts shall be manufactured of ductile iron conforming to ASTM A536-80. Harness shall be manufactured by EBAA Iron, Inc., Ford Meter Box Co. Inc., or approved equal.

### **33-15 DESIGN CRITERIA FOR RECYCLED WATER METERS**

The City shall determine the appropriate meter sizes and types, based on the building plumbing plans and the landscape sprinkler plans furnished by the Developer.

## **PART IV – MATERIALS**

### **33-16 REQUIREMENTS**

Materials shall be chosen for their strength, durability and ease of maintenance, with due consideration for dead and live loads, beam strength and resistance to corrosion. Pipe joints shall be selected to provide sufficient flexibility to adjust to the residual conditions during and after construction.

### **33-17 PIPE MATERIALS**

The following are acceptable materials for recycled water line construction:

#### **33-17.1 Ductile Iron Pipe and Ductile Iron Fittings**

Ductile iron pipe and associated fittings shall conform to the applicable sections of the City Standard Specifications.

(a) Fabrication

Ductile iron pipe shall be Pressure Class 350 ductile iron for sizes up to and including 12 inch and Pressure Class 250 ductile iron from 14 inch to 20 inch; complete with all accessories and conforming to ANSI/AWWA C151/A21.51, unless otherwise indicated on the construction plans. Ductile iron pipe shall be eighteen (18) foot laying lengths.

(b) Joints

Joining of ductile iron pipe shall be with elastomeric-gasket bell ends or couplings. The joints and rubber gaskets shall be in conformance with ANSI/AWWA C111/A21.11.

(c) Inspection and Testing

City at its discretion may inspect the plant facilities, materials, manufacture and testing of the pipe to be furnished by Contractor. Testing of the pipe to ensure compliance with these Specifications shall be made in accordance with applicable AWWA Standards latest edition. All cost incurred by City for witnessing the manufacture of the pipe and in obtaining test results shall be borne by Contractor furnishing the pipe.

(d) Affidavit of Compliance

City may elect to waive any of the above testing and inspection requirements in which event the Engineer may require the manufacturer to submit affidavits stating that all pipe has been manufactured and tested in accordance with this Specification.

(e) Fittings

All fittings for use with ductile iron pipe shall be ductile iron manufactured in accordance with ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53. All Mechanical Joint or push-on joint fittings shall be rated for 350 psi working pressure in sizes 4" through 24". Flange fittings shall be rated for 250 psi working pressure. Flange drilling pattern shall be in accordance with ANSI/AWWA C110/A21.10, or commonly referred to as a 125# drilling pattern.

In accordance with Section 4.3 of ANSI/AWWA C153/A21.53, fittings may be provided with a cement-mortar lining and asphalt



coating or fusion bonded epoxy inside and outside. Fusion bonded epoxy shall be in accordance with ANSI/AWWA C116/A21.16 and shall be applied to interior and exterior surfaces.

All tees and crosses shall have all flanged ends with the exception of blowoff, and pumping connections, which shall have flange by Mechanical Joint or push-on joint ends; reducers shall have flange by Mechanical Joint ends; elbows may be either Mechanical Joint or flanged ends.

(f) Appurtenances

All appurtenances used in conjunction with the ductile iron pipe shall meet the City Standard Specifications.

(g) Lining and Coating

Unless otherwise approved, the internal surface shall be lined with a uniform thickness of cement mortar and then sealed with a thin asphaltic coating in accordance to AWWA C104.

(h) Encasement

The outside surface shall be protected with purple polyethylene encasement furnished and installed in accordance with AWWA C105.

(i) Marking/Identification

Ductile iron pipe shall be identified and marked in accordance to City Standard Drawing RW-1.

**33-17.1.1 Confined Easements**

All confined easement construction shall be ductile iron.

**33-17.2 Polyvinyl Chloride (PVC) Pressure Pipe**

Polyvinyl chloride (PVC) pressure pipe shall conform to the applicable sections of the City Standard Specifications.

(a) Fabrication

Polyvinyl chloride pressure pipe shall be purple in color, or be installed in a purple sleeve marked "RECLAIMED WATER –DO

NOT DRINK" the entire length of the pipeline, shall conform to AWWA C-900 latest edition for 12" and smaller and AWWA C905 latest edition for 14" and larger, unless otherwise indicated on the construction Plans.

