City of Carlsbad

Engineering Standards

Volume 3
Standard Drawings and Specifications

2022 Edition

CITY OF CARLSBAD
ENGINEERING STANDARDS

VOLUME 3 - STANDARD DRAWINGS AND SPECIFICATIONS

TABLE OF CONTENTS

REVISIONS/ADDENDUM		
CHAPTER/ PAGE/DWG.	**ITEM**	**REVISION DATE**
All Chapters	Revised Water & Sewer Standard Drawings & Specifications	6/30/08
Chapter 3	Revised Recycled Water Title Sheet	3/17/09
Chapter 1	Revised Standard Drawings GS-1, GS-1A, GS-3, GS-4; added GS-1B	11/30/09
Chapter 6	Revised Section 15064	11/30/09
Chapter 1	Revised Standard Drawing GS-25; added GS-26, GS-27, GS-28, GS-29	2/10/10
Chapter 1	Revised Standard Drawings DS-1, GS-6, GS-6A, GS-18, GS-19, GS-24, S-1, S-1A	2/21/12
Chapter 4	Revised Standard Drawings W-20, W-21; added W-35	2/21/12
Chapter 6	Revised Section 15139	12/20/13
Chapter 3	Revised Grading and Improvement Plan Title Sheets	1/5/16
Chapter 4 & 5	Revised Standard Drawings W-3, W-3A, W-4; removed Chapter 5 (sample drawings)	2/16/16
Chapter 3	Revised Grading and Improvement Plan Title Sheets	4/12/17
Chapter 5 & 6	Removed Chapter 5 (not used), renamed Chapter 6 to Chapter 5	4/29/22
Chapter 5	Revised Section 03460. Added Sections 02060, 02262, 09961, 15065. Removed Sections 15066, 15122.	4/29/22
Chapter 6	Added Chapter 6	4/29/22
All Chapters	Various Revisions Throughout	4/29/22
Chapter 4	Revised Table of Contents, Standard Drawings W-5, W-6, W-9, W-14, WC-14. Added W-19A, W-30, W-31, W-32	7/22/22
Chapter 5	Revised Table of Contents and Sections 02223, 03000, 03460, 09870, 09900, 15065, 15074, 15112, 15121, 15125, 15139	7/22/22

CITY OF CARLSBAD
ENGINEERING STANDARDS

VOLUME 3 - STANDARD DRAWINGS AND SPECIFICATIONS

CHAPTER 1 – CITY OF CARLSBAD STANDARD DRAWINGS

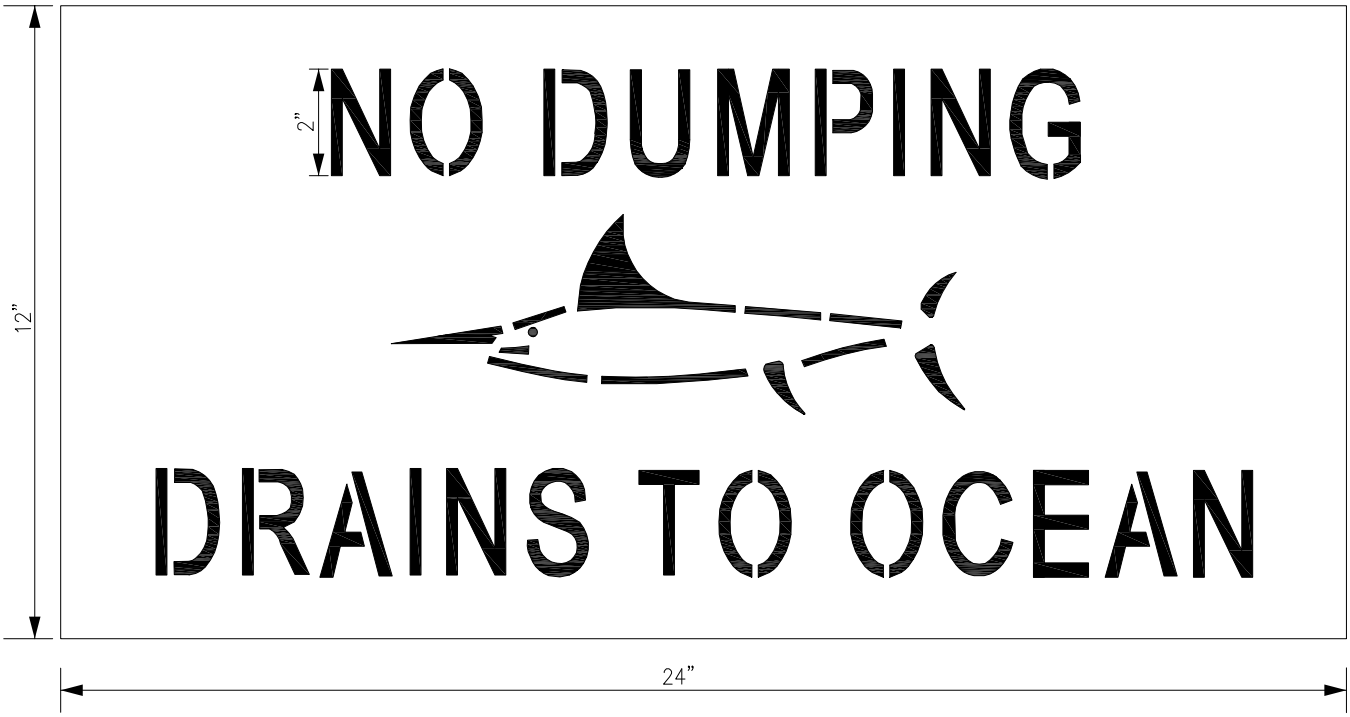
TABLE OF CONTENTS

DWG NO.

CHAPTER 1 – CITY OF CARLSBAD STANDARD DRAWINGS

TABLE OF CONTENTS (CONTINUED)

PAINT COLOR: WHITE
STENCIL BY: PIPELINE PRODUCTS
SAN MARCOS, CA
PH: 1-800-998-1079



REV.	APPROVED	DATE

CITY OF CARLSBAD

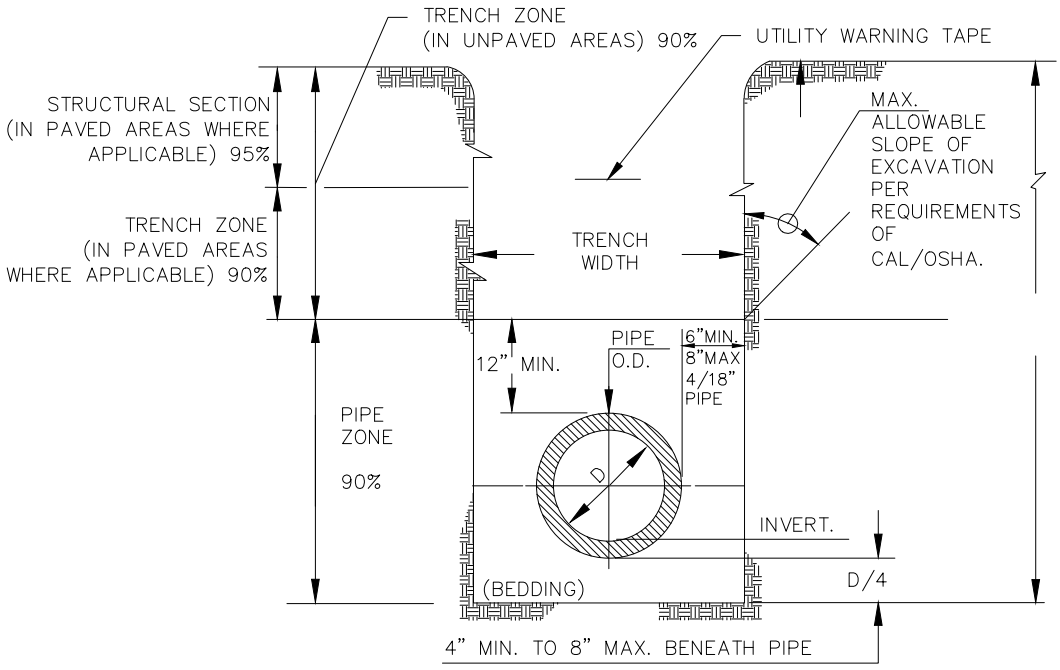
STORM DRAIN STENCIL

CITY ENGINEER — 4/29/2022 DATE

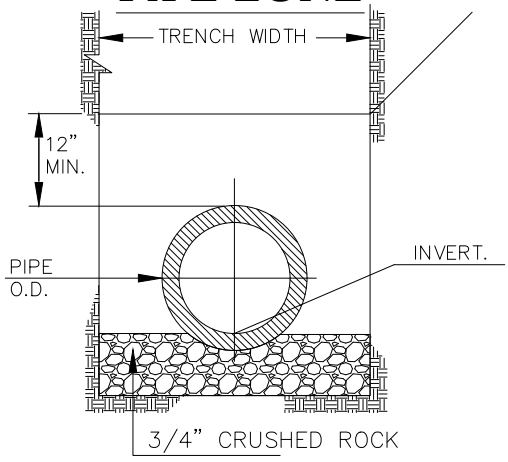
SUPPLEMENTAL STANDARD NO. DS-1

TYPICAL TRENCH SECTION

WITH DIMENSIONS AND COMPACTION ZONES



RCP PIPE PIPE ZONE



NOTES:

1. PERCENTAGES SHOWN EQUAL MINIMUM RELATIVE COMPACTION.
2. MINIMUM DEPTH OF COVER FROM TOP OF PIPE TO FINISH GRADE FOR ALL STORM DRAIN INSTALLATIONS SHALL BE 3 FEET. FOR COVER LESS THAN 3', SPECIAL DESIGN AND APPROVAL REQUIRED.
3. TRENCH ZONE BACKFILL SHALL BE PER SECTION 02223. NO ROCKS LARGER THAN 4" IN ANY DIMENSION WILL BE ALLOWED IN BACKFILL. ASPHALT OR CONCRETE CHUNKS WILL NOT BE ALLOWED.
4. CITY SHALL INSPECT TRENCH BOTTOMS PRIOR TO BACKFILL TO CONFIRM STABILITY OF TRENCH.

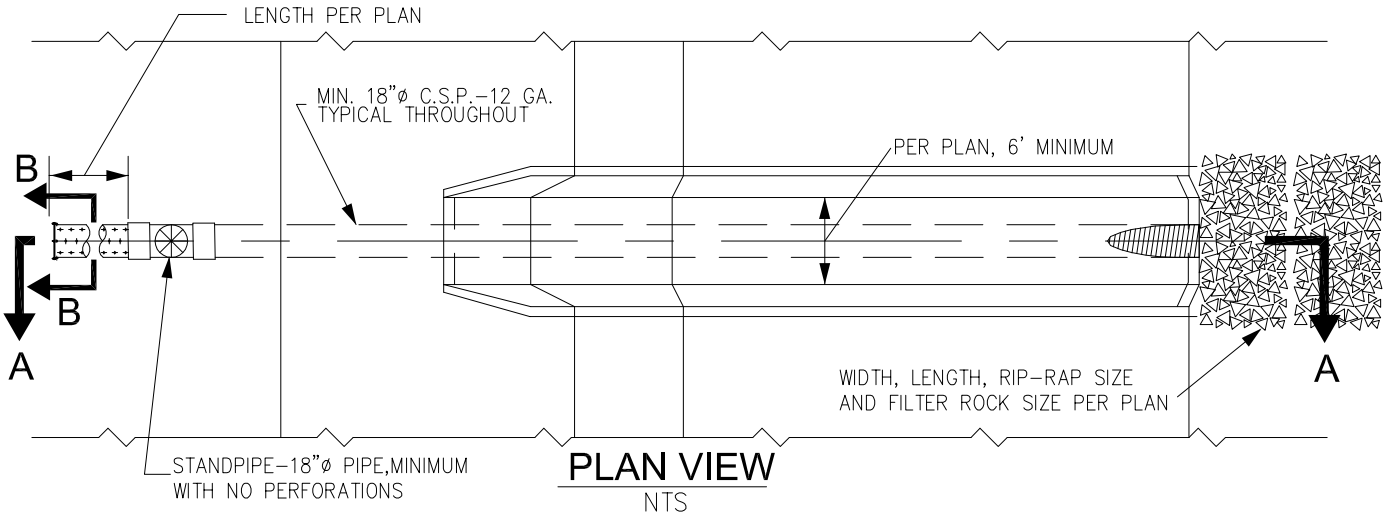
REV.	APPROVED	DATE

CITY OF CARLSBAD

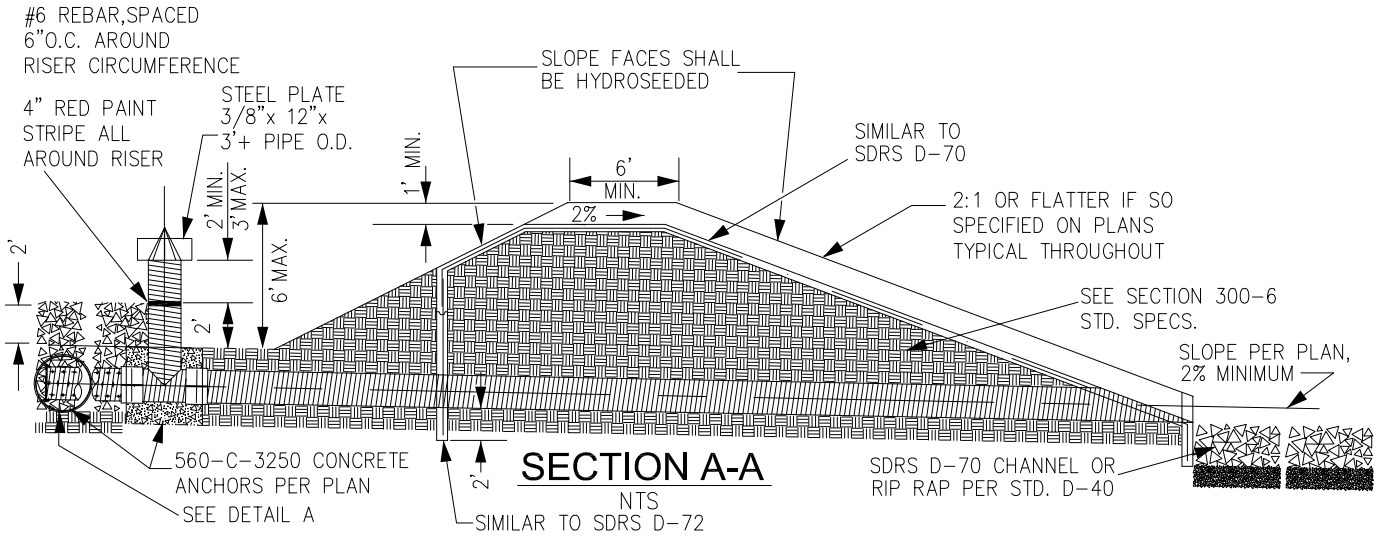
PIPE BEDDING AND TRENCH BACKFILL FOR STORM DRAINS

CITY ENGINEER — 4/29/2022 DATE

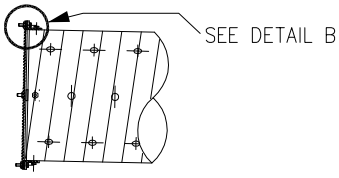
SUPPLEMENTAL STANDARD NO. DS-2



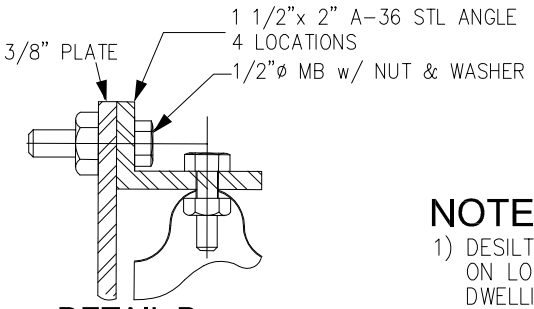
PLAN VIEW
NTS



SECTION A-A
NTS



DETAIL A
NTS



DETAIL B
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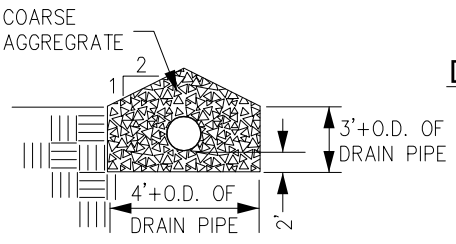


SECTION B-B
NTS

NOTES:

1) DESILTATION BASINS BUILT ON LOTS ADJACENT TO DWELLINGS SHALL BE COMPLETELY LINED WITH 3" GUNITE.
2) ALL STEEL PIPE AND HARDWARE TO BE HOT DIP GALVANIZED.

REV.	APPROVED	DATE

CITY OF CARLSBAD

TEMPORARY DESILTATION BASIN OUTLET AND CAPACITY TABLE

4/29/2022
CITY ENGINEER — DATE

SUPPLEMENTAL STANDARD NO. **DS-3**

BASIN CAPACITY TABLE*

(IN SQUARE FEET)

TRACT AREA (ACRES)	AVERAGE SLOPES					
	2%	5%	8%	10%	12%	15%
1	6,100	7,050	7,300	7,300	7,300	7,300
5	20,000	23,100	25,600	27,000	28,000	29,100
10	35,500	40,200	42,900	44,700	46,000	48,700
15	49,700	55,400	60,100	62,100	63,400	66,000
20	62,500	70,900	75,300	78,400	80,600	83,300
30	84,600	100,500	105,800	108,400	111,700	116,300
40	103,100	127,700	135,600	139,200	141,800	146,200
50	123,800	152,300	164,300	168,700	172,000	176,400

*FOR DESILTING BASINS ONLY, DOES NOT APPLY TO BIOFILTRATION OR BIORETENTION BASINS.

NOTES: BASIN SIZING VALUES ARE BASED CASQA FACT SHEET SE-2 WITH AN AVERAGE TRIBUTARY WATERSHED RUNOFF COEFFICIENT (C) OF 0.5, A DESIGN PARTICLE SIZE OF 0.01 MM, A BASIN HEIGHT OF 5 FEET, AND BASIN SIDE SLOPES OF 2:1 (HORIZONTAL: VERTICAL). PROJECTS HAVE THE OPTION TO PERFORM BASIN SIZING CALCULATIONS BASED ON SITE SPECIFIC PARAMETERS.

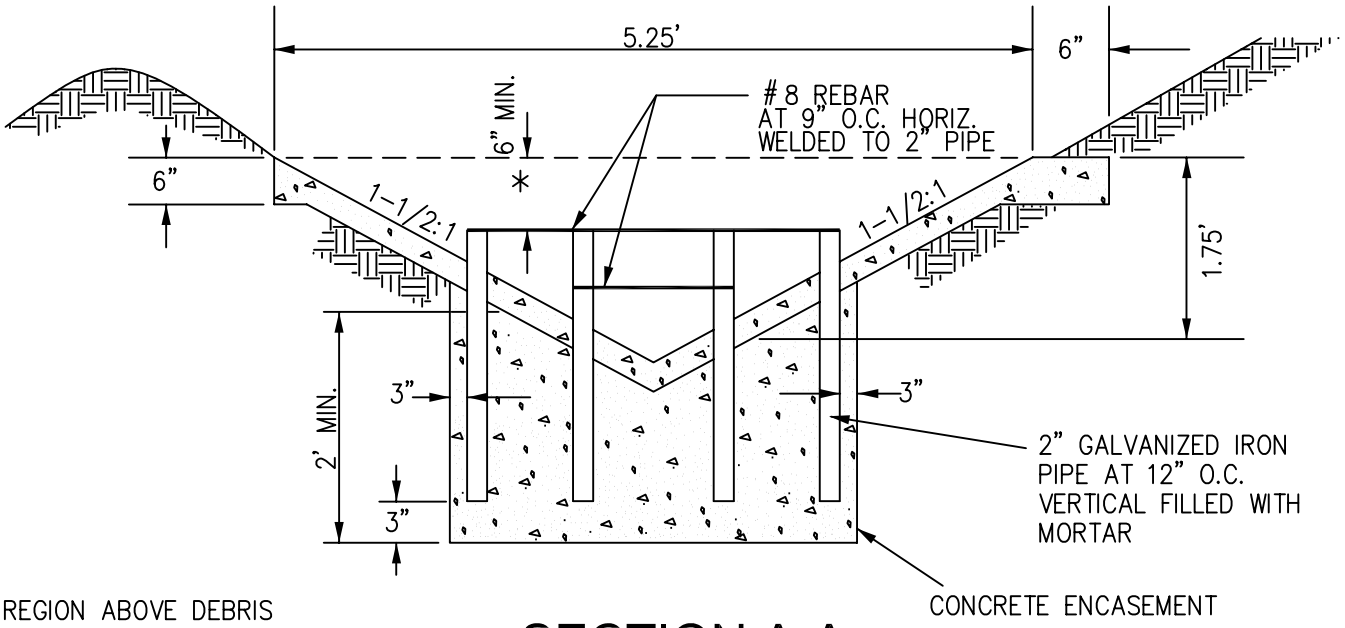
REV.	APPROVED	DATE

CITY OF CARLSBAD

TEMPORARY DESILTATION BASIN OUTLET AND CAPACITY TABLE

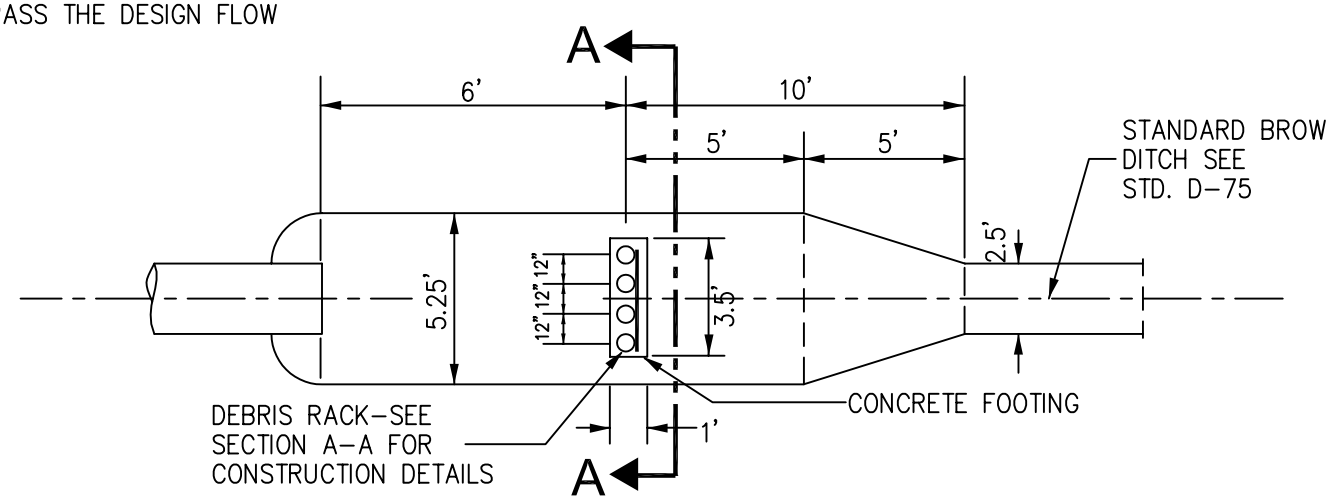
CITY ENGINEER — 4/29/2022 DATE

SUPPLEMENTAL STANDARD NO. DS-3

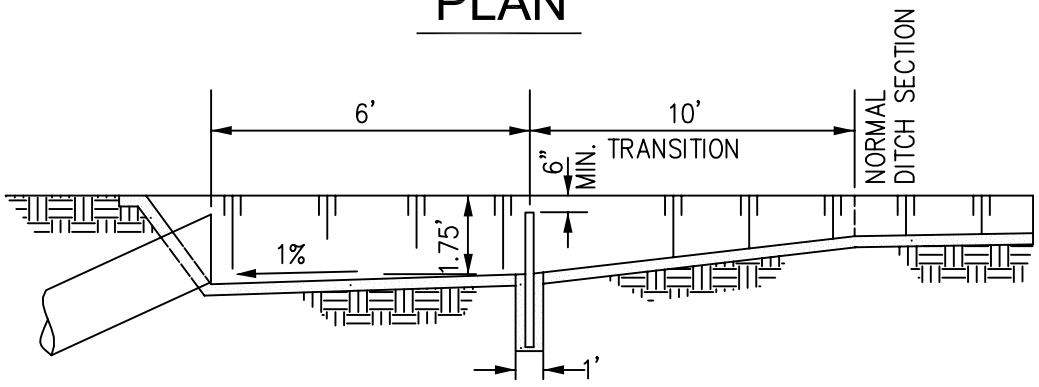


* REGION ABOVE DEBRIS RACK SHALL HAVE AN AREA SUFFICIENT TO PASS THE DESIGN FLOW

SECTION A-A



PLAN



ELEVATION

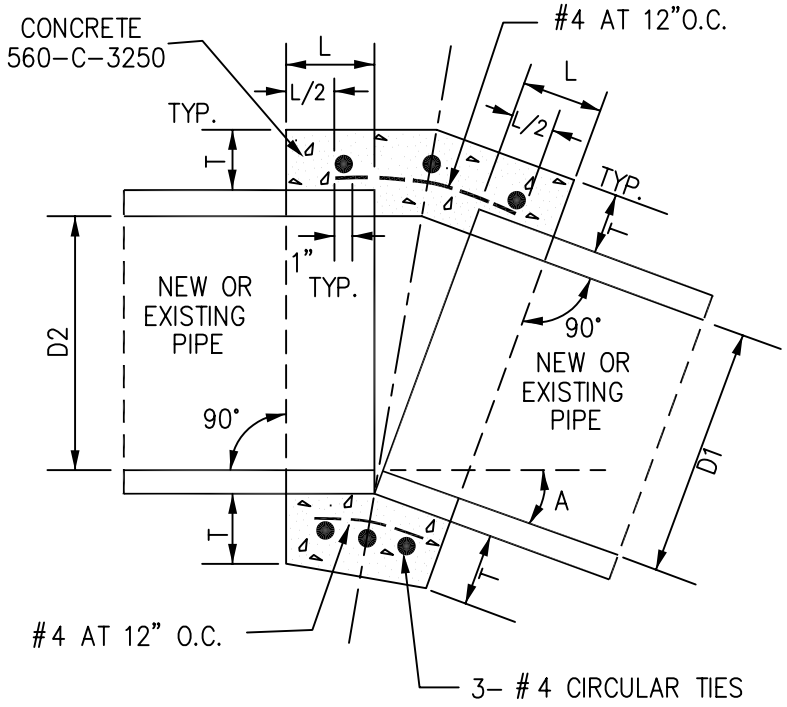
REV.	APPROVED	DATE

CITY OF CARLSBAD

BROW DITCH DEBRIS RACK

6-04
CITY ENGINEER DATE

SUPPLEMENTAL STANDARD NO. DS-4



D	L	T
12"	1'-0"	4"
18"	1'-0"	5"
24"	1'-0"	6"
36"	1'-6"	8"
48"	1'-6"	10"
57"	1'-6"	10"
60"	1'-9"	11"
66"	1'-9"	11"

NOTES:

1). A CONCRETE COLLAR IS REQUIRED WHERE THE CHANGE IN GRADE EXCEEDS 0.10 FT. PER FT.

2). WHERE PIPES OF DIFFERENT DIAMETERS ARE JOINED WITH A CONCRETE COLLAR, L AND T SHALL BE THOSE OF THE LARGER PIPE. D=D1 OR D2 WHICHEVER IS GREATER.

3). FOR PIPES LARGER THAN 66" A SPECIAL COLLAR DETAIL IS REQUIRED.

4). FOR PIPE SIZE NOT LISTED USE NEXT SIZE LARGER.

5). OMIT REINFORCING ON PIPES 24" AND LESS IN DIAMETER AND ON ALL PIPES WHERE ANGLE A IS LESS THAN 10°.

6). WHERE REINFORCING IS REQUIRED THE DIAMETER OF THE CIRCULAR TIES SHALL BE D+(2xWALL THICKNESS)+8".

7). WHEN D1 IS EQUAL TO OR LESS THAN D2, JOIN INVERTS AND WHEN D1 IS GREATER THAN D2 JOIN SOFFITS.

8). PIPE MAY BE CORRUGATED METAL PIPE, CONCRETE PIPE OR REINFORCED CONCRETE PIPE.

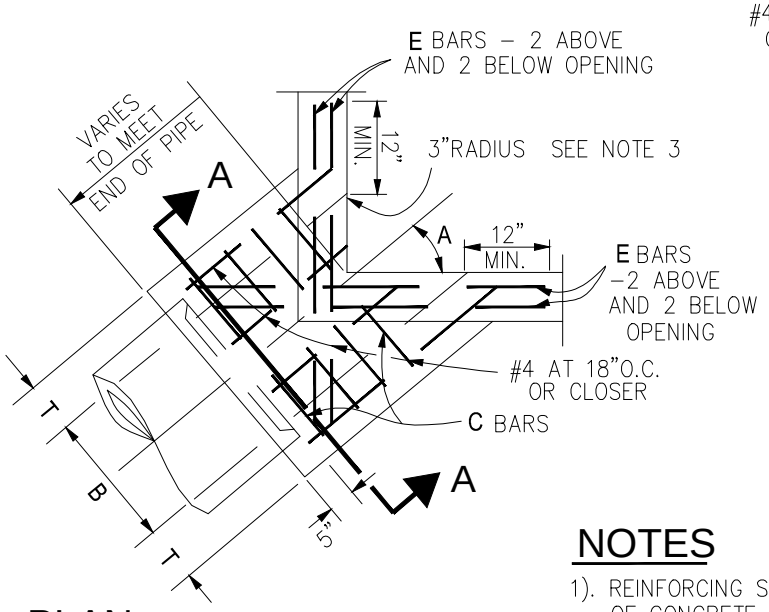
REV.	APPROVED	DATE

CITY OF CARLSBAD

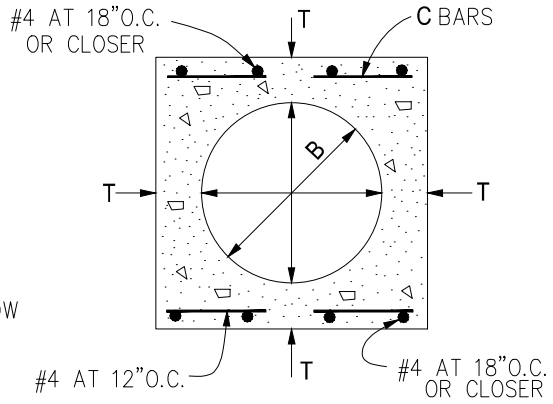
CONCRETE PIPE COLLAR
FOR PIPES 12" THROUGH 66"

CITY ENGINEER — 6-04 DATE

SUPPLEMENTAL STANDARD NO. DS-5



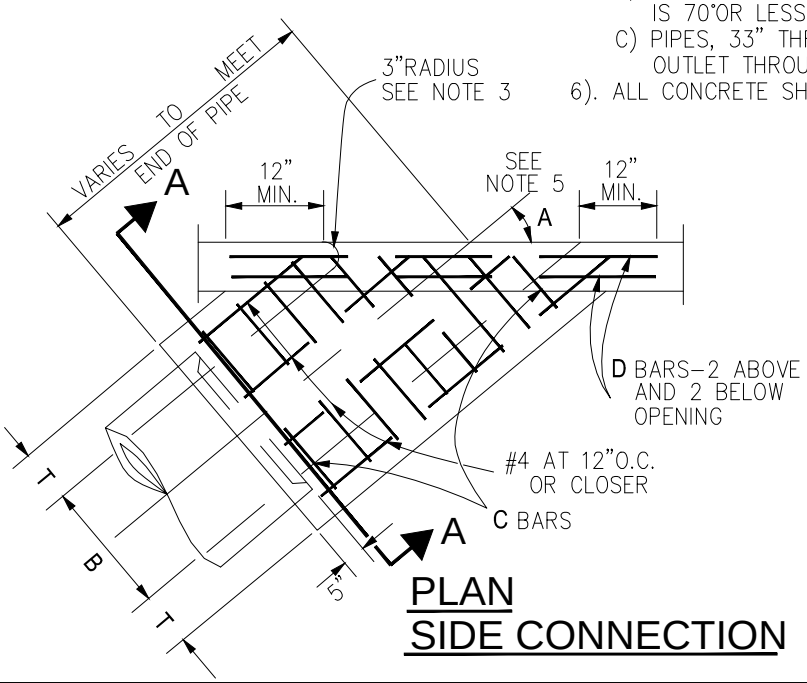
PLAN
CORNER CONNECTION



SECTION A-A

NOTES

1). REINFORCING STEEL SHALL BE 1–1/2" CLEAR FROM FACE OF CONCRETE UNLESS OTHERWISE SHOWN.
2). REINFORCING STEEL FOR INSIDE FACE OF CURB INLET BASIN SHALL BE CUT AT CENTER OF OPENING AND BENT INTO WALLS OF MONOLITHIC CONNECTION. REINFORCING STEEL FOR OUTSIDE FACE OF CATCH BASIN WALL SHALL BE CUT 2" CLEAR OF OPENING.
3). CONNECTION SHALL BE POURED MONOLITHIC WITH CURB INLET. THE ROUNDED EDGE OF OUTLET SHALL BE CONSTRUCTED BY POURING CONCRETE AGAINST A CURVED FORM WITH A RADIUS OF 3".
4). FLOOR OF STRUCTURE SHALL BE STEEL–TROWELED TO SPRING LINE.
5). CONNECTIONS SHALL BE CONSTRUCTED WHEN:
   A) PIPES, 12" THROUGH 72" IN DIAMETER, INLET OR OUTLET THROUGH CORNER OF CURB INLET.
   B) ANGLE **A**, FOR PIPES 24" THROUGH 30" IN DIAMETER, IS 70°OR LESS.
   C) PIPES, 33" THROUGH 72" IN DIAMETER, INLET OR OUTLET THROUGH THE SIDE WALL OF CURB INLET.
6). ALL CONCRETE SHALL BE TYPE 560–C–3250.



PLAN
SIDE CONNECTION

B	T	C BARS	D AND E BARS
12"	4"	#4 AT 6" O.C.	#5
15"	4–1/4		
18"	4–1/2		
21"	5"		
24"	5–1/4		
27"	5–1/2		
30"	6"		
33"	6–1/4		
36"	6–1/2		
39"	7"		

B	T	C BARS	D AND E BARS
42"	7–1/2	#5 AT 6" O.C.	#6
45"	7–3/4		
48"	8"		
51"	8–1/2		
54"	9"		
57"	9–1/4		
60"	9–1/2		
63"	10"		
66"	10–1/4		
69"	10–3/4		
72"	11"		

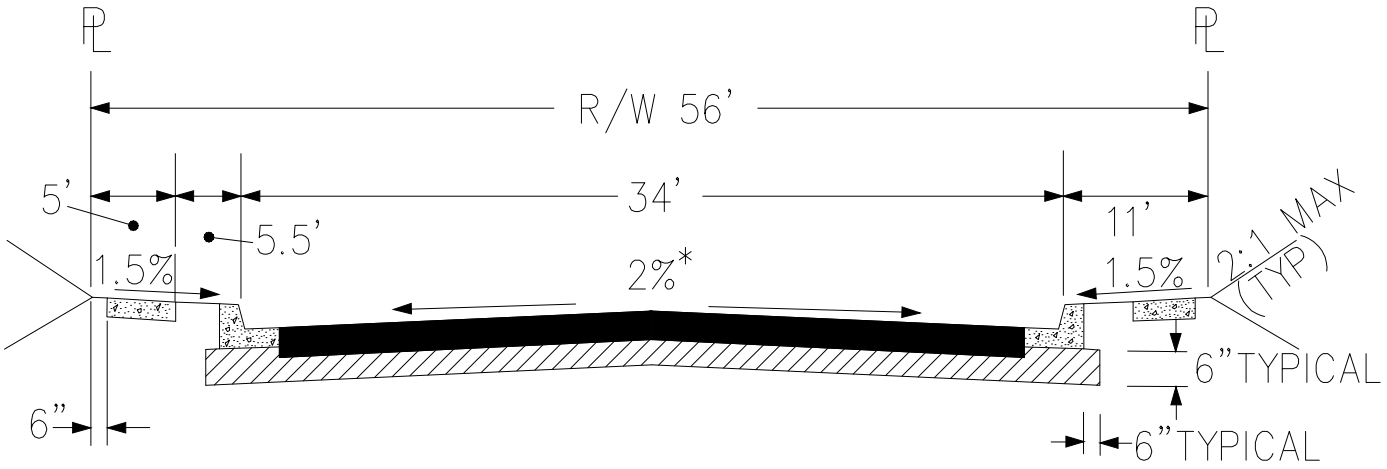
REV.	APPROVED	DATE

CITY OF CARLSBAD

PIPE CONNECTION TO STRUCTURES FOR PIPES 12" THROUGH 72"

4/29/2022
CITY ENGINEER — DATE

SUPPLEMENTAL STANDARD NO. DS-9



* CROSS SLOPE MAY VARY TO MEET DESIGN PARAMETERS. GRADE DIFFERING FROM TYPICAL 2% SHALL RECEIVE PRIOR APPROVAL FROM THE CITY ENGINEER.

LEGEND

- ASPHALT
- AGGREGATE BASE
- CONCRETE

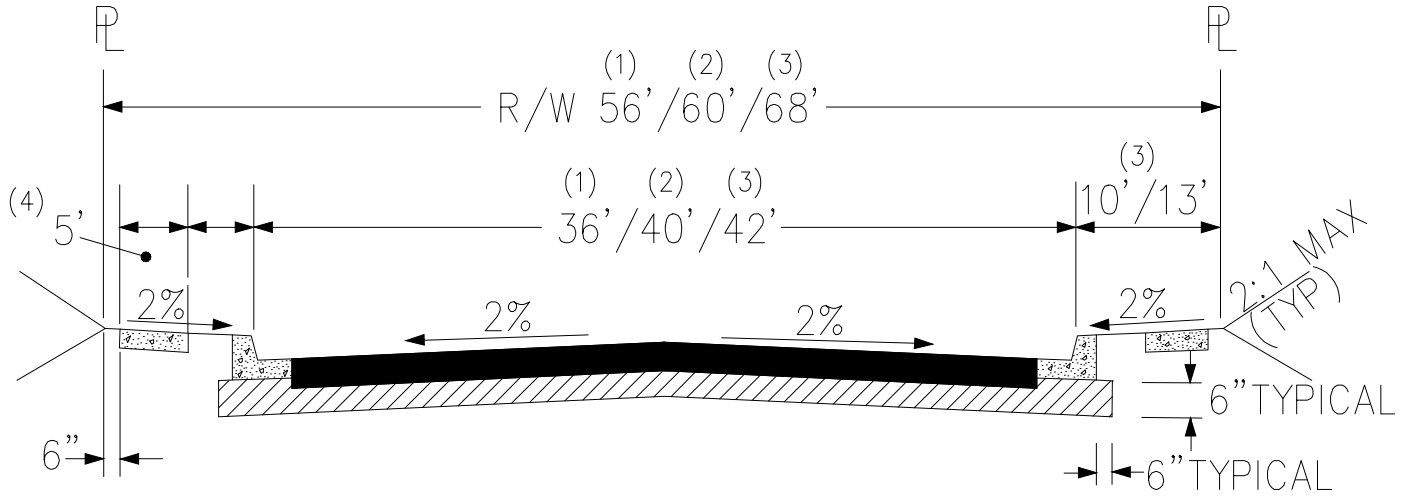
REV.	APPROVED	DATE

CITY OF CARLSBAD

HILLSIDE STREET

CITY ENGINEER — 4/29/2022 DATE

SUPPLEMENTAL STANDARD NO. GS-1A



(1) FOR CUL-DE-SACS SERVING 20 LOTS OR LESS.

(2) FOR CUL-DE-SACS SERVING MORE THAN 20 AND UP TO 50 LOTS. AUTOMATIC FIRE SPRINKLERS SYSTEMS REQUIRED.

(3) WHERE ANY OF THE ADJACENT LOTS CONTAIN A PORTION OF A FIRE HAZARD/FIRE SUPPRESSION ZONE, A 28-FOOT CLEAR TRAVEL WAY IS REQUIRED.

(4) SIDEWALK TO BE ADJACENT TO CURB AROUND BULB OF CUL-DE-SAC TO PROVIDE 5-FOOT CLEAR BEHIND CURB FOR FIRE DEPARTMENT EQUIPMENT.

LEGEND

- ASPHALT
- AGGREGATE BASE
- CONCRETE

REV.	APPROVED	DATE

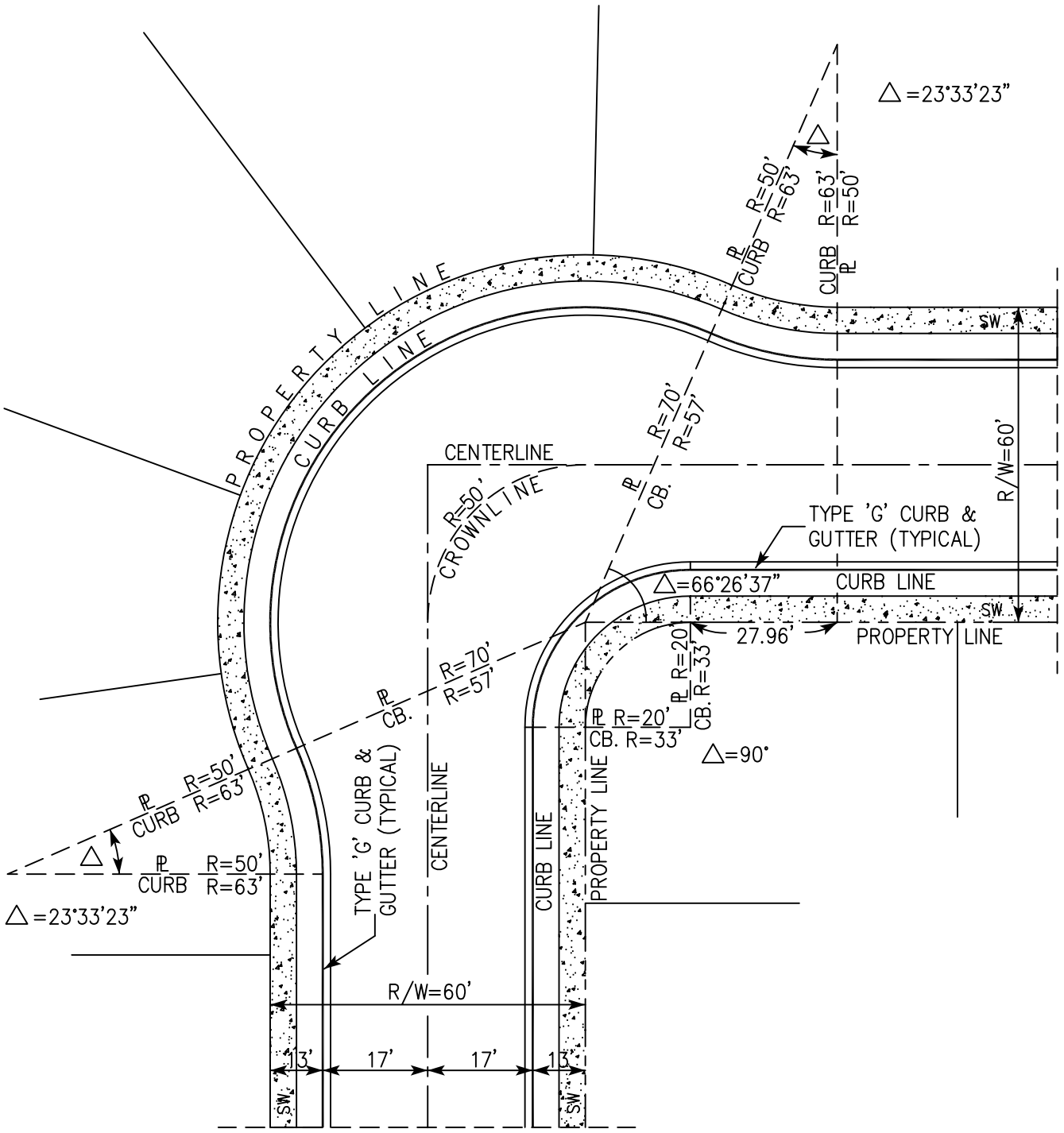
CITY OF CARLSBAD

CUL-DE-SAC STREET WIDTHS

4/29/2022

CITY ENGINEER DATE

SUPPLEMENTAL STANDARD NO. GS-1B



PLAN

NOTE: MINIMUM 1.0% ON ALL HORIZONTAL CURVE GRADES

REV.	APPROVED	DATE

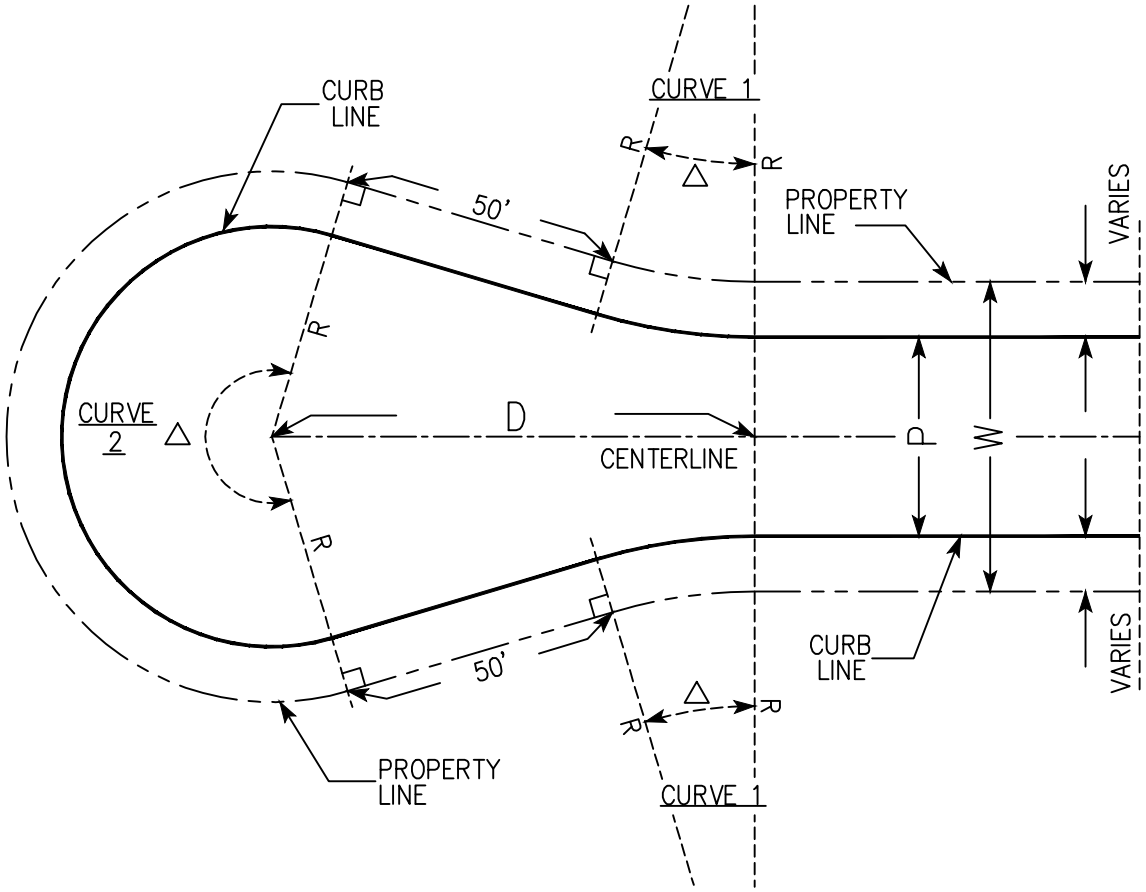
CITY OF CARLSBAD

STANDARD KNUCKLE

Glenn Pruim 6-04

CITY ENGINEER DATE

SUPPLEMENTAL STANDARD NO. GS-2



PLAN

CURVE 1				CURB		PROP. LINE	
W	P	D	△	R	L	R	L
56'	36'	93.49'	18° 59' 27"	100'	33.15'	90'	29.83'
60'	36'	93.49'	18° 59' 27"	100'	33.15'	88'	29.17'
60'	40'	90.91'	17° 44' 53"	100'	30.98'	90'	27.88'
68'	42'	89.57'	17° 06' 47"	100'	29.87'	87'	25.99'

CURVE 2				CURB		PROP. LINE	
W	P	D	△	R	L	R	L
56'	36'	93.49'	217° 58' 54"	42'	159.79'	52'	197.83'
60'	36'	93.49'	217° 58' 54"	42'	159.79'	54'	205.44'
60'	40'	90.91'	215° 29' 46"	42'	157.97'	52'	195.58'
68'	42'	89.57'	214° 13' 34"	42'	157.04'	55'	205.64'

REV.	APPROVED	DATE

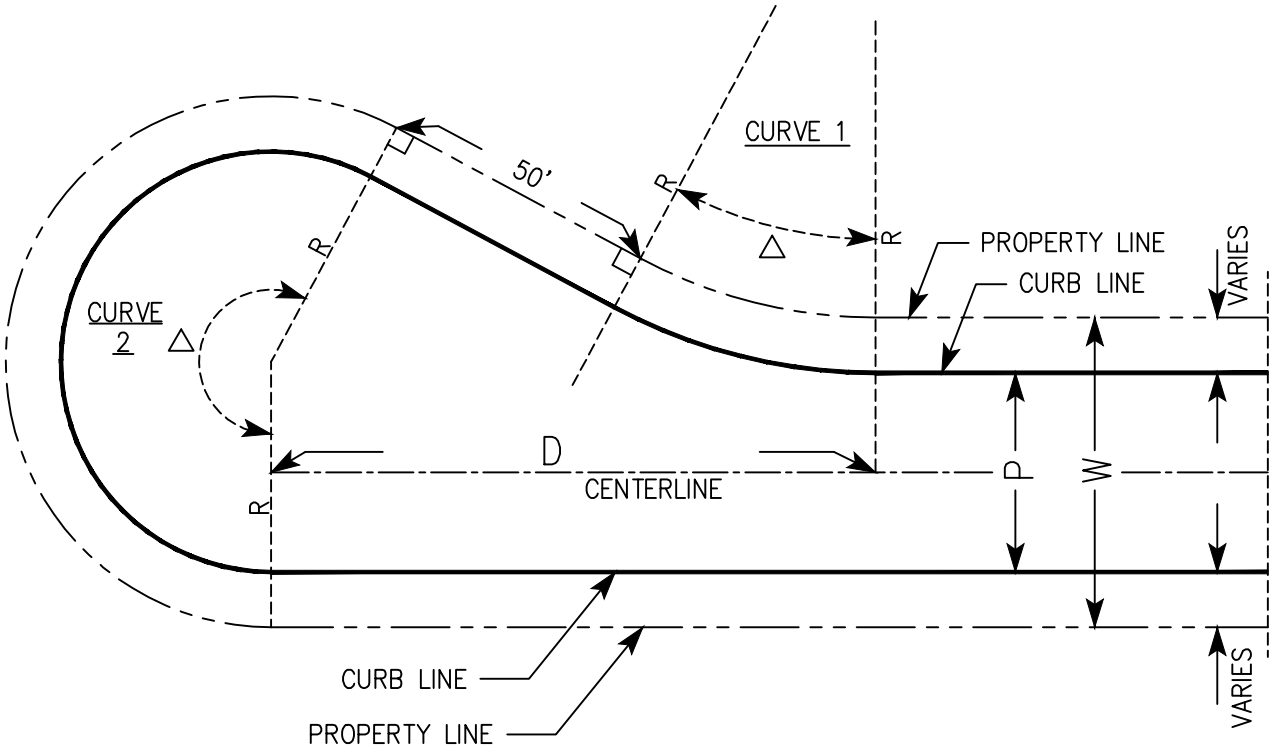
CITY OF CARLSBAD

CONCENTRIC CUL-DE-SAC

Robert T. Johnson Jr. 11/09

CITY ENGINEER DATE

SUPPLEMENTAL STANDARD NO. GS-3



PLAN

CURVE 1			CURB		PROP. LINE	
W	P	Δ	R	L	R	L
56'	36'	31° 57' 52"	100'	55.79'	90'	50.21'
60'	36'	31° 57' 52"	100'	55.79'	88'	49.09'
60'	40'	29° 59' 16"	100'	52.34'	90'	47.10'
68'	42'	28° 58' 38"	100'	50.57'	87'	44.00'

CURVE 2				CURB		PROP. LINE	
W	P	D	Δ	R	L	R	L
56'	36'	117.59'	211° 57' 51"	42'	155.38'	52'	192.37'
60'	36'	117.59'	211° 57' 51"	42'	155.38'	54'	199.77'
60'	40'	114.28'	209° 59' 16"	42'	153.93'	52'	190.58'
68'	42'	112.53'	208° 58' 38"	42'	153.19'	55'	200.60'

REV.	APPROVED	DATE

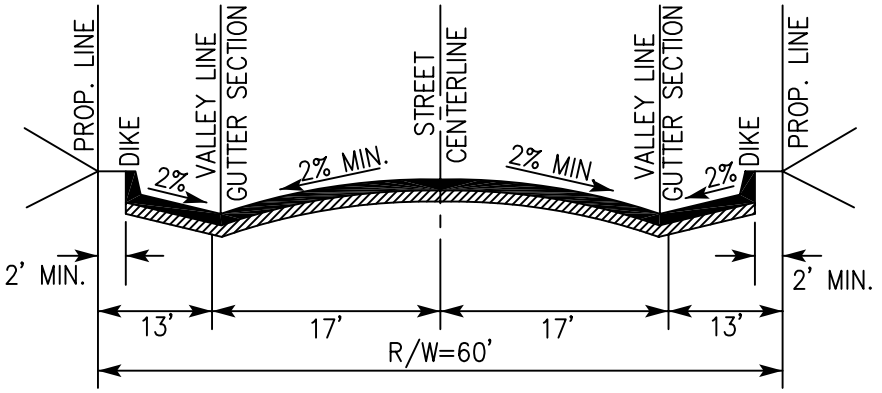
CITY OF CARLSBAD

OFFSET CUL-DE-SAC

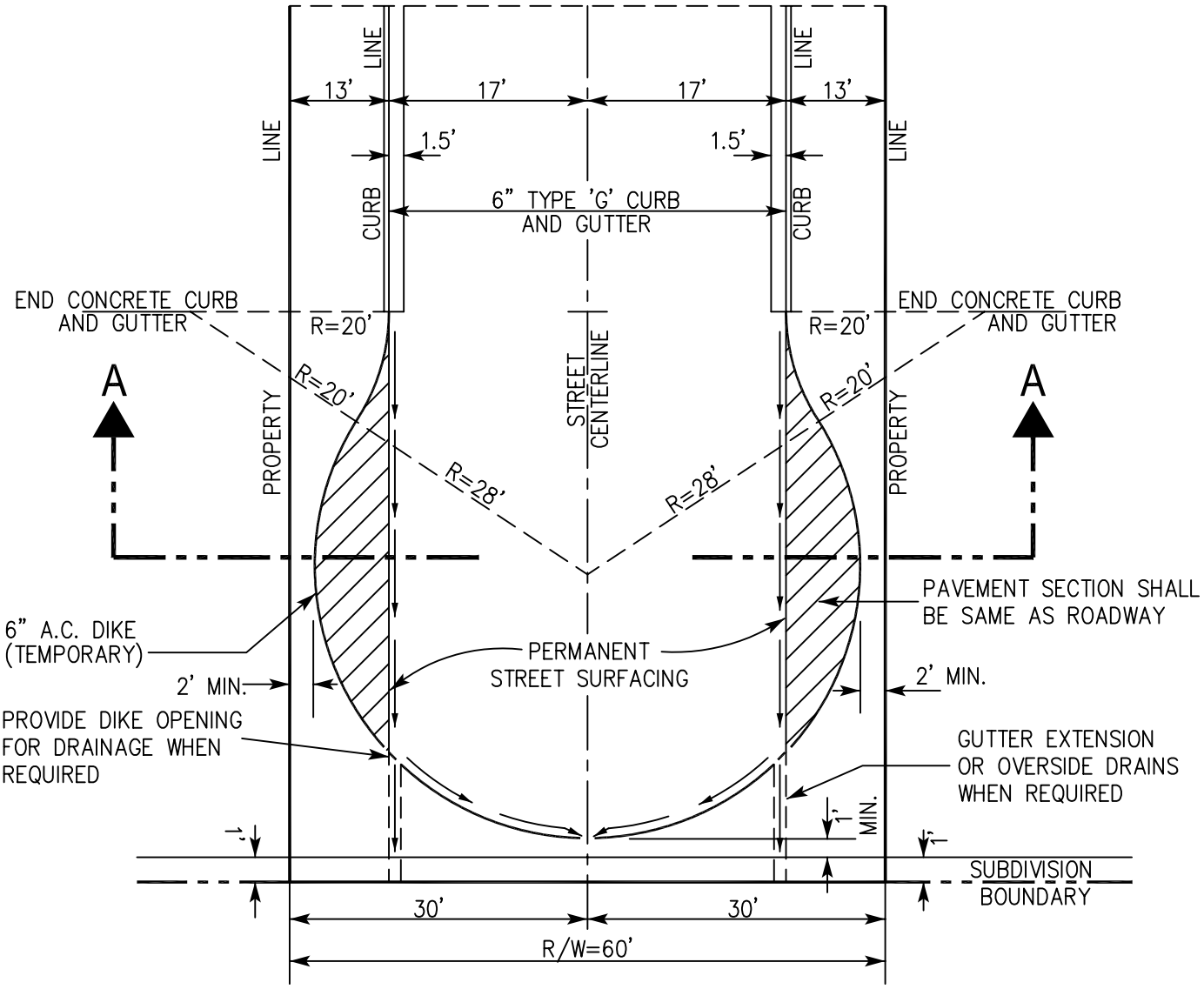
Robert T. Johnson Jr. 11/09

CITY ENGINEER DATE

SUPPLEMENTAL STANDARD NO. GS-4



SECTION A-A



PLAN

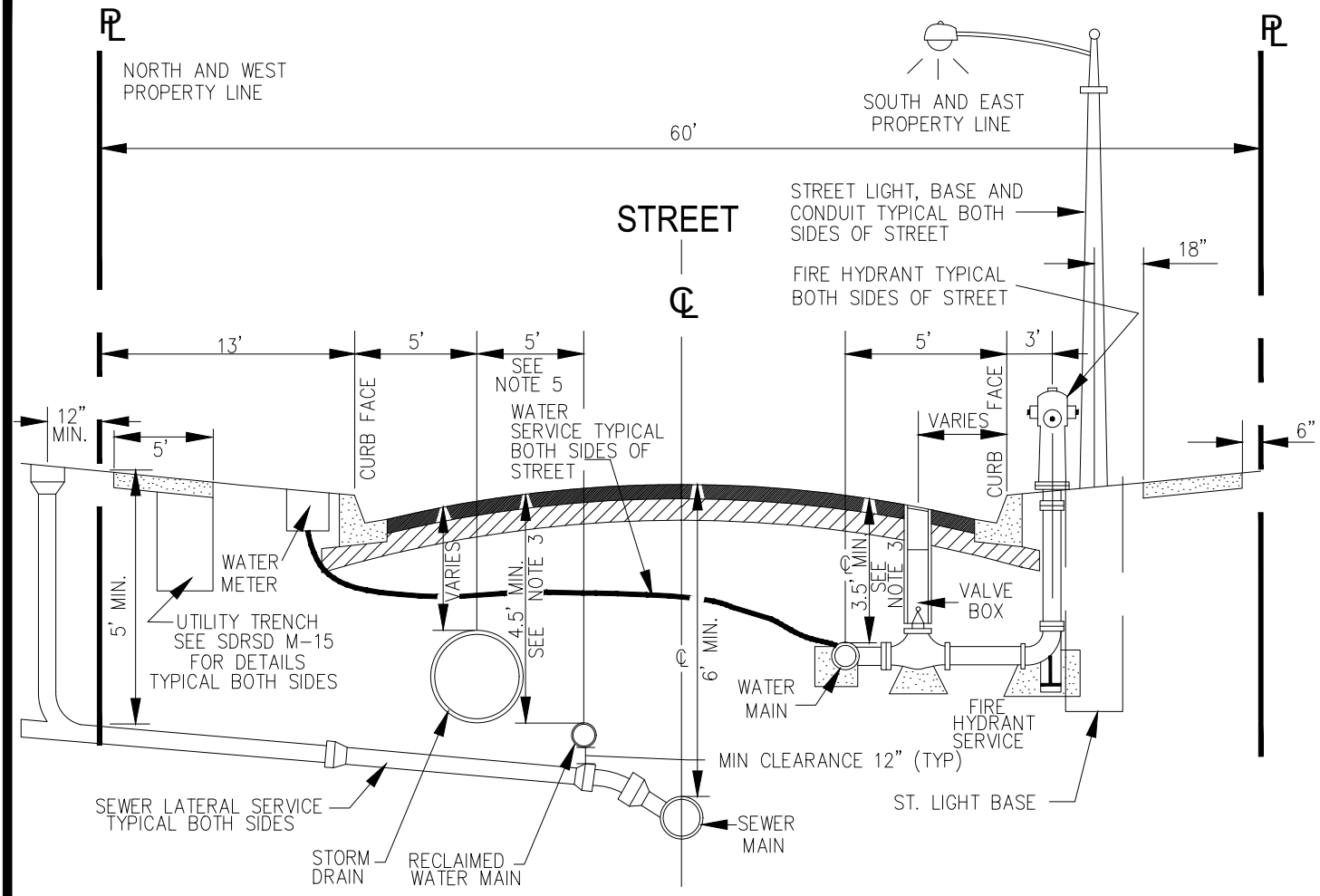
REV.	APPROVED	DATE

CITY OF CARLSBAD

TEMPORARY TURN-AROUND AT DEAD-END STREET

Glenn Pruim — 6-04
CITY ENGINEER — DATE

SUPPLEMENTAL STANDARD NO. GS-5



TYPICAL SECTION
LOCAL STREET

NOTES

1). LOCATION OF WATER MAIN WILL GOVERN LOCATION OF UTILITIES. NORMALLY THE WATER MAIN WILL BE LOCATED ON SOUTH AND EAST SIDE OF STREET EXCEPT ON SINGLE LOADED STREETS WHERE IT MAY BE PLACED ON THE LOADED SIDE OF THE STREET.

2). STREET LIGHTS AND FIRE HYDRANTS WILL BE LOCATED 18" OFF OF SIDEWALK.

3). WATERLINE DEPTH TO BE 3.5' MIN. WITHIN ALL LOCAL AND COLLECTOR STREET CLASSIFICATIONS AND 4.5' MIN. ON ALL ARTERIAL STREETS. RECLAIMED WATERLINE DEPTH TO BE 4.5' MIN. WITHIN ALL LOCAL AND COLLECTOR STREET CLASSIFICATIONS AND 5.5' MIN. ON ALL ARTERIAL STREETS.

4). WHEN SIDEWALK MEANDERS, WATER METER SHALL BE INSTALLED AT BACK OF CURB.

5). HORIZONTAL ALIGNMENT OF UTILITIES SHALL FOLLOW THE STREET CURVATURE UNLESS SPECIFICALLY WAIVED BY THE CITY ENGINEER.

REV.	APPROVED	DATE

CITY OF CARLSBAD

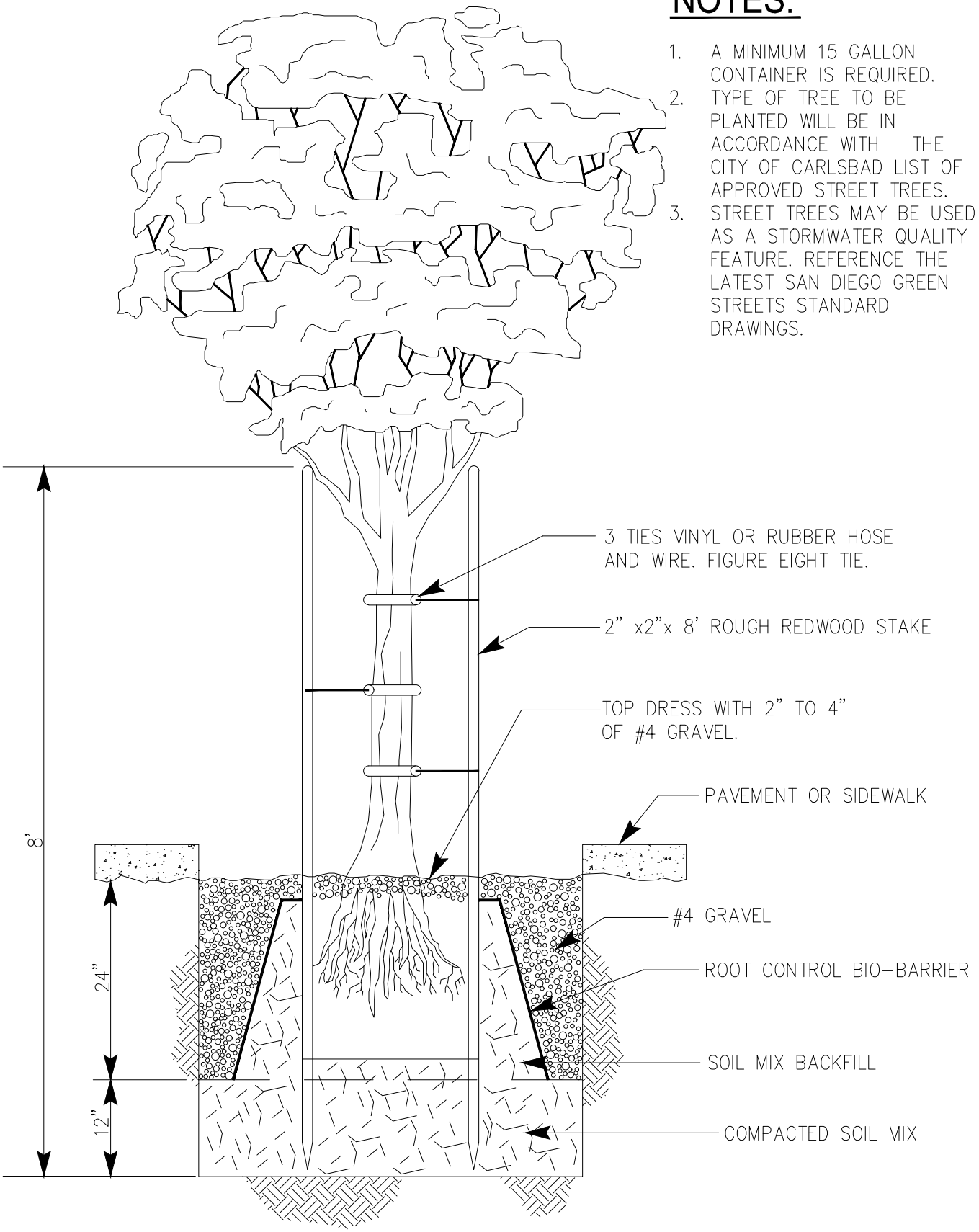
LOCATIONS OF UNDERGROUND UTILITIES

CITY ENGINEER — 4/29/2022 DATE

SUPPLEMENTAL STANDARD NO. GS-6

NOTES:

1. A MINIMUM 15 GALLON CONTAINER IS REQUIRED.
2. TYPE OF TREE TO BE PLANTED WILL BE IN ACCORDANCE WITH THE CITY OF CARLSBAD LIST OF APPROVED STREET TREES.
3. STREET TREES MAY BE USED AS A STORMWATER QUALITY FEATURE. REFERENCE THE LATEST SAN DIEGO GREEN STREETS STANDARD DRAWINGS.



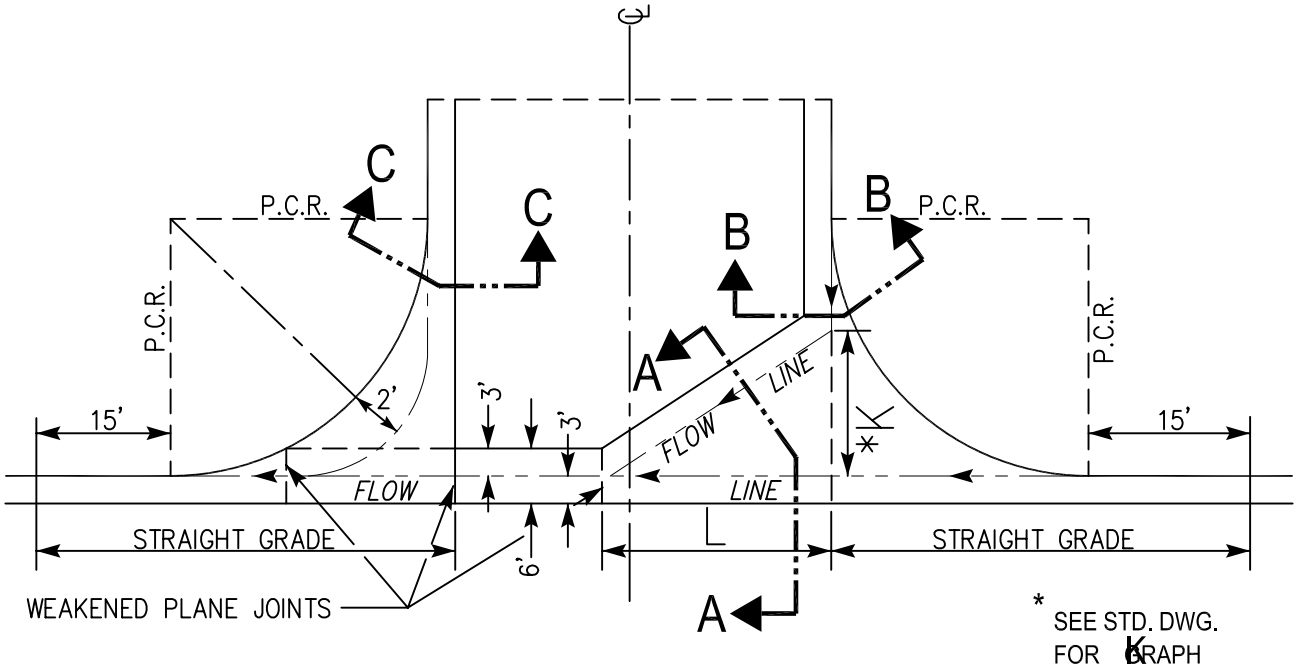
REV.	APPROVED	DATE

CITY OF CARLSBAD

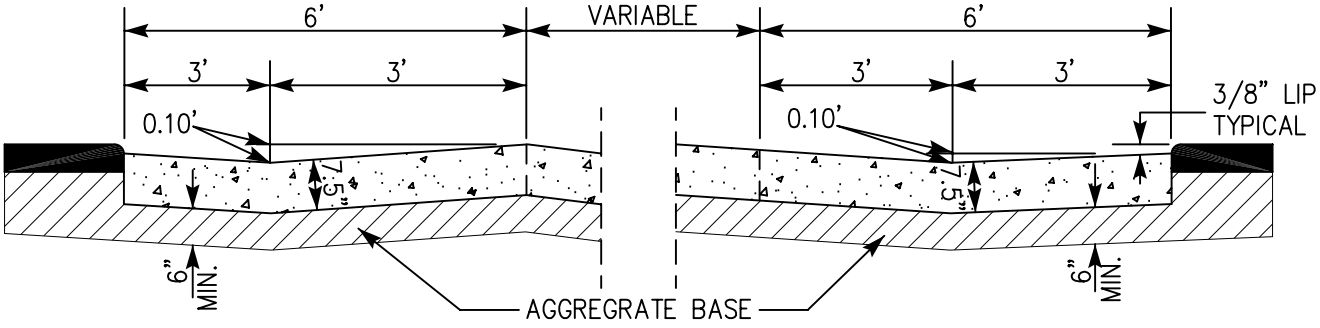
PARKWAY TREE PLANTING

CITY ENGINEER — 4/29/2022 DATE

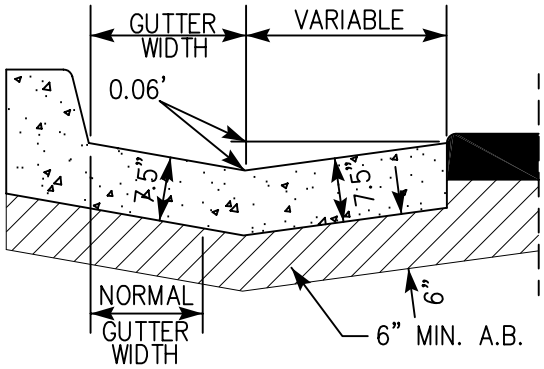
SUPPLEMENTAL STANDARD NO. GS-8



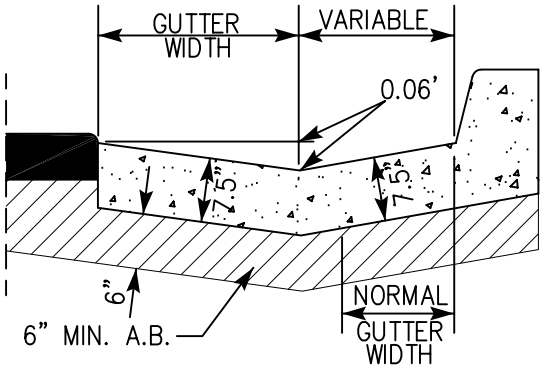
DETAIL PLAN OF CROSS GUTTER



SECTION A-A



SECTION C-C



SECTION B-B

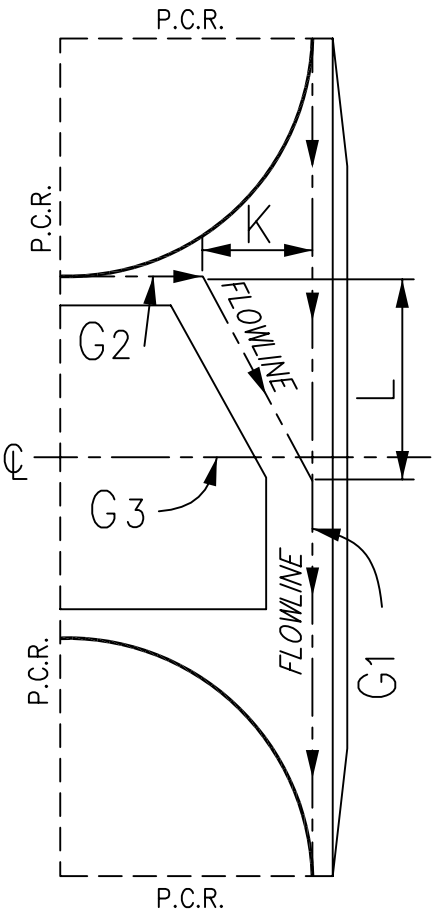
REV.	APPROVED	DATE

CITY OF CARLSBAD

SPECIAL CROSS GUTTER
(STEEP GRADES)

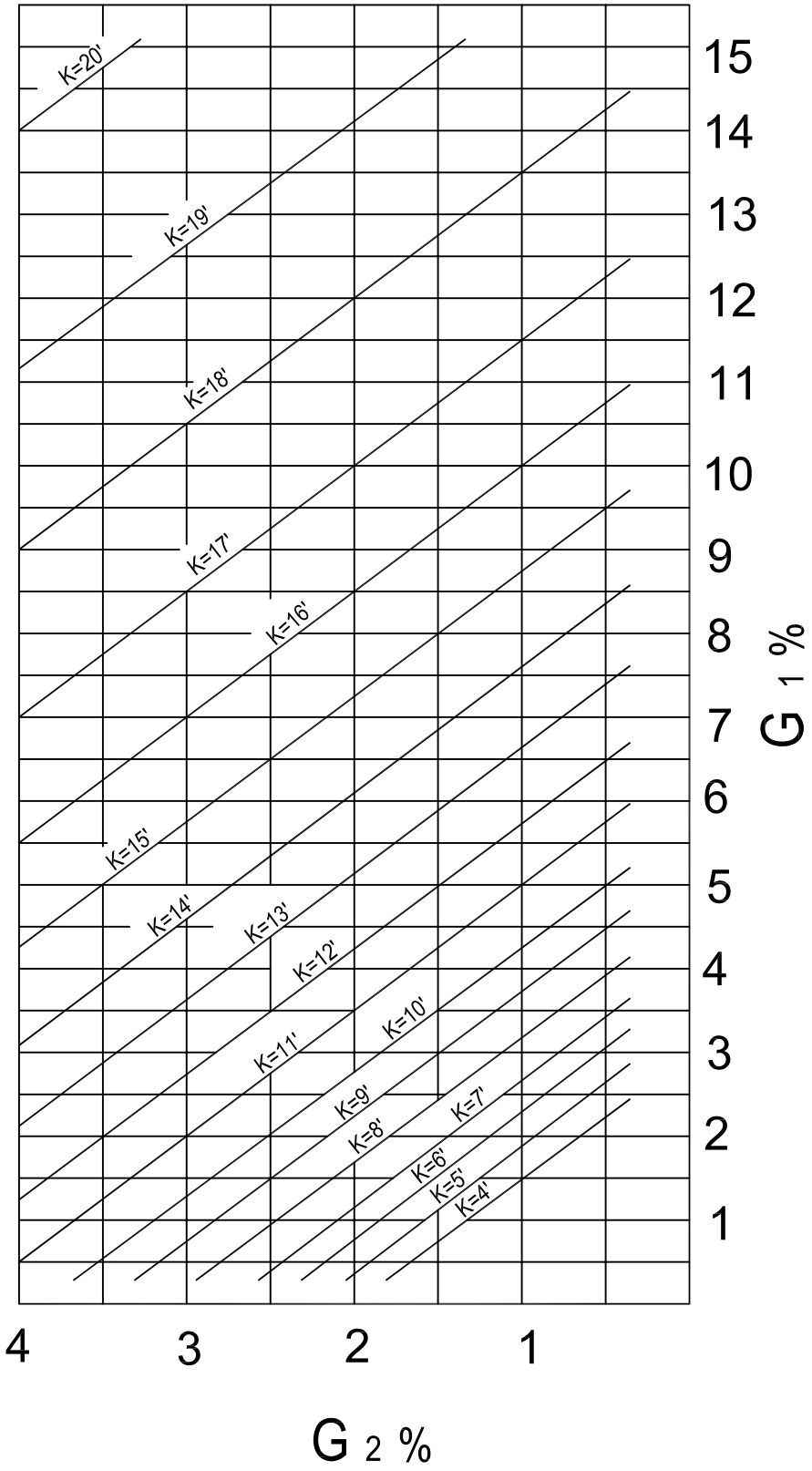
6-04
CITY ENGINEER DATE

SUPPLEMENTAL STANDARD NO. GS-9



$$L = \frac{KG_1}{G_3}$$

PLAN



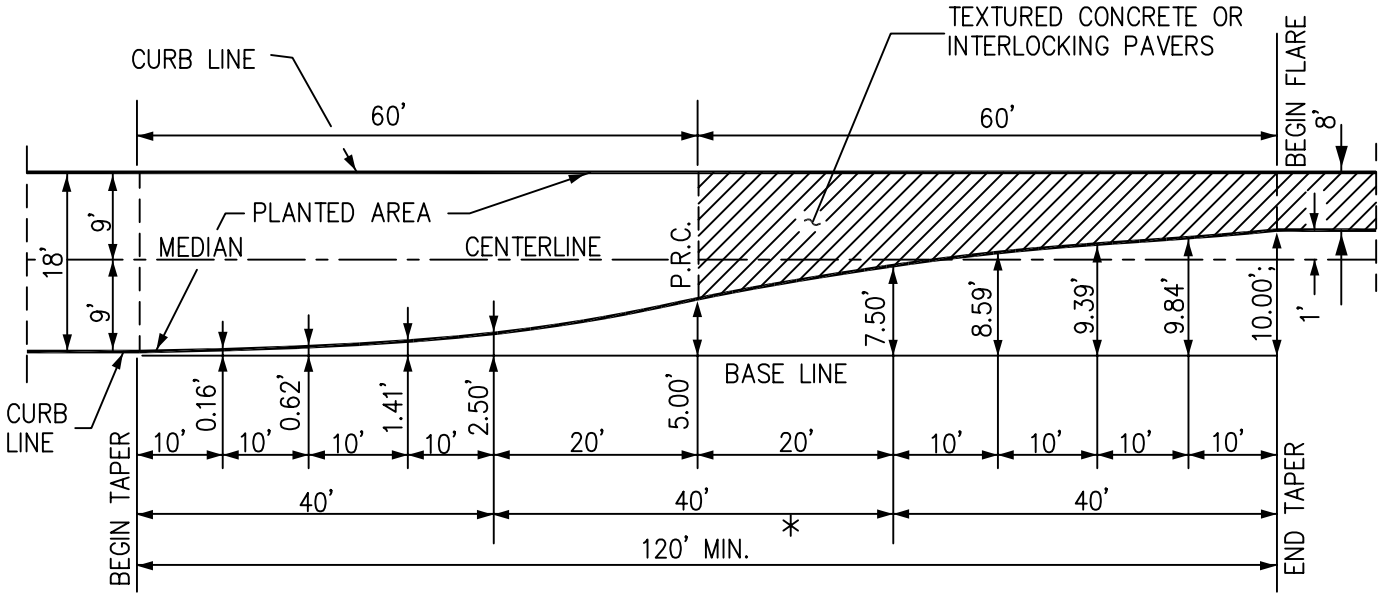
REV.	APPROVED	DATE

CITY OF CARLSBAD

GRAPH FOR SPECIAL CROSS GUTTER

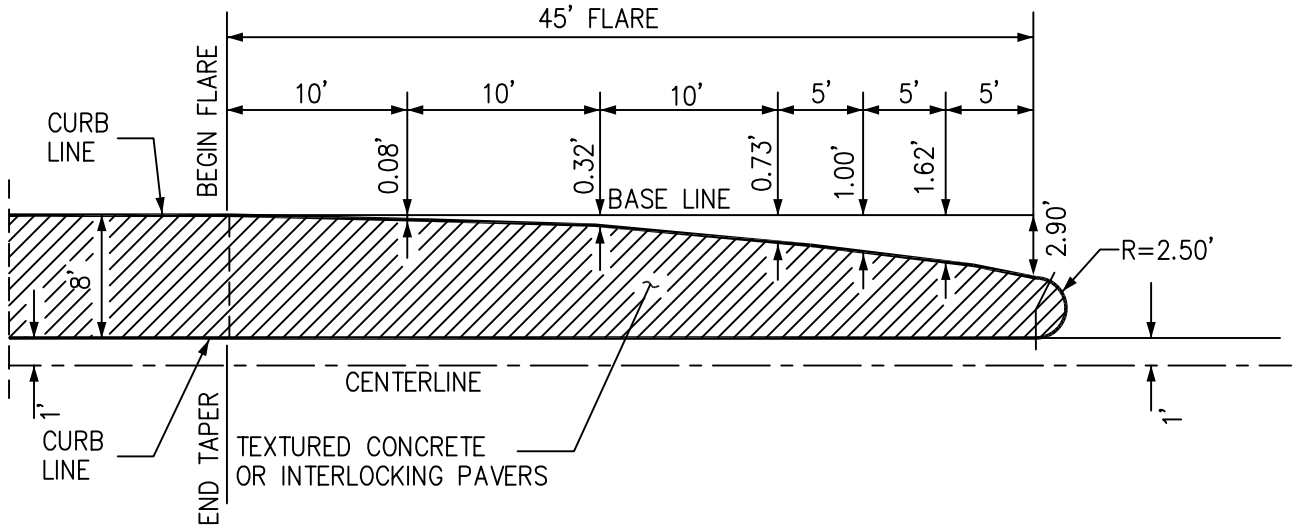
6-04
CITY ENGINEER DATE

SUPPLEMENTAL STANDARD NO. GS-10



* NOTE:
FOR STREETS REQUIRING LONGER TAPERS THE DIMENSIONS MAY BE EXTENDED IN A PROPORTIONATE MANNER.