(b) Joints

Joining of PVC pipe shall be with elastomeric-gasket bell ends or couplings. The bell ends shall be an integral thickened bell end (IB) or an integral Sleeve-reinforced bell end. The bell end joints shall have a minimum wall thickness of the bell or Sleeve-reinforced bell equal, at all points, to the DR Requirements for the pipe. The minimum wall thickness in the ring groove and bell-entry sections shall equal or exceed the minimum wall thickness of the pipe barrel.

If bell ends are not part of the pipe, one PVC coupling, manufactured of the same material and by the same manufacturer as the pipe, shall be furnished with each length of pipe together with two (2) rubber rings. The coupling shall be designed to ensure a water-tight joint with the pipe. The coupling body and socket shall have a wall thickness equal to the pipe barrel thickness with which the coupling is to be used.

All rubber rings shall be furnished by the pipe manufacturer. These rubber rings (Elastomeric Gaskets) shall be manufactured to conform with the requirements of ASTM F-477.

(c) Hydrostatic Proof-test

Each length of pipe shall be proof-tested at two (2) times its rated Pressure Class for a minimum dwell of five (5) seconds, in accordance with AWWA C900 and C905.

(d) Inspection and Testing

The City, at its discretion, may inspect the plant facilities, materials, manufacture and testing of the pipe to be furnished by Contractor.

Testing of the pipe to ensure compliance with these Specifications shall be made in accordance with applicable AWWA Standards latest edition. All cost incurred by City for witnessing the manufacture of the pipe and in obtaining test results shall be borne by Contractor furnishing the pipe.

(e) Affidavit of Compliance

City may elect to waive any of the above testing and inspection requirements in which event the Engineer may require the manufacturer to submit affidavits stating that all pipe has been manufactured and tested in accordance with this Specification.

(f) Fittings

All fittings for use with Polyvinyl chloride pipe shall be ductile iron manufactured in accordance with ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53. All Mechanical Joint or push-on joint fittings shall be rated for 350 psi working pressure in sizes 4" through 24". Flange fittings shall be rated for 250 psi working pressure. Flange drilling pattern shall be in accordance with ANSI/AWWA C110/A21.10, or commonly referred to as a 125# drilling pattern. In accordance with Section 4.3 of ANSI/AWWA C153/A21.53, fittings may be provided with a cement-mortar lining and asphalt coating or fusion bonded epoxy inside and outside. Fusion bonded epoxy shall be in accordance with ANSI/AWWA C116/A21.16 and shall be applied to interior and exterior surfaces.

All tees and crosses shall have all flanged ends with the exception of blow-off, and pumping connections, which shall have flange by Mechanical Joint or push-on joint ends; reducers shall have flange by Mechanical Joint ends; elbows maybe either Mechanical Joint or flanged ends. A/C to C.I.O.D. (PVC adapter rings may not be used).

(g) Appurtenances

All appurtenances used in conjunction with PVC shall meet the City Standard Specifications.

(h) Detachable Ribbon or Tapes

Because PVC is non-conductive and subject to more damage if struck with excavation equipment, an identification marking tape shall be installed in accordance to City Standard Drawing No. RW-1.

## **33-18 VALVES**

### **33-18.1 Butterfly Valves**

(a) General

These Specifications designate the requirements for the manufacture and installation of butterfly valves. The Contractor shall furnish all labor, materials, tools and equipment necessary to install, complete and ready for operation, the valves as shown on the Plans and herein specified.

(b) Materials and Workmanship

Butterfly valves shall be of the rubber-seated tight-closing type. They shall meet or exceed AWWA Standard C504 latest revision. All valves must use full AWWA C504 Class 150B valve shaft diameter, and full Class 150B underground-service-operator torque rating throughout entire travel. All valves shall be NSF approved. Valve body shall be high-strength cast iron ASTM A126 Class B with 18-8 Type 304 stainless steel body seat. Valve vane shall be high-strength cast iron ASTM A48 Class 40, having rubber seat mechanically secured with an integral 18-8 stainless steel clamp ring and 18-8 stainless steel self-locked screws.

Rubber seat shall be full-circle 360 degree seat not penetrated by the valve shaft. Valve shaft shall be one piece, extending full size through the entire valve. Valve shaft shall be 304 stainless steel. Packing shall be O-ring cartridge designed for permanent duty underground. All exposed cap screws and fasteners on the valve body and flanges shall be Ni-Cad steel or approved equal.

(c) Valve Operations

Valve operators shall be of the manual type. The operator shall be totally enclosed, self-locking worm gear or screw type, with adjustable stops to limit disc travel. The number of complete turns of the operator required to rotate this disc 90 degrees shall be approximately the same as an equivalent sized gate valve. All valve operators shall be fully gasketed, weather-proof and factory packed with grease. Operators shall be of the size required for opening and closing the valve against 150 psi water pressure, and shall have a torque rating of not less than shown in AWWA C-504, 1, Class 150-B. Operators for valves located above ground shall have disc-position indicators and a hand-wheel.

Should the difference between the operating nut and the valve cover exceed 50 inches, an extension mast shall be installed so that the operating nut will not exceed 50 inches from the valve cover or ground surface. Buried operators shall be worm gear or screw type and shall be threaded to accommodate a two inch operating nut, and shall include the operating nut, and a 3/4" hex head plated bolt for operating nut hold-down. All exposed fastenings shall be specifically designed and suitable for permanent buried service. Input shaft and thread for the operating nut shall be at a right angle to the operating shaft. The input shaft shall



extend vertically from the side when the valve is in the horizontal position.

Epoxy shall be applied to all surfaces of valve body and vane to an average minimum thickness of 5 mils, conforming to AWWA C 550 Standards. A primer shall be applied before the coating per the epoxy manufacturer's recommendations. The coating shall be applied to the entire valve body and vane before final assembly.

(d) Valve Ends

Valve ends shall be for Flanged Joint pipe and shall conform to ANSI C111 (AWWA A21.11-1972, Class 125) and drilled to ANSI B16.1 for cast iron flanges and flanged fittings, Class 125. Flanges shall be 125# ANSI. The butterfly valves shall be right closing Class 150-B designed for tight shut off with a maximum differential pressure across the disc of 200 psi. Valve shafts shall consist of a one-piece unit extending completely through the valve disc.

(e) Valve Boxes, Nuts and Bolts, Gaskets and Marker Posts shall conform to the provisions specified herein for gate valves.

(f) Marking/Identification

Install an identification tag in accordance to City Standard Drawing RW-18.

### **33-18.2 Gate Valves**

(a) General

These Specifications designate the requirements for the manufacture and installation of gate valves. The Contractor shall furnish all labor, materials, tools and equipment necessary to install, complete and ready for operation, the valves as shown on the Plans and herein specified.

(b) Materials and Workmanship

Gate valves shall be non-rising stem resilient seated type. Valves shall conform to the latest version of AWWA C-509. Valve bodies shall be ductile iron and wedges shall be fully rubber encapsulated.

The stem shall have two O-rings above the collar and one O-ring below the collar. Stem seals must be replaceable with the valve under pressure. The stem material shall be stainless steel [ANSI-420], low zinc bronze or manganese bronze. The waterway shall be full size. No

cavities or depressions are permitted in the seat area. Valve body and bonnet shall be electrostatically applied, fusion bonded, epoxy coated both inside and out by the valve manufacturer. The coating shall meet the requirements of AWWA C-550 and NSF 61 approved. All valve body and bonnets bolts and nuts shall be type 304 stainless steel.

All valves must be tested by hydrostatic pressure equal to the requirements in the AWWA C-509 specifications prior to shipment.

Tapping gate valve assemblies shall be used only in conjunction with tapping Sleeves and shall be furnished and installed by the Department of Public Utilities.

Nuts and bolts used for bolting flanged-end gate valves to pipeline flanges above ground, shall be hexagonal head machine bolts and hexagonal nuts conforming to ASTM A307, Grade B. All buried flanged-end gate valves shall be bolted to the pipe line flanges with Ni-Cad nuts and bolts or approved equal.