DETAIL 120' TAPER



DETAIL NOSE FLARE

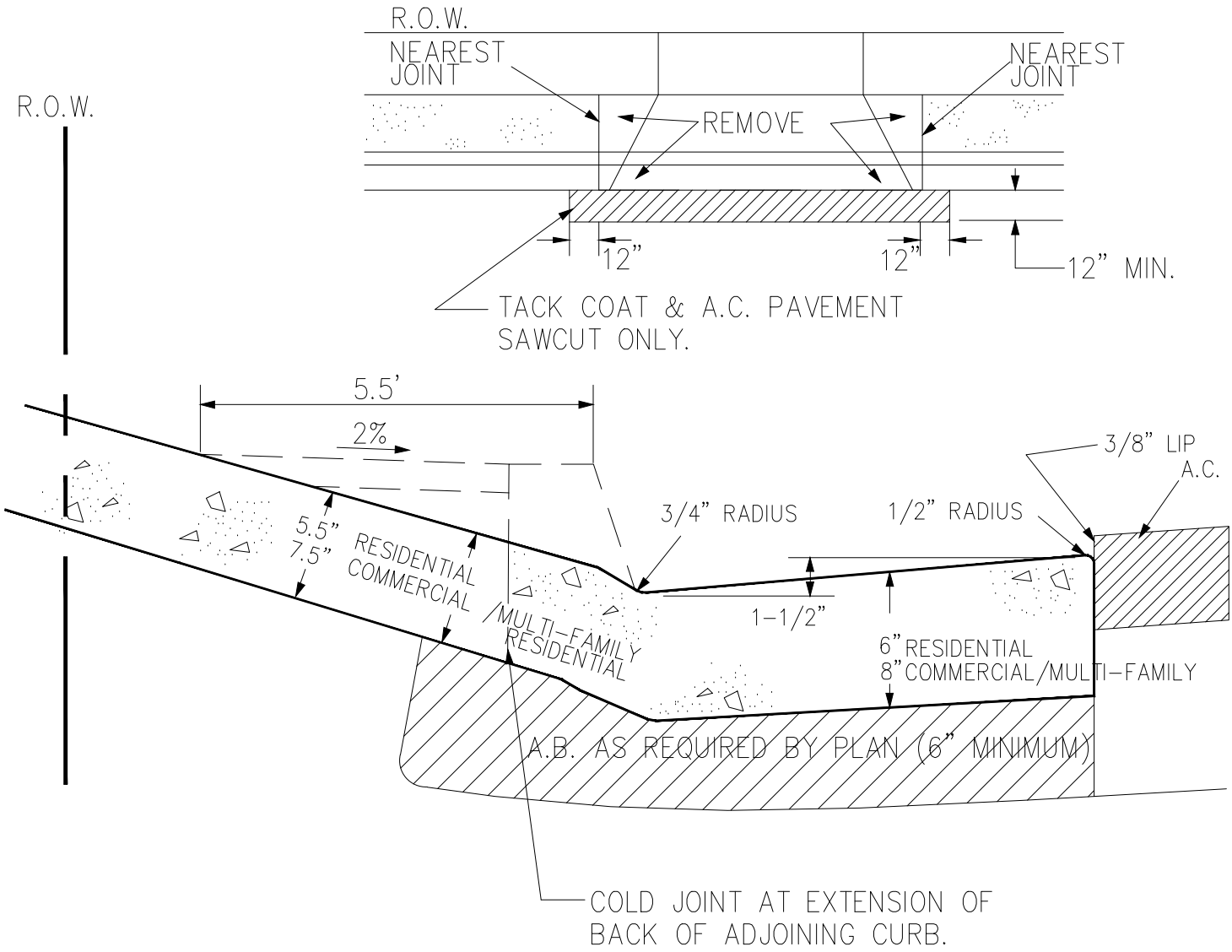
REV.	APPROVED	DATE

CITY OF CARLSBAD

MEDIAN TAPER AND NOSE FLARE

6-04
CITY ENGINEER DATE

SUPPLEMENTAL STANDARD NO. GS-11



NOTES:

1. PROVIDE WEAKENED PLANE AT 15' MAXIMUM, OR AT TOP OF TRANSITION.
2. REMOVE CURB, GUTTER & SIDEWALK AS SHOWN ABOVE TO NEAREST EXISTING JOINTS. FORM ON A.C. SIDE AND SLOT PAVE WITH C2-PG64-10

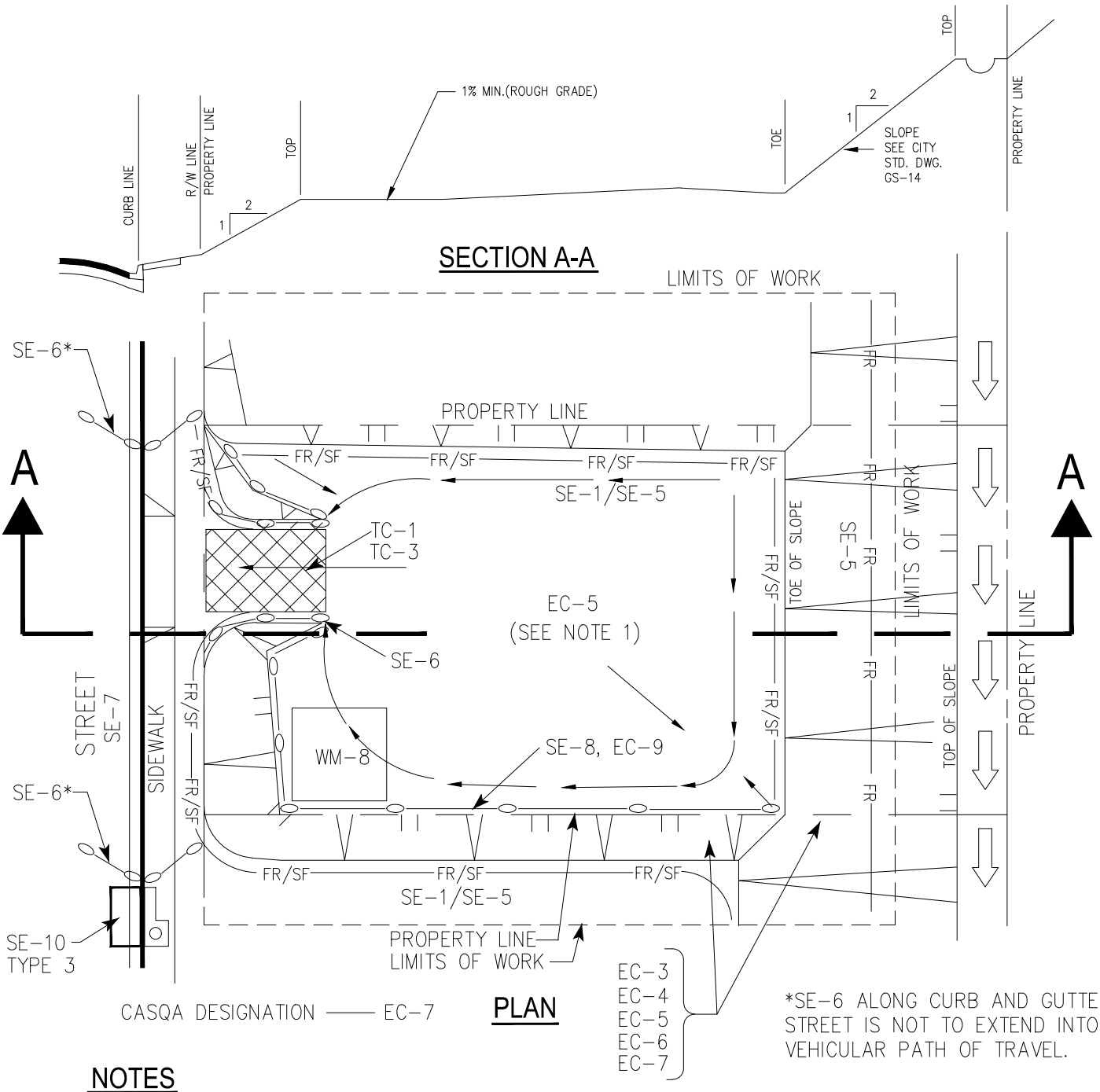
REV.	APPROVED	DATE

CITY OF CARLSBAD

TYPICAL DRIVEWAY ADDITIONS

CITY ENGINEER — 4/29/2022 DATE

SUPPLEMENTAL STANDARD NO. GS-12



NOTES

1). USE EC-3, EC-4, EC-6, EC-7 OR AS APPLICABLE AND APPROVED BY INSPECTOR.

2). NON-STORMWATER MANAGEMENT BMPS INCLUDE NS-1, NS-3, NS-6, NS-7, NS-12, NS-13. USE OF NS-8, NS-9, AND NS-10 IS DISCOURAGED, BUT IF UTILIZED SHOULD BE PROPERLY AS SHOWN ON PROJECT SPECIFIC PLANS. NS-2, NS-4, NS-5, NS-11, NS-14, AND NS-15 ARE USED AS AS-NEEDED DEPENDING ON SITE CONDITIONS AND SLOPE OF WORK.

3). WASTE MANAGEMENT BMPS INCLUDE WM-1, WM-2, WM-3, WM-4, WM-5, WM-8, WM-9, AND WM-10. WM-6 AND WM-7 ARE USED AS-NEEDED DEPENDING ON SITE CONDITIONS AND SCOPE OF WORK.

4). BEST MANAGEMENT PRACTICE (BMP) FACT SHEETS AS REFERENCED CAN BE DOWNLOADED FROM THE CALIFORNIA STORMWATER QUALITY ASSOCIATION (CASQA) WEBSITE AT WWW.CASQA.ORG/RESOURCES/BMP-HANDBOOKS/CONSTRUCTION

5). DEPENDING ON SITE CONDITIONS, ADDITIONAL BMP'S MAY BE REQUIRED BY THE INSPECTOR.

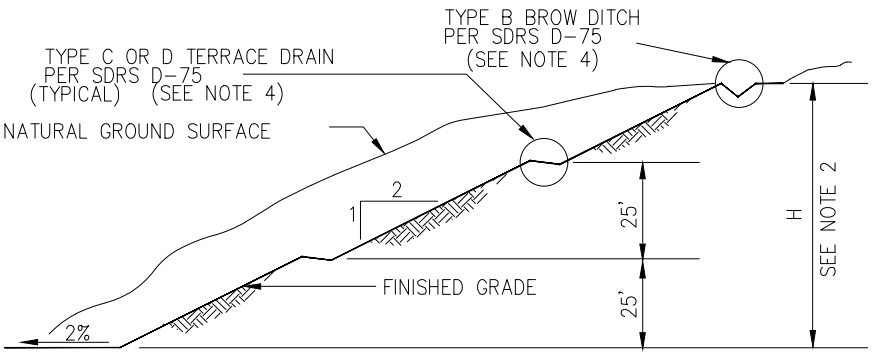
REV.	APPROVED	DATE

CITY OF CARLSBAD

TYPICAL BUILDING PAD CONSTRUCTION BMP REQUIREMENTS

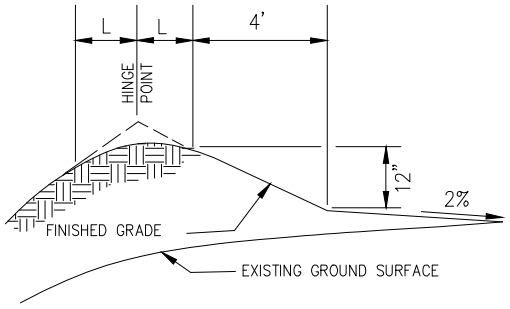
CITY ENGINEER — DATE: 4/29/2022

SUPPLEMENTAL STANDARD NO. GS-13



TYPICAL CUT SLOPE

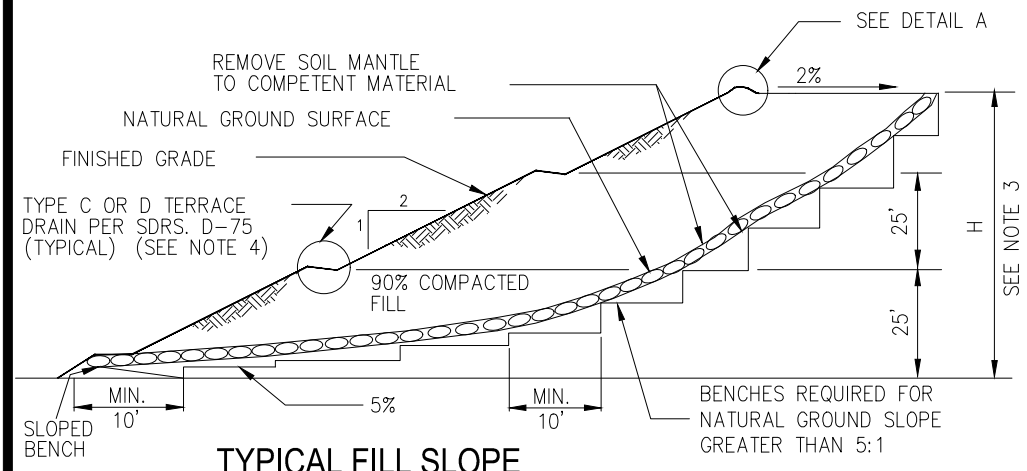
SEE TABLE BELOW FOR L VALUES



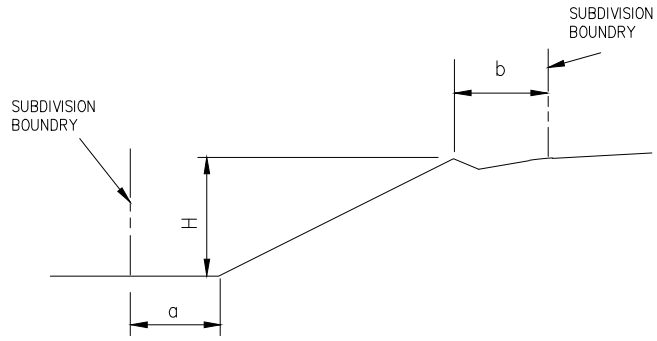
H IN FEET	L IN FEET
0'-5'	—
5'-20'	2.5'
20'-40'	5'
OVER 40'	10'

SLOPE ROUNDING DETAIL
(DOES NOT APPLY TO SIDE SLOPES BETWEEN RESIDENTIAL UNITS)

DETAIL A



TYPICAL FILL SLOPE



H in feet	a	b
less than 10'	2'	3.5'
10' - 20'	(H/5)'	4'
over 20'	4+H/10' (10' MAX)	H/5'(10'max.)

SETBACKS

NOTES

1). ALL FILL MUST BE COMPACTED TO A MINIMUM OF 90% OF THE MAXIMUM DENSITY WITH THE EXCEPTION OF THE OUTER 8" OF THE SLOPE SURFACE WHICH MAY BE GRID ROLLED TO 85% DENSITY.

2). CUT SLOPES TO 40' REQUIRE NO BENCH. CUT SLOPES OVER 100' REQUIRE ONE MIN. 20' BENCH MIDWAY ON SLOPE.

3). FILL SLOPES TO 30' REQUIRE NO BENCH. FILL SLOPES OVER 100' REQUIRE ONE MIN. 20' BENCH MIDWAY ON SLOPE.

4). AS MODIFIED BY CITY OF CARLSBAD ENGINEERING STANDARDS.

5). SEE CASQA BEST MANAGEMENT PRACTICE (BMP) FACTS SHEETS EC-4, EC-15, AND EC-16 FOR TEMPORARY/PERMANENT SLOPE STABILIZATION MEASURES.

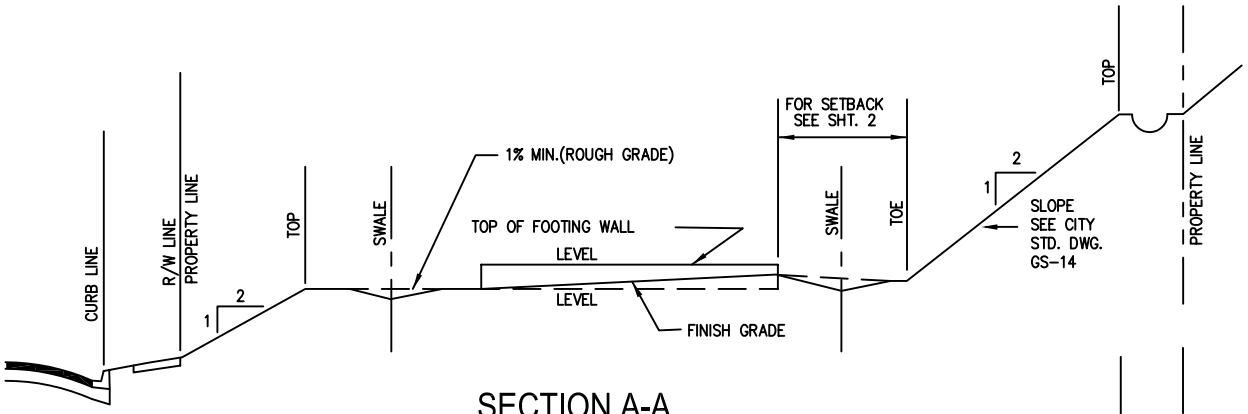
REV.	APPROVED	DATE

CITY OF CARLSBAD

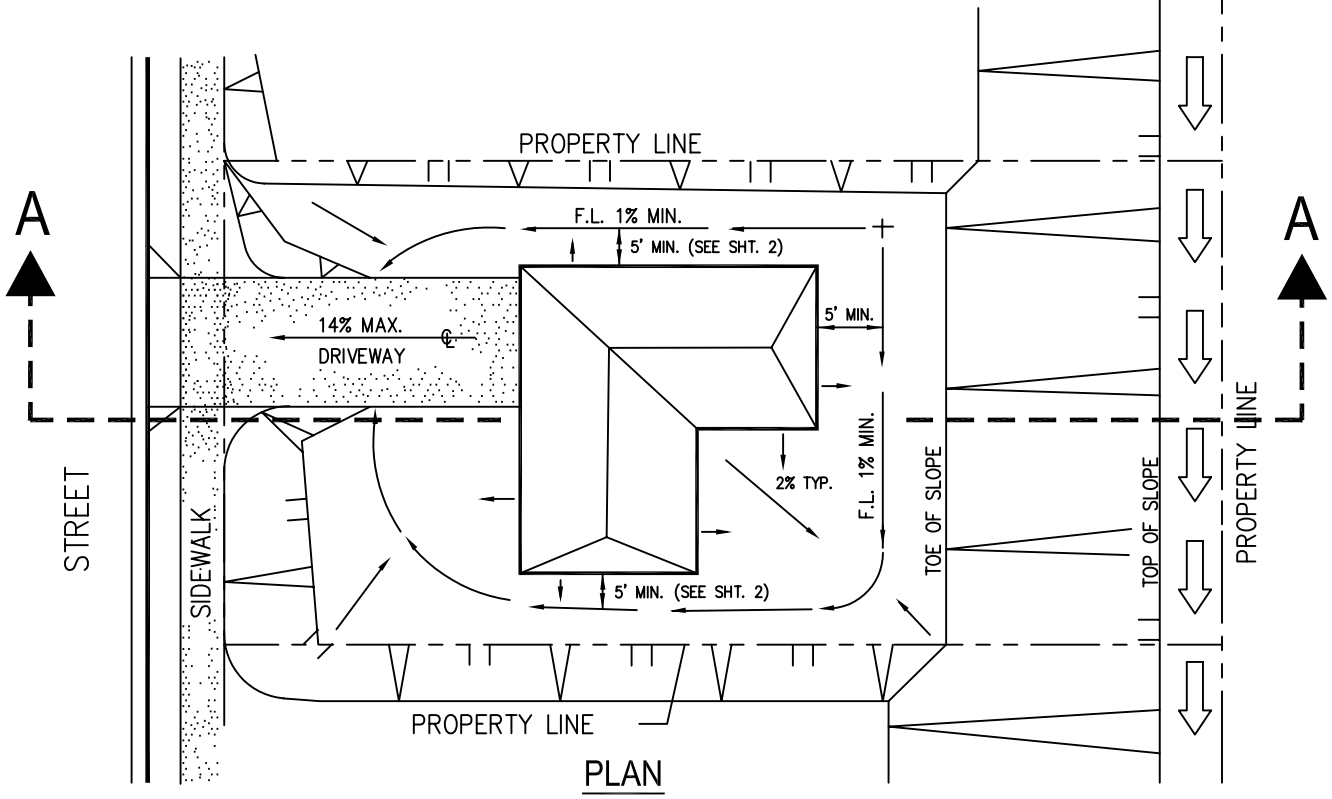
GRADING OF SLOPES AND REQUIRED SETBACKS

CITY ENGINEER — DATE: 4/29/2022

SUPPLEMENTAL STANDARD NO. GS-14



SECTION A-A



PLAN

NOTES

1). DRAINAGE SHALL BE CONDUCTED TO STREET AS SURFACE FLOW WHENEVER POSSIBLE.

2). NON-EROSIVE DRAINAGE SURFACE REQUIRED WHERE FLOW IS COLLECTED.

3). FINISH GRADING SHALL PROVIDE A MINIMUM POSITIVE DRAINAGE OF 2% TO SWALE 5' AWAY FROM THE BUILDING UNLESS SPECIFICALLY APPROVED OTHERWISE BY THE CITY ENGINEER.(SEE SHEET 2)

4). DRIVEWAYS BETWEEN 14% AND 20% MUST RECEIVE SPECIAL APPROVAL OF THE CITY ENGINEER. SUBMIT ENGINEERED PROFILE AND LETTER OF REQUEST TO THE ENGINEERING DEPARTMENT.

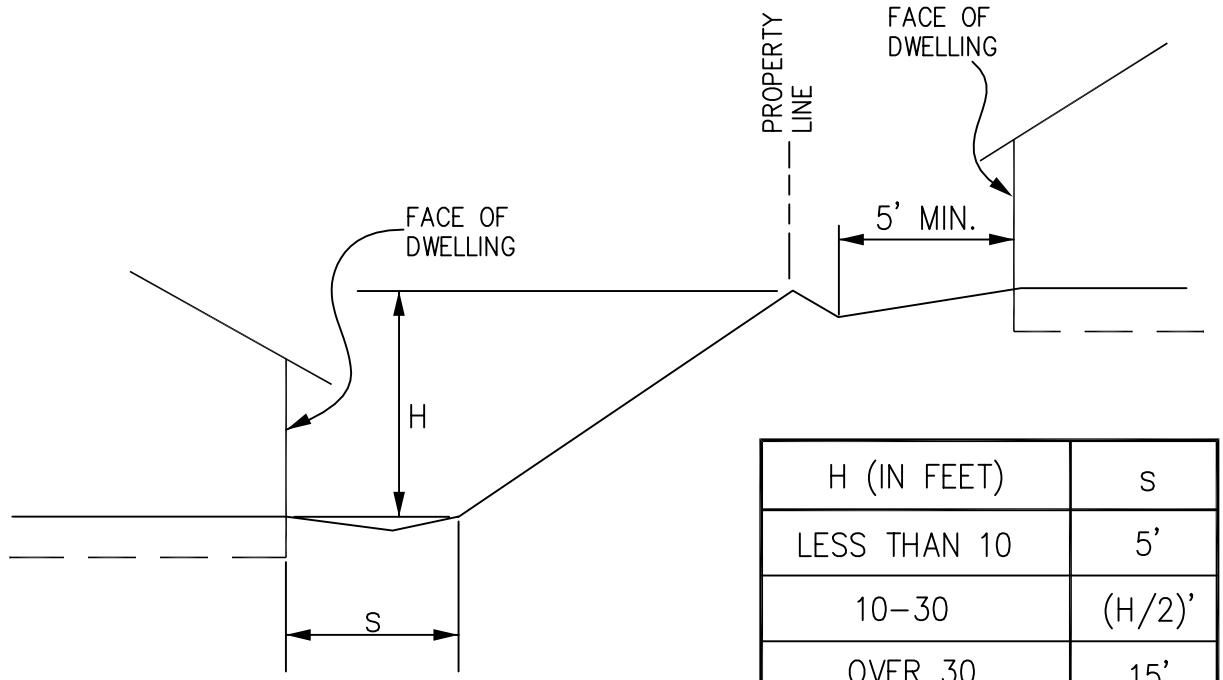
REV.	APPROVED	DATE

CITY OF CARLSBAD

TYPICAL FINISHED LOT GRADING

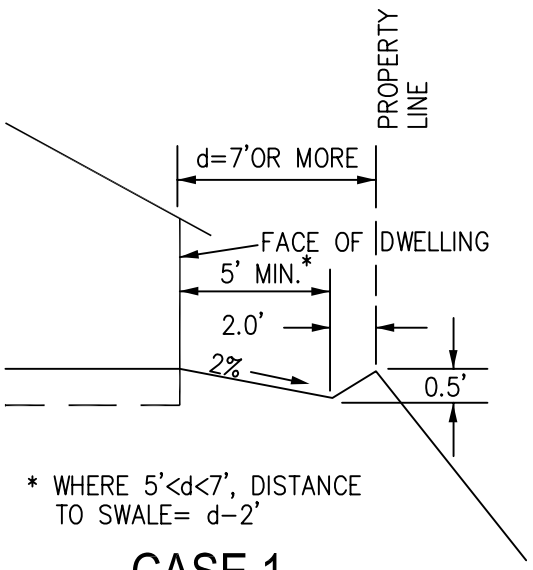
CITY ENGINEER — DATE 6-04

SUPPLEMENTAL STANDARD NO. GS-15



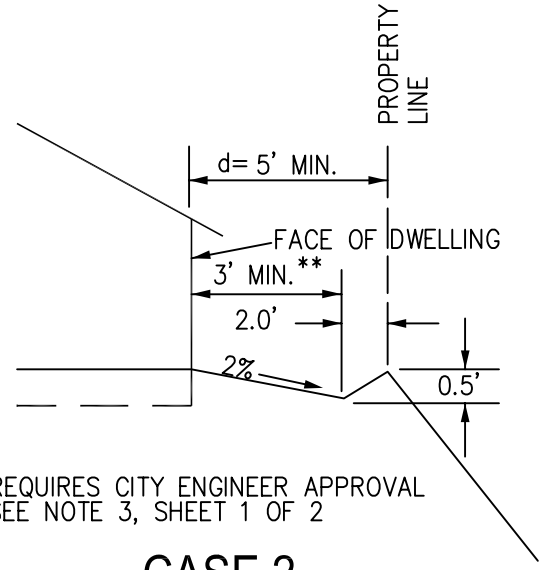
H (IN FEET)	S
LESS THAN 10	5'
10–30	(H/2)'
OVER 30	15'

DWELLING SETBACK FROM SLOPE



* WHERE 5'<d<7', DISTANCE TO SWALE= d–2'

CASE 1



** REQUIRES CITY ENGINEER APPROVAL SEE NOTE 3, SHEET 1 OF 2

CASE 2

DRAINAGE SWALE DETAIL

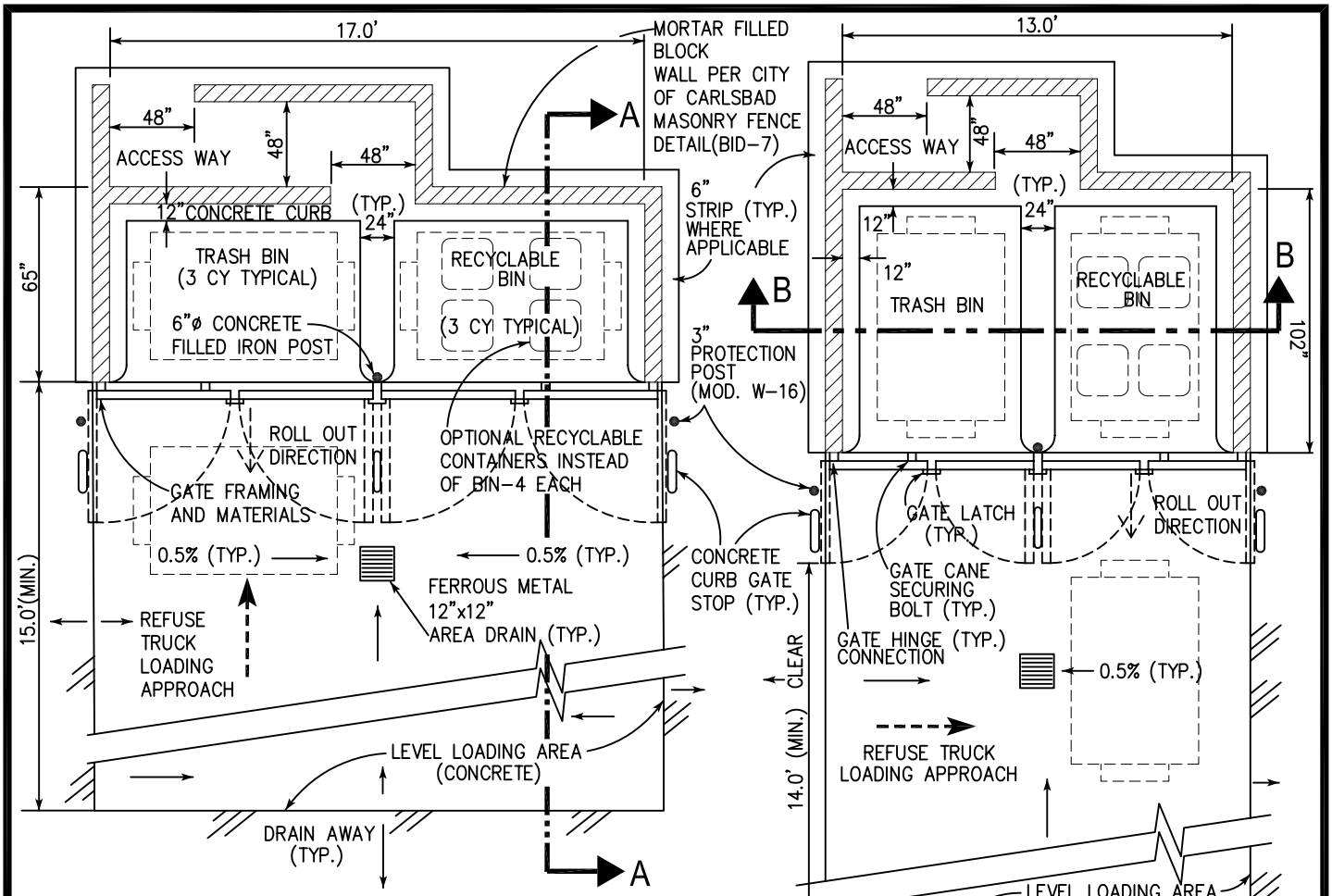
REV.	APPROVED	DATE

CITY OF CARLSBAD

TYPICAL FINISHED LOT GRADING

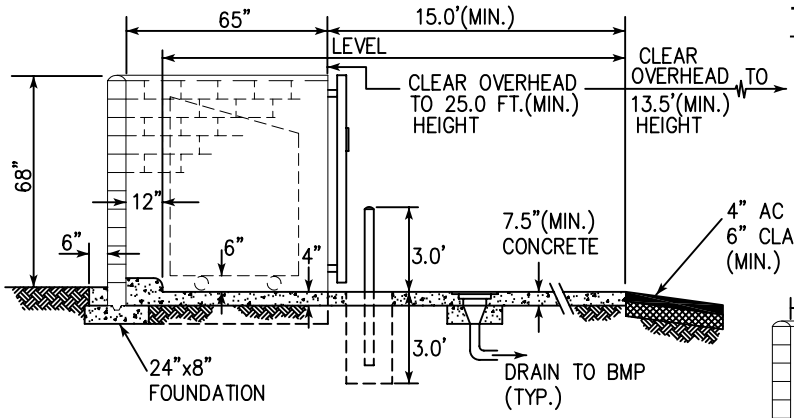
6-04
CITY ENGINEER DATE

SUPPLEMENTAL STANDARD NO. GS-15

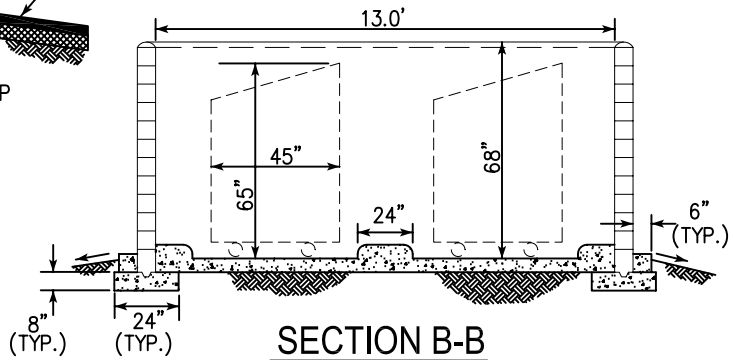


TYPE A - DRIVE AND LOAD FRONT APPROACH

TYPE B - DRIVE AND LOAD SIDE APPROACH



SECTION A-A



SECTION B-B

REV.	APPROVED	DATE

CITY OF CARLSBAD

REFUSE BIN ENCLOSURE
FOR 3 CUBIC YARDS BINS

Glenn Pruim 6-04
CITY ENGINEER DATE

SUPPLEMENTAL STANDARD NO. GS-16

NOTES:

1. LOCATION OF REFUSE BIN ENCLOSURES SHALL BE APPROVED BY THE PLANNING DIRECTOR AND THE CITY ENGINEER. ENCLOSURE SHALL BE OF SIMILAR COLORS AND/OR MATERIALS AS THE PROJECT TO THE SATISFACTION OF THE PLANNING DIRECTOR.
2. THE ENCLOSURE SLAB AND LOADING AREA SHALL BE LEVEL IN ORDER TO FACILITATE THE ROLLING OF BINS FOR LOADING POSITIONING.
3. GATES SHALL BE MOUNTED SO THAT THEY SWING FULLY OPEN WITH NO PROTRUSION INTO THE PATH OF THE BIN. THE GATES SHALL HAVE CHAINS, HOOKS OR PIN STOPS AT THEIR FULL OPEN POSITION TO HOLD THEM OPEN.
4. ALL GATE CONNECTION LATCHES, SECURING BOLTS, FRAMING, AND HINGES SHALL BE HEAVY DUTY TYPE AND PAINTED OR TREATED AGAINST CORROSION.
5. GATE MATERIALS TO BE APPROVED BY PLANNING DIRECTOR.
6. POSITIVE DRAINAGE AWAY FROM THE ENCLOSURE AND LOADING AREAS SHALL BE PROVIDED AND MAINTAINED.
7. ALTERNATIVE CONFIGURATION AND LOCATION OF THE ACCESS WAY MAY BE ACCEPTABLE ON A CASE BY CASE BASIS PROVIDED NO PORTION OF THE TRASH BINS ARE DIRECTLY VISIBLE TO THE PUBLIC.
8. LOADING AND ENCLOSURE AREA DRAINAGE SHALL BE INDEPENDENT AND DRAINED TOWARDS AN APPROVED SITE BMP.
9. DEVELOPMENT PROJECTS SHALL INCORPORATE THE REQUIREMENTS OF THE "MODEL ORDINANCE OF THE CALIFORNIA INTEGRATED WASTE MANAGEMENT BOARD RELATING TO AREAS FOR COLLECTING AND LOADING RECYCLABLE MATERIALS".
10. AREAS FOR RECYCLING SHALL BE ADEQUATE IN CAPACITY, NUMBER AND DISTRIBUTION TO SERVE THE DEVELOPMENT WHERE THE PROJECT OCCURS.
11. RECYCLING AREAS SHALL BE SECURED TO PREVENT THE THEFT OF RECYCLABLE MATERIALS BY UNAUTHORIZED PERSONS WHILE ALLOWING AUTHORIZED PERSONS ACCESS FOR DISPOSAL OF MATERIALS.
12. RECYCLING AREAS OR THE BINS AND CONTAINERS PLACED THEREIN MUST PROVIDE PROTECTION AGAINST SEVERE ENVIRONMENTAL CONDITIONS WHICH MIGHT RENDER THE COLLECTED MATERIALS UNMARKETABLE.
13. A SIGN CLEARLY IDENTIFYING ALL RECYCLING AND SOLID WASTE COLLECTION AND LOADING AREAS AND THE MATERIALS ACCEPTED THEREIN SHALL BE POSTED ADJACENT TO ALL POINTS OF ACCESS TO THE RECYCLING AREAS.
14. EACH RECYCLING AREA WITHIN A MULTI–FAMILY RESIDENTIAL DEVELOPMENT SHALL BE NO GREATER THAN 250 FEET FROM EACH LIVING UNIT.
15. EACH TRASH BIN MUST HAVE A FULLY FUNCTIONING LID AND MUST REMAIN CLOSED WHEN NOT BEING ACTIVELY LOADED/UNLOADED.
16. ENCLOSURE SHALL HAVE A SIGN VISIBLE TO USERS STATING, "BIN LID MUST REMAIN CLOSED WHEN NOT BEING ACTIVELY LOADED."
17. EACH TRASH BIN IS TO BE WATERTIGHT.
18. PLACE REFUSE BIN ENCLOSURE IN LOCATION THAT DOES NOT RECEIVE OFFSITE RUNOFF OR GRADE CONCRETE TO AREA DRAIN.

REV.	APPROVED	DATE

CITY OF CARLSBAD

REFUSE BIN ENCLOSURE
FOR 3 CUBIC YARDS BINS

Tony Frail — 4/29/2022

CITY ENGINEER — DATE

SUPPLEMENTAL STANDARD NO. GS-16

MINIMUM STRUCTURAL SECTION IN INCHES TI= 1.35 (EWL)

T.I.	4.5		5.0		6.0		7.0		8.0		8.5		9.0	
TYPE	CUL-DE-SAC		LOCAL STREET		COLLECTOR		LIGHT INDUSTRIAL		SECONDARY ARTERIAL		MAJOR ARTERIAL		PRIME ARTERIAL	
SUBGRADE R-VALUE	AC	AB	AC	AB	AC	AB	AC	AB	AC	AB	AC	AB	AC	AB
8			4	7	4	13	4	15						
10	4	5							4	18	5	18	6	18
12			4	6	4	12	4	14						
14									4	17	5	17	6	17
16	4	4			4	11	4	13			5	16	6	16
18			4	5					4	16				
20					4	10	4	12	4	15	5	15	6	15
22													6	14
24			4	4	4	9	4	11	4	14	5	14		
26											5	13	6	13
28					4	8	4	10	4	13				
30											5	12	6	12
32					4	7	4	9	4	12			6	11
34									4	11	5	11		
36					4	6	4	8					6	10
38									4	10	5	10	6	9
40							4	7			5	9		
42									4	9			6	8
44							4	6			5	8		
46									4	8			6	7
48											5	7	6	6
50									4	7	5	6		
52														
54									4	6				

1. SOILS HAVING AN R VALUE LESS THAN 12 REQUIRE SPECIAL CONSIDERATION. AN ALTERNATIVE TO INCREASING THE STRUCTURAL SECTION IS TO TEST FOR LIME STABILIZATION. THE CORRESPONDING STRUCTURAL SECTION DETERMINED AND % LIME ESTABLISHED.
2. A.B. = ALL AGGREGRATE BASE MATERIALS SHALL BE CLASS II PER CALTRANS SECTION 26-1.02A OR CMB PER SECTION 200-2.4 SSPWC.
3. THE BOTTOM FIGURES LISTED ARE THE MINIMUM PERMITTED.
4. TOP 12" OF SUB-GRADE TO BE 95% COMPACTION.
5. PAVING SHALL BE DONE IN A MINIMUM OF TWO LIFTS WITH THE SURFACE COURSE DONE JUST PRIOR OCCUPANCY. THE BASE COURSE SHALL BE 2.5" MIN.
6. POTABLE, RECLAIMED WATER AND GAS, VALVE BOXES SHALL BE RAISED TO GRADE OR MADE ACCESSIBLE AT EACH PAVING LIFT AS APPROVED BY THE CITY ENGINEER. IF THE SEWER MAIN IS IN SERVICE, THE ACCESSHOLE SHALL BE RAISED TO AT EACH PAVING LIFT. RAISING APPURTENANCES TO FS BEFORE AC CAP WILL NOT BE ALLOWED. RAISING VALVE BOXES, CLEANOUTS OR ACCESSORIES TO FINISH GRADE BEFORE FINISH AC CAP IS PLACED WILL NOT BE ALLOWED.

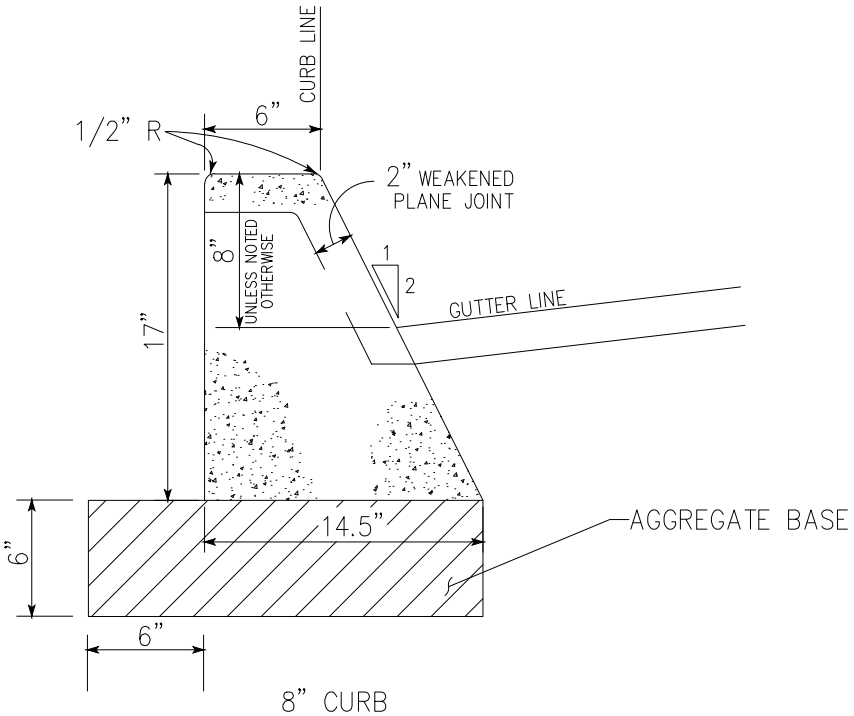
REV.	APPROVED	DATE

CITY OF CARLSBAD

STRUCTURAL SECTION OF STREETS AND ALLEYS

6-04
CITY ENGINEER DATE

SUPPLEMENTAL STANDARD NO. GS-17



8" CURB
AREA = 1.21 SQ. FT.

LEGEND ON PLANS

8" CURB

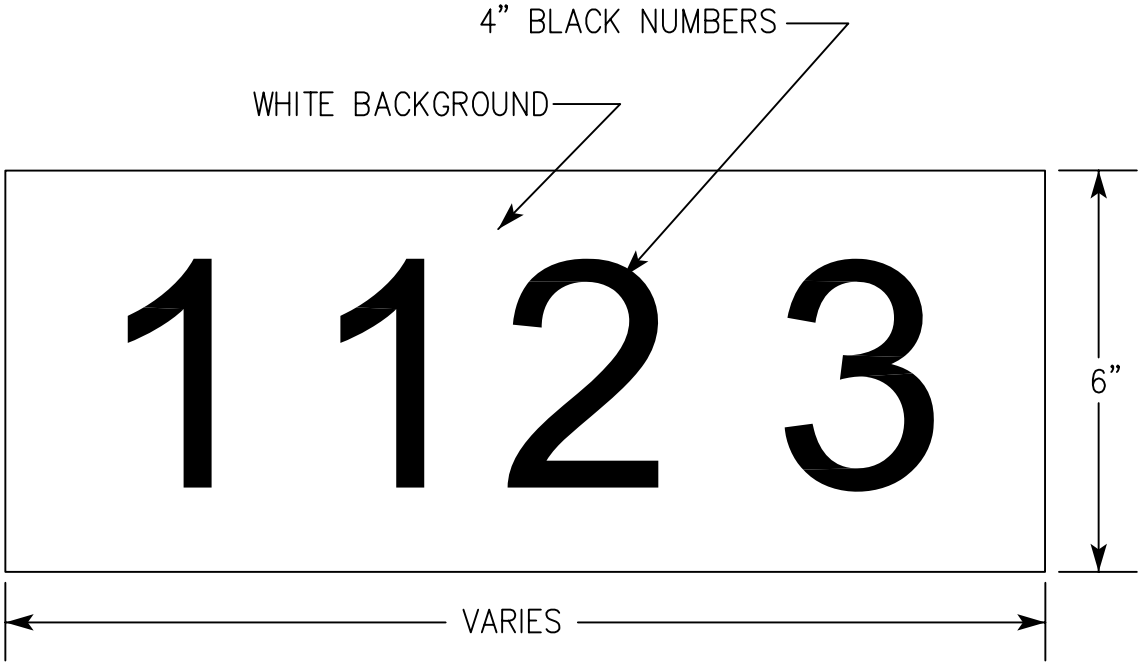
REV.	APPROVED	DATE

CITY OF CARLSBAD

MEDIAN CURB

4/29/2022
CITY ENGINEER DATE

SUPPLEMENTAL STANDARD NO. GS-18



1. NUMBERS TO BE CENTERED ON WHITE BACKGROUND.
2. NUMBERS TO BE PLACED WITHIN 5 FEET OF DRIVEWAY

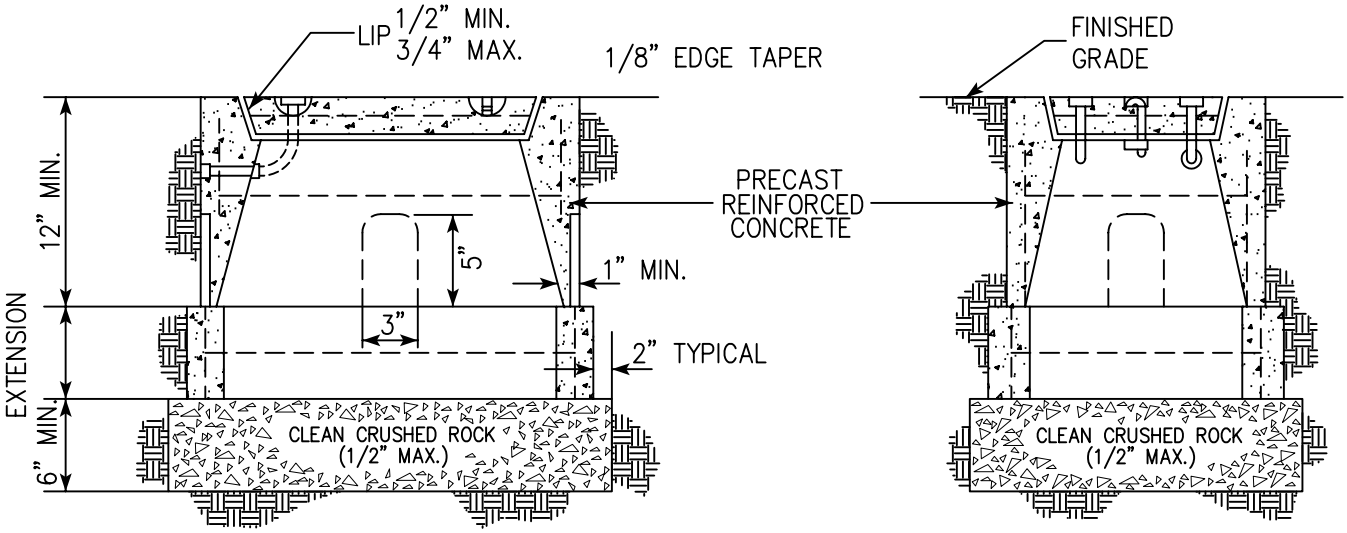
REV.	APPROVED	DATE

CITY OF CARLSBAD

PAINTED CURB ADDRESS

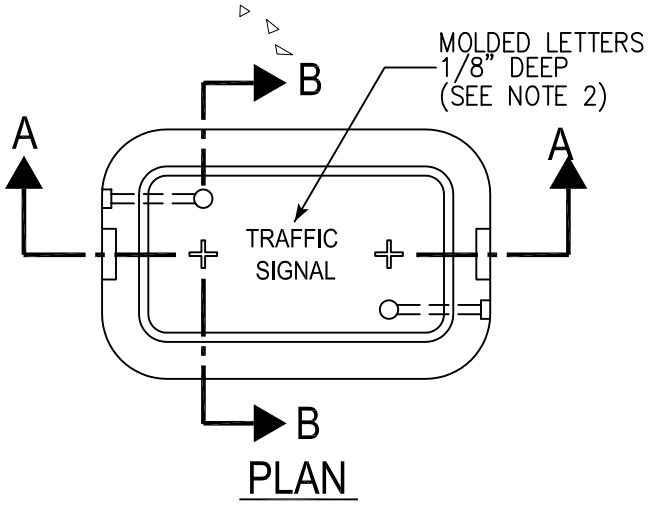
Glen R. Van Patti 12/11
CITY ENGINEER DATE

SUPPLEMENTAL STANDARD NO. GS-19

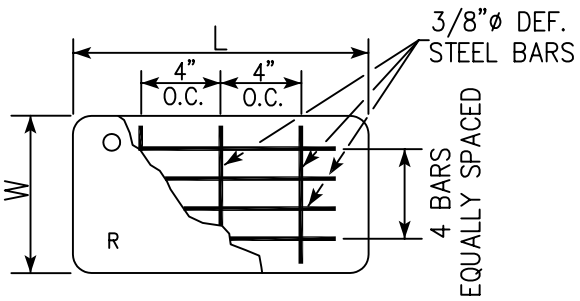


SECTION A-A

SECTION B-B



PLAN



COVER REINFORCING PLAN

TYPE	COVER EDGE THICKNESS	MIN. DEPTH BOX AND EXTENSION	L*	W*	R
31/2	1 3/4"	NO EXTENSION	15 3/8"	10 1/8"	1 1/8"
5	2"	22"	23 1/4"	13 3/4"	1 1/4"

* TOP DIMENSION

NOTES:

1). USE STEEL COVER WHEN SUBJECTED TO TRAFFIC LOADS.

2). PULL BOX COVER SHALL BE MARKED "STREET LIGHTING" WHERE PULL BOX CONTAINS STREET LIGHTING CONDUCTORS ONLY. "HIGH VOLTAGE" SHALL BE ADDED WHERE VOLTAGE IS ABOVE 600 VOLTS.

3). THE L AND W DIMENSIONS OF THE COVER SEAT SHALL BE 1/8" GREATER THAN THE COVER DIMENSIONS.

4). COMPACT EARTH UNDER AND AROUND PULL BOX.

REV.	APPROVED	DATE

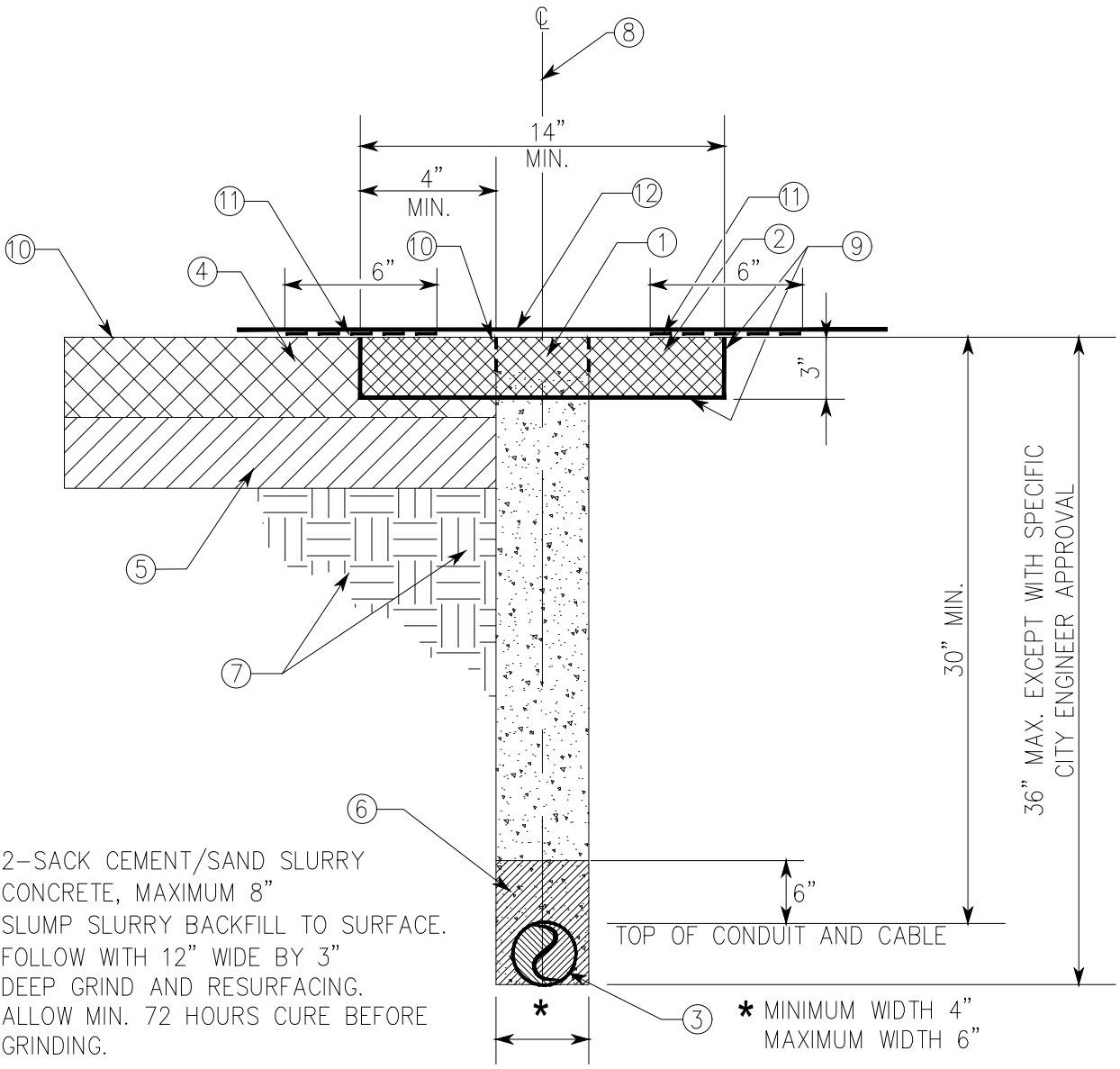
CITY OF CARLSBAD

PULL BOX FOR TRAFFIC SIGNAL AND STREET LIGHTING

6-04

CITY ENGINEER DATE

SUPPLEMENTAL STANDARD NO. GS-21



SECTION
N.T.S.

① 2-SACK CEMENT/SAND SLURRY CONCRETE, MAXIMUM 8" SLUMP SLURRY BACKFILL TO SURFACE. FOLLOW WITH 12" WIDE BY 3" DEEP GRIND AND RESURFACING. ALLOW MIN. 72 HOURS CURE BEFORE GRINDING.

② C2-PG64-10 ASPHALT CONCRETE

③ ALL CONDUIT AND CABLE

④ EXISTING A.C. PAVEMENT

⑤ EXISTING BASE MATERIAL

⑥ MORTAR SAND COMPACTED TO 95% RELATIVE DENSITY.

⑦ UNDISTURBED SOIL

⑧ SYMMETRICAL ABOUT CENTERLINE OF TRENCH.

⑨ GRADE SS-1h EMULSIFIED ASPHALT APPLIED AT 0.15 GALLON PER SQUARE YARD.

⑩ EXISTING ASPHALT PAVEMENT FINISHED GRADE, SMOOTHNESS & COMPACTION OF RESURFACING SHALL MEET THE REQUIREMENTS OF SEC 302-5.6.2 SSPWC EXCEPT THAT THE SMOOTHNESS SHALL BE DETERMINED OVER THE LENGTH & WIDTH OF PAVEMENT AREAS DISTURBED BY THE CONTRACTOR'S/ PERMITEE'S OPERATIONS.

⑪ RESPRAY GRADE SS-1h EMULSIFIED ASPHALT AT 0.15 GALLON PER SQUARE YARD 6" WIDE, CENTERED ON EDGE LINE OF GRIND AFTER PLACING A.C. & BEFORE SURFACE TREATMENT.

⑫ SURFACE TREATMENT TO MATCH EXISTING PAVEMENT (E.G. SEAL COAT, CHIP SEAL)

⑬ WHEN THE EDGE OF THE GRIND LINE IS WITHIN 12" OF EDGE OF PAVEMENT, ANY STRUCTURE, AN ADJACENT TRENCH PATCH OR ANY OTHER PAVING JOIN LINE THE 1-1/2" DEEP GRIND SHALL BE EXTENDED TO AT LEAST 24" TO THE EXISTING STRUCTURE OR JOIN LINE.

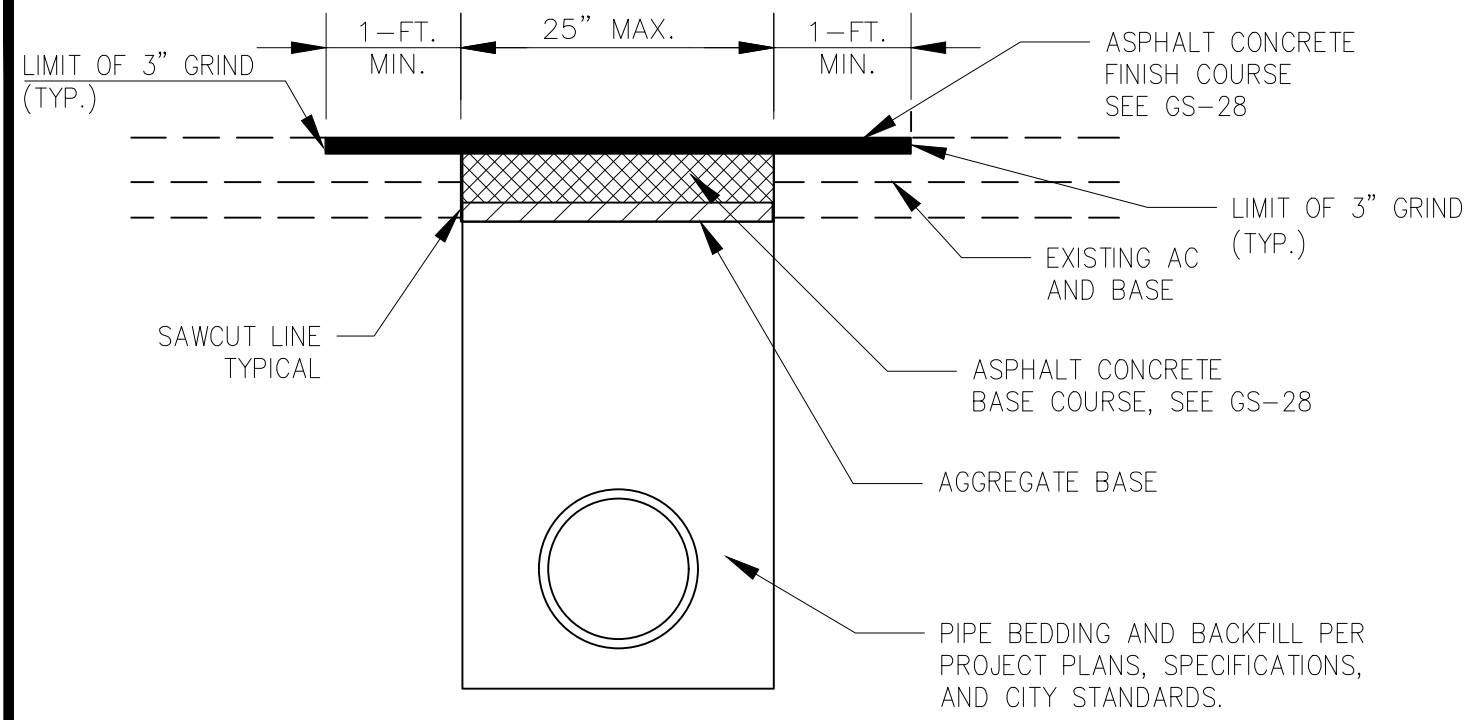
REV.	APPROVED	DATE

CITY OF CARLSBAD

NARROW TRENCH BACKFILL & ASPHALT CONCRETE RESURFACING

CITY ENGINEER — 4/29/2022 DATE

SUPPLEMENTAL STANDARD NO. GS-24



NOTES:

1. THE DETAIL SHOWN ABOVE APPLIES TO TRENCH WIDTHS LESS THAN 25 INCHES.
2. EXISTING A.C. SHALL BE CUT AND REMOVED IN SUCH A MANNER SO AS NOT TO TEAR, BULGE OR DISPLACE ADJACENT PAVEMENT. EDGES SHALL BE CLEAN AND VERTICAL. ALL CUTS SHALL BE PARALLEL OR PERPENDICULAR TO STREET CENTERLINE, WHEN PRACTICAL.
3. BASE MATERIAL SHALL BE REPLACED TO DEPTH OF EXISTING BASE OR A MINIMUM OF 6 INCHES, WHICHEVER IS GREATER. A.C. MAY BE SUBSTITUTED FOR BASE MATERIAL AT THE CITY ENGINEER'S DISCRETION.
4. WHEN THE EDGE OF THE GRIND AREA IS WITHIN 24 INCHES OF EDGE OF PAVEMENT, ANY STRUCTURE, AN ADJACENT TRENCH PATCH OR OTHER PAVING JOIN LINE, THE GRIND AREA SHALL BE EXTENDED TO THE EXISTING STRUCTURE OR JOIN LINE.
5. WHEN THE EDGE OF THE GRIND LIES WITHIN A WHEEL PATH, THE GRIND AREA SHALL BE EXTENDED TO THE NEAREST LANE LINE OR EDGE OF PAVEMENT.
6. IN AN EFFORT TO MAINTAIN A STREET'S EXPECTED LIFESPAN, RETURN THE STREET TO THE SAME OR SIMILAR CONDITION AS BEFORE THE TRENCHING TOOK PLACE, AND TO MEET CITY OF CARLSBAD AND GREENBOOK STANDARDS PERTAINING TO ROAD SMOOTHNESS:
   - A) IF THE TRENCH IS LOCATED WITHIN A BIKE LANE, THEN THE ENTIRE BIKE LANE WIDTH SHALL BE COLD PLANED 1–1/2" MINIMUM AND OVERLAYED 1–1/2" MINIMUM.
   - B) IF THE TRENCH IN WITHIN 24" OF A CONCRETE STRUCTURE (I.E. LIP OF GUTTER, VAULT, ETC.) THEN THE AREA BETWEEN THE TRENCH AND THE CONCRETE STRUCTURE SHALL BE COLD PLANED 1–1/2" MINIMUM AND OVERLAYED 1–1/2" MINIMUM.
   - C) IF THE TRENCH IS LOCATED LONGITUDINALLY WITHIN THE TRAVEL LANE OF A PRIME, MAJOR, OR 4–LANE COLLECTOR STREET, THEN THE ENTIRE LANE SHALL BE COLD–PLANE 1–1/2" MINIMUM AND OVERLAYED 1–1/2" MINIMUM. HOWEVER, THE CITY ENGINEER MAY, ON A CASE–BY–CASE BASIS AND AT HIS/HER SOLE DISCRETION, MODIFY THE REQUIREMENT TO COLD PLANE AND OVERLAY THE ENTIRE LANE BASED ON THE FOLLOWING CRITERIA: (1) EXISTING CONDITION OF THE PAVEMENT; (2) FUTURE REHABILITATION STRATEGIES AND SCHEDULE; (3) DEPTH OF TRENCH; (4) OTHER TRENCH WORK IN THE AREA; (5) EXISTENCE OF A COMPARABLE TRENCH PAVING TECHNOLOGY OR TECHNIQUES WHICH WOULD ACHIEVE THE DESIRED ROAD SMOOTHNESS AND LONGEVITY; AND (6) OTHER SITE–SPECIFIC CONDITIONS AND FACTORS DEEMED BY THE CITY ENGINEER TO ALLEVIATE THE NEED TO COLD–PLANE AND OVERLAY THE ENTIRE LANE.

REV.	APPROVED	DATE

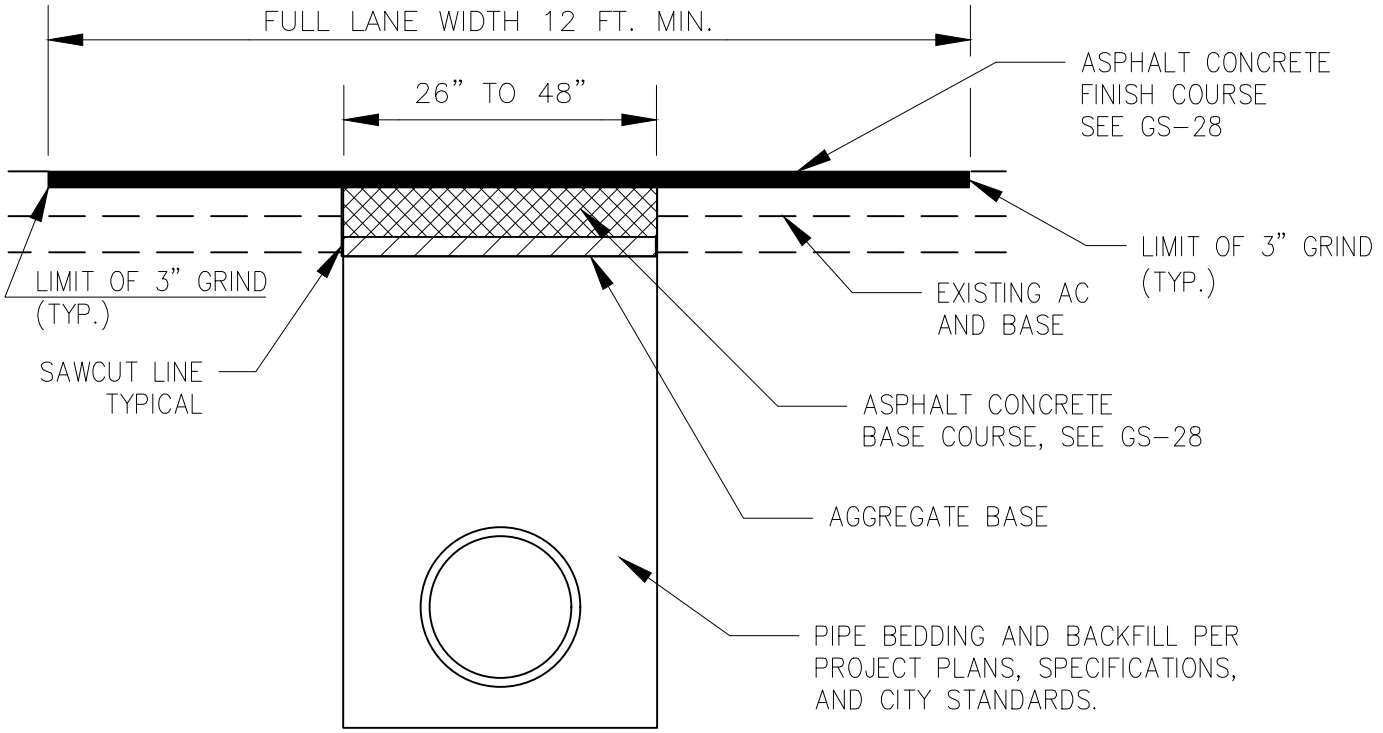
CITY OF CARLSBAD

TRENCH RESURFACING ASPHALT CONCRETE PAVEMENT FOR TRENCH WIDTHS LESS THAN 25"

4/29/2022

CITY ENGINEER — DATE

SUPPLEMENTAL STANDARD NO. GS-25



NOTES:

1. THE DETAIL SHOWN ABOVE APPLIES TO TRENCH WIDTHS FROM 26 INCHES TO 48 INCHES.
2. EXISTING A.C. SHALL BE CUT AND REMOVED IN SUCH A MANNER SO AS NOT TO TEAR, BULGE OR DISPLACE ADJACENT PAVEMENT. EDGES SHALL BE CLEAN AND VERTICAL. ALL CUTS SHALL BE PARALLEL OR PERPENDICULAR TO STREET CENTERLINE, WHEN PRACTICAL.
3. BASE MATERIAL SHALL BE REPLACED TO DEPTH OF EXISTING BASE OR A MINIMUM OF 6 INCHES, WHICHEVER IS GREATER. A.C. MAY BE SUBSTITUTED FOR BASE MATERIAL AT THE CITY ENGINEER'S DISCRETION.
4. WHEN THE EDGE OF THE GRIND AREA IS WITHIN 24 INCHES OF EDGE OF PAVEMENT, ANY STRUCTURE, AN ADJACENT TRENCH PATCH, OR OTHER PAVING JOIN LINE, THE GRIND AREA SHALL BE EXTENDED TO THE EXISTING STRUCTURE OR JOIN LINE.
5. WHEN THE EDGE OF THE GRIND LIES WITHIN A WHEEL PATH, THE GRIND AREA SHALL BE EXTENDED TO THE NEAREST LANE LINE OR EDGE OF PAVEMENT.
6. IN AN EFFORT TO MAINTAIN A STREET'S EXPECTED LIFESPAN, RETURN THE STREET TO THE SAME OR SIMILAR CONDITION AS BEFORE THE TRENCHING TOOK PLACE, AND TO MEET CITY OF CARLSBAD AND GREENBOOK STANDARDS PERTAINING TO ROAD SMOOTHNESS:
   - A) IF THE TRENCH IS LOCATED WITHIN A BIKE LANE, THEN THE ENTIRE BIKE LANE WIDTH SHALL BE COLD PLANED 1-1/2" MINIMUM AND OVERLAYED 1-1/2" MINIMUM.
   - B) IF THE TRENCH IN WITHIN 24" OF A CONCRETE STRUCTURE (I.E. LIP OF GUTTER, VAULT, ETC.) THEN THE AREA BETWEEN THE TRENCH AND THE CONCRETE STRUCTURE SHALL BE COLD PLANED 1-1/2" MINIMUM AND OVERLAYED 1-1/2" MINIMUM.
   - C) IF THE TRENCH IS LOCATED LONGITUDINALLY WITHIN THE TRAVEL LANE OF A PRIME, MAJOR, OR 4-LANE COLLECTOR STREET, THEN THE ENTIRE LANE SHALL BE COLD-PLANE 1-1/2" MINIMUM AND OVERLAYED 1-1/2" MINIMUM. HOWEVER, THE CITY ENGINEER MAY, ON A CASE-BY-CASE BASIS AND AT HIS/HER SOLE DISCRETION, MODIFY THE REQUIREMENT TO COLD PLANE AND OVERLAY THE ENTIRE LANE BASED ON THE FOLLOWING CRITERIA: (1) EXISTING CONDITION OF THE PAVEMENT; (2) FUTURE REHABILITATION STRATEGIES AND SCHEDULE; (3) DEPTH OF TRENCH; (4) OTHER TRENCH WORK IN THE AREA; (5) EXISTENCE OF A COMPARABLE TRENCH PAVING TECHNOLOGY OR TECHNIQUES WHICH WOULD ACHIEVE THE DESIRED ROAD SMOOTHNESS AND LONGEVITY; AND (6) OTHER SITE-SPECIFIC CONDITIONS AND FACTORS DEEMED BY THE CITY ENGINEER TO ALLEVIATE THE NEED TO COLD-PLANE AND OVERLAY THE ENTIRE LANE.

REV.	APPROVED	DATE

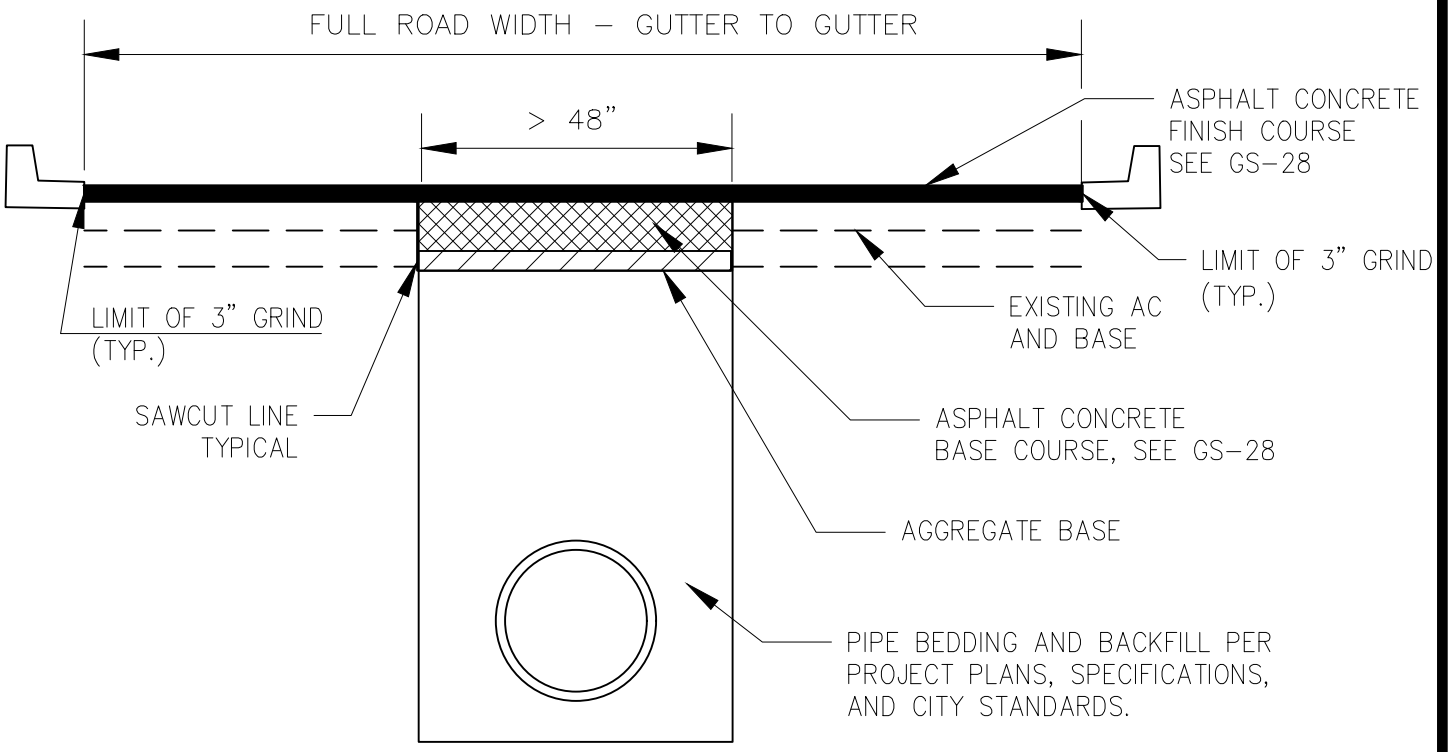
CITY OF CARLSBAD

TRENCH RESURFACING ASPHALT CONCRETE PAVEMENT FOR TRENCH WIDTHS FROM 26" TO 48"

4/29/2022

CITY ENGINEER — DATE

SUPPLEMENTAL STANDARD NO. GS-26



NOTES:

1. THE DETAIL SHOWN ABOVE APPLIES TO TRENCH WIDTHS GREATER THAN 48 INCHES.
2. EXISTING A.C. SHALL BE CUT AND REMOVED IN SUCH A MANNER SO AS NOT TO TEAR, BULGE OR DISPLACE ADJACENT PAVEMENT. EDGES SHALL BE CLEAN AND VERTICAL. ALL CUTS SHALL BE PARALLEL OR PERPENDICULAR TO STREET CENTERLINE, WHEN PRACTICAL.
3. BASE MATERIAL SHALL BE REPLACED TO DEPTH OF EXISTING BASE OR A MINIMUM OF 6 INCHES, WHICHEVER IS GREATER. A.C. MAY BE SUBSTITUTED FOR BASE MATERIAL AT THE CITY ENGINEER'S DISCRETION.
4. IN AN EFFORT TO MAINTAIN A STREET'S EXPECTED LIFESPAN, RETURN THE STREET TO THE SAME OR SIMILAR CONDITION AS BEFORE THE TRENCHING TOOK PLACE, AND TO MEET CITY OF CARLSBAD AND GREENBOOK STANDARDS PERTAINING TO ROAD SMOOTHNESS:
   - A) IF THE TRENCH IS LOCATED WITHIN A BIKE LANE, THEN THE ENTIRE BIKE LANE WIDTH SHALL BE COLD PLANED 1–1/2" MINIMUM AND OVERLAYED 1–1/2" MINIMUM.
   - B) IF THE TRENCH IN WITHIN 24" OF A CONCRETE STRUCTURE (I.E. LIP OF GUTTER, VAULT, ETC.) THEN THE AREA BETWEEN THE TRENCH AND THE CONCRETE STRUCTURE SHALL BE COLD PLANED 1–1/2" MINIMUM AND OVERLAYED 1–1/2" MINIMUM.
   - C) IF THE TRENCH IS LOCATED LONGITUDINALLY WITHIN THE TRAVEL LANE OF A PRIME, MAJOR, OR 4–LANE COLLECTOR STREET, THEN THE ENTIRE LANE SHALL BE COLD–PLANE 1–1/2" MINIMUM AND OVERLAYED 1–1/2" MINIMUM. HOWEVER, THE CITY ENGINEER MAY, ON A CASE–BY–CASE BASIS AND AT HIS/HER SOLE DISCRETION, MODIFY THE REQUIREMENT TO COLD PLANE AND OVERLAY THE ENTIRE LANE BASED ON THE FOLLOWING CRITERIA: (1) EXISTING CONDITION OF THE PAVEMENT; (2) FUTURE REHABILITATION STRATEGIES AND SCHEDULE; (3) DEPTH OF TRENCH; (4) OTHER TRENCH WORK IN THE AREA; (5) EXISTENCE OF A COMPARABLE TRENCH PAVING TECHNOLOGY OR TECHNIQUES WHICH WOULD ACHIEVE THE DESIRED ROAD SMOOTHNESS AND LONGEVITY; AND (6) OTHER SITE–SPECIFIC CONDITIONS AND FACTORS DEEMED BY THE CITY ENGINEER TO ALLEVIATE THE NEED TO COLD–PLANE AND OVERLAY THE ENTIRE LANE.

REV.	APPROVED	DATE

CITY OF CARLSBAD

TRENCH RESURFACING ASPHALT CONCRETE PAVEMENT FOR TRENCH WIDTHS GREATER THAN 48"

Tom Frank — CITY ENGINEER — 4/29/2022 — DATE

SUPPLEMENTAL STANDARD NO. GS-27

NOTES:

1. A TACK COAT OF ASPHALTIC EMULSION OR PAVING ASPHALT SHALL BE APPLIED TO EXISTING A.C. OR P.C.C. CONTACT SURFACES PRIOR TO RESURFACING PER SSPWC SECTION 302-5.

2. ASPHALT CONCRETE RESURFACING - BASE COURSE:
   a. MINIMUM TOTAL A.C. THICKNESS SHALL BE ONE INCH GREATER THAN EXISTING
   b. AC SHALL BE B-PG 64-10 OR III B2-PG 64-10 OR III B3-PG 64-10 FOR BASE COURSE. IF APPROVED BY THE CITY ENGINEER, 1/2" AC MIXES INCLUDING C1-PG 64-10, C2-PG 64-10, III-C2-PG 64-10 AC MIXES ALSO MAY BE USED FOR BASE COURSE. III C3 AC MIX SHALL NOT BE USED FOR BASE COURSE. PG 70-10 OR MODIFIED ASPHALT BINDER MAY ALSO BE USED WITH ANY OF THE AC MIXES IF APPROVED BY THE CITY ENGINEER.
   c. BASE COURSE SHALL BE LAID DOWN WITH SELF PROPELLED PAVING MACHINE AND COMPACTED PER SSPWC SECTION 302-5a.

3. ASPHALT CONCRETE RESURFACING (FINISH COURSE)
   a. PROVIDE 3 INCH DEEP GRIND AND A.C. FINISH COURSE C2-PG64-10 OR III-C2-PG64-10 OR III-C3-PG 64-10. PG 70-10 OR MODIFIED ASPHALT BINDER MAY ALSO BE USED WITH ANY OF THE AC MIXES IF APPROVED BY THE CITY ENGINEER.
   b. FINISH COURSE FOR RESURFACING SHALL BE LAID DOWN USING A SELF-PROPELLED PAVING MACHINE AND COMPACTED.
   c. SMOOTHNESS AND COMPACTION OF RESURFACING SHALL MEET THE REQUIREMENTS OF SEC 302-5 SSPWC EXCEPT THAT THE SMOOTHNESS SHALL BE DETERMINED OVER THE LENGTH AND WIDTH OF PAVED AREAS DISTURBED BY THE CONTRACTOR'S OPERATIONS.

4. SURFACE TREATMENT TO MATCH EXISTING PAVEMENT SURFACE (SLURRY, CHIP SEAL, ETC.)

5. SLOUGHING OF TRENCH UNDER PAVEMENT SHALL BE CAUSE FOR REQUIRING ADDITIONAL PAVEMENT AND BASE.

6. MULTIPLE TRENCHES ON THE SAME STREET SEGMENT WILL REQUIRE FULL WIDTH MILL AND OVERLAY TO A DEPTH OF 2 INCHES MINIMUM. MULTIPLE TRENCHES INCLUDES MAIN LINE TRENCH WITH LATERAL TRENCHES OR PARALLEL TRENCHES ON THE SAME STREET SEGMENT.

7. ASPHALT CONCRETE FINISH COURSE MATERIAL SHALL MATCH EXISTING SURFACE ASPHALT CONCRETE MATERIAL. IF EXISTING STREET IS SURFACED WITH MODIFIED AC, THEN THE FINAL FINISH COURSE SHALL ALSO BE WITH THE SIMILAR MODIFIED AC. CONVENTIONAL AC MATERIAL MAY BE USED IN THE FINAL FINISH COURSE WITH MINIMUM TOTAL AC THICKNESS ONE INCH GREATER THAN THE EXISTING AC FINISH COURSE IF REQUESTED AND APPROVED BY THE CITY ENGINEER.