(c) Gaskets

Gaskets for flanged-end gate valves shall be right face 1/8".

(d) Valve Ends

Valves may be provided with Mechanical Joint ends, push-on joint ends, flanged ends, Mechanical Joint by flange ends or push-on joint by flange ends.

(e) Marking/Identification

Install an identification tag in accordance to City Standard Drawing RW-18.

### **33-19 APPURTENANCES**

#### **33-19.1 Blow-off Assemblies for Recycled Water Mains**

(a) General

Blow-off assemblies shall be furnished and installed by the Contractor at the locations shown on the Plans. The Contractor shall furnish all labor, materials, tools and equipment necessary to furnish and install, complete and ready for operation, the assemblies as shown on the plans and herein specified. See City Standard Drawings RW-7 and RW-8.

(b) **Materials, Fabrication and Installation**

- (1) Materials Shall be ductile iron and sized as designated on the City Standard Drawings. RW-7 and RW-8 or on the Plans.
- (2) Valves Gate valves or butterfly valves for blow-off assemblies shall be as specified herein.
- (3) Pipes and Fittings Shall be 6 inch or 8 inch ductile iron and shall conform with the standard for ductile iron pipe water main and fittings. Joints on the recycled water main side of the gate valves shall be flanged. Properly restrained MJ fittings are allowed downstream of the gate valve.
- (4) Pipe Sleeves and Lids Shall be used per City Standard Drawing RW-2.
- (5) Boxes and Lids Shall be per City Standard Drawings RW-7 and RW-8 or Engineer approved equivalent and marked "Recycled Water". Covers shall be seated flush with the surface of the natural ground or paved surface, such that they may not be damaged by, nor present an obstruction or rough surface to traffic.

**33-19.2 Air Release Valve Assemblies**

(a) **General**

Air release valve assemblies shall be furnished and installed by the Contractor at all points where air pockets may form and at the locations shown and/or established in the field by the Engineer. The Contractor shall furnish all labor, materials, tools and equipment necessary to install, complete and ready for operation, the valve assemblies shown on the plans and herein specified. See City Standard Drawing No. RW-9, RW-10, and RW-11.

(b) **Materials, Fabrication and Installation**

Materials shall be in accordance with City Standard Drawings. The valve shall be a Vent-o-Mat RBX series, Vent- Tech or approved equal.

**33-19.3 Recycled Water Service Assemblies (2 inches and smaller)**

(a) **General**

Recycled water service assemblies shall be furnished and installed by the

Contractor at the locations shown on Plans or established in the field by the Developer. The Contractor shall furnish all labor, materials, tools and equipment necessary to install, complete and ready for operation, the assemblies as shown on the Plans and herein specified. The Contractor shall perform the installation of the lot services in accordance with the City Standard Drawing Nos. RW-4 and RW-5. The Developer shall provide the City with a Plan showing the "As Built" location of all services.

(b) Materials, Fabrication and Installation

- (1) Materials Shall be those designated on the City Standard Drawings RW-4 and RW-5

<u>Service Size</u>	<u>Corp. Stop</u>	<u>Service Pipe</u>	<u>Angle Meter Stop</u>
1"	1"	1"	1"
1 1/2"	1 1/2"	1 1/2"	
2"	2"	2"	

- (2) Pipe and Fittings Service pipe shall be Type K soft copper tubing, or Polyethylene CTS 200 psi SDR-9 PE 3408. Solder fittings shall be soldered with 95% tin / 5% lead or silver solder (pure).
- (3) Saddles Service saddles shall be used for all 1", 1-1/2", and 2" taps made on ductile iron and PVC pipe. A circumferential type stainless steel band or bands shaped to fit the actual O.D. of the pipe shall be used. Double strap bands shall provide a minimum bearing width of 1-1/2 inches per band along the axis of the pipe. Single strap bands shall provide a minimum bearing width of 3 inches per band along the axis of the pipe. Saddles shall not have lugs that will cut into the pipe when the saddle is tightened. Saddles are to be Jones, Ford, Mueller or approved equal.

Multiple O.D. range saddles shall not be used.

- (4) Service Taps In no case shall a service tap be made in a main closer than 18 inches to a bell coupling joint, or fitting. Service taps shall not be less than two feet apart. Service taps shall be located opposite the service locations so that the service laterals will be perpendicular to the Street centerline. Service tap locations varying more than two feet from the perpendicular must be approved by the Engineer prior to installation. Service taps shall be in accordance with City Standard Drawing Nos. RW-4 and RW-5. Where dissimilar metals are joined, a dielectric connection, approved by the Engineer shall be provided. Hole

size drilled in the pipe shall be the same size as the corporation stop. The cutting tool shall be muller cutting type (hole) cutter which will retain the coupon.

Tapping Sleeves and corporation stop valves shall be used for service connections of 2 inches and smaller. For ductile iron recycled water mains, double strap ductile iron service saddles must be used.

(5) Service Boxes

Service casing and covers and meter boxes and covers shall be furnished and installed by the Contractor as shown on City Standard Drawings RW-4 and RW-5. All service casings shall be complete and in place at the time of acceptance of the subdivision. All services shall be marked by an "RW" clearly visible on the curb face. Minimum size 1 ½" X 1 ½" maximum 3" X 3".

(6) Curb Stops in Driveway

No services in driveway approaches allowed.

(7) Encasement and Identification

Due to the corrosive nature of soils, a protective polyethylene sleeve shall be installed over the copper service line on all sizes from 1" to 2". It must be purple in color, to immediately identify it as non-potable service, and shall encase the service line from the corp stop to the angle meter stop in one continuous piece. It shall be attached to both the corp and the angle meter stop by using PVC tape, duct tape, or other suitable adhesive tape.



#### **33-19.4 Valve Service Casing and Lid**

Valve Service Casing and Lid Shall conform with City Standard Drawing RW-2. Covers shall be seated flush with the surface of the natural ground or paved surface such that they may not be damaged by, or present an obstruction or rough surface to traffic. Covers shall have a 9 inch wide and 6 inch thick stabilizing concrete ring constructed when the valve is outside the pavement area. Covers must be painted purple by using Pantone 512.

## **SECTION 34 – RECYCLED WATER FACILITIES**

### **34-1 SCOPE**

These City Standard Specifications are intended to describe the execution and workmanship to be used in construction of a recycled water system operated in the City of Fresno. It is presumed that the Developer or his/her engineer has prepared such general and special Specifications as are necessary to define the nature and location of the Work, contractual arrangements, payment for Work, and any other matters concerning the owner or his/her Contractor. All Street work permits shall be obtained and fees shall be paid by the Developer or Contractor.

### **34-2 GENERAL**

#### **34-2.1 Quality Control of Materials**

The quality control of materials shall conform to the applicable sections of the City Standard Specifications as published by the City of Fresno.

#### **34-2.2 Quality of Workmanship**

All Work will be done by Persons experienced in the specific Work, under competent supervision and in a first class manner to the Engineer's complete satisfaction. Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the trench. If the pipe-laying crew cannot put the pipe into the trench and in place without getting earth into it, the Engineer may require that before lowering the pipe into the trench a heavy tightly woven burlap 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 laying operations, no debris, tools, clothing or other materials shall be placed in the pipe. After placing a length of pipe in the trench and completing the jointing operation, in a method approved by the pipe manufacturer, the pipe shall be secured in place with approved backfill material placed under it. At times when pipe laying is not in progress, the open ends of the pipe shall be closed by a watertight plug or other means approved by the Engineer. This provision shall apply during any Work stoppage.

#### **34-2.3 Connections to Existing Facilities**

Connections shall be performed by Wastewater Division personnel only. One week notice shall be given before any connection is to be made.

#### **34-2.4 Defective Work**

Any defective materials or workmanship which becomes evident within one year after the City assumes responsibility for the completed Work shall be

replaced or repaired without cost to the City. Refusal of the Contractor to correct defective Work which is his/her responsibility will be considered just cause for excluding him/her from performing future Work to be connected to the City's system. Such exclusion does not impair the City's right to bring legal action to correct the deficiencies.