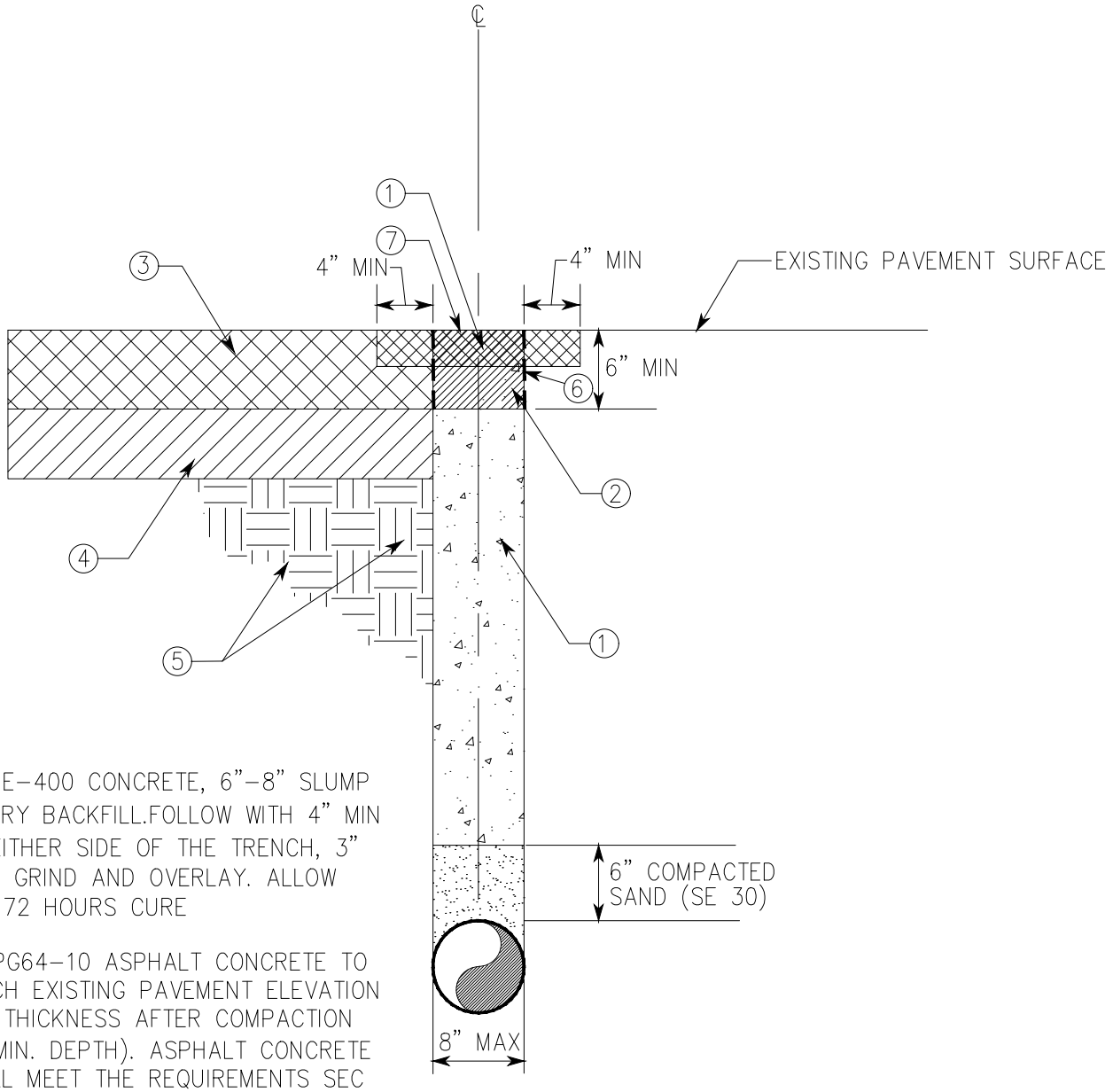
REV.	APPROVED	DATE

CITY OF CARLSBAD

NOTES FOR ASPHALT CONCRETE TRENCH RESURFACING

CITY ENGINEER — 4/29/2022 DATE

SUPPLEMENTAL STANDARD NO. GS-28



SECTION
N.T.S.

1. 190-E-400 CONCRETE, 6"-8" SLUMP SLURRY BACKFILL.FOLLOW WITH 4" MIN ON EITHER SIDE OF THE TRENCH, 3" DEEP GRIND AND OVERLAY. ALLOW MIN. 72 HOURS CURE
2. D2-PG64-10 ASPHALT CONCRETE TO MATCH EXISTING PAVEMENT ELEVATION AND THICKNESS AFTER COMPACTION (6" MIN. DEPTH). ASPHALT CONCRETE SHALL MEET THE REQUIREMENTS SEC 203-6 AND SEC 302-5 SSPWC. NO MATERIAL SUBSTITUTIONS ALLOWED.
3. EXISTING A.C. PAVEMENT
4. EXISTING BASE MATERIAL
5. UNDISTURBED SOIL
6. TACK COAT SHALL BE APPLIED TO ALL CONTACT SURFACE PER SEC 302-5.4 OF SSPWC (TYP.).
7. SURFACE TREATMENT TO MATCH EXISTING PAVEMENT (E.G. SEAL COAT, CHIP SEAL, SLURRY SEAL)

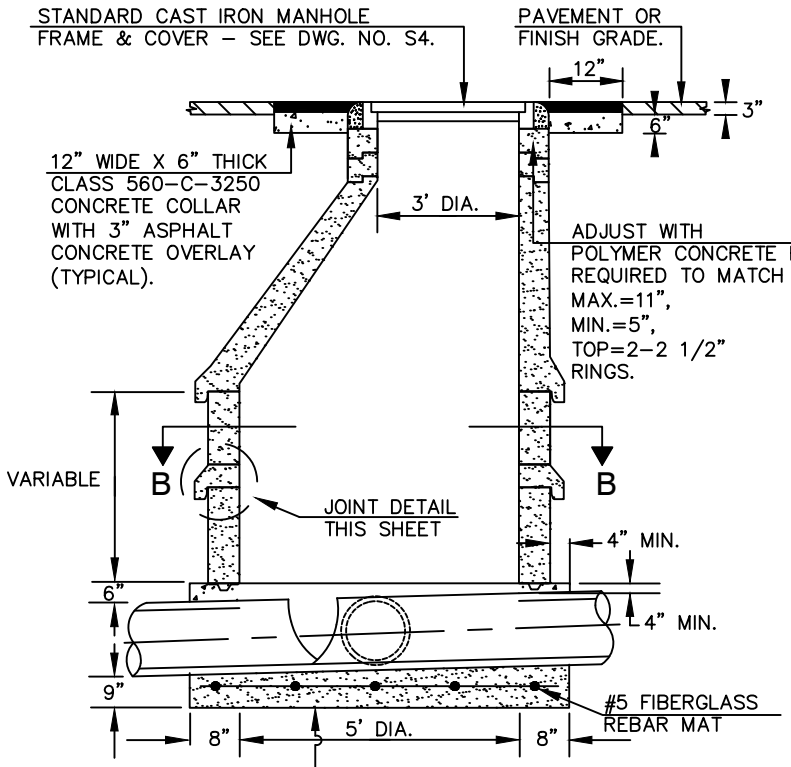
REV.	APPROVED	DATE

CITY OF CARLSBAD

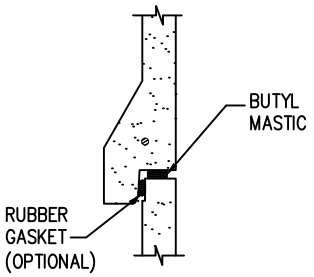
EXPLORATORY UTILITY POTHOLE BACKFILL AND RESURFACING (DIAM ≤ 8 IN.)

4/29/2022
CITY ENGINEER — DATE

SUPPLEMENTAL STANDARD NO. GS-29



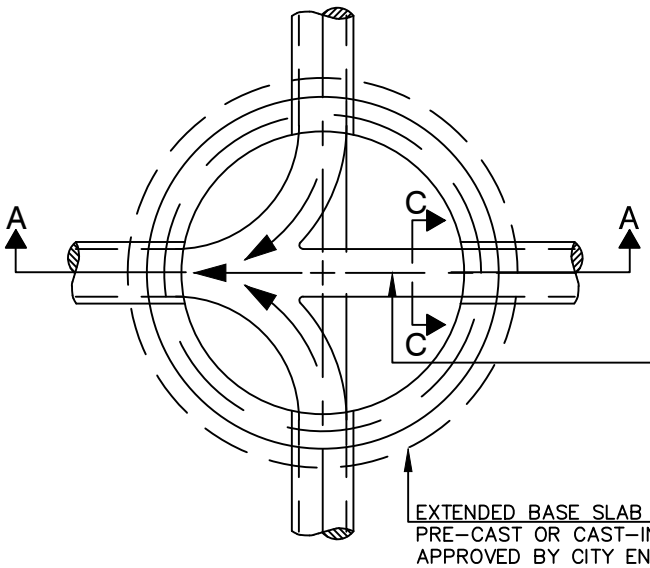
SECTION A-A



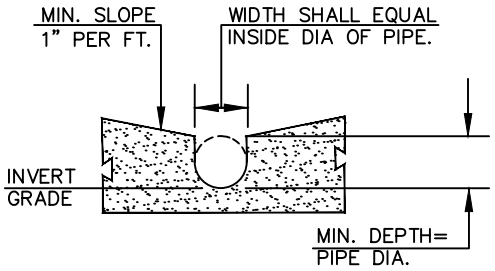
JOINT DETAIL

NOTES:

1. ALL PRE-CAST MANHOLE STRUCTURAL COMPONENTS SHALL BE POLYMER CONCRETE. MANHOLE BASE SHALL BE POLYMER CONCRETE OR CAST IN PLACE CONCRETE (560-C-3250) WITH EPOXY LINER, AS APPROVED BY THE CITY ENGINEER.
2. ALL PIPE IN MANHOLE SHALL BE PVC OR VITRIFIED CLAY PIPE AND SHALL BE INCLUDED AS PART OF MANHOLE, EXCEPT WHERE PRE-CAST BASE IS USED OR OTHERWISE APPROVED.
3. MANHOLE SHALL BE CONSTRUCTED IN ACCORDANCE WITH APPLICABLE PROVISIONS OF ASTM C-478.
4. EACH SHAFT AND RISER JOINT SHALL BE SEALED PER JOINT DETAIL WITH BUTYL RUBBER SEALANT ROPE. SEE DETAIL THIS SHEET.
5. PROVIDE PIPE TO MANHOLE CONNECTORS WITH PRE-CAST POLYMER BASE.



PLAN B-B



SECTION C-C

NOT TO SCALE

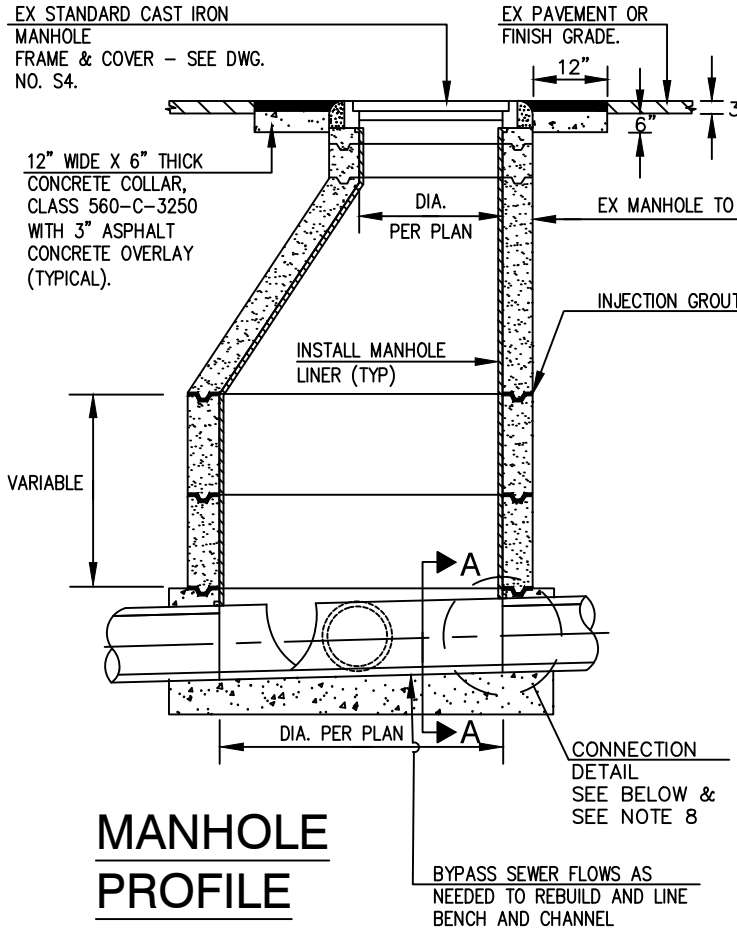
REV.	APPROVED	DATE

CITY OF CARLSBAD

STANDARD SEWER MANHOLE

CITY ENGINEER — 4/29/22 DATE

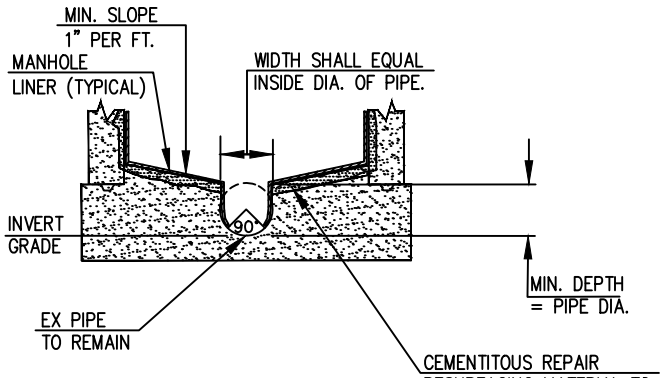
STANDARD DWG. NO. S-1



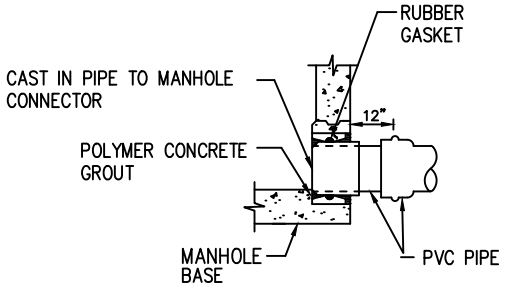
MANHOLE PROFILE

NOTES:

1. MANHOLE REHABILITATION SHALL BE IN ACCORDANCE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION (GREENBOOK) SECTION 502.
2. CLEAN, INSPECT, PRESSURE WASH ALL INTERIOR SURFACES OF MANHOLE.
3. STOP ACTIVE INFILTRATION INTO MANHOLE BY INJECTION GROUTING.
4. REPAIR AND RESURFACE INTERIOR WITH CEMENTITIOUS MATERIAL TO REBUILD TO WITHIN ONE-HALF INCH OF THE NOMINAL INSIDE DIAMETER OF MANHOLE.
5. INSTALL EPOXY LINING SYSTEM, RAVEN 405 OR APPROVED EQUAL, ON ALL INTERIOR SURFACE WALLS, BENCH AND CHANNEL IN ACCORDANCE WITH GREENBOOK SECTION 502-5.4. LINING SYSTEM SHALL BE APPROVED BY THE CITY ENGINEER AND SUBJECT TO SPECIAL INSPECTION.
6. INSTALL TERMINATION POINTS PER SPECIFICATIONS AT THE MANHOLE FRAME AND CHIMNEY JOINT, 1" BELOW NORMAL FLOW LEVELS AT THE BENCH, AND A MIN. 1" INTERFACING WITHIN EACH PIPE PENETRATION.
7. FIELD VERIFY EXISTING MANHOLE CONFIGURATION, MATERIAL, DIMENSIONS AND ELEVATIONS PRIOR TO ORDERING SUPPLIES FOR LINING OPERATION, AS APPROVED BY THE CITY ENGINEER.
8. DETAIL SHOWN IS FOR FUTURE BREAK-IN CONNECTION – APPROVAL REQ'D.



SECTION A-A



PIPE TO MANHOLE CONNECTION DETAIL

NOT TO SCALE

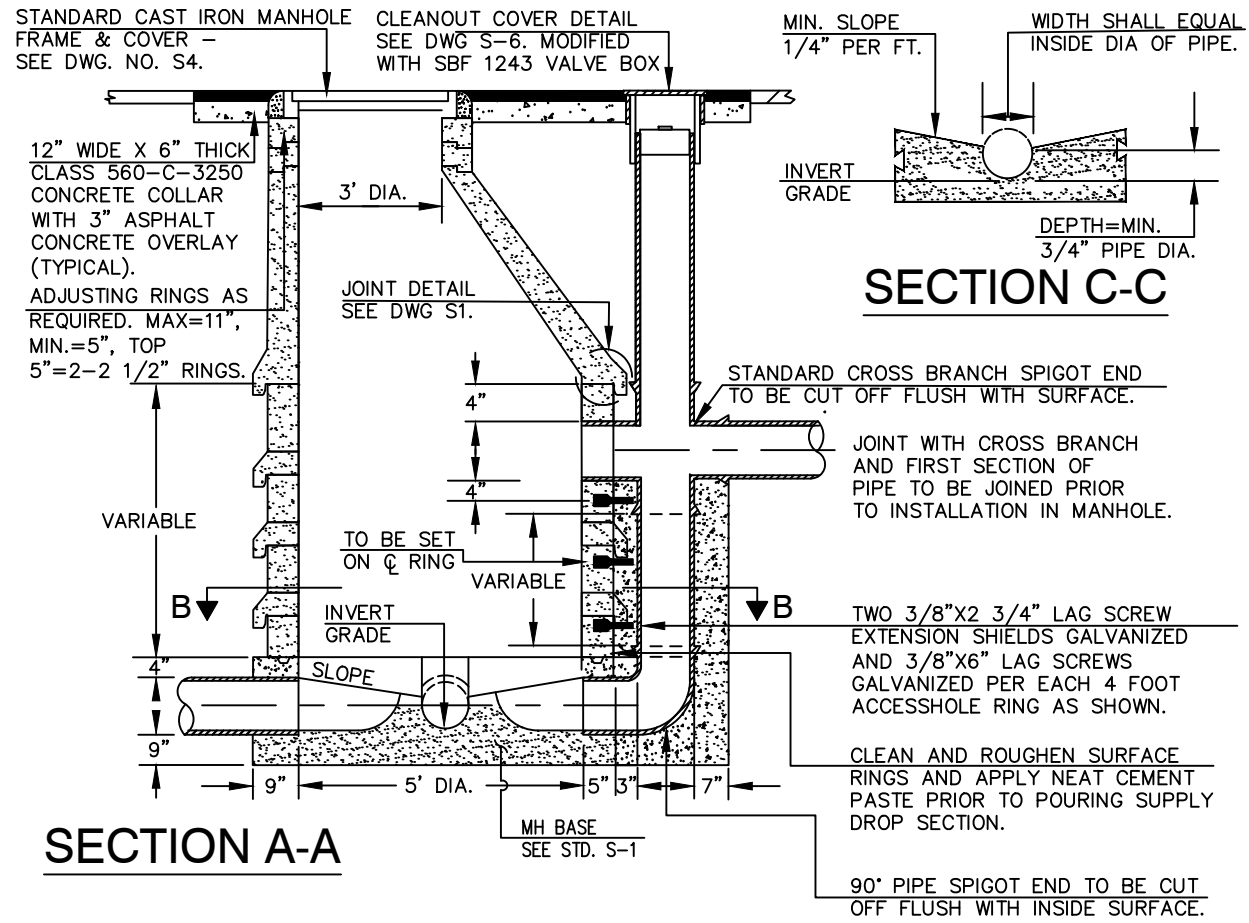
REV.	APPROVED	DATE

CITY OF CARLSBAD

EXISTING MANHOLE REHABILITATION

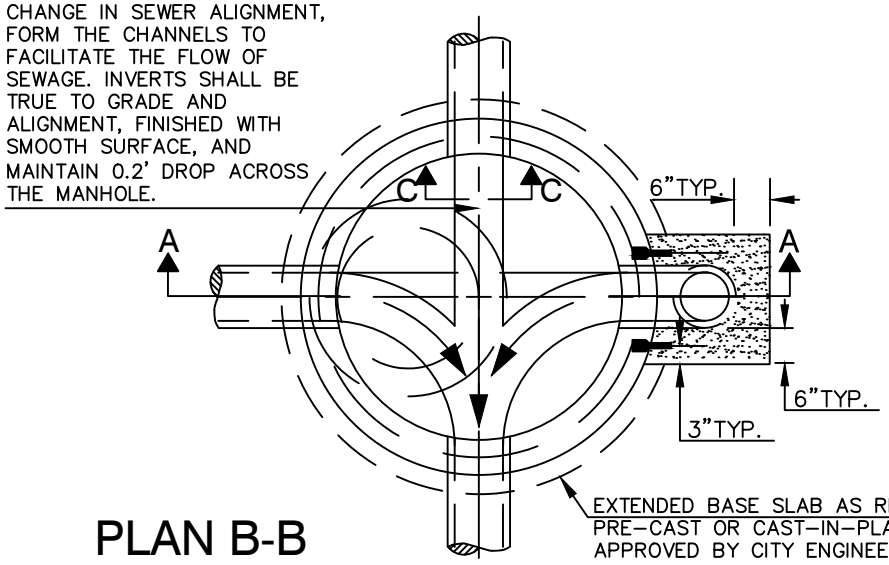
CITY ENGINEER — 4/29/22 DATE

STANDARD DWG. NO. S-1A



SECTION A-A

SECTION C-C



PLAN B-B

NOTES:

1. ALL PRE-CAST MANHOLE STRUCTURAL COMPONENTS SHALL BE POLYMER CONCRETE. MANHOLE BASE SHALL BE POLYMER CONCRETE OR CAST IN PLACE CONCRETE (560-C-3250) WITH EPOXY LINER, AS APPROVED BY THE CITY ENGINEER.
2. ALL PIPE IN MANHOLE SHALL BE PVC OR VITRIFIED CLAY PIPE AND SHALL BE INCLUDED AS PART OF MANHOLE, EXCEPT WHERE PRE-CAST BASE IS USED.
3. DOUBLE DROP MANHOLE IS CONSTRUCTED THE SAME AS DROP MANHOLE EXCEPT THAT IT HAS TWO DROP SECTIONS.

REV.	APPROVED	DATE

CITY OF CARLSBAD

DROP MANHOLE

CITY ENGINEER — 4/29/22 DATE

STANDARD DWG. NO. S-2

12" WIDE X 6" THICK CLASS 560-C-3250 CONCRETE COLLAR WITH 3" ASPHALT CONCRETE OVERLAY (TYPICAL).

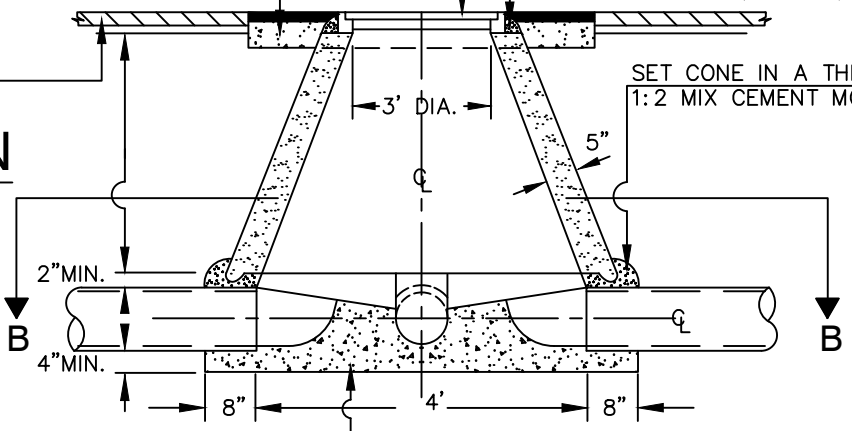
STANDARD CAST IRON MANHOLE FRAME & COVER - SEE DWG. NO. S4.

CEMENT IN PLACE WITH 1:2 MIX CEMENT MORTAR (TYPICAL).

PAVEMENT OR FINISH GRADE.

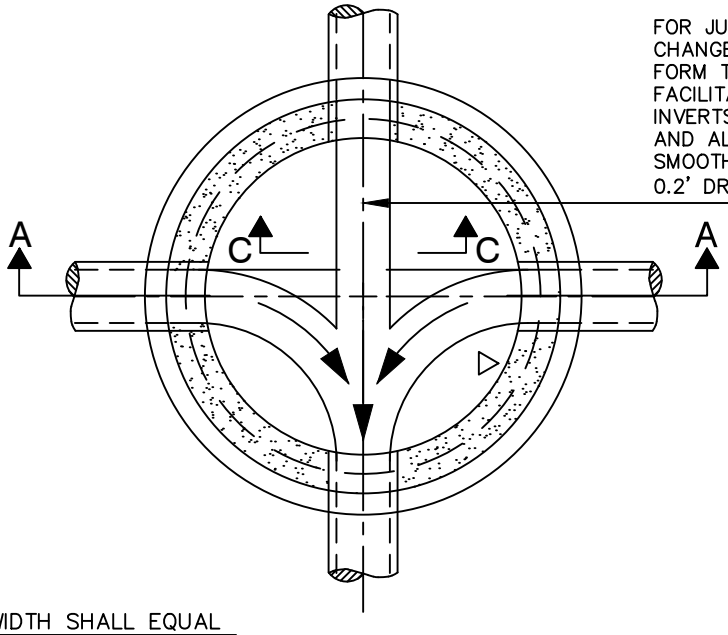
SET CONE IN A THICK BED OF 1:2 MIX CEMENT MORTAR

SECTION A-A



POUR BASE AGAINST 6-INCHES OF 3/4" OF CRUSHED ROCK BASE.

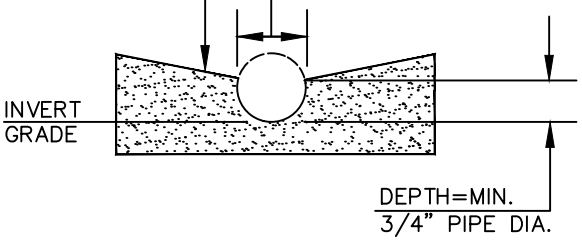
PLAN B-B



FOR JUNCTION MANHOLES AND CHANGE IN SEWER ALIGNMENT, FORM THE CHANNELS TO FACILITATE THE FLOW OF SEWAGE. INVERTS SHALL BE TRUE TO GRADE AND ALIGNMENT, FINISHED WITH SMOOTH SURFACE, AND MAINTAIN 0.2' DROP ACROSS THE MANHOLE.

MIN. SLOPE 1" PER FT.

WIDTH SHALL EQUAL INSIDE DIA OF PIPE.



SECTION C-C

NOTES:

1. ALL PRE-CAST MANHOLE STRUCTURAL COMPONENTS SHALL BE POLYMER CONCRETE. MANHOLE BASE SHALL BE POLYMER CONCRETE OR CAST IN PLACE CONCRETE (560-C-3250) WITH EPOXY LINER, AS APPROVED BY THE CITY ENGINEER.
2. MANHOLE SHALL BE CONSTRUCTED IN ACCORDANCE WITH ASTM C-478.
3. STUB OUTS SHALL HAVE A MINIMUM LENGTH OF 3 FEET.

REV.	APPROVED	DATE

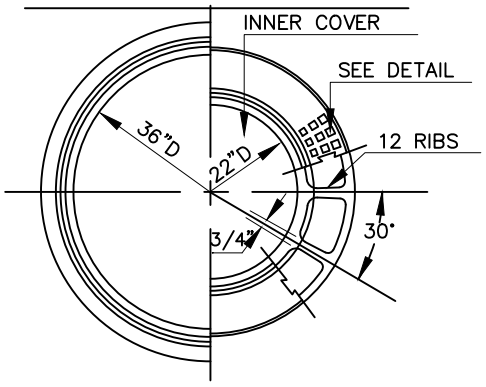
CITY OF CARLSBAD

SHALLOW MANHOLE

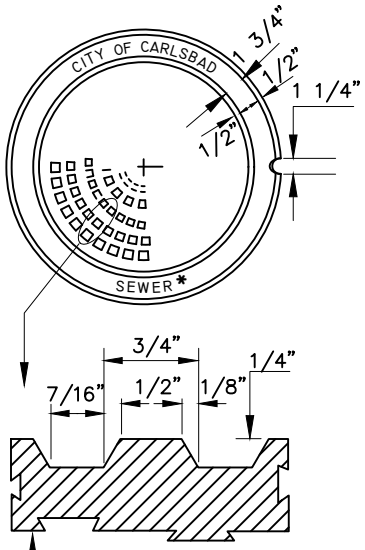
CITY ENGINEER — 4/29/22 DATE

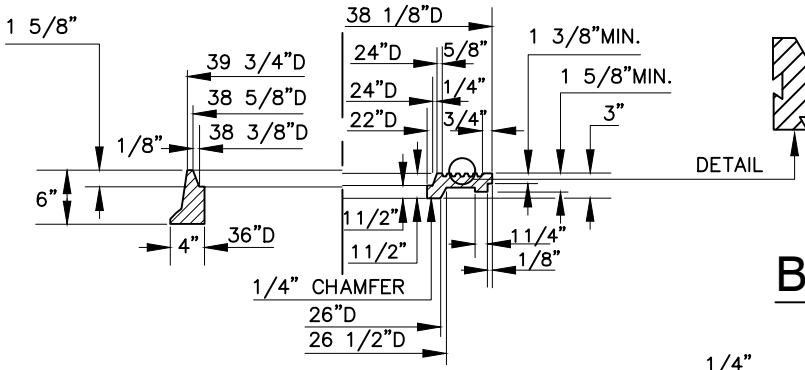
STANDARD DWG. NO. S-3

HALF PLAN FRAME & COVER



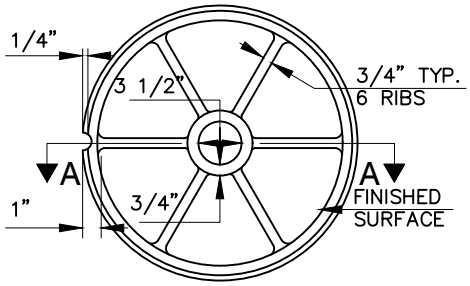
INNER COVER TOP SIDE





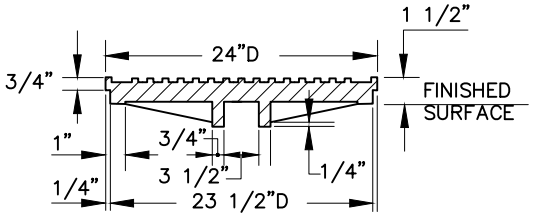
HALF SECTION FRAME & COVER

BOTTOM SIDE



NOTES:

1. WEIGHTS:
   - INNER COVER =155 LBS.
   - OUTER COVER =300 LBS.
   - FRAME =330 LBS.
2. MATERIAL: CAST IRON.
3. MACHINE SEATS TO PREVENT NOISE.
4. FILLET RADII TO BE 12".
5. IMPORTED COVERS AND FRAMES SHALL HAVE COUNTRY OF ORIGIN MARKING IN COMPLIANCE WITH FEDERAL REGULATIONS.
6. COVERS AND FRAMES SHALL BE PROVIDED FROM THE SAME MANUFACTURER TO ENSURE ACCURATE FIT.
7. CITY SHALL REJECT AND REQUIRE REMOVAL AND REPLACEMENT OF ALL FRAMES AND COVERS NOT MEETING MACHINING TOLERANCES AND THAT DO NOT PROPERLY SEAT.



SECTION A-A

*	FOR	MARK
	SEWER PROJECTS	SEWER
	STORM DRAIN PROJECTS	STORM DRAIN

REV.	APPROVED	DATE

CITY OF CARLSBAD

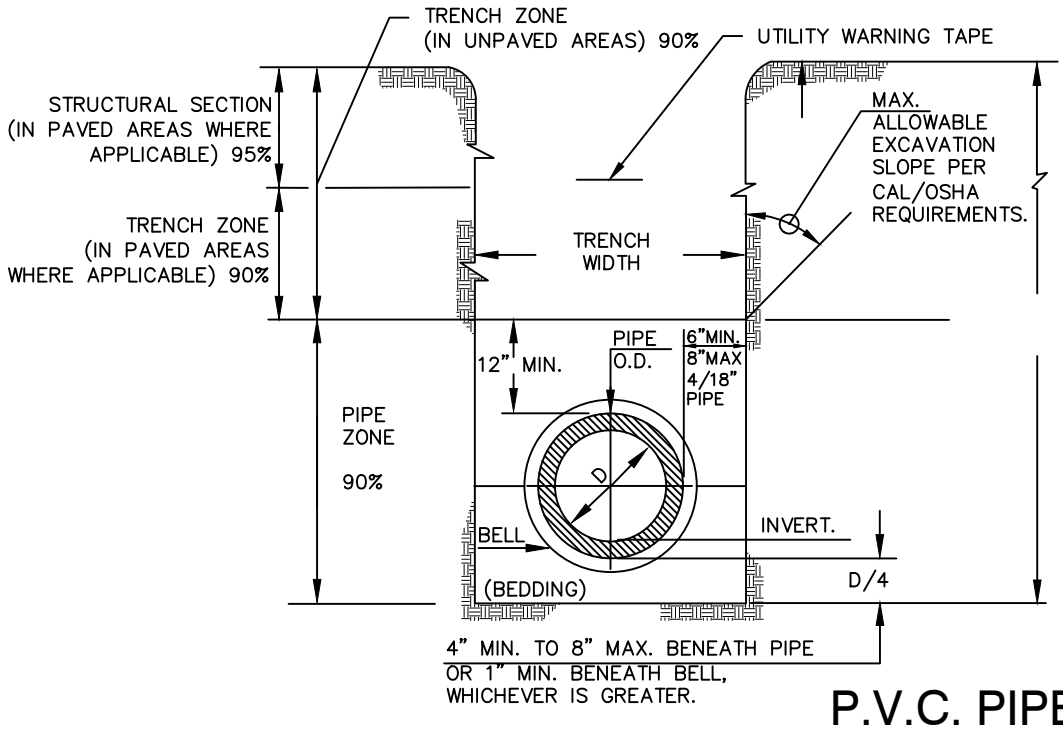
MANHOLE FRAME AND COVER

CITY ENGINEER 4/29/22 DATE

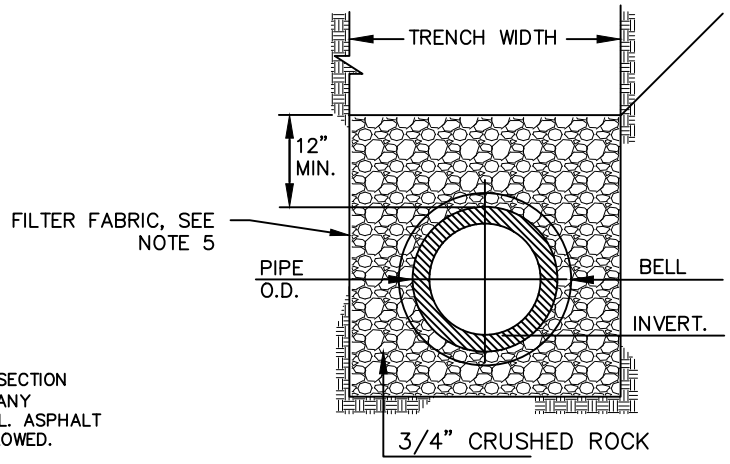
STANDARD DWG. NO. S-4

TYPICAL TRENCH SECTION

WITH DIMENSIONS AND COMPACTION ZONES



P.V.C. PIPE
PIPE ZONE



NOTES:

1. PERCENTAGES SHOWN EQUAL MINIMUM RELATIVE COMPACTION.
2. MINIMUM DEPTH OF COVER FROM TOP OF PIPE TO FINISH GRADE FOR ALL SANITARY SEWER INSTALLATIONS SHALL BE 3 FEET. FOR COVER LESS THAN 3', SPECIAL DESIGN AND APPROVAL REQUIRED.
3. TRENCH ZONE BACKFILL SHALL BE PER SECTION 02223. NO ROCKS LARGER THAN 4" IN ANY DIMENSION WILL BE ALLOWED IN BACKFILL. ASPHALT OR CONCRETE CHUNKS WILL NOT BE ALLOWED.
4. CITY SHALL INSPECT TRENCH BOTTOMS PRIOR TO BACKFILL TO CONFIRM STABILITY OF TRENCH.
5. FILTER FABRIC (WRAP ALL AROUND) AS REQUIRED IN SECTION 02223 WITH A MINIMUM 12–INCH OVERLAP.

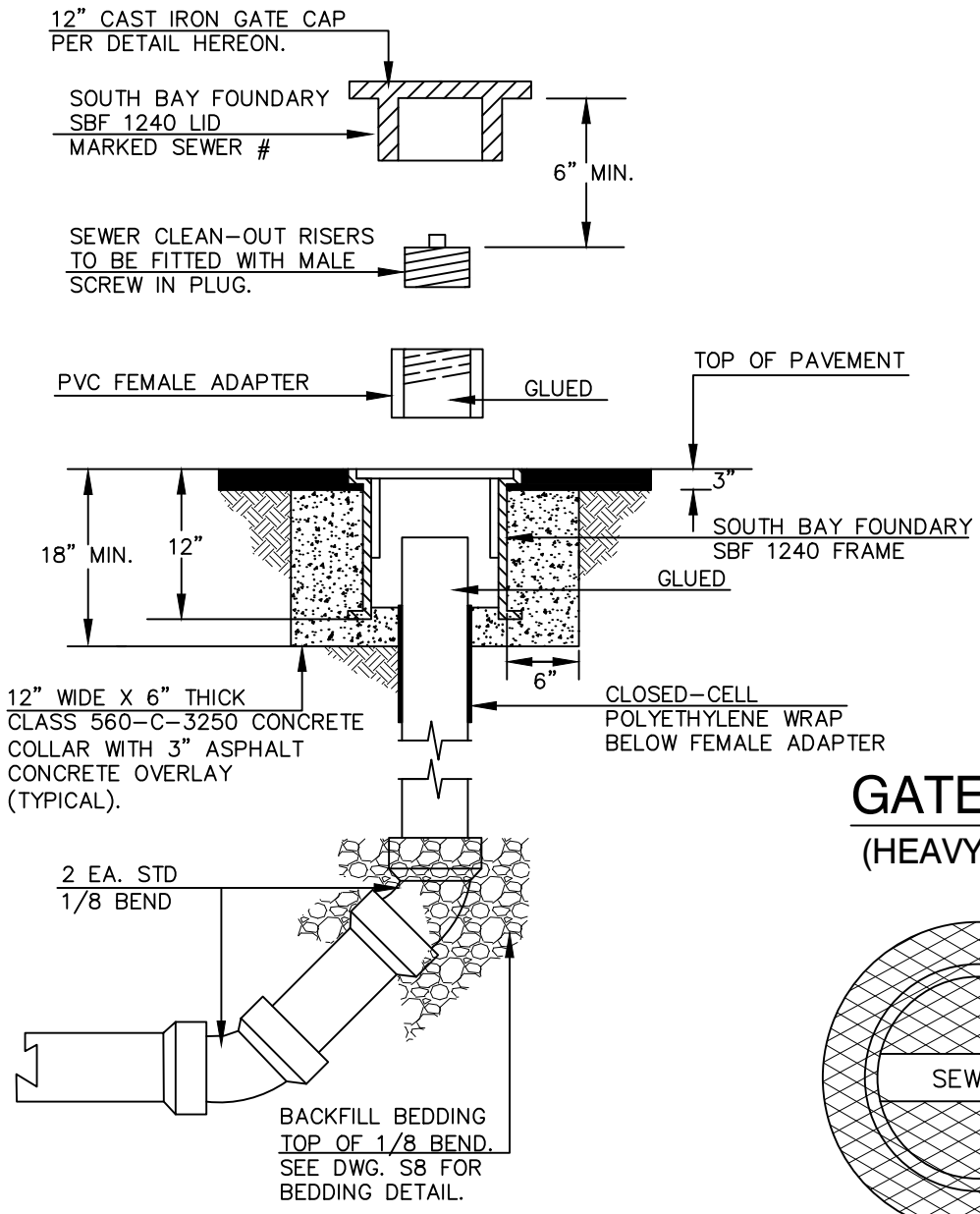
REV.	APPROVED	DATE

CITY OF CARLSBAD

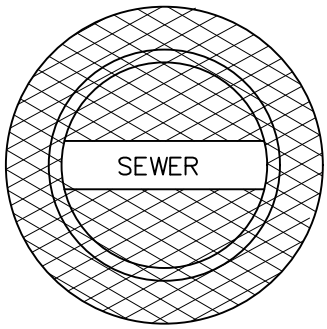
PIPE BEDDING AND TRENCH BACKFILL FOR SEWERS

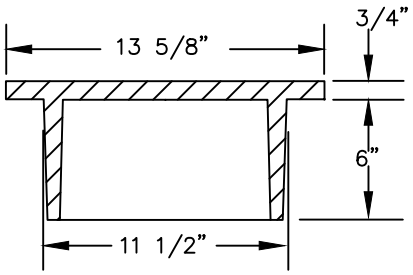
CITY ENGINEER — 4/29/22 DATE

STANDARD DWG. NO. S-5



GATE CAP
(HEAVY DUTY)





NOTES:

1. GATE CAP SHALL BE LABELED SEWER.
2. CLEANOUTS MAY BE USED WITH P.V.C. SEWER MAIN.
3. RISER SHALL BE SAME DIAMETER AS SEWER MAIN.

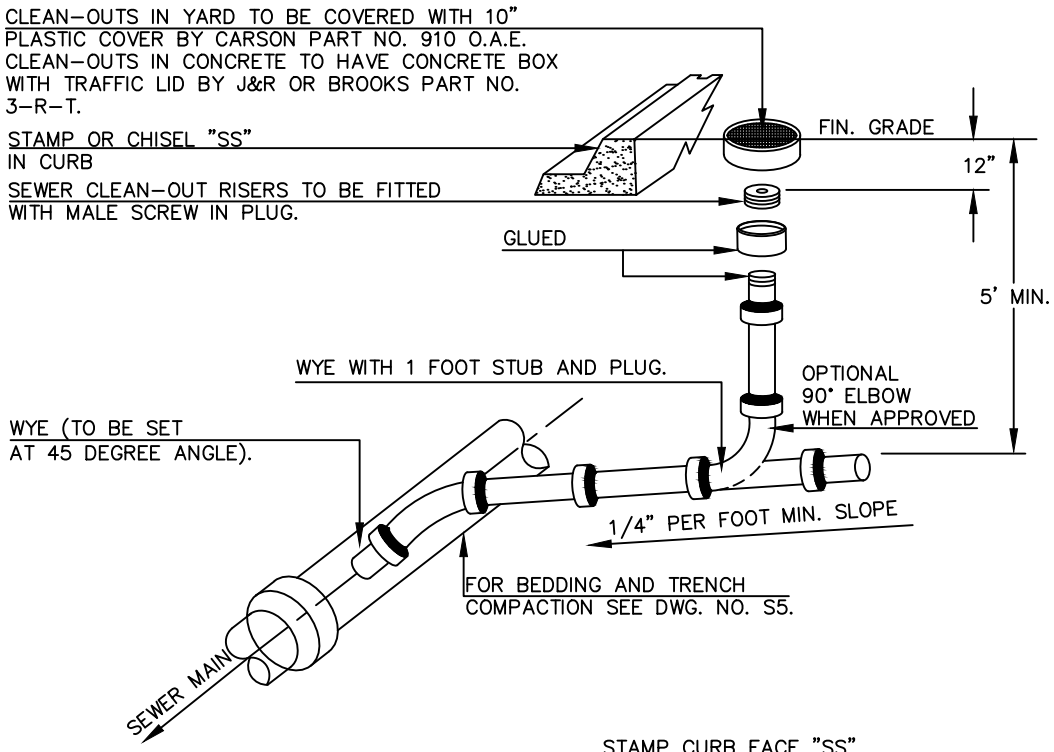
REV.	APPROVED	DATE

CITY OF CARLSBAD

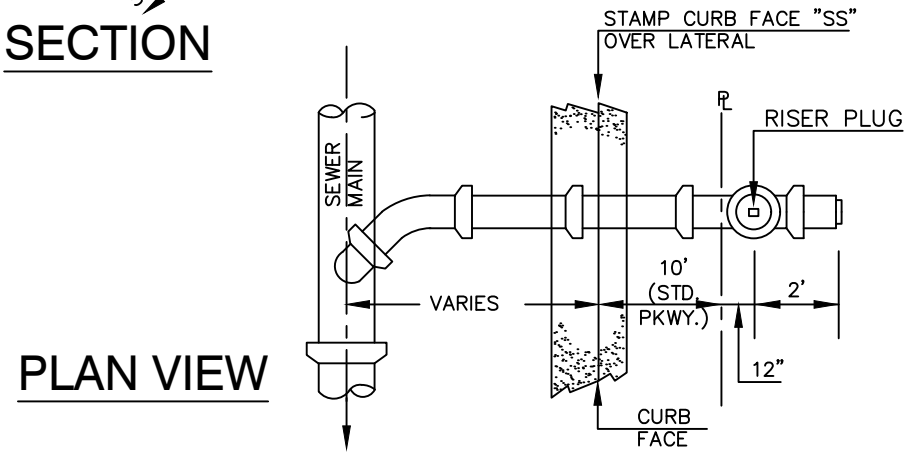
SEWER MAIN CLEANOUT

CITY ENGINEER 4/29/22
DATE

STANDARD DWG. NO. S-6



SECTION



PLAN VIEW

NOTES:

1. THE LATERAL SHALL BE BEDDED THE SAME AS THE MAIN LINE SEWER.
2. IN NO CASE SHALL A LATERAL CONNECT TO THE SEWER MAIN DIRECTLY ON TOP OF THE PIPE.
3. SEWER LATERALS SHALL HAVE A 2% MINIMUM SLOPE.
4. ALL JOINTS ON SEWER LATERAL PIPE SHALL BE COMPRESSION TYPE OR APPROVED SOLVENT WELD.
5. AS–BUILT SEWER LATERAL LOCATIONS SHALL BE FURNISHED TO THE CITY INSPECTOR ON FORMS PROVIDED PRIOR TO FINAL APPROVAL OF WORK.
6. ALL LATERAL TRENCHES TO PROPERTY LINE AND SEWER MAIN TRENCHES TO BE COMPACTED PER STD. SWG. S–5.
7. CLEAN–OUT TO BE ADJUSTED TO GRADE AFTER FINAL FINISH GRADING.
8. FOR BACKFILL AROUND CLEANOUT RISER SEE STD. DWG. S–5, NOTE 3.
9. MAINTENANCE OF THE SEWER LATERAL FROM THE SEWER MAIN TO THE BUILDING IS THE RESPONSIBILTY OF THE PROERTY OWNER.
10. SEWER LATERALS SHALL BE EQUIPPED WITH AN APPROVED BACKWATER DEVICE AT ALL LOCATIONS WHERE DICTATED BY THE CURRENTLY ADOPTED EDITION OF THE CALIFORNIA PLUMBING CODE.

REV.	APPROVED	DATE

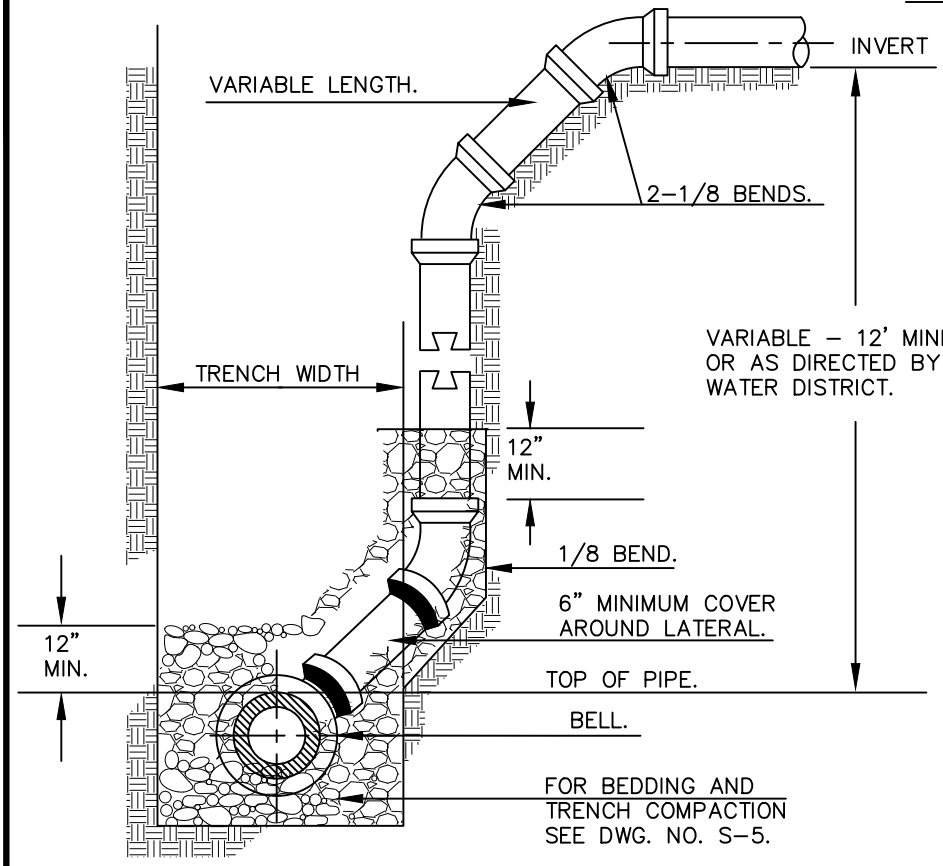
CITY OF CARLSBAD

SEWER LATERAL (WITH OPTIONAL WYE)

CITY ENGINEER — 4/29/22 DATE

STANDARD DWG. NO. S-7

ELEVATION

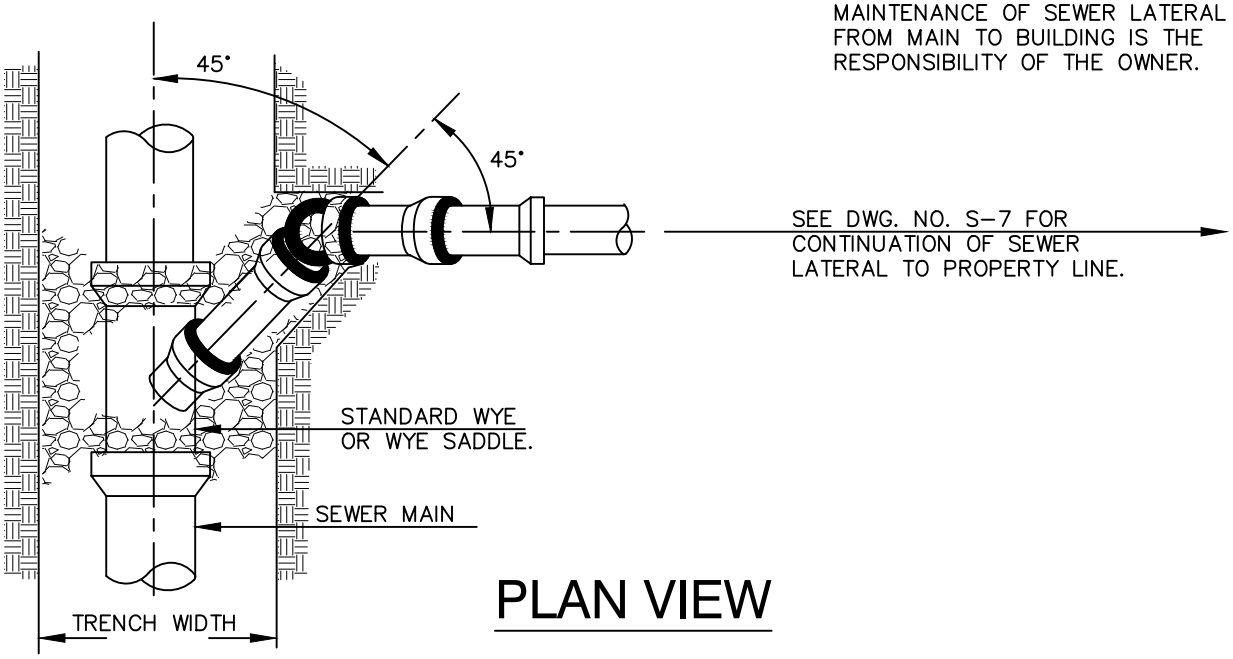


NOTES:

THE VERTICAL PIPE SHALL BE BRACED WHILE TRENCH IS BEING BACKFILLED.

ALL JOINTS ON SEWER LATERAL PIPE SHALL BE COMPRESSION TYPE OR APPROVED SOLVENT WELD.

MAINTENANCE OF SEWER LATERAL FROM MAIN TO BUILDING IS THE RESPONSIBILITY OF THE OWNER.



PLAN VIEW

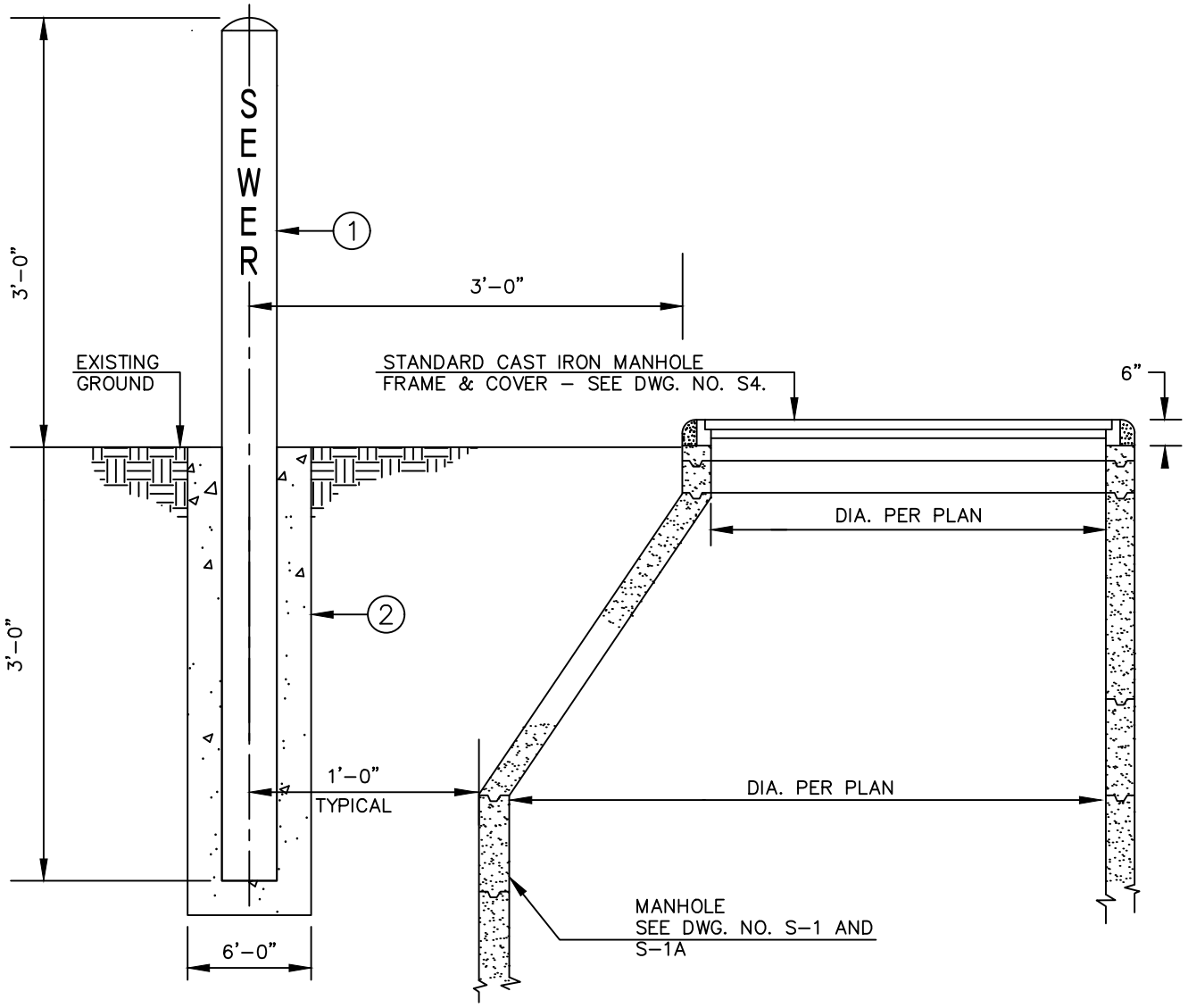
REV.	APPROVED	DATE

CITY OF CARLSBAD

SEWER LATERAL (DEEP CUT)

CITY ENGINEER — 4/29/22 DATE

STANDARD DWG. NO. S-8



NOT TO SCALE

ITEM	DESCRIPTION	SPEC/DWG
1	PIPELINE MARKER POST	AML
2	CONTROLLED LOW STRENGTH MATERIAL	03000

REV.	APPROVED	DATE

CITY OF CARLSBAD

MANHOLE MARKER POST

CITY ENGINEER — 4/29/22 DATE

STANDARD DWG. NO. S-9

CITY OF CARLSBAD
ENGINEERING STANDARDS

VOLUME 3 – STANDARD DRAWINGS & SPECIFICATIONS

CHAPTER 2 - CITY OF CARLSBAD MODIFICATIONS TO THE SAN DIEGO REGIONAL STANDARD DRAWINGS

Note: The minimum allowable concrete mix design for all concrete placed within public right- of-way shall be 560-C-3250 (TYPE V) as specified in the Standard Specifications for Public Works Construction.

DWG.	MODIFICATION
D-2	Enlarge curb inlet top to the width of sidewalk (not to exceed 5'-6") by length of inlet including wings. Existing reinforcing steel shall be extended across enlarged top to clear distances shown.
D-20	Delete.
D-27	Add: A maximum of three (3) combined outlets in lieu of Std. D-25.
D-40	Add: "T" dimension shall be a minimum of three (3) times size of rip rap.
D-60	Add: Backfill ¾" crushed rock up to spring line of pipe. Pipe bedding thickness shall be pipe diameter / 4 with a minimum thickness of 4" and a maximum thickness of 8". Modify Note 3 to read: Upper trench zone (top 3') shall be compacted to 95% relative compaction.
D-70	Minimum bottom width shall be 6' to facilitate cleaning.
D-71	Minimum bottom width shall be 6' to facilitate cleaning.
D-75	Delete "Type-A" Add: 6" x 6" x #10 x #10 welded wire mesh, instead of stucco netting.
E-1	Delete direct burial foundation. Add: The light standard shall be pre-stressed concrete round pole.
E-2	Grounding per note 2. Attachment of the grounding wire to the anchor bolt shall be below the light standard base plate with an approved connection.
G-3	Delete.
G-5	Add: Note 4. Tack coat shall be applied between dike and existing asphalt concrete surface as specified in SSPWC.

CHAPTER 2 - CITY OF CARLSBAD MODIFICATIONS TO THE SAN DIEGO REGIONAL STANDARD DRAWINGS (CONTINUED)

DWG.	MODIFICATION
G-6	Type B-1 not used. When specified, Type B-2 shall have a curb height of 8”, width of 6”, with a 3:1 batter. When specifically approved by the City Engineer, which is hereby defined as the “*City Engineer or designee**”.*** Type B-3 shall have a curb height of 8”, width of 6”, a 3:1 batter with the hinge point eliminated.
G-11	Add: Remove curb/gutter and sidewalk from score-mark to score-mark or from joint-to-joint or approved combination.
G-12	Add: smooth trowel flow line (typical) 7-1/2" thick with a minimum of 6” of aggregate base per City of Carlsbad Standard GS-17.
G-13	Add: smooth trowel flow line (typical), 7-1/2” thick, with a minimum 6” of aggregate base per City of Carlsbad Standard GS-17.
G-14	Change: Residential Thickness = 5-1/2" Commercial/Multi-Family Residential Thickness = 7-1/2"
G-15	Delete requirement 3
GS-21	Pull-Box for Traffic Signal and Street Lighting
G-24	Replaced with Carlsbad Standard Drawing GS-25
G-25	"Type-C" only (delete "Type D")
G-26	Change thickness from 5-1/2" to 7-1/2" and add minimum 6" Class II base under curb/gutter (to 6" past back of curb).
G-33	Delete
G-34	"Type-C" only (delete "Type D")
G-35	"Type-F" only (delete "Type E")
M	General: Agency shall be "City of Carlsbad"
M-2	Add: To be used only with specific approval of the City Engineer, which is hereby defined as the “*City Engineer or designee*”.

CITY OF CARLSBAD
ENGINEERING STANDARDS

VOLUME 3 - STANDARD DRAWINGS AND SPECIFICATIONS

CHAPTER 3 –STANDARD TITLE SHEETS

Capital Improvement Projects (CIP)

Improvement Plans Title Sheet

Grading Plans Title Sheet

Private (Onsite) Recycled Water System Title Sheet

Traffic Control Plan

Private Projects

Improvement Plans Title Sheet

Grading Plans Title Sheet

Private (Onsite) Recycled Water System Title Sheet

CIP IMPROVEMENTS

GENERAL NOTES

1. THIS PLAN SUPERSEDES ALL OTHER PLANS PREVIOUSLY APPROVED BY THE CITY OF CARLSBAD REGARDING GRADING SHOWN ON THIS SET OF PLANS.
2. A RIGHT-OF-WAY PERMIT FROM THE CITY ENGINEER WILL BE REQUIRED FOR ANY WORK IN THE PUBLIC RIGHT OF WAY.
3. NO WORK SHALL BE COMMENCED UNTIL ALL PERMITS HAVE BEEN OBTAINED FROM THE CITY AND OTHER APPROPRIATE AGENCIES AT THE CONTRACTOR'S EXPENSE.
4. ORIGINAL DRAWINGS SHALL BECOME THE PROPERTY OF THE CITY UPON BEING SIGNED BY THE CITY ENGINEER.
5. THE ORIGINAL DRAWING SHALL BE REVISED TO REFLECT AS-BUILT CONDITIONS BY THE CONTRACTOR PRIOR TO FINAL ACCEPTANCE OF THE WORK BY THE CITY.
6. ACCESS FOR FIRE AND OTHER EMERGENCY VEHICLES SHALL BE MAINTAINED TO THE PROJECT SITE AT ALL TIMES DURING CONSTRUCTION.
7. THE CONTRACTOR SHALL DESIGN, CONSTRUCT AND MAINTAIN ALL SAFETY DEVICES, INCLUDING SHORING, AND SHALL BE SOLELY RESPONSIBLE FOR CONFORMING TO ALL LOCAL, STATE AND FEDERAL SAFETY AND HEALTH STANDARDS, LAWS AND REGULATIONS.
8. THE CONTRACTOR SHALL CONFORM TO LABOR CODE SECTION 6705 BY SUBMITTING A DETAIL PLAN SHOWING THE DESIGN OF SHORING, BRACING SLOPING OR OTHER PROVISIONS TO BE MADE OF WORKER PROTECTION FROM THE HAZARD OF CAVING GROUND DURING THE EXCAVATION OF SUCH TRENCH OR TRENCHES OR DURING THE PIPE INSTALLATION THEREIN. THIS PLAN MUST BE PREPARED FOR ALL TRENCHES FIVE FEET (5') OR MORE IN DEPTH PRIOR TO EXCAVATION. IF THE PLAN VARIES FROM THE SHORING SYSTEM STANDARDS ESTABLISHED BY THE CONSTRUCTION SAFETY ORDERS, TITLE 8 CALIFORNIA ADMINISTRATIVE CODE, THE PLAN SHALL BE PREPARED BY A REGISTERED ENGINEER AT THE CONTRACTORS EXPENSE. A COPY OF THE OSHA EXCAVATION PERMIT MUST BE SUBMITTED TO THE INSPECTOR PRIOR TO EXCAVATION.
9. NO BLASTING SHALL BE PERFORMED UNTIL A VALID BLASTING PERMIT HAS BEEN OBTAINED FROM THE CITY OF CARLSBAD. SUBMIT APPLICATION FOR BLASTING PERMIT WELL IN ADVANCE OF THE SCHEDULING OF BLASTING OPERATIONS.
10. IF ANY ARCHAEOLOGICAL RESOURCES ARE DISCOVERED WITHIN ANY WORK AREA DURING CONSTRUCTION, OPERATIONS WILL CEASE IMMEDIATELY, AND THE CONTRACTOR WILL NOTIFY THE CITY. OPERATIONS WILL NOT RESTART UNTIL THE CONTRACTOR HAS RECEIVED WRITTEN AUTHORITY FROM THE CITY TO DO SO.
11. ALL OPERATIONS CONDUCTED ON THE SITE OR ADJACENT THERETO, INCLUDING WARMING UP, REPAIR, ARRIVAL, DEPARTURE OR OPERATION OF TRUCKS, EARTHMOVING EQUIPMENT, CONSTRUCTION EQUIPMENT AND ANY OTHER ASSOCIATED GRADING EQUIPMENT SHALL BE LIMITED TO THE PERIOD BETWEEN _____ AND EACH DAY,_____THRU_____AND NO EARTHMOVING OR GRADING OPERATIONS SHALL BE CONDUCTED ON WEEKENDS OR HOLIDAYS. (A LIST OF CITY HOLIDAYS IS AVAILABLE AT THE ENGINEERING DEPARTMENT COUNTER.)
12. ALL OFF-SITE HAUL ROUTES SHALL BE SUBMITTED BY THE CONTRACTOR TO THE CITY ENGINEER FOR APPROVAL TWO FULL WORKING DAYS PRIOR TO BEGINNING OF WORK. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DEBRIS OR DAMAGE OCCURRING ALONG THE HAUL ROUTE OR ADJACENT STREETS AS A RESULT OF THE GRADING OPERATION.
13. THE EXISTENCE AND LOCATION OF UTILITY STRUCTURES AND FACILITIES SHOWN ON THE CONSTRUCTION PLANS WERE OBTAINED BY A SEARCH OF AVAILABLE RECORDS. ATTENTION IS CALLED TO THE POSSIBLE EXISTENCE OF OTHER UTILITY FACILITIES OR STRUCTURES NOT SHOWN OR IN A LOCATION DIFFERENT FROM THAT SHOWN ON THE PLANS. THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURES TO PROTECT THE UTILITIES SHOWN ON THE PLANS AND ANY OTHER EXISTING FACILITIES OR STRUCTURES NOT SHOWN.
14. THE CONTRACTOR SHALL VERIFY THE LOCATION OF ALL EXISTING FACILITIES (ABOVE GROUND AND UNDER GROUND) WITHIN THE PROJECT SITE SUFFICIENTLY AHEAD OF WORK.
15. THE CONTRACTOR SHALL NOTIFY AFFECTED UTILITY COMPANIES (SEE BELOW) AT LEAST 2 FULL WORKING DAYS PRIOR TO STARTING GRADING NEAR THEIR FACILITIES AND SHALL COORDINATE THE WORK WITH A COMPANY REPRESENTATIVE.

UNDERGROUND SERVICE ALERT	811
SDG&E	(800)411-7343
AT&T	(800)892-0123
TIME WARNER CABLE	(760)438-7741
COX COMMUNICATIONS	(619)262-1122
CITY OF CARLSBAD(STREETS & STORM DRAIN)	(760)434-2980
*CITY OF CARLSBAD(SEWER,WATER & RECLAIMED WATER)	(760)438-2722
*SAN DIEGUITO WATER DISTRICT	(760)633-2650
*LEUCADIA WASTEWATER DISTRICT	(760)753-0155
*VALLECITOS WATER DISTRICT	(760)744-0460
*OLIVENHAIN WATER DISTRICT	(760)753-6466
*BUENA SANITATION DISTRICT	(760)726-1340 x1330

*AS APPROPRIATE

16. IN ACCORDANCE WITH THE CITY STORM WATER STANDARDS, ALL STORM DRAIN INLETS CONSTRUCTED BY THIS PLAN SHALL INCLUDE "STENCILS" BE ADDED TO PROHIBIT WASTEWATER DISCHARGE DOWNSTREAM. STENCILS SHALL BE ADDED TO THE SATISFACTION OF THE CITY.
17. THE CONTRACTOR SHALL NOTIFY THE CITY OF CARLSBAD CONSTRUCTION MANAGEMENT & INSPECTION DEPARTMENT 48 HOURS PRIOR TO STARTING WORK SO THAT INSPECTION MAY BE PROVIDED.

STREET NOTES

1. STREET LIGHTS SHALL BE INSTALLED AS SHOWN ON THESE PLANS, UNDERGROUND CONDUIT RUNS, SERVICE POINTS AND HAND-HOLES SHALL BE SHOWN ON THE "AS-BUILT" PLANS. NO DIRECT BURIAL STREET LIGHT FOUNDATIONS WILL BE ALLOWED. ALL LUMINAIRES SHALL BE "CUT OFF" TYPE.
2. ALL UNDERGROUND UTILITIES AND LATERALS SHALL BE INSTALLED PRIOR TO CONSTRUCTION OF CURBS, CROSS GUTTERS OR SURFACING OF STREETS.
3. WHERE AN EXISTING PIPE LINE IS TO BE ABANDONED IT SHALL BE REMOVED WITHIN TWENTY FEET OF BUILDING OR STREET AREAS AND REPLACED WITH PROPERLY COMPACTED SOILS. IN OTHER AREAS THE PIPE WILL BE PLUGGED WITH CONCRETE OR REMOVED AS APPROVED BY THE CITY ENGINEER.
4. WHEELCHAIR RAMPS SHALL BE INSTALLED PER REQUIREMENTS OF TITLE 24, CALIFORNIA ADMINISTRATIVE CODE.
5. STREET TREES SHALL BE INSTALLED PER SECTION VI OF THE CITY OF CARLSBAD LANDSCAPE MANUAL.
6. FIRE HYDRANT MARKERS SHALL BE PLACED IN THE STREET WITHIN THE LIMITS OF WORK OF THIS PLAN PER SDRS DWG M19.
7. ALL SURVEY MONUMENTS AND POINTS THAT ARE DISTURBED BY THIS WORK SHALL BE REESTABLISHED, PERPETUATED, AND DOCUMENTED PER THE PROFESSIONAL LAND SURVEYORS ACT.
8. TWO (2) SETS OF SURVEY (CUT) SHEETS SHALL BE PROVIDED TO THE CITY INSPECTOR.
9. STREET LIGHTS SHALL BE 5,500 LUMEN (40 WATT) OR 13,700 PUPIL LUMEN (100 WATT) HIGH EFFICIENCY INDUCTION LIGHTS.

SEWER NOTES

1. SEWER MAIN AND APPURTENANCES SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE "CITY OF CARLSBAD ENGINEERING STANDARDS (LATEST EDITION), VOLUME 1- GENERAL DESIGN STANDARDS, CHAPTER 6-DESIGN CRITERIA FOR GRAVITY SEWER LINES AND APPURTENANCES, AND VOLUME 3 - STANDARD DRAWINGS AND NOTES AND THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, LATEST EDITION (GREEN BOOK).
2. BEFORE ANY CONNECTION TO THE CITY'S EXISTING SYSTEM, A PERMIT SHALL BE OBTAINED FROM THE CITY. IT MUST BE SIGNED AND APPROVED BY THE CITY.
3. BEFORE CONSTRUCTION BEGINS IN ANY PUBLIC RIGHT OF WAY, A CITY RIGHT OF WAY PERMIT SHALL BE REQUIRED.

WATER NOTES

1. WATER & RECYCLED WATER MAIN AND APPURTENANCES SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE "CITY OF CARLSBAD ENGINEERING STANDARDS" (LATEST EDITION) VOLUMES 2 & 3.
2. BEFORE ANY CONNECTION OR SHUT DOWN OF VALVES ON EXISTING C.M.W.D. LINES, CONTRACTOR MUST SUBMIT A UTILITY REQUEST FORM (E-28) A MINIMUM OF 2 WEEKS PRIOR TO REQUESTED WORK BEING PERFORMED.
3. THE CONTRACTOR SHALL NOTIFY THE CITY OF CARLSBAD CONSTRUCTION MANAGEMENT & INSPECTION DEPARTMENT 48 HOURS PRIOR TO STARTING WORK SO THAT INSPECTION MAY BE PROVIDED.
4. NO TREES OR STRUCTURES SHALL BE ALLOWED IN THE WATER LINE EASEMENT, ALL EXISTING TREES AND STRUCTURES SHALL BE REMOVED PRIOR TO COMMENCEMENT OF WORK - ANY EXCEPTIONS SHALL REQUIRE WRITTEN PERMISSION FROM THE DISTRICT ENGINEER.
5. ALL BURIED COPPER PIPING AND APPURTENANCES SHALL BE PROTECTED BY MEANS OF CATHODIC PROTECTION.
6. THE EXACT HORIZONTAL AND VERTICAL ALIGNMENT AND TYPE OF MATERIALS OF THE FIRE LINE LOCATED BETWEEN THE DETECTOR CHECK VALVE AND BUILDING SHALL BE DETERMINED BY THE CITY OF CARLSBAD FIRE MARSHAL.
7. ALL POTABLE WATER SERVICES SHALL BE 1" AND ALL METERS SHALL BE 1" (UNLESS OTHERWISE NOTED ON PLANS).
8. ALL WATER METER BOXES SHALL BE 17" X 30" X 12" POLYMER CONCRETE AS MANUFACTURED BY ARMORCAST OR EQUAL.
9. MINIMUM SPACING BETWEEN POTABLE WATER SERVICES AND SEWER LATERALS SHALL BE 10 FEET OR THE DDW SEPARATION REQUIREMENTS, WHICHEVER IS MORE STRINGENT.
10. THE TOP OF WATER METER BOXES SHALL BE FLUSH WITH THE FINISHED SURFACE GRADE.
11. CONSTRUCTION OF WATER MAINS AND RECYCLED WATER MAINS SHALL ADHERE TO THE "CRITERIA FOR THE SEPARATION OF WATER MAINS AND SANITARY SEWERS" PUBLISHED BY THE STATE OF CALIFORNIA'S DEPARTMENT OF HEALTH SERVICES.
12. AXIAL DEFLECTION AT THE PIPE JOINTS IS NOT ALLOWED. THE USE OF A HIGH-DEFLECTION COUPLING AT A PIPE JOINT MAY BE PERMITTED BY THE INSPECTOR ON A CASE BY CASE BASIS NOT TO EXCEED 4 DEGREES TOTAL DEFLECTION PER COUPLING (2 DEGREES/EACH GASKET). USE CERTAINTEED "VINYL-IRON" H.D. FOR C900.
13. BEFORE CONSTRUCTION BEGINS IN ANY PUBLIC RIGHT OF WAY, A CITY RIGHT OF WAY PERMIT SHALL BE REQUIRED.
14. NO CUTTING AND/OR SNAPPING OF ASBESTOS CEMENT PIPE (ACP) IS PERMITTED. CONTRACTOR SHALL REMOVE ACP TO NEAREST COUPLING AND INSTALL ACP X PVC ADAPTORS AND THE NECESSARY PVC SIZE AND CLASS PIPE TO INSTALL THE TEE AT THE STATION.
15. PRIOR TO BACKFILL, INSTALL TRACER WIRE ON TOP OF PIPE AND SECURE IN PLACE WITH 2-INCH WIDE PLASTIC ADHESIVE TAPE AT MAXIMUM 10-FOOT INTERVALS. WIRE TO ENTER VALVE STANDS BY MEANS OF DRILLED HOLE IN PIPE STAND WALL JUST BELOW 4TTBOX. WIRE IS NOT TO INTERFERE WITH VALVE NUT OPERATION. RUN TRACER WIRE CONTINUOUSLY ALONG PIPE AND TERMINATE IN ADJACENT VALVE BOXES FOR BURIED ASSEMBLIES OR BURIED VALVES. WHERE BURIED SPLICES OCCUR, USE AN ELECTRICAL EPOXY RESIN SUCH AS SCOTCHCAST, OR APPROVED EQUAL. PROVIDE 24 INCHES OF COILED WIRE AT ACCESS POINTS FOR ATTACHMENTS OF PIPE LOCATING EQUIPMENT. EACH INSTALLED RUN OF PIPE SHALL BE CAPABLE OF BEING LOCATED USING THE TRACER WIRE. PROTECT WIRE INSULATION FROM DAMAGE DURING INSTALLATION AND BACKFILLING. WIRE INSULATION THAT IS BROKEN, CUT, OR DAMAGED SHALL BE REPLACED. TRACER WIRE SHALL BE AWG NO. 8 STRANDED COPPER WIRE WITH HIGH MOLECULAR WEIGHT POLYETHYLENE (HMW/PE) INSULATION SPECIFICALLY DESIGNED FOR DIRECT BURIAL IN CORROSIVE SOIL OR WATER. POLYETHYLENE INSULATION SHALL CONFORM TO ASTM D 1248, TYPE 1, CLASS C. WIRES WITH CUT OR DAMAGED INSULATION ARE NOT ACCEPTABLE AND REPLACEMENT OF THE ENTIRE WIRE WHICH HAS BEEN DAMAGED WILL BE REQUIRED AT THE CONTRACTOR'S EXPENSE.

SIGNING AND STRIPING NOTES

1. PREPARATION OF SIGNING AND STRIPING PLAN TO BE APPROVED BY THE CITY INSPECTOR. THE CONTRACTOR IS RESPONSIBLE FOR INSTALLING ALL APPROVED SIGNING AND STRIPING.
2. SIGNING, STRIPING AND PAVEMENT MARKINGS SHALL CONFORM TO THE CALIFORNIA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (FHWA'S MUTCD 2003 REVISION 1, AS AMENDED FOR USE IN CALIFORNIA), CALTRANS STANDARD SPECIFICATIONS (JULY 2006 OR LATEST VERSION THEREOF), THESE PLANS AND THE SPECIAL PROVISIONS.
3. ALL SIGNING AND STRIPING IS SUBJECT TO THE APPROVAL OF THE TRANSPORTATION DIRECTOR OR THEIR REPRESENTATIVE, PRIOR TO INSTALLATION.
4. ANY DEVIATION FROM THESE SIGNING AND STRIPING PLANS SHALL BE APPROVED BY THE ENGINEER OF WORK AND TRANSPORTATION DIRECTOR PRIOR TO ANY CHANGE IN THE FIELD.
5. ALL SIGNING AND STRIPING SHALL BE REFLECTIVE PER CALTRANS SPECIFICATIONS. STRIPING SHALL BE REPAINTED TWO WEEKS AFTER INITIAL PAINTING. SIGNING SHALL USE ENCAPSULATED LENS REFLECTIVE SHEETING (HIGH INTENSITY OR EQUAL).
6. EXACT LOCATION OF STRIPING AND STOP LIMIT LINES SHALL BE APPROVED BY THE TRANSPORTATION DIRECTOR OR THEIR REPRESENTATIVE PRIOR TO INSTALLATION.
7. CONTRACTOR SHALL REMOVE ALL CONFLICTING PAINTED LINES, MARKINGS AND PAVEMENT LEGENDS BY GRINDING. DEBRIS SHALL BE PROMPTLY REMOVED BY THE CONTRACTOR. NO PRESSURE WASHING OR GRADING DEBRIS SHALL ENTER THE GUTTER LINE OR STORM DRAIN SYSTEM.
8. ALL PAVEMENT LEGENDS SHALL BE THE LATEST VERSION OF THE CALTRANS METRIC STENCILS.
9. LIMIT LINES AND CROSSWALKS SHALL BE FIELD LOCATED. CROSSWALKS SHALL HAVE 10' INSIDE DIMENSION UNLESS OTHERWISE SPECIFIED.
10. ALL CROSSWALKS, LIMIT LINES, STOP BARS, PAVEMENT ARROWS AND PAVEMENT LEGENDS SHALL BE THERMOPLASTIC UNLESS OTHERWISE SPECIFIED.
11. FIRE HYDRANT PAVEMENT MARKERS SHALL CONFORM TO THE CALIFORNIA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (FHWA'S MUTCD 2003 REVISION 1, AS AMENDED FOR USE IN CALIFORNIA) AND SAN DIEGO REGIONAL STANDARD DRAWING M-19.
12. ALL MEDIAN NOSES AND FLARES SHALL BE PAINTED YELLOW.
13. ALL SIGNS SHALL BE STANDARD SIZE AS SHOWN IN THE CALIFORNIA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (FHWA'S MUTCD 2003 REVISION 1, AS AMENDED FOR USE IN CALIFORNIA) UNLESS OTHERWISE SPECIFIED.
14. SIGN POSTS SHALL BE SQUARE PERFORATED STEEL TUBING WITH BREAKAWAY BASE PER SAN DIEGO REGIONAL STANDARD DRAWING M-45.
15. WHEN A SIGN IS ATTACHED TO A POLE, IT SHALL BE MOUNTED USING A STANDARD CITY OF CARLSBAD MOUNTING BRACKET WITH STRAPS.
16. EXISTING SIGNS REMOVED BY THE CONTRACTOR SHALL BE DELIVERED BY THE CONTRACTOR TO THE CITY OF CARLSBAD PUBLIC WORKS YARD AT 405 OAK AVENUE.
17. ALL SIGNS SHOWN ON THESE PLANS SHALL BE NEW SIGNS PROVIDED AND INSTALLED BY THE CONTRACTOR EXCEPT THOSE SIGNS SPECIFICALLY SHOWN AS EXISTING TO BE RELOCATED OR TO REMAIN.
18. (IF NECESSARY) WHERE R4-7 SIGN AND OM1-3 OBJECT MARKER ARE TO BE INSTALLED IN A 2-FOOT WIDE MEDIAN NOSE, THE R4-7 SIGN SHALL BE 18"X24" AND THE OM1-3 OBJECT MARKER SHALL BE 12"X12"

SOURCE OF TOPOGRAPHY

TOPOGRAPHY SHOWN ON THESE PLANS WAS GENERATED BY_____ _____ METHODS FROM INFORMATION GATHERED ON _____ 20___ BY_____. TOPOGRAPHY SHOWN HEREON CONFORMS TO NATIONAL MAP ACCURACY STANDARDS.

REFERENCE DRAWINGS

BASIS OF BEARINGS

BENCH MARK

DESCRIPTION: _____
LOCATION: _____
_____
RECORDED: _____
ELEVATION: _____ DATUM: NGVD 29

"DECLARATION OF RESPONSIBLE CHARGE"

I HEREBY DECLARE THAT I AM THE ENGINEER OF WORK FOR THIS PROJECT, THAT I HAVE EXERCISED RESPONSIBLE CHARGE OVER THE DESIGN OF THE PROJECT AS DEFINED IN SECTION 6703 OF THE BUSINESS AND PROFESSIONS CODE, AND THAT THE DESIGN IS CONSISTENT WITH CURRENT STANDARDS.

I UNDERSTAND THAT THE CHECK OF PROJECT DRAWINGS AND SPECIFICATIONS BY THE CITY OF CARLSBAD DOES NOT RELIEVE ME AS ENGINEER OF WORK, OF MY RESPONSIBILITIES FOR PROJECT DESIGN.

FIRM: _____
ADDRESS: _____
CITY, ST.: _____
TELEPHONE: _____
BY: _____ DATE: _____
(NAME OF ENGINEER)
R.C.E. NO.: _____
REGISTRATION EXPIRATION DATE: _____

INDEX OF SHEETS

WORK TO BE DONE

THE IMPROVEMENT WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE FOLLOWING DOCUMENTS, CURRENT AT THE TIME OF CONSTRUCTION, AS DIRECTED BY THE CITY ENGINEER.

1. CARLSBAD MUNICIPAL CODE
2. CITY OF CARLSBAD ENGINEERING STANDARDS
3. THIS SET OF PLANS
4. RESOLUTION NO._____ DATED_____
5. THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION (GREEN BOOK).
6. SOILS REPORT AND RECOMMENDATIONS BY _____ _____ DATED _____
7. THE SAN DIEGO AREA REGIONAL STANDARD DRAWINGS AND AS MAY BE MODIFIED BY THE CITY OF CARLSBAD STANDARDS.
8. CALIFORNIA COASTAL COMMISSION DEVELOPMENT PERMIT CONDITIONS DATED _____
9. STORM WATER POLLUTION PREVENTION PLAN PREPARED BY _____ DATED _____ WDID NO. 9 37S_____, SW NO._____.
10. STORM WATER MANAGEMENT PLAN PREPARED BY _____ DATED _____, SWMP NO._____.
11. CALIFORNIA STORM WATER QUALITY ASSOCIATION BMP CONSTRUCTION HANDBOOK AND CALTRANS CONSTRUCTION SITE BMP MANUAL.