#### **34-2.5 Construction Staking and "Record-Drawings"**

Construction stakes will be set parallel to the recycled water main alignment at an offset distance and direction agreed upon with the Contractor but in no case shall construction stakes be offset more than 10 feet. Stakes will be set at no greater interval than 100 feet on straight alignments. For horizontally or vertically curved recycled water mains, the stake intervals shall be 25 feet. For all Street recycled water mains, regardless of alignment or slope, the Developer's engineers shall determine "Record-Drawings" elevations at the top of pipe centerline at each change in pipe grade and shall provide a written record of such elevations to the inspector. The Developer's engineer shall also provide "Record-Drawings" of all main line valve locations and all service stop locations.

### **34-3 POLYVINYL CHLORIDE (PVC) PRESSURE PIPE AND FITTINGS INSTALLATION**

#### **34-3.1 Scope of Work**

The Contractor performing the Work under this Specification shall furnish all labor tools and equipment, which are necessary to install, complete, and ready for operation, the PVC pressure pipe recycled water mains as herein specified and/or as indicated on the contract drawings.

#### **34-3.2 Installation**

Installation shall conform to Chapter 7, Installation, of AWWA Standard C605 and AWWA Manual M23. Bending of PVC pipe barrels to accomplish horizontal or vertical curves is not permitted.

#### **34-3.3 Tracer Wire with Marking Tape**

Tracer wire used with PVC **where called for on the Plans** shall be copper wire, Type TW, Size AWG #12 and shall be placed above the PVC recycled water main along with a recycled water marking tape, purple (pantone 512). The marking tape shall be a minimum of six inches wide and a minimum of 12" but no greater than 24" above the pipeline. See City Standard Drawing No.'s RW-1 and RW-24.

## **34-4 DUCTILE IRON PRESSURE PIPE AND FITTINGS INSTALLATION**

### **34-4.1 Scope of Work**

The Contractor performing the Work under this Specification shall furnish all labor tools and equipment, which are necessary to install, complete, and ready for operation, the ductile iron pressure pipe recycled water mains as herein specified and/or as indicated on the contract drawings.

### **34-4.2 Installation**

Installation shall conform to AWWA C-600 and Installation of Ductile Iron Pipe and Fittings in AWWA Manual M41.

## **34-5 VALVE CASING AND LID INSTALLATION**

When recycled water mains are installed, casings and lids in Street areas shall be installed in a lowered position below any sub-grade which may be removed or re-compacted.

When sub-grade is compacted and base material installed and completed, casing and lids shall be completed in accordance with City Standard Drawing Nos. RW-2, "Recycled Water Valve and Valve Box," and RW-16, "Recycled Water Irrigation Box Cover Markings".

Valves located in the sidewalk shall be marked with a 2" X 4" stake so that casings and lids may be brought to finished grade at the time concrete is poured.

Any excavation necessary for valve casing and lid work shall be thoroughly re-compacted to the satisfaction of the Engineer. All casings shall be installed in a vertical position. All valve operating nuts shall be free of any dirt or debris and all valves shall be checked to ensure that they are left in a wide open position.

**It shall be the responsibility of the Contractor to do this Work exactly as specified.**

## **34-6 EARTHWORK FOR DUCTILE IRON AND PVC PIPE INSTALLATION**

### **34-6.1 Trench Excavation**

The trench shall be constructed per City Standard Specifications, Section 16, City Standard Drawings P-48 and RW-1. Unless shown otherwise on the Plans a minimum cover of 3.5' is required for mains.



### **34-6.2 Trench Bottom**

The trench bottom shall be true and even so that the barrel of the pipe will have soil support for its full length. Earth mounds can be used to support the pipe with the Engineer's approval and under his/her direction.

### **34-6.3 Bell Holes**

Bell holes are required for push-on and mechanical joint pipe. While push-on joints require only a small depression beneath each bell to allow pipe to lay flat on the trench bottom, mechanical joints require additional space for operation of a ratchet wrench.

Minor excavations, which are necessary for removing the sling and for assembling the joints, shall be made in advance of the laying crew and filled after these operations are completed.