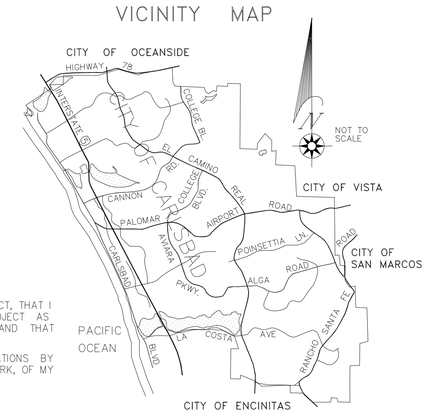
LEGEND

DESCRIPTION	DWG. NO.	SYMBOL	QUANTITY

PROJECT LOCATION

THIS PROJECT IS LOCATED WITHIN ASSESSORS PARCEL NUMBER(S) _____, _____, _____.
THE CALIFORNIA COORDINATE INDEX OF THIS PROJECT IS N_____ E _____.

VICINITY MAP



ALL STANDARD DRAWINGS ARE SAN DIEGO REGIONAL STANDARD DRAWINGS (SDRSD) UNLESS NOTED OTHERWISE:
* CITY OF CARLSBAD STANDARD
** CARLSBAD MUINICIPAL WATER DISTRICT STANDARD DRAWING
*** SDRSD AS MODIFIED BY CITY OF CARLSBAD

TOTAL DISTURBED AREA = _____
(THIS AREA INCLUDES BUT IS NOT LIMITED TO OFF-SITE WORK INCLUDING PUBLIC IMPROVEMENTS AND TEMPORARY DISTURBANCE SUCH AS VEHICLE AND EQUIPMENT STAGING AREAS, CONSTRUCTION WORKER FOOT TRAFFIC, SOIL/GRAVEL PILES, UTILITY TRENCHES, BACKFILL CUTS, AND SLOPE KEYWAYS)
TOTAL REPLACED IMPERVIOUS AREA =_____
TOTAL PROPOSED IMPERVIOUS AREA =_____

CITY OF CARLSBAD FIRE DEPARTMENT
REQUIREMENTS
NO. OF F.H.(S)____F.FLOW_____G.P.M. OUT OF____F.H.(S).
BLDG. SPRINKLED YES/NO. . . F.FLOW_____G.P.M.

FIRE MARSHAL DATE

"AS BUILT"

P.E. _____ EXP. _____ DATE

REVIEWED BY:

INSPECTOR DATE

POST-CONSTRUCTION BMP TABLE

STORMWATER REQUIREMENTS THAT APPLY:
☐ *STANDARD STORMWATER REQUIREMENTS*
☐ *PRIORITY PROJECT REQUIREMENTS*

EXEMPT FROM HYDROMODIFICATION?
☐ *YES (SEE SWMP FOR DOCUMENTATION)*
☐ *NO*

TYPE	DESCRIPTION	OWNERSHIP	MAINTENANCE AGREEMENT	SHEET NO.	MAINTENANCE FREQUENCY

DATE	INITIAL		DATE	INITIAL	DATE	INITIAL
ENGINEER OF WORK		1 REVISION DESCRIPTION	OTHER APPROVAL		CITY APPROVAL	

SHEET | CITY OF CARLSBAD ENGINEERING DEPARTMENT | SHEETS

IMPROVEMENT PLANS FOR:
TITLE SHEET

APPROVED:
EXPIRES DATE

DWN BY: _____
CHKD BY: _____
RVWD BY: _____

PROJECT NO. | DRAWING NO.

D:\DRAWING FILES\TITLE SHEETS\IMPROVEMENT TITLE SHEET.DWG REVISED: 01/05/16

GRADING NOTES

(IN ADDITION TO THE REQUIREMENTS OF CHAPTER 15.16 OF THE CARLSBAD MUNICIPAL CODE.)

1. THIS PLAN SUPERSEDES ALL OTHER PLANS PREVIOUSLY APPROVED BY THE CITY OF CARLSBAD REGARDING GRADING SHOWN ON THIS SET OF PLANS.
2. A RIGHT-OF-WAY PERMIT FROM THE CITY ENGINEER WILL BE REQUIRED FOR ANY WORK IN THE PUBLIC RIGHT OF WAY.
3. NO WORK SHALL BE COMMENCED UNTIL ALL PERMITS HAVE BEEN OBTAINED FROM THE CITY AND OTHER APPROPRIATE AGENCIES AT THE CONTRACTOR'S EXPENSE.
4. ORIGINAL DRAWINGS SHALL BECOME THE PROPERTY OF THE CITY UPON BEING SIGNED BY THE CITY ENGINEER.
5. THE ORIGINAL DRAWING SHALL BE REVISED TO REFLECT AS-BUILT CONDITIONS BY THE CONTRACTOR PRIOR TO FINAL ACCEPTANCE OF THE WORK BY THE CITY.
6. ACCESS FOR FIRE AND OTHER EMERGENCY VEHICLES SHALL BE MAINTAINED TO THE PROJECT SITE AT ALL TIMES DURING CONSTRUCTION.
7. THE CONTRACTOR SHALL DESIGN, CONSTRUCT AND MAINTAIN ALL SAFETY DEVICES, INCLUDING SHORING, AND SHALL BE SOLELY RESPONSIBLE FOR CONFORMING TO ALL LOCAL, STATE AND FEDERAL SAFETY AND HEALTH STANDARDS, LAWS AND REGULATIONS.
8. THE CONTRACTOR SHALL CONFORM TO LABOR CODE SECTION 6705 BY SUBMITTING A DETAIL PLAN SHOWING THE DESIGN OF SHORING, BRACING SLOPING OR OTHER PROVISIONS TO BE MADE OF WORKER PROTECTION FROM THE HAZARD OF CAVING GROUND DURING THE EXCAVATION OF SUCH TRENCH OR TRENCHES OR DURING THE PIPE INSTALLATION THEREIN. THIS PLAN MUST BE PREPARED FOR ALL TRENCHES FIVE FEET (5') OR MORE IN DEPTH PRIOR TO EXCAVATION. IF THE PLAN VARIES FROM THE SHORING SYSTEM STANDARDS ESTABLISHED BY THE CONSTRUCTION SAFETY ORDERS, TITLE 8 CALIFORNIA ADMINISTRATIVE CODE, THE PLAN SHALL BE PREPARED BY A REGISTERED ENGINEER AT THE CONTRACTORS EXPENSE. A COPY OF THE OSHA EXCAVATION PERMIT MUST BE SUBMITTED TO THE INSPECTOR PRIOR TO EXCAVATION.
9. NO BLASTING SHALL BE PERFORMED UNTIL A VALID BLASTING PERMIT HAS BEEN OBTAINED FROM THE CITY OF CARLSBAD. SUBMIT APPLICATION FOR BLASTING PERMIT WELL IN ADVANCE OF THE SCHEDULING OF BLASTING OPERATIONS.
10. IF ANY ARCHAEOLOGICAL RESOURCES ARE DISCOVERED WITHIN ANY WORK AREA DURING CONSTRUCTION, OPERATIONS WILL CEASE IMMEDIATELY, AND THE CONTRACTOR WILL NOTIFY THE CITY. OPERATIONS WILL NOT RESTART UNTIL THE CONTRACTOR HAS RECEIVED WRITTEN AUTHORITY FROM THE CITY ENGINEER TO DO SO.
11. ALL OPERATIONS CONDUCTED ON THE SITE OR ADJACENT THERETO, INCLUDING WARMING UP, REPAIR, ARRIVAL, DEPARTURE OR OPERATION OF TRUCKS, EARTHMOVING EQUIPMENT, CONSTRUCTION EQUIPMENT AND ANY OTHER ASSOCIATED GRADING EQUIPMENT SHALL BE LIMITED TO THE PERIOD BETWEEN _____ AND _____ EACH DAY, _____THRU _____ AND NO EARTHMOVING OR GRADING OPERATIONS SHALL BE CONDUCTED ON WEEKENDS OR HOLIDAYS. (A LIST OF CITY HOLIDAYS IS AVAILABLE AT THE ENGINEERING DEPARTMENT COUNTER.)
12. ALL OFF-SITE HAUL ROUTES SHALL BE SUBMITTED BY THE CONTRACTOR TO THE CITY ENGINEER FOR APPROVAL TWO FULL WORKING DAYS PRIOR TO BEGINNING OF WORK. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DEBRIS OR DAMAGE OCCURRING ALONG THE HAUL ROUTE OR ADJACENT STREETS AS A RESULT OF THE GRADING OPERATION.
13. WHERE AN EXISTING PIPE LINE IS TO BE ABANDONED AS A RESULT OF THE GRADING OPERATION, IT SHALL BE REMOVED WITHIN TWENTY FEET OF BUILDING OR STREET AREAS AND REPLACED WITH PROPERLY COMPACTED SOILS. IN OTHER AREAS THE PIPE WILL BE PLUGGED WITH CONCRETE OR REMOVED AS APPROVED BY THE CITY ENGINEER.
14. THE EXISTENCE AND LOCATION OF UTILITY STRUCTURES AND FACILITIES SHOWN ON THE CONSTRUCTION PLANS WERE OBTAINED BY A SEARCH OF THE AVAILABLE RECORDS. ATTENTION IS CALLED TO THE POSSIBLE EXISTENCE OF OTHER UTILITY FACILITIES OR STRUCTURES NOT SHOWN OR IN A LOCATION DIFFERENT FROM THAT SHOWN ON THE PLANS. THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURES TO PROTECT THE UTILITIES SHOWN ON THE PLANS AND ANY OTHER EXISTING FACILITIES OR STRUCTURES NOT SHOWN.
15. THE CONTRACTOR SHALL VERIFY THE LOCATION OF ALL EXISTING FACILITIES (ABOVE GROUND AND UNDER GROUND) WITHIN THE PROJECT SITE SUFFICIENTLY AHEAD OF GRADING TO PERMIT THE REVISION OF THE GRADING PLANS IF IT IS FOUND THAT THE ACTUAL LOCATIONS ARE IN CONFLICT WITH THE PROPOSED WORK.
16. THE CONTRACTOR SHALL NOTIFY AFFECTED UTILITY COMPANIES (SEE BELOW) AT LEAST 2 FULL WORKING DAYS PRIOR TO STARTING GRADING NEAR THEIR FACILITIES AND SHALL COORDINATE THE WORK WITH A COMPANY REPRESENTATIVE.

UNDERGROUND SERVICE ALERT	811
SDG&E	(800)411-7343
AT&T	(800)892-0123
TIME WARNER CABLE	(760)438-7741
COX COMMUNICATIONS	(619)262-1122
CITY OF CARLSBAD(STREETS & STORM DRAIN)	(760)434-2980
*CITY OF CARLSBAD(SEWER,WATER & RECLAIMED WATER)	(760)438-2722
*SAN DIEGUITO WATER DISTRICT	(760)633-2650
*LEUCADIA WASTEWATER DISTRICT	(760)753-0155
*VALLECITOS WATER DISTRICT	(760)744-0460
*OLIVENHAIN WATER DISTRICT	(760)753-6466
*BUENA SANITATION DISTRICT	(760)726-1340 x1330

*AS APPROPRIATE

17. IN ACCORDANCE WITH THE CITY STORM WATER STANDARDS, ALL STORM DRAIN INLETS CONSTRUCTED BY THIS PLAN SHALL INCLUDE "STENCILS" BE ADDED TO PROHIBIT WASTEWATER DISCHARGE DOWNSTREAM. STENCILS SHALL BE ADDED TO THE SATISFACTION OF THE CITY.

ABANDONMENT NOTES

PARTIALLY COMPLETED PROJECTS SEEKING TO INDEFINITELY STOP WORK AND CLOSE THE GRADING PERMIT MUST IMPLEMENT APPROPRIATE ACCESS RESTRICTION AND EROSION AND SEDIMENT CONTROL MEASURES TO THE SATISFACTION OF THE CITY, INCLUDING BUT NOT LIMITED TO THE FOLLOWING:

1) PERMANENTLY STABILIZE ALL SLOPES (>5%) – 70% COVER WITH WELL-ESTABLISHED, SUSTAINABLE, NON-WEED VEGETATION (SEE CITY LANDSCAPE MANUAL FOR GUIDELINES) IS CONSIDERED ADEQUATE.
2) PERMANENTLY STABILIZE FLAT AREAS (≤5%) – 70% COVER WITH WELL-ESTABLISHED, SUSTAINABLE, NON-WEED VEGETATION (SEE CITY LANDSCAPE MANUAL FOR GUIDELINES) OR 2 INCHES (MINIMUM) OF PERMEABLE COVER (E.G., GRAVEL) IS CONSIDERED ADEQUATE.
3) RESTRICT ACCESS TO SITE – COORDINATE WITH CITY STAFF TO DETERMINE APPROPRIATE FENCING TYPE.
4) SIGNAGE ALONG FRONTAGE ROAD(S) POSTING THAT DUMPING, LITTERING, AND TRESPASSING ARE PROHIBITED.
5) TRESPASS ENFORCEMENT AUTHORIZATION LETTER MUST BE SENT FROM THE OWNER TO THE CITY OF CARLSBAD POLICE DEPARTMENT.
6) NOTARIZE AND RECORD AGAINST THE PROPERTY AN AGREEMENT STATING THAT OWNER IS RESPONSIBLE FOR MAINTAINING FENCING AND SIGNAGE, ADHERING TO THE FIRE PREVENTION ORDINATION, KEEPING THE SITE FREE FROM LITTER ACCUMULATION AND VEGETATION GROWTH, AND REMOVING ANY ILLEGALLY DUMPED MATERIALS AT THE SITE UNTIL THE PROPERTY IS DEVELOPED IN THE FUTURE.

"DECLARATION OF RESPONSIBLE CHARGE"

I HEREBY DECLARE THAT I AM THE ENGINEER OF WORK FOR THIS PROJECT, THAT I HAVE EXERCISED RESPONSIBLE CHARGE OVER THE DESIGN OF THE PROJECT AS DEFINED IN SECTION 6703 OF THE BUSINESS AND PROFESSIONS CODE, AND THAT THE DESIGN IS CONSISTENT WITH CURRENT STANDARDS.

I UNDERSTAND THAT THE CHECK OF PROJECT DRAWINGS AND SPECIFICATIONS BY THE CITY OF CARLSBAD DOES NOT RELIEVE ME, AS ENGINEER OF WORK, OF MY RESPONSIBILITIES FOR PROJECT DESIGN.

FIRM: _____

ADDRESS: _____

CITY, STATE: _____

TELEPHONE: _____

BY: _____ *DATE:* _____
(NAME OF ENGINEER)

R.C.E. NO.: _____

REGISTRATION EXPIRATION DATE: _____

SOILS ENGINEER'S CERTIFICATE

I, _____, *A REGISTERED (CIVIL/GEOTECHNICAL) ENGINEER OF THE STATE OF CALIFORNIA, PRINCIPALLY DOING BUSINESS IN THE FIELD OF APPLIED SOILS MECHANICS, HEREBY CERTIFY THAT A SAMPLING AND STUDY OF THE SOIL CONDITIONS PREVALENT WITHIN THIS SITE WAS MADE BY ME OR UNDER MY DIRECTION BETWEEN THE DATES OF _____, 20____ AND _____, 20____. TWO COPIES OF THE SOILS REPORT COMPILED FROM THIS STUDY, WITH MY RECOMMENDATIONS, HAS BEEN SUBMITTED TO THE OFFICE OF THE CITY ENGINEER.*

SIGNED: _____

G.E./P.E. NO.: _____

DATE: _____

LICENSE EXPIRATION DATE: _____

EROSION CONTROL NOTES

1. EQUIPMENT AND WORKERS FOR EMERGENCY WORK SHALL BE MADE AVAILABLE AT ALL TIMES DURING THE RAINY SEASON. ALL NECESSARY MATERIALS SHALL BE STOCKPILED ON SITE AT CONVENIENT LOCATIONS TO FACILITATE RAPID CONSTRUCTION OF TEMPORARY DEVICES WHEN RAIN IS EMINENT.
2. FOR PROJECTS COVERED BY STATE SWPPP/WDID, IN ACCORDANCE WITH THE CONSTRUCTION ORDER ISSUED BY THE CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD, THE CONTRACTOR'S QUALIFIED SWPPP PRACTITIONER (QSP) SHALL UPDATE AND MAINTAIN THE WATER POLLUTION CONTROL (WPC) PLAN TO ADDRESS UPDATED SITE CONDITIONS OF THE PROJECT. THE UPDATED WPC PLAN AND UPDATED SWPPP SHALL BE KEPT AT THE PROJECT SITE AND MADE AVAILABLE TO THE CITY INSPECTOR. ADDITIONAL CONSTRUCTION BMP'S BEYOND THE ORIGINAL APPROVED SWPPP SHALL BE PROVIDED BY THE CONTRACTOR TO ADDRESS SITE CONDITIONS NOT ANTICIPATED. THE QSP SHALL REPORT BMP DEFICIENCIES TO THE CITY INSPECTOR. THE QSP SHALL OBTAIN APPROVAL FROM THE CONTRACTOR'S QUALIFIED SWPPP DEVELOPER AND THE CITY INSPECTOR REGARDING ANY SIGNIFICANT CHANGES TO BMP DEPLOYMENT.
3. THE CONTRACTOR SHALL RESTORE ALL EROSION CONTROL DEVICES TO WORKING ORDER TO THE SATISFACTION OF THE CITY AFTER EACH RUN-OFF PRODUCING RAINFALL.
4. THE CONTRACTOR SHALL INSTALL ADDITIONAL EROSION CONTROL MEASURES AS MAY BE REQUIRED BY THE CITY DUE TO UNCOMPLETED GRADING OPERATIONS OR UNFORESEEN CIRCUMSTANCES WHICH MAY ARISE AT NO ADDITIONAL COST TO THE CITY.
5. THE CONTRACTOR SHALL BE RESPONSIBLE AND SHALL TAKE NECESSARY PRECAUTIONS TO PREVENT PUBLIC TRESPASS ONTO AREAS WHERE IMPOUNDED WATERS CREATE A HAZARDOUS CONDITION.
6. ALL EROSION CONTROL MEASURES PROVIDED PER THE APPROVED SWPPP AND/OR EROSION CONTROL PLAN SHALL BE INCORPORATED HEREON.
9. ALL REMOVABLE PROTECTIVE DEVICES SHOWN SHALL BE IN PLACE AT THE END OF EACH WORKING DAY WHEN THE FIVE (5) DAY RAIN PROBABILITY FORECAST EXCEEDS FORTY PERCENT (40%). SILT AND OTHER DEBRIS SHALL BE REMOVED AFTER EACH RAINFALL.
10. ALL GRAVEL BAGS SHALL BE BURLAP TYPE WITH 3/4 INCH MINIMUM AGGREGRATE.

INDEX OF SHEETS

LEGAL DESCRIPTION

PROJECT ADDRESS

EARTHWORK QUANTITIES

CUT: _____ *CY*

FILL: _____ *CY*

IMPORT: _____ *CY*

EXPORT: _____ *CY*

REMEDIAL: _____ *CY*

SOURCE OF TOPOGRAPHY

TOPOGRAPHY SHOWN ON THESE PLANS WAS GENERATED BY _____ _____ METHODS FROM INFORMATION GATHERED ON _____, 20____ BY _____. TOPOGRAPHY SHOWN HEREON CONFORMS TO NATIONAL MAP ACCURACY STANDARDS.

PROJECT LOCATION

THIS PROJECT IS LOCATED WITHIN ASSESSORS PARCEL NUMBER(S) _____

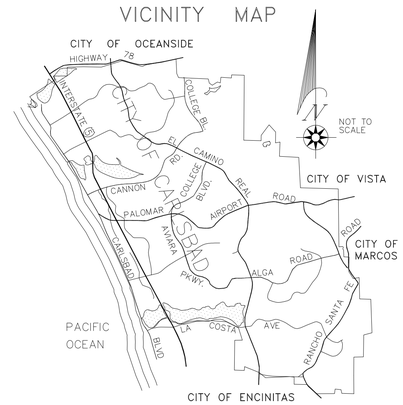
THE CALIFORNIA COORDINATE INDEX OF THIS PROJECT IS:
N _____ *E* _____.

REFERENCE DRAWINGS

BENCH MARK

DESCRIPTION: _____
LOCATION: _____
_____
RECORDED: _____
ELEVATION: _____ *DATUM:* NGVD 29

VICINITY MAP



WORK TO BE DONE

THE GRADING WORK SHALL CONSIST OF THE CONSTRUCTION OF ALL CUTS AND FILLS, REMEDIAL GRADING, DRAINAGE FACILITIES, EROSION CONTROL FACILITIES, AND PLANTING OF PERMANENT LANDSCAPING AND PREPARATION OF AS-BUILT GRADING PLANS, AS-BUILT GEOLOGIC MAPS AND REPORTS, ALL AS SHOWN OR REQUIRED ON THIS SET OF PLANS AND THE CITY STANDARDS, SPECIFICATIONS, REQUIREMENTS, RESOLUTIONS AND ORDINANCES CITED ON THESE PLANS.

THE GRADING WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE FOLLOWING DOCUMENTS, CURRENT AT THE TIME OF CONSTRUCTION, AS DIRECTED BY THE CITY ENGINEER.

1. CARLSBAD MUNICIPAL CODE
2. CITY OF CARLSBAD ENGINEERING STANDARDS
3. THIS SET OF PLANS
4. RESOLUTION NO._____ DATED_____
5. THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION (GREEN BOOK).
6. SOILS REPORT AND RECOMMENDATIONS BY _____ _____ DATED _____
7. THE SAN DIEGO REGIONAL STANDARD DRAWINGS AND AS MAY BE MODIFIED BY THE CITY OF CARLSBAD STANDARDS.
8. CALIFORNIA COASTAL COMMISSION DEVELOPMENT PERMIT CONDITIONS DATED _____
9. ENVIRONMENTAL APPROVAL DOCUMENTS DATED _____
10. STORM WATER POLLUTION PREVENTION PLAN PREPARED BY _____ DATED _____ SW NO._____ WDID NO. 9 375 _____
11. STORM WATER MANAGEMENT PLAN PREPARED BY _____ DATED _____ SWMP NO._____
12. CALIFORNIA STORM WATER QUALITY ASSOCIATION BMP CONSTRUCTION HANDBOOK AND CALTRANS CONSTRUCTION SITE BMP MANUAL.

LEGEND

DESCRIPTION	DWG.NO.	SYMBOL	QUANTITY

POST-CONSTRUCTION BMP TABLE

STORMWATER REQUIREMENTS THAT APPLY:
☐ *STANDARD STORMWATER REQUIREMENTS*
☐ *PRIORITY PROJECT REQUIREMENTS*

EXEMPT FROM HYDROMODIFICATION?
☐ *YES (SEE SWMP FOR DOCUMENTATION)*
☐ *NO*

TYPE	DESCRIPTION	OWNERSHIP	MAINTENANCE AGREEMENT	SHEET NO.	MAINTENANCE FREQUENCY

TOTAL LOT AREA = _____

TOTAL DISTURBED AREA = _____
(THIS AREA INCLUDES BUT IS NOT LIMITED TO OFF-SITE WORK INCLUDING PUBLIC IMPROVEMENTS AND TEMPORARY DISTURBANCE SUCH AS VEHICLE AND EQUIPMENT STAGING AREAS, CONSTRUCTION WORKER FOOT TRAFFIC, SOIL/GRAVEL PILES, UTILITY TRENCHES, BACKFILL CUTS AND SLOPE KEYWAYS)
TOTAL REPLACED IMPERVIOUS AREA = _____
TOTAL PROPOSED IMPERVIOUS AREA = _____

"AS BUILT"

_____ _____
RCE _____ EXP._____ DATE

REVIEWED BY:
_____ _____
INSPECTOR DATE

DATE	INITIAL	REVISION DESCRIPTION	DATE	INITIAL	DATE	INITIAL
ENGINEER OF WORK		1	OTHER APPROVAL		CITY APPROVAL	

SHEET | CITY OF CARLSBAD ENGINEERING DEPARTMENT | SHEETS

GRADING PLANS FOR:
TITLE SHEET

APPROVED:
_____ _____
EXPIRES DATE

DWN BY: _____
CHKD BY: _____
RVWD BY: _____

PROJECT NO. | DRAWING NO.

CIP GRADING

D:\DRAWING FILES\TITLE SHEETS\GRADING TITLE SHEET.DWG REVISED:01/05/16

GENERAL NOTES

1. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE CARLSBAD MUNICIPAL WATER DISTRICT'S RULES AND REGULATIONS.
2. DRINKING WATER FOUNTAINS AND DESIGNATED OUTDOOR EATING AREAS SHALL BE PROTECTED AGAINST CONTACT WITH RECYCLED WATER SPRAY, MIST OR MISTING.
3. BEST MANAGEMENT PRACTICES SHALL BE USED TO ELIMINATE OR CONTROL TO THE BEST EXTENT POSSIBLE PONDING, RUN-OFF, OVER-SPRAY, AND MISTING.
4. HOSE BIBS ARE STRICTLY PROHIBITED.
5. CROSS-CONNECTIONS BETWEEN RECYCLED WATER LINES AND POTABLE WATER LINES ARE STRICTLY PROHIBITED.
6. NO SUBSTITUTION OF PIPE MATERIALS WILL BE ALLOWED WITHOUT PRIOR APPROVAL OF THE CITY OF CARLSBAD MUNICIPAL WATER DISTRICT.
7. ALL MAINLINE PIPES SHALL HAVE WARNING TAPE PER CARLSBAD MUNICIPAL WATER DISTRICT'S RULES AND REGULATIONS.
8. HOURS FOR IRRIGATION WITH RECYCLED WATER ARE FROM_____ TO_____. THE HOURS FOR IRRIGATION WITH DISINFECTED TERTIARY RECYCLED WATER MAY BE MODIFIED BY THE LOCAL AUTHORITY. IRRIGATION DURING PUBLIC USE PERIODS WITH DISINFECTED TERTIARY RECYCLED WATER SHALL BE UNDER THE SUPERVISION OF THE DESIGNATED USER SUPERVISOR. IRRIGATION WITH WATER OF A LESSER QUALITY THAN DISINFECTED TERTIARY RECYCLED WATER SHALL BE BETWEEN THE HOURS OF 9:00 P.M. TO 6:00 A.M.
9. NON-DESIGNATED USE AREAS SHALL BE PROTECTED FROM CONTACT WITH RECYCLED WATER, WHETHER BY WIND BLOWN SPRAY OR BY DIRECT APPLICATION THROUGH IRRIGATION OR OTHER USE. LACK OF PROTECTION, WHETHER BY DESIGN, CONSTRUCTION PRACTICE OR SYSTEM OPERATION IS STRICTLY PROHIBITED.
10. ALL IRRIGATION PIPE SHALL BE STENCILED WITH WARNING, "NON-POTABLE OR RECYCLED WATER", COLOR-CODED (PURPLE) AND LAID WITH WARNING TAPE AND STENCILING ORIENTED TOWARD THE TOP OF THE TRENCH PER THE CARLSBAD MUNICIPAL WATER DISTRICT'S RULES AND REGULATIONS.
11. THE REQUIRED CROSS-CONNECTION INSPECTION SHALL BE DONE BY EITHER THE CARLSBAD MUNICIPAL WATER DISTRICT AND/OR THE SAN DIEGO COUNTY DEPARTMENT OF ENVIRONMENTAL HEALTH. COPIES OF INSPECTION REPORTS WILL BE FORWARDED TO THE NON-INSPECTING PARTY.
12. WHEN RECYCLED WATER BECOMES AVAILABLE, AN ON-SITE USER SUPERVISOR SHALL BE DESIGNATED IN WRITING. THIS INDIVIDUAL SHALL BE FAMILIAR WITH PLUMBING SYSTEM WITHIN THE PROPERTY, WITH THE BASIC CONCEPTS OF BACKFLOW/CROSS-CONNECTION PROTECTION, THE RECYCLED PUREYOR'S RULES AND REGULATIONS AND THE SPECIFIC REQUIREMENTS OF A RECYCLED WATER SYSTEM. COPIES OF THE DESIGNATION, WITH CONTACT PHONE NUMBERS SHALL BE PROVIDED TO THE CARLSBAD MUNICIPAL WATER DISTRICT.
    IN CASE OF EMERGENCY CONTACT AT _____
    OR AFTER HOURS CONTACT AT _____
13. ALL IRRIGATION BACKFLOW PREVENTERS SHALL BE TESTED BY A CERTIFIED TESTER AND RESULTS MUST BE GIVEN TO THE CITY AND THE CARLSBAD MUNICIPAL WATER DISTRICT. PIPE BETWEEN THE METER AND BACKFLOW PREVENTER SHALL BE "SCHEDULE K HARD COPPER". APPROVED CONTRACT BACKFLOW TESTERS CAN BE FOUND ON THE CITY WEB SITE AT WWW.CI.CARLSBAD.CA.US/PDFDOC.HTML?PID=340.

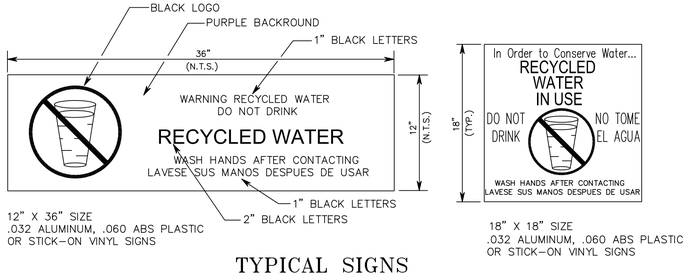
INSPECTION PROCEDURES

1. *CITY CONSTRUCTION INSPECTION SHALL INCLUDE:*
   - A. LOCATION OF PIPE LINES.
   - B. TRENCH DEPTH.
   - C. REQUIRED SEPARATION (HORIZONTALLY AND VERTICALLY).
   - D. PIPE IDENTIFICATION.
   - E. POINTS-OF-CONNECTION (POC'S).
   - F. LOCATION AND IDENTIFICATION OF SPRINKLER HEADS.
   - G. WARNING SIGNS AT THE SITE AND ON THE TRUCKS HAULING RECYCLED WATER (IF RECYCLED WATER IS USED FOR CONSTRUCTION).

   AN APPROVAL LETTER REGARDING THE INSPECTION OF THE PROJECT SHALL BE OBTAINED FROM THE CITY AND THE DISTRICT, AND BE FORWARDED TO THE COUNTY HEALTH DEPARTMENT PRIOR TO FINAL INSPECTION APPROVAL.
2. *DISTRICT FINAL INSPECTION SHALL INCLUDE:*
   - A. COVERAGE TEST, AFTER COMPLETION OF THE SPRINKLER SYSTEM, TO DETERMINE THE ADEQUACY OF COVERAGE ON THE APPROVED USE AREA AND PROTECTION OF AREAS NOT APPROVED FOR RECEIVING RECYCLED WATER.
   - B. WARNING SIGNS AND LABELS.
   - C. QUICK COUPLING VALVES.
   - D. ALL ASPECTS OF THE IRRIGATION CONDITIONS INCLUDING WINDBLOWN SPRAY, RUNOFF, AND PONDING.
   - E. REQUIRED PROTECTION OF ALL RESIDENTIAL AREAS.
   - F. REQUIRED PROTECTION OF WELL, STREAMS, RESERVOIRS, ETC.
   - G. CROSS-CONNECTION.
3. *ANNUAL INSPECTION SHALL INCLUDE:*

   A COMPLETE INSPECTION WHICH SHOULD COVER PART A, PART B AND PART G OF THE DISTRICT FINAL INSPECTION.

   REVISIONS MUST BE APPROVED BY PUBLIC HEALTH ENGINEER, CITY ENGINEER & DISTRICT ENGINEER PRIOR TO IMPLEMENTATION IN FIELD.



12" X 36" SIZE
.032 ALUMINUM, .060 ABS PLASTIC
OR STICK-ON VINYL SIGNS

18" X 18" SIZE
.032 ALUMINUM, .060 ABS PLASTIC
OR STICK-ON VINYL SIGNS

TYPICAL SIGNS

INDEX OF SHEETS

LEGAL DESCRIPTION

PROJECT ADDRESS

EARTHWORK QUANTITIES

CUT: _____ CY
FILL: _____ CY
IMPORT: _____ CY
EXPORT: _____ CY
REMEDIAL: _____ CY

SOURCE OF TOPOGRAPHY

TOPOGRAPHY SHOWN ON THESE PLANS WAS GENERATED BY _____ _____ METHODS FROM INFORMATION GATHERED ON _____, 20____ BY _____. TOPOGRAPHY SHOWN HEREON CONFORMS TO NATIONAL MAP ACCURACY STANDARDS.

PROJECT LOCATION

THIS PROJECT IS LOCATED WITHIN ASSESSORS PARCEL NUMBER(S) _____

THE CALIFORNIA COORDINATE INDEX OF THIS PROJECT IS: N _____ E _____.

REFERENCE DRAWINGS

BENCH MARK

DESCRIPTION: _____
LOCATION: _____
_____
RECORDED: _____
ELEVATION: _____ *DATUM:* NGVD 29

DECLARATION OF RESPONSIBLE CHARGE:

I HEREBY DECLARE THAT I AM _____ OF WORK FOR THIS PROJECT, THAT I HAVE EXERCISED RESPONSIBLE CHARGE OVER THE DESIGN OF THIS PROJECT AS DEFINED IN SECTION 6703 OF THE BUSINESS AND PROFESSIONS CODE AND THAT THE DESIGN IS CONSISTENT WITH CURRENT STANDARDS.

I UNDERSTAND THAT THE CHECK OF PROJECT DRAWINGS AND SPECIFICATIONS BY THE CITY OF CARLSBAD AND SAN DIEGO COUNTY DEPARTMENT OF HEALTH SERVICES IS CONFINED TO A REVIEW ONLY AND DOES NOT RELIEVE ME, AS _____ OF WORK, OF MY RESPONSIBILITIES FOR PROJECT DESIGN.

FIRM NAME & ADDRESS:

_____
_____
_____

PHONE NO: (____) _____
REGISTRATION NO: _____ *EXPIRATION DATE:* _____

DIGALERT
DIAL TOLL FREE
1 - 800 - 422 - 4133
AT LEAST TWO DAYS BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

RECYCLED WATER SYSTEM

PROJECT NAME

(PROJECT ADDRESS)

SHEET TITLE	SHEET NUMBER
TITLE SHEET	
IRRIG. LEGEND & NOTES	
IRRIGATION PLANS	
IRRIGATION DETAILS	

PROJECT MAP

SHOW ON MAP:

STREETS & STREET NAMES, SHEET & SHEET NUMBERS, DWELLING UNITS, DRINKING FOUNTAINS, LIMIT LINE OF RECYCLED WATER USE, MAIN LINE GATE VALVES, METERS, LAKES & RECREATIONAL AREAS, OPEN SPACE AREAS, NORTH ARROW, SCALE OF MAP, BOUNDARY LIMITS, MATCH LINES, SCALE, ASSESSORS PARCEL NUMBER, INDEX OF SHEETS, RESERVOIRS, SHOW POINTS OF CONNECTION AND LOCATION OF "DO NOT DRINK" SIGNS.

REGARDING THE FOLLOWING SHEETS:

THE NEXT ONE OR MORE SHEETS SHOULD BE THE IRRIGATION & LANDSCAPE NOTES, SYMBOLS, LEGENDS, ETC. AFTER THESE SHEETS WILL BE YOUR ACTUAL CONSTRUCTION (IRRIGATION) PLANS. LAST SHEET/S WILL BE YOUR DETAIL SHEETS.

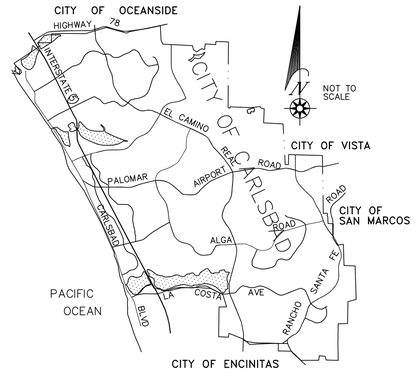
KEEP IN MIND THE OBJECTIVE IS TO HAVE A PLAN THAT IS UNDERSTANDABLE TO OPERATION AND MAINTENANCE PEOPLE. THE INDEX-KEY MAP SHOULD ENABLE A PERSON TO EASILY LOCATE THE CONTROL VALVES AND QUICKLY GAIN AN UNDERSTANDING OF THE ENTIRE RECYCLED SYSTEM AND IT'S LIMITS.

IMPROVEMENT PLANS INCLUDE:

A DESCRIPTION & LOCATION OF WATER SERVICES INCLUDING TYPE (DOMESTIC OR RECYCLED). DESIGN P.S.I. AND INSTALLATION REQUIREMENTS, MINIMUM VERTICAL DEPTH, HORIZONTAL SEPARATION, IDENTIFICATION, AND CROSS CONNECTION CONTROL. LOCATE ALL PUBLIC FACILITIES INCLUDING DRINKING FOUNTAINS, FOOD SERVICE AND PICNIC AREAS, SWIMMING POOLS, SIDEWALK AREAS, EATING TABLES AND AREAS, WALLS, TOPOGRAPHY OF SITE, DIRECTION OF DRAINAGE, LOCATION OF WELLS, STREAMS, LIMIT LINE OF 100 YEAR FLOOD PLAIN, EXISTING/PROPOSED SEWER, EXISTING & PROPOSED RECYCLED AND POTABLE WATER SYSTEMS.

LEGEND

- (W) POTABLE WATER METER
- (R) RECYCLED WATER METER
- BACKFLOW PREVENTION DEVICE INSTALL PER CMWD
- —W— POTABLE WATER LINE
- —RW— RECYCLED WATER LINE
- —RC— RECYCLED WATER PRESSURE SUPPLY LINE
- —FS— FIRE SERVICE LINE
- RECYCLED WATER USE AREA
- △ DO NOT DRINK SIGN
- OUTDOOR EATING AREA (PROTECTED AGAINST CONTACT WITH RECYCLED WATER)



VICINITY MAP

ARCHITECT/ ENGINEERS STAMP SEAL
Expiration Date:_____

CARLSBAD MUNICIPAL WATER DISTRICT

_____ _____
DEPUTY CITY ENGINEER EXP. DATE

DEVELOPERS NAME: _____
ADDRESS: _____
_____
TELEPHONE: _____
DATE PLAN PREPARED: _____
BY: _____

DATE	INITIAL	REVISION DESCRIPTION	DATE	INITIAL	DATE	INITIAL
ENGINEER OF WORK			OTHER APPROVAL		CITY APPROVAL	

COUNTY OF SAN DIEGO
DEPARTMENT OF ENVIRONMENTAL HEALTH
LAND AND WATER QUALITY DIVISION
_____ _____
ENVIRONMENTAL HEALTH SPECIALIST DATE

APPROVED
_____ _____
ENGINEERING PLANCHECKER DATE

"AS BUILT"
_____ _____
TITLE DATE

REVIEWED BY:
_____ _____
INSPECTOR DATE

CARLSBAD MUNICIPAL WATER DISTRICT

SHEET | CITY OF CARLSBAD PLANNING DEPARTMENT | SHEETS

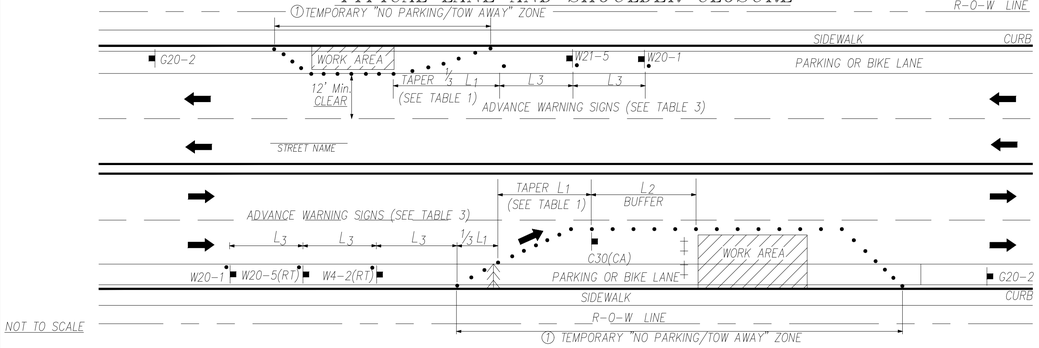
PRIVATE (ONSITE) RECYCLED WATER SYSTEM FOR:

APPROVED
_____ _____
ASSISTANT PLANNING DIRECTOR DATE

DRWN BY: | PROJECT NO. | DRAWING NO.
CHCKD BY:

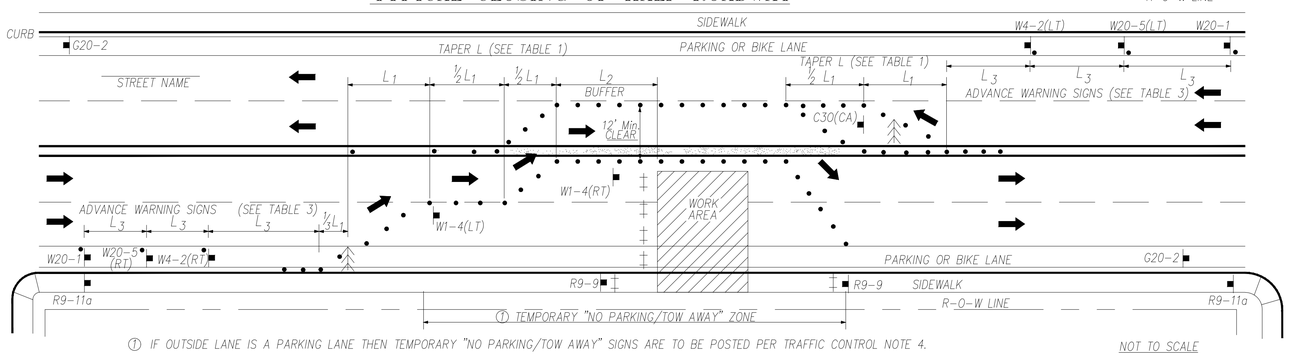
RW XXXX
CIP RECYCLED WATER SYSTEM

TYPICAL LANE AND SHOULDER CLOSURE



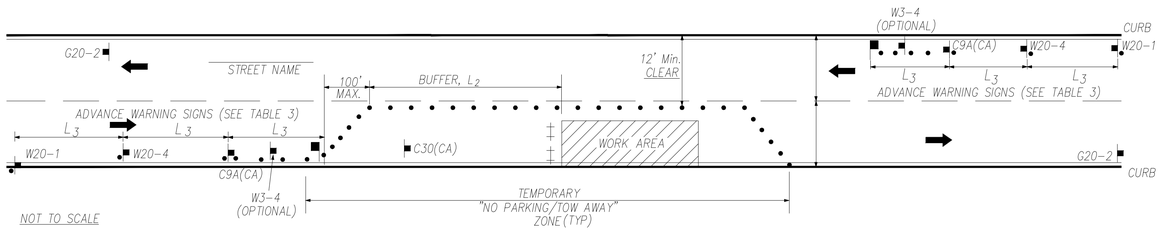
① IF OUTSIDE LANE IS A PARKING LANE THEN TEMPORARY "NO PARKING/TOW AWAY" SIGNS ARE TO BE POSTED PER TRAFFIC CONTROL NOTE 4.