### **34-6.4 Trench Width**

The trench must be wide enough to permit proper installation of the pipe with room for assembling joints and tamping backfill around the pipe. The trench must be at least 12 inches wider than the outside diameter of the pipe to allow for proper placement, tamping, and compaction of the initial backfill. Per the City Standard Specifications, Section 16, the width of the trench at the top of the pipe shall not be greater than 16 inches more than the outside diameter of the barrel of the pipe to be laid therein. These requirements may be modified by the Engineer or as shown on the Plans.

### **34-6.5 Rock or Hardpan Excavation**

In rock or hardpan excavations it is necessary that the rock or hardpan be removed so that it will not be closer than 4 inches to the bottom and sides of the pipe for sizes up to 24 inches in diameter. This same practice shall be followed should the trench excavation pass through piles of abandoned masonry, large pieces of concrete or other debris. The pipe shall not be permitted to rest on masonry walls, piers, foundations or other unyielding, subterranean structures which may be encountered in the excavation.

### **34-6.6 Barricades and Safety**

The Contractor shall follow all the requirements in Section 7-10.4 of the City Standard Specifications.

### **34-6.7 Shoring**

In addition to, and consistent with public safety considerations, every precaution for safety must be provided for the workers at the Site. Shoring must comply with Cal-OSHA Standards.

### **34-7 BACKFILLING AND TAMPING**

Backfilling usually follows pipe installation as closely as possible. This protects the pipe from falling materials, eliminates possibility of lifting the pipe due to flooding of open trench, and avoids shifting pipe out of line by cave-ins. The purpose of backfilling is not only to protect the pipe by covering it, but to provide firm, continuous support that will prevent the pipe from settling or resting on the couplings. The essentials of a first class backfilling job shall be as follows:

Provide continuous bedding or support by carefully consolidating approved material under pipe and couplings and between the run of pipe and the trench walls. Provide a cushion on top by hand - placing approved material to at least 12" over the pipe - the balance can then be backfilled by machine.

The first step in providing firm, continuous support for the pipeline is to tamp soil solidly under the pipe and couplings. Tamping can be done with tamping bars to consolidate the backfill material. Hand tamping is best accomplished with damp loamy earth or sand.

The initial backfill material used shall be slightly damp which will pack more solidly under the pipe. This initial backfill is always placed by hand. It shall be shoveled in evenly along both sides of the pipe, making a layer about 4" thick. Then the tamping bar is used to tamp this soil firmly under the pipe. If more than 4" of soil is shoveled in before tamping, the soil can bridge and fail to go under the pipe. Next, another 4" layer is shoveled in and tamped. This is repeated until the pipe is firmly bedded in compact soil up to the top of the pipe. Two 6 inch lifts are then used to achieve a 12 inch cover over the pipe. This completes what is called the "initial" backfill, the thoroughly tamped soil which provides a continuous supporting bed for the pipeline. Where clay soil or unstable soil is encountered, the pipe shall be enveloped in a minimum of four inches of sand - then the backfill completed to at least 12" above the pipe with selected material, then dry sand or other suitable materials shall be laid.

The balance of the backfill which is usually placed by machine, need not be as carefully selected as the initial material. Cleanup shall be in accordance with the City Standard Specifications.

## 34-8 TESTING AND STERILIZATION

### 34-8.1 General

The Specifications constituting this section designate the requirements for the procedure, materials, performance, and payment for testing and sterilization of recycled water mains and appurtenances intended for the conveyance of non-potable water under pressure.

Scope of Work The Contractor shall furnish all labor, material, tools, and equipment, including all chemicals, necessary to perform all operations required to complete the testing and sterilization as herein specified.

### 34-8.2 Field Testing

- (a) Hydrostatic Pressure Test Hydrostatic Pressure test. After the pipe and all appurtenances have been laid and the backfill has been placed and compacted, a hydrostatic pressure test shall be conducted. A hydrostatic test shall be conducted on the entire pipeline for a period of 2 hours at a hydrostatic pressure of 200 psi for Class 200 pipe and 150 psi for Class 150 pipe. In locations where there is a combination of Class 200 and Class 150 pipe, the system testing pressure shall be 150 psi. All valves in the pipeline shall be in the open position during system testing.
- (b) Preparation The line shall be filled with water at least 24 hours prior to testing. While filling and immediately prior to testing, all air shall be expelled from the pipeline. Where air valves or other suitable outlets are not available for introducing water or releasing air for test purposes, taps and fittings approved by the Engineer shall be installed and later securely plugged.
- (c) Procedure The procedure shall follow those specified in the AWWA Standard C-600 Sec. 5.2 for ductile iron and C-605 Sec. 7.3 for PVC pipe. The pressure in the pipeline shall be pumped up to the specified test pressure. When the test pressure has been reached, the pumping shall be discontinued until the pressure in the line has dropped 5 psi, at which time the pressure shall again be pumped up to the specified test pressure. This procedure shall be repeated until the end of the test period. At the end of the test period, the



pressure shall be pumped up to the test pressure for the last time. The total quantity of water pumped to maintain pressure shall be measured and compared to the allowable.

- (d) Leakage Shall not exceed the amount calculated, using AWWA Standard C-605 for PVC and C-600 for ductile iron.

### **34-8.3 Sterilization**

Prior to pressure testing and prior to acceptance of Work, the entire pipeline including all valves, fitting, hydrants, service laterals, and other accessories shall be sterilized in accordance with AWWA C-601 latest revision. All mains shall be flushed with potable water after completion of construction and prior to disinfection. The Contractor shall provide a sufficient number of suitable outlets at the end(s) of the line(s) being sterilized in addition to those required by the Plans, to permit the main to be flushed with water at a velocity of at least 5.5 feet per second over its entire length. The outlets provided shall meet the requirements for fittings as specified for the type of main constructed. Temporary blow-offs may be installed during the sterilization and flushing to satisfy these requirements. Drainage facilities shall be constructed such that the water lines cannot be contaminated through the flushing outlet. After flushing, chlorine compound solution made with liquid chlorine, calcium hypochlorite in solution or sodium hypochlorite solution shall be water mixed and introduced into the mains to form a chlorine concentration of approximately 100 ppm or that which will provide a minimum residual of 50 ppm in all parts of the line after 24 hours have elapsed.

During the sterilization process all valves, hydrants and other accessories shall be operated. After chlorination, the water shall be flushed from the line at its extremities until the replacement water tests are equal chemically and bacteriologically to those of the permanent source of supply. The placing of chlorine capsules or tablets in pipe sections during the laying process will be considered as an acceptable method of sterilization. The chlorine water solutions shall be diluted to a chlorine concentration of not more than 100 ppm and not less than 50 ppm measured in the water lines. The Contractor shall keep adequate chlorine residual testing and indicating apparatus available on the site during the entire sterilization period.

After final flushing, the flushing fitting shall be plugged with devices intended for this purpose at the pressure class of the pipe. Where water main is coated, plugs and outlets shall be similarly coated. Bacteriologic samples of water for the specified bacteriologic test shall be taken from each end of the sterilized main (located downstream of the point of introduction of chlorine disinfectant and at other locations as determined necessary by the Engineer.) Additional samples shall be taken at intermediate points in such a manner that at least



one sample is taken for each 700 feet of main. Bacterial samples will be taken a minimum of 48 hours after the mains have been flushed of all chlorine.

The Contractor shall dechlorinate disinfecting water and flushing water if required by the Plans

### **34-9 SIGNAGE**

A sign reading "Recycled Water-Do Not Drink" in English and Spanish, shall be posted at all points where consumption of the water may be attractive to the public, in areas of public use that receive reclaimed water and at all valves, control boxes, and similar features in accordance with City Standard Drawing No RW-13 . This requirement may also apply to sprinkler heads when after-market clip-on purple rings are readily available in accordance with City Standard Drawing No RW-19.

### **34-10 ABANDONMENT**

#### **34-10.1 General**

All existing non-potable waterlines or structures that are to be abandoned must be identified in the drawing. In general, abandoned lines that are in service will be replaced with a parallel line of equal or larger size, and the Engineer shall demonstrate in any case that the abandonment does not adversely affect the water system.

#### **34-10.2 Recycled Water Lines**

All non-potable water lines to be abandoned shall be entirely filled by pumping concrete into them. The pump mix shall be a mixture sufficiently workable for the purposes intended.