TYPICAL CLOSING OF HALF ROADWAY



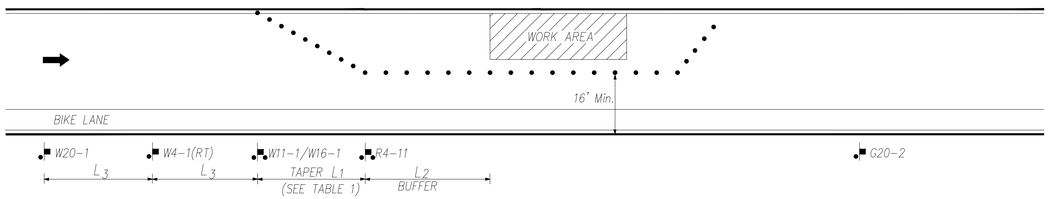
① IF OUTSIDE LANE IS A PARKING LANE THEN TEMPORARY "NO PARKING/TOW AWAY" SIGNS ARE TO BE POSTED PER TRAFFIC CONTROL NOTE 4.

TYPICAL LANE CLOSURE ON TWO-LANE ROAD USING FLAGGERS

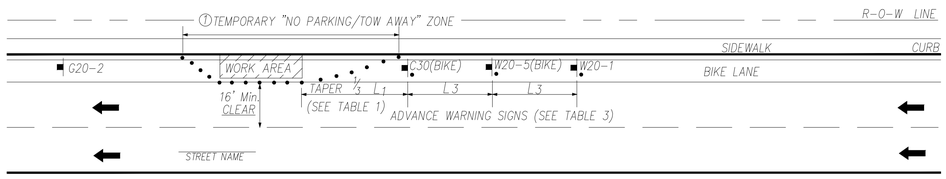


TYPICAL SIDEWALK CLOSURE

TYPICAL LANE SHIFT INTO BIKE LANE



TYPICAL BIKE LANE CLOSURE



TRAFFIC CONTROL NOTES

1. WORK HOURS TO BE RESTRICTED TO _____ TO _____ UNLESS APPROVED OTHERWISE.
2. PEDESTRIAN CONTROLS WILL BE PROVIDED AS SHOWN.
3. PEDESTRIANS SHALL BE PROTECTED FROM ENTERING THE EXCAVATION BY PHYSICAL BARRIERS DESIGNED, INSTALLED, AND MAINTAINED TO THE SATISFACTION OF THE CITY ENGINEER.
4. TEMPORARY "NO PARKING/TOW AWAY" SIGNS STATING THE DATE AND TIME OF PROHIBITION WILL BE POSTED 72 HOURS PRIOR TO COMMENCING WORK. CALL CARLSBAD POLICE DISPATCH AT (760)931-2197 TO VALIDATE POSTING.
5. ACCESS WILL BE MAINTAINED TO ALL DRIVEWAYS UNLESS OTHER ARRANGEMENTS ARE MADE.
6. TRENCHES MUST BE BACKFILLED OR PLATED DURING NON-WORKING HOURS UNLESS K-RAIL BARRIERS ARE PROVIDED. K-RAIL IS APPROVED ONLY WHEN SPECIFICALLY SHOWN ON THE APPROVED TRAFFIC CONTROL PLAN. PLATES SHALL HAVE CLEATS AND COLD MIX AT THE EDGES AS APPROVED BY THE CITY INSPECTOR.
7. EXISTING STRIPING, CROSSWALKS, LEGENDS AND/OR PAVEMENT MARKERS SHALL BE REPLACED BY THE CONTRACTOR WITHIN 24 HOURS, IF REMOVED OR DAMAGED.
8. WORK THAT DISTURBS NORMAL TRAFFIC SIGNAL TIMING OPERATIONS SHALL BE COORDINATED WITH THE CITY OF CARLSBAD, 72 HOURS PRIOR TO COMMENCING WORK.
9. TRAFFIC SIGNALS SHALL REMAIN FULLY ACTUATED AT ALL TIMES, UNLESS OTHERWISE APPROVED BY THE CITY TRAFFIC ENGINEER OR HIS REPRESENTATIVE. IF TRAFFIC SIGNAL LOOP DETECTORS ARE RENDERED INOPERATIVE BY THE PROPOSED WORK, VIDEO DETECTION SHALL BE USED TO PROVIDE ACTUATION.
10. FLAGGERS SHALL BE EQUIPPED WITH A WHITE HARD HAT, AN ORANGE VEST, AND A "STOP/SLOW" PADDLE ON A 5 FOOT STAFF.
11. ALL TRAFFIC CONTROL DEVICES MUST BE MAINTAINED 24 HOURS A DAY, 7 DAYS PER WEEK, BY THE CONTRACTOR.
12. ALL TRAFFIC CONTROL SHALL BE IN ACCORDANCE WITH THE CALIFORNIA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (CALIFORNIA MUTCD, LATEST EDITION).
13. TRAFFIC CONTROL PLAN SUBMITTALS ARE REQUIRED FOR EACH PHASE OF THE WORK IN THE DETAIL, FORMAT, AND QUALITY ILLUSTRATED ON THIS SHEET.
14. ALL TRAFFIC CONTROL DEVICES SHALL BE REMOVED FROM VIEW OR COVERED WHEN NOT IN USE.
15. THE CITY TRAFFIC ENGINEER OR HIS REPRESENTATIVE HAS THE AUTHORITY TO INITIATE FIELD CHANGES TO INSURE PUBLIC SAFETY.
16. ALL WORK AFFECTING BUS STOPS SHALL BE COORDINATED WITH NORTH COUNTY TRANSIT DISTRICT. CONTRACTOR SHALL CALL NCTD AT (760) 967-2828 AT LEAST 72 HOURS IN ADVANCE OF STARTING WORK.
17. CHANGEABLE MESSAGE SIGNS SHALL BE USED IN ADVANCE OF TRAFFIC CONTROL ON MAJOR AND PRIME ARTERIALS, UNLESS OTHERWISE APPROVED. THESE SIGNS SHALL BE SHOWN ON THE TRAFFIC CONTROL PLAN.

SIGNAGE NOTES

1. AT LEAST ONE PERSON SHALL BE ASSIGNED TO FULL TIME MAINTENANCE OF TRAFFIC CONTROL DEVICES ON ALL NIGHT LANE CLOSURES.
2. ALL WARNING SIGNS FOR NIGHT LANE CLOSURES SHALL BE ILLUMINATED OR REFLECTORIZED AS SPECIFIED IN THE SPECIFICATIONS.
3. ALL ADVANCE WARNING SIGN INSTALLATIONS SHALL BE EQUIPPED WITH FLAGS FOR DAYTIME CLOSURES OF ALL MAJOR AND PRIME ARTERIALS. FLASHING BEACONS SHALL BE USED DURING NIGHT LANE CLOSURES.
4. A G20-2 "END ROAD WORK" SIGN SHALL BE PLACED AT THE END OF THE LANE CLOSURE UNLESS THE END OF THE WORK AREA IS OBVIOUS, OR ENDS WITHIN A LARGER PROJECT LIMITS.
5. ALL CONES USED FOR NIGHT LANE CLOSURES SHALL BE ILLUMINATED TRAFFIC CONES OR FITTED WITH 13" REFLECTIVE SLEEVES.
6. FLASHING ARROW SIGNS SHALL BE USED PER THE CALIFORNIA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (CALIFORNIA MUTCD, LATEST EDITION). SILENT TYPE SHALL BE USED IN RESIDENTIAL AREAS.
7. THE MAXIMUM SPACING BETWEEN CONES IN A TAPER OR A TANGENT SHALL BE APPROXIMATELY AS SHOWN IN TABLE 1.
8. ADDITIONAL ADVANCE FLAGGERS SHALL BE REQUIRED WHEN TRAFFIC QUEUES DEVELOP. FLAGGER STATIONS FOR WORK AT NIGHT SHALL BE ILLUMINATED AS NOTED IN SECTION 6G.20 OF THE MUTCD.
9. PLACE C30 (CA) "LANE CLOSED" SIGN AT 500'-1000' INTERVALS THROUGHOUT EXTENDED WORK AREAS.
10. ALL REQUIRED SIGNS THAT ARE TO BE LEFT IN PLACE OVER A WEEKEND OR HOLIDAY SHALL BE POST MOUNTED USING SQUARE PERFORATED STEEL TUBING WITH BREAKAWAY BASE PER SDRSD M-45.
11. CONSTRUCTION AREA TRAFFIC CONTROL DEVICES SHALL MEET THE PROVISIONS OF SECTION 12 OF THE MOST RECENT EDITION OF THE CALTRANS STANDARD SPECIFICATIONS.

SIGNS

DETOUR AHEAD — W20-2	W1-3(LT)
RIGHT LANE CLOSED AHEAD — W20-5(RT)	C9A(CA)
LEFT LANE CLOSED AHEAD — W20-5(LT)	LANE CLOSED — C30(CA)
BIKE LANE CLOSED AHEAD — W20-5(BIKE)	SHOULDER CLOSED — C30A(CA)
ROAD WORK AHEAD — W20-1	BIKE LANE CLOSED — C30(BIKE)
ONE LANE ROAD AHEAD — W20-4	W11-1
SHOULDER WORK — W21-5	W1-4(LT)
BE PREPARED TO STOP — W3-4	W1-4(RT)
W4-2(RT)	SIDEWALK CLOSED USE OTHER SIDE — R9-10 — XX M.P.H. — W13-1
END ROAD WORK — G20-2	MAY USE FULL LANE — R4-11 — KEEP RIGHT — R4-7a
SIDEWALK CLOSED — R9-9	SHARE THE ROAD — W16-1
SIDEWALK CLOSED CROSS HERE — R9-11a	

TABLE 3: SIGN SPACING, L_3

APPROACH SPEED (M.P.H.)	MINIMUM DISTANCE IN FEET L_3	
	BETWEEN SIGNS *	FROM LAST * SIGN TO TAPER
LESS THAN 25	100'	100'
25 TO 40	350'	350'
GREATER THAN 40	500'	500'

* EXACT SPACING MAY VARY DUE TO FIELD CONDITIONS

TABLE 1: TAPER LENGTHS, L_1

APPROACH SPEED (M.P.H.)	MINIMUM TAPER LENGTH L_1 *	MINIMUM NUMBER OF CONES FOR TAPER *	MAXIMUM SPACING OF CONES ALONG TAPER (FEET) ±	MAXIMUM SPACING OF CONES ALONG TANGENT (FEET) ±
25	125	6	25	50
30	180	7	30	60
35	245	8	35	70
40	320	9	40	80
45	540	13	45	90
50	600	13	50	100
55	660	13	55	110
60	720	13	60	120

* BASED ON 12 FOOT WIDE LANE. THIS COLUMN IS ALSO APPROPRIATE FOR LANE WIDTHS LESS THAN 12 FEET.

TABLE 2: BUFFER SPACE, L_2

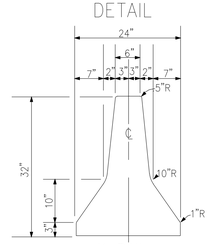
APPROACH SPEED (M.P.H.)	LONGITUDINAL BUFFER SPACE L_2 (FEET)±*
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570

* SEE CA MUTCD TABLE 6E-101(CA) FOR SUSTAINED DOWNGRADES STEEPER THAN 3% AND LONGER THAN 1 MILE.

LEGEND

- DIRECTION OF TRAVEL
- PORTABLE SIGN
- TRAFFIC CONE/DELINEATOR
- TYPE II BARRICADE
- FLAGGER
- FLAG TREE
- FLASHING ARROW SIGN
- PORTABLE FLASHING BEACON (SEE SIGNAGE NOTE #3)
- K-RAIL (TYPE 50 CONCRETE BARRIER)
- CMS — CHANGEABLE MESSAGE SIGN

DETAIL



K-RAIL
(CONCRETE BARRIER TYPE 50)

ENGINEERS SEAL

CITY OF CARLSBAD
APPROVED
for TRAFFIC ENGINEER DATE

DRAWN BY: _____
DATE: _____
RCE. _____ EXP. _____

SHEET | CITY OF CARLSBAD ENGINEERING DEPARTMENT | SHEETS

TRAFFIC CONTROL PLAN FOR:

NOTES AND DETAILS

APPROVED: ROBERT T. JOHNSON JR.

CITY ENGINEER PE 28515 EXPIRES 6/30/10 DATE

DWN BY: _____
CHK'D BY: _____
RV'W'D BY: _____

PROJECT NO. | DRAWING NO.

C:\DRAWING FILES\TITLE SHEETS\TCP-PLAN.DWG REVISED 11/14/06

DRAWN BY S.EVANS

PRIVATE IMPROVEMENTS

GENERAL NOTES

1. THIS PLAN SUPERSEDES ALL OTHER PLANS PREVIOUSLY APPROVED BY THE CITY OF CARLSBAD REGARDING IMPROVEMENTS SHOWN ON THIS SET OF PLANS.
2. APPROVAL OF THIS PLAN DOES NOT LESSEN OR WAIVE ANY PORTION OF THE CARLSBAD MUNICIPAL CODE, RESOLUTION OF CONDITIONAL APPROVAL, CITY STANDARDS OR OTHER ADDITIONAL DOCUMENTS LISTED HEREON AS THEY MAY PERTAIN TO THIS PROJECT. THE ENGINEER IN RESPONSIBLE CHARGE SHALL REVISE THESE PLANS WHEN NON-CONFORMANCE IS DISCOVERED.
3. CITY APPROVAL OF PLANS DOES NOT RELIEVE THE DEVELOPER OR ENGINEER-OF-WORK FROM RESPONSIBILITY FOR THE CORRECTION OF ERRORS AND OMISSIONS DISCOVERED DURING CONSTRUCTION. ALL PLAN REVISIONS SHALL BE PROMPTLY SUBMITTED TO THE CITY ENGINEER FOR APPROVAL.
4. A RIGHT-OF-WAY PERMIT FROM THE CITY ENGINEER WILL BE REQUIRED FOR ANY WORK IN THE PUBLIC RIGHT OF WAY, PRIOR TO PERMIT ISSUANCE, A CERTIFICATE OF INSURANCE MUST BE FILED NAMING THE CITY OF CARLSBAD AS AN ADDITIONAL INSURED ON THE PERMITTEE'S POLICY IN THE MINIMUM AMOUNT OF $1,000,000.00 FOR EACH OCCURRENCE OF LIABILITY. THE INSURANCE COMPANY WRITING THE POLICY MUST HAVE A RATING OF "A-" OR BETTER AND A SIZE CATEGORY OF CLASS VII OR BETTER AS ESTABLISHED BY "BESTS" KEY RATING GUIDE.
5. NO WORK SHALL BE COMMENCED UNTIL ALL PERMITS HAVE BEEN OBTAINED FROM THE CITY AND OTHER APPROPRIATE AGENCIES.
6. REVISION OF THESE PLANS MAY BE REQUIRED IF THE PROPOSED IMPROVEMENTS ARE NOT CONSTRUCTED PRIOR TO THE DEADLINE DATE OF THE IMPROVEMENT AGREEMENT.
7. NO REVISIONS WILL BE MADE TO THESE PLANS WITHOUT THE WRITTEN APPROVAL OF THE CITY ENGINEER, NOTED WITHIN THE REVISION BLOCK, ON THE APPROPRIATE SHEET OF THE PLANS AND TITLE SHEET.
8. ORIGINAL DRAWINGS SHALL BECOME THE PROPERTY OF THE CITY UPON BEING SIGNED BY THE CITY ENGINEER.
9. THE ORIGINAL DRAWING SHALL BE REVISED TO REFLECT AS-BUILT CONDITIONS BY THE ENGINEER-OF-WORK PRIOR TO FINAL ACCEPTANCE OF THE WORK BY THE CITY.
10. ACCESS FOR FIRE AND OTHER EMERGENCY VEHICLES SHALL BE MAINTAINED TO THE PROJECT SITE AT ALL TIMES DURING CONSTRUCTION.
11. WHERE TRENCHES ARE WITHIN CITY EASEMENTS, A SOILS REPORT COMPRISED OF: (A) SUMMARY SHEET, (B) LABORATORY WORK SHEETS AND (C) COMPACTION CURVES, SHALL BE SUBMITTED BY A PROFESSIONAL ENGINEER OF THE STATE OF CALIFORNIA, PRINCIPALLY DOING BUSINESS IN THE FIELD OF APPLIED SOILS MECHANICS. THE SOILS REPORT WILL BE SUBMITTED TO THE CITY ENGINEERING INSPECTOR WITHIN TWO WORKING DAYS OF COMPLETION OF FIELD TESTS. THE WRITTEN FIELD COMPACTION REPORT(S) SHALL BE IMMEDIATELY SUBMITTED TO THE CITY ENGINEERING INSPECTOR UPON COMPLETION OF THE FIELD TESTS.
12. A PRECONSTRUCTION MEETING SHALL BE HELD AT THE SITE PRIOR TO THE BEGINNING OF WORK AND SHALL BE ATTENDED BY ALL REPRESENTATIVES RESPONSIBLE FOR CONSTRUCTION, INSPECTION, SUPERVISION, TESTING AND ALL OTHER ASPECTS OF THE WORK. THE CONTRACTOR SHALL SCHEDULE THE MEETING BY CALLING THE INSPECTION LINE AT (760) 438-3891 AT LEAST FIVE (5) WORKING DAYS PRIOR TO STARTING CONSTRUCTION. APPROVED DRAWINGS MUST BE AVAILABLE PRIOR TO SCHEDULING.
13. ALL INSPECTION REQUESTS OTHER THAN FOR PRECONSTRUCTION MEETING WILL BE MADE BY CALLING THE ENGINEERING 24-HOUR INSPECTION REQUEST LINE AT (760) 438-3891. INSPECTION REQUESTS MUST BE RECEIVED PRIOR TO 2:00 P.M. ON THE DAY BEFORE THE INSPECTION IS NEEDED. INSPECTIONS WILL BE MADE THE NEXT WORK DAY UNLESS YOU REQUEST OTHERWISE. REQUESTS MADE AFTER 2:00 P.M. WILL BE SCHEDULED FOR TWO FULL WORK DAYS LATER.
14. THE OWNER AND/OR APPLICANT THROUGH THE DEVELOPER AND/OR CONTRACTOR SHALL DESIGN, CONSTRUCT AND MAINTAIN ALL SAFETY DEVICES, INCLUDING SHORING, AND SHALL BE SOLELY RESPONSIBLE FOR CONFORMING TO ALL LOCAL, STATE AND FEDERAL SAFETY AND HEALTH STANDARDS, LAWS AND REGULATIONS.
15. THE CONTRACTOR SHALL CONFORM TO LABOR CODE SECTION 6705 BY SUBMITTING A DETAIL PLAN TO THE CITY ENGINEER AND/OR CONCERNED AGENCY SHOWING THE DESIGN OF SHORING, BRACING SLOPE OR OTHER PROVISIONS TO BE MADE OF WORKER PROTECTION FROM THE HAZARD OF CAVING GROUND DURING THE EXCAVATION OF SUCH TRENCH OR TRENCHES OR DURING THE PIPE INSTALLATION THEREIN. THIS PLAN MUST BE PREPARED FOR ALL TRENCHES FIVE FEET (5') OR MORE IN DEPTH AND APPROVED BY THE CITY ENGINEER AND/OR CONCERNED AGENCY PRIOR TO EXCAVATION. IF THE PLAN VARIES FROM THE SHORING SYSTEM STANDARDS ESTABLISHED BY THE CONSTRUCTION SAFETY ORDERS, TITLE 8 CALIFORNIA ADMINISTRATIVE CODE, THE PLAN SHALL BE PREPARED BY A REGISTERED ENGINEER AT THE CONTRACTORS EXPENSE. A COPY OF THE OSHA EXCAVATION PERMIT MUST BE SUBMITTED TO THE INSPECTOR PRIOR TO EXCAVATION.
16. NO BLASTING SHALL BE COMMENCED WITHOUT A CITY ENGINEER APPROVED BLASTING PROGRAM AND BLASTING PERMIT.
17. IF ANY ARCHAEOLOGICAL RESOURCES ARE DISCOVERED WITHIN ANY WORK ZONE DURING CONSTRUCTION, OPERATIONS WILL CEASE IMMEDIATELY, AND THE PERMITTEE WILL NOTIFY THE CITY ENGINEER. OPERATIONS WILL NOT RESTART UNTIL THE PERMITTEE HAS RECEIVED WRITTEN AUTHORITY FROM THE CITY ENGINEER TO DO SO.
18. ALL OPERATIONS CONDUCTED ON THE SITE OR ADJACENT THERETO, INCLUDING WARMING UP, REPAIR, ARRIVAL, DEPARTURE OR OPERATION OF TRUCKS, EARTHMOVING EQUIPMENT, CONSTRUCTION EQUIPMENT AND ANY OTHER ASSOCIATED GRADING EQUIPMENT SHALL BE LIMITED TO THE PERIOD BETWEEN 7:00 A.M. AND 6:00 P.M. EACH DAY, MONDAY THRU FRIDAY AND NO EARTHMOVING OR GRADING OPERATIONS SHALL BE CONDUCTED ON WEEKENDS OR HOLIDAYS. (A LIST OF CITY HOLIDAYS IS AVAILABLE AT THE ENGINEERING DEPARTMENT COUNTER.)
19. ALL OFF-SITE HAUL ROUTES SHALL BE SUBMITTED BY THE CONTRACTOR TO THE CITY ENGINEER FOR APPROVAL TWO FULL WORKING DAYS PRIOR TO BEGINNING OF WORK. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DEBRIS OR DAMAGE OCCURRING ALONG THE HAUL ROUTE OR ADJACENT STREETS AS A RESULT OF THE GRADING OPERATION.
20. IMPORT MATERIAL SHALL BE OBTAINED FROM, AND WASTE MATERIAL SHALL BE DEPOSITED AT, A SITE APPROVED BY THE CITY ENGINEER. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DEBRIS OR DAMAGE OCCURRING ALONG THE HAUL ROUTES OR ADJACENT STREETS AS A RESULT OF THE GRADING OPERATION.
21. THE EXISTENCE AND LOCATION OF UTILITY STRUCTURES AND FACILITIES SHOWN ON THE CONSTRUCTION PLANS WERE OBTAINED BY A SEARCH OF THE AVAILABLE RECORDS. ATTENTION IS CALLED TO THE POSSIBLE EXISTENCE OF OTHER UTILITY FACILITIES OR STRUCTURES NOT SHOWN OR IN A LOCATION DIFFERENT FROM THAT SHOWN ON THE PLANS. THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURES TO PROTECT THE UTILITIES SHOWN ON THE PLANS AND ANY OTHER EXISTING FACILITIES OR STRUCTURES NOT SHOWN.
22. THE CONTRACTOR SHALL VERIFY THE LOCATION OF ALL EXISTING FACILITIES (ABOVEGROUND AND UNDERGROUND) WITHIN THE PROJECT SITE SUFFICIENTLY AHEAD OF THE CONSTRUCTION TO PERMIT THE REVISIONS OF THE CONSTRUCTION PLANS IF IT IS FOUND THAT THE ACTUAL LOCATIONS ARE IN CONFLICT WITH THE PROPOSED WORK.
23. THE CONTRACTOR SHALL NOTIFY AFFECTED UTILITY COMPANIES (SEE BELOW) AT LEAST TWO FULL WORKING DAYS PRIOR TO STARTING CONSTRUCTION NEAR THEIR FACILITIES AND SHALL COORDINATE WORK WITH A COMPANY REPRESENTATIVE.

UNDERGROUND SERVICE ALERT	(800)422-4133
SDG&E	(800)411-7343
AT&T	(800)892-0123
TIME WARNER CABLE	(760)438-7741
COX COMMUNICATIONS	(619)262-1122
CITY OF CARLSBAD(STREETS AND STORM DRAIN)	(760)434-2980
*CITY OF CARLSBAD(SEWER,WATER & RECLAIMED WATER)	(760)438-2722
*SAN DIEGUITO WATER DISTRICT	(760)633-2650
*LEUCADIA WASTEWATER DISTRICT	(760)753-0155
*VALLECITOS WATER DISTRICT	(760)744-0460
*OLIVENHAIN WATER DISTRICT	(760)753-6466
*BUENA SANITATION DISTRICT	(760)726-1340 x1330

* AS APPROPRIATE

24. IN ACCORDANCE THE CITY STORM WATER STANDARDS ALL STORM DRAIN INLETS CONSTRUCTED BY THIS PLAN SHALL INCLUDE "STENCILS" BE ADDED TO PROHIBIT WASTE DISCHARGE DOWNSTREAM. STENCILS SHALL BE ADDED TO THE SATISFACTION OF THE CITY ENGINEER.

STREET NOTES

1. ACTUAL STRUCTURAL SECTIONS WILL BE DETERMINED AFTER "R" VALUE TESTS HAVE BEEN CONDUCTED BY A PROFESSIONAL ENGINEER OF THE STATE OF CALIFORNIA, PRINCIPALLY DOING BUSINESS IN THE FIELD OF APPLIED SOIL MECHANICS, ON THE PREPARED BASEMENT SOIL. THE "R" VALUE TESTS AND THE ENGINEERED STRUCTURAL SECTION MUST BE SUBMITTED TO THE ENGINEERING INSPECTOR FOR REVIEW AND APPROVAL A MINIMUM OF TWO (2) CITY WORKING DAYS BEFORE THE WORK BEGINS.
2. STREET LIGHTS SHALL BE INSTALLED AS SHOWN ON THESE PLANS, UNDERGROUND CONDUIT RUNS, SERVICE POINTS AND HAND-HOLES SHALL BE SHOWN ON THE "AS-BUILT" PLANS. NO DIRECT BURIAL STREET LIGHT FOUNDATIONS WILL BE ALLOWED. ALL LUMINAIRES SHALL BE "CUT OFF" TYPE.
3. ALL UNDERGROUND UTILITIES AND LATERALS SHALL BE INSTALLED PRIOR TO CONSTRUCTION OF CURBS, CROSS GUTTERS OR SURFACING OF STREETS.
4. WHERE AN EXISTING PIPE LINE IS TO BE ABANDONED IT SHALL BE REMOVED WITHIN TWENTY FEET OF BUILDING OR STREET AREAS AND REPLACED WITH PROPERLY COMPACTED SOILS. IN OTHER AREAS THE PIPE WILL BE PLUGGED WITH CONCRETE OR REMOVED AS APPROVED BY THE CITY ENGINEER.
5. WHEELCHAIR RAMPS SHALL BE INSTALLED PER REQUIREMENTS OF TITLE 24, CALIFORNIA ADMINISTRATIVE CODE.
6. STREET TREES SHALL BE INSTALLED PER SECTION VI OF THE CITY OF CARLSBAD LANDSCAPE MANUAL.
7. FIRE HYDRANT MARKERS SHALL BE PLACED IN THE STREET WITHIN THE LIMITS OF WORK OF THIS PLAN PER SDRS DWG M19.
8. ALL SURVEY MONUMENTS AND POINTS THAT ARE DISTURBED BY THIS WORK SHALL BE REESTABLISHED, PERPETUATED, AND DOCUMENTED PER THE PROFESSIONAL LAND SURVEYORS ACT.
9. TWO (2) SETS OF SURVEY (CUT) SHEETS SHALL BE PROVIDED TO THE CITY ENGINEERING INSPECTOR.
10. STREET LIGHTS SHALL BE 5,500 LUMEN (40 WATT) OR 13,700 PUPIL LUMEN (100 WATT) HIGH EFFICIENCY INDUCTION LIGHTS.

SEWER NOTES

1. SEWER MAIN AND APPURTENANCES SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE "CITY OF CARLSBAD ENGINEERING STANDARDS (LATEST EDITION), VOLUME 1- GENERAL DESIGN STANDARDS, CHAPTER 6-DESIGN CRITERIA FOR GRAVITY SEWER LINES AND APPURTENANCES, AND VOLUME 3 - STANDARD DRAWINGS AND NOTES AND THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, LATEST EDITION (GREEN BOOK).
2. BEFORE ANY CONNECTION TO THE CITY'S EXISTING SYSTEM, A PERMIT SHALL BE OBTAINED FROM THE CITY. IT MUST BE SIGNED AND APPROVED BY THE CITY ENGINEER AND SUPERINTENDENT.
3. BEFORE CONSTRUCTION BEGINS IN ANY PUBLIC RIGHT OF WAY, A CITY RIGHT OF WAY PERMIT SHALL BE REQUIRED.

WATER NOTES

1. WATER & RECYCLED WATER MAIN AND APPURTENANCES SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE "CITY OF CARLSBAD ENGINEERING STANDARDS" (LATEST EDITION) VOLUMES 2 & 3.
2. BEFORE ANY CONNECTION OR SHUT DOWN OF VALVES ON EXISTING C.M.W.D. LINES, A PERMIT SHALL BE OBTAINED FROM THE C.M.W.D. OFFICE AND MUST BE SIGNED AND APPROVED BY THE CITY OF CARLSBAD'S DEPUTY CITY ENGINEER AND THE UTILITY OPERATIONS' PUBLIC WORKS MANAGER.
3. THE CONTRACTOR SHALL NOTIFY THE CITY OF CARLSBAD ENGINEERING INSPECTION DEPARTMENT 48 HOURS PRIOR TO STARTING WORK SO THAT INSPECTION MAY BE PROVIDED - TELEPHONE NO. (760)438-3891.
4. NO TREES OR STRUCTURES SHALL BE ALLOWED IN THE WATER LINE EASEMENT, ALL EXISTING TREES AND STRUCTURES SHALL BE REMOVED PRIOR TO COMMENCEMENT OF WORK - ANY EXCEPTIONS SHALL REQUIRE WRITTEN PERMISSION FROM THE DISTRICT ENGINEER.
5. ALL BURIED COPPER PIPING AND APPURTENANCES SHALL BE PROTECTED BY MEANS OF CATHODIC PROTECTION. IF DEVELOPER/OWNER CONDUCTS A SOILS TEST REPORT AND DEMONSTRATES THAT PROTECTION CAN BE PERFORMED IN ANOTHER MANNER, THE DISTRICT ENGINEER WILL CONSIDER AN ALTERNATIVE FORM OF PROTECTION.
6. THE EXACT HORIZONTAL AND VERTICAL ALIGNMENT AND TYPE OF MATERIALS OF THE FIRE LINE LOCATED BETWEEN THE DETECTOR CHECK VALVE AND BUILDING SHALL BE DETERMINED BY THE CITY OF CARLSBAD FIRE MARSHAL.
7. ALL POTABLE WATER SERVICES SHALL BE 1" AND ALL METERS SHALL BE 1" (UNLESS OTHERWISE NOTED ON PLANS).
8. ALL WATER METER BOXES SHALL BE 17" X 30" X 12" POLYMER CONCRETE AS MANUFACTURED BY ARMORCAST OR EQUAL.
9. MINIMUM SPACING BETWEEN POTABLE WATER SERVICES AND SEWER LATERALS SHALL BE 10 FEET.
10. THE TOP OF WATER METER BOXES SHALL BE FLUSH WITH THE FINISHED SURFACE GRADE.
11. CONSTRUCTION OF WATER MAINS AND RECYCLED WATER MAINS SHALL ADHERE TO THE "CRITERIA FOR THE SEPARATION OF WATER MAINS AND SANITARY SEWERS" PUBLISHED BY THE STATE OF CALIFORNIA'S DEPARTMENT OF HEALTH SERVICES.
12. AXIAL DEFLECTION AT THE PIPE JOINTS IS NOT ALLOWED. THE USE OF A HIGH-DEFLECTION COUPLING AT A PIPE JOINT MAY BE PERMITTED BY THE INSPECTOR ON A CASE BY CASE BASIS NOT TO EXCEED 4 DEGREES TOTAL DEFLECTION PER COUPLING (2 DEGREES/EACH GASKET). USE CERTAINTEED "VINYL-IRON" H.D. FOR C900.
13. BEFORE CONSTRUCTION BEGINS IN ANY PUBLIC RIGHT OF WAY, A CITY RIGHT OF WAY PERMIT SHALL BE REQUIRED.
14. NO CUTTING OF ASBESTOS CEMENT PIPE (ACP) IS PERMITTED. CONTRACTOR SHALL REMOVE ACP TO NEAREST COUPLING AND INSTALL ACP X PVC ADAPTORS AND THE NECESSARY PVC SIZE AND CLASS PIPE TO INSTALL THE TEE AT THE STATION.
15. PRIOR TO BACKFILL, INSTALL TRACER WIRE ON TOP OF PIPE AND SECURE IN PLACE WITH 2-INCH WIDE PLASTIC ADHESIVE TAPE AT MAXIMUM 10-FOOT INTERVALS. WIRE TO ENTER VALVE STANDS BY MEANS OF DRILLED HOLE IN PIPE STAND WALL JUST BELOW 4TTBOX. WIRE IS NOT TO INTERFERE WITH VALVE NUT OPERATION. RUN TRACER WIRE CONTINUOUSLY ALONG PIPE AND TERMINATE IN ADJACENT VALVE BOXES FOR BURIED ASSEMBLIES OR BURIED VALVES. WHERE BURIED SPLICES OCCUR, USE AN ELECTRICAL EPOXY RESIN SUCH AS SCOTCHCAST, OR APPROVED EQUAL. PROVIDE 24 INCHES OF COILED WIRE AT ACCESS POINTS FOR ATTACHMENTS OF PIPE LOCATING EQUIPMENT. EACH INSTALLED RUN OF PIPE SHALL BE CAPABLE OF BEING LOCATED USING THE TRACER WIRE. PROTECT WIRE INSULATION FROM DAMAGE DURING INSTALLATION AND BACKFILLING. WIRE INSULATION THAT IS BROKEN, CUT, OR DAMAGED SHALL BE REPLACED.
TRACER WIRE SHALL BE AWG NO. 8 STRANDED COPPER WIRE WITH HIGH MOLECULAR WEIGHT POLYETHYLENE (HMW/PE) INSULATION SPECIFICALLY DESIGNED FOR DIRECT BURIAL IN CORROSIVE SOIL OR WATER. POLYETHYLENE INSULATION SHALL CONFORM TO ASTM D 1248, TYPE 1, CLASS C. WIRES WITH CUT OR DAMAGED INSULATION ARE NOT ACCEPTABLE AND REPLACEMENT OF THE ENTIRE WIRE WHICH HAS BEEN DAMAGED WILL BE REQUIRED AT THE CONTRACTOR'S EXPENSE.

SIGNING AND STRIPING NOTES

1. THE CONTRACTOR IS RESPONSIBLE FOR INSTALLING ALL SIGNING AND STRIPING.
2. SIGNING, STRIPING AND PAVEMENT MARKINGS SHALL CONFORM TO THE CALIFORNIA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (FHWA'S MUTCD 2003 REVISION 1, AS AMENDED FOR USE IN CALIFORNIA), CALTRANS STANDARD SPECIFICATIONS (JULY 2006 OR LATEST VERSION THEREOF), THESE PLANS AND THE SPECIAL PROVISIONS.
3. ALL SIGNING AND STRIPING IS SUBJECT TO THE APPROVAL OF THE PUBLIC WORKS DIRECTOR OR HIS REPRESENTATIVE, PRIOR TO INSTALLATION.
4. ANY DEVIATION FROM THESE SIGNING AND STRIPING PLANS SHALL BE APPROVED BY THE ENGINEER OF WORK AND PUBLIC WORKS DIRECTOR PRIOR TO ANY CHANGE IN THE FIELD.
5. ALL SIGNING AND STRIPING SHALL BE REFLECTIVE PER CALTRANS SPECIFICATIONS. STRIPING SHALL BE REPAINTED TWO WEEKS AFTER INITIAL PAINTING. SIGNING SHALL USE ENCAPSULATED LENS REFLECTIVE SHEETING (HIGH INTENSITY OR EQUAL).
6. PRIOR TO FINAL ACCEPTANCE OF STREET IMPROVEMENTS, ALL STREET STRIPING AND AND MARKINGS WITHIN A 500' PERIMETER OF THE CONSTRUCTION PROJECT WILL BE RESTORED TO A "LIKE NEW" CONDITION, IN A MANNER MEETING THE APPROVAL OF THE CITY INSPECTOR.
7. EXACT LOCATION OF STRIPING AND STOP LIMIT LINES SHALL BE APPROVED BY THE PUBLIC WORKS DIRECTOR OR HIS REPRESENTATIVE PRIOR TO INSTALLATION.
8. CONTRACTOR SHALL REMOVE ALL CONFLICTING PAINTED LINES, MARKINGS AND PAVEMENT LEGENDS BY GRINDING. DEBRIS SHALL BE PROMPTLY REMOVED BY THE CONTRACTOR.
9. ALL PAVEMENT LEGENDS SHALL BE THE LATEST VERSION OFTHE CALTRANS METRIC STENCILS.
10. LIMIT LINES AND CROSSWALKS SHALL BE FIELD LOCATED. CROSSWALKS SHALL HAVE 10' INSIDE DIMENSION UNLESS OTHERWISE SPECIFIED.
11. ALL CROSSWALKS, LIMIT LINES, STOP BARS, PAVEMENT ARROWS AND PAVEMENT LEGENDS SHALL BE THERMOPLASTIC UNLESS OTHERWISE SPECIFIED.
12. FIRE HYDRANT PAVEMENT MARKERS SHALL CONFORM TO THE CALIFORNIA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (FHWA'S MUTCD 2003 REVISION 1, AS AMENDED FOR USE IN CALIFORNIA) AND SAN DIEGO REGIONAL STANDARD DRAWING M-19.
13. ALL MEDIAN NOSES AND FLARES SHALL BE PAINTED YELLOW.
14. ALL SIGNS SHALL BE STANDARD SIZE AS SHOWN IN THE CALIFORNIA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (FHWA'S MUTCD 2003 REVISION1, AS AMENDED FOR USE IN CALIFORNIA) UNLESS OTHERWISE SPECIFIED.
15. SIGN POSTS SHALL BE SQUARE PERFORATED STEEL TUBING WITH BREAKAWAY BASE PER SAN DIEGO REGIONAL STANDARD DRAWING M-45.
16. WHEN A SIGN IS ATTACHED TO A POLE, IT SHALL BE MOUNTED USING A STANDARD CITY OF CARLSBAD MOUNTING BRACKET WITH STRAPS.
17. EXISTING SIGNS REMOVED BY THE CONTRACTOR SHALL BE DELIVERED BY THE CONTRACTOR TO THE CITY OF CARLSBAD PUBLIC WORKS YARD AT 405 OAK AVENUE.
18. ALL SIGNS SHOWN ON THESE PLANS SHALL BE NEW SIGNS PROVIDED AND INSTALLED BY THE CONTRACTOR EXCEPT THOSE SIGNS SPECIFICALLY SHOWN AS EXISTING TO BE RELOCATED OR TO REMAIN.
19. (IF NECESSARY) WHERE R4-7 SIGN AND OM1-3 OBJECT MARKER ARE TO BE INSTALLED IN A 2-FOOT WIDE MEDIAN NOSE, THE R4-7 SIGN SHALL BE 18"X24" AND THE OM1-3 OBJECT MARKER SHALL BE 12"X12"

SOURCE OF TOPOGRAPHY

TOPOGRAPHY SHOWN ON THESE PLANS WAS GENERATED BY_____ _____ METHODS FROM INFORMATION GATHERED ON _____, 20____ BY_____.
TOPOGRAPHY SHOWN HEREON CONFORMS TO NATIONAL MAP ACCURACY STANDARDS.

PROJECT LOCATION

THIS PROJECT IS LOCATED WITHIN ASSESSORS PARCEL NUMBER(S) _____.
THE CALIFORNIA COORDINATE INDEX OF THIS PROJECT IS N_____ E_____.

BENCH MARK

DESCRIPTION: _____
LOCATION: _____
_____
RECORDED: _____
ELEVATION: _____ DATUM: NGVD 29

"DECLARATION OF RESPONSIBLE CHARGE"

I HEREBY DECLARE THAT I AM THE ENGINEER OF WORK FOR THIS PROJECT, THAT I HAVE EXERCISED RESPONSIBLE CHARGE OVER THE DESIGN OF THE PROJECT AS DEFINED IN SECTION 6703 OF THE BUSINESS AND PROFESSIONS CODE, AND THAT THE DESIGN IS CONSISTENT WITH CURRENT STANDARDS.

I UNDERSTAND THAT THE CHECK OF PROJECT DRAWINGS AND SPECIFICATIONS BY THE CITY OF CARLSBAD DOES NOT RELIEVE ME AS ENGINEER OF WORK, OF MY RESPONSIBILITIES FOR PROJECT DESIGN.

FIRM: _____
ADDRESS: _____
CITY, ST.: _____
TELEPHONE: _____
BY: _____ DATE: _____
(NAME OF ENGINEER)
R.C.E. NO.: _____
REGISTRATION EXPIRATION DATE: _____

INDEX OF SHEETS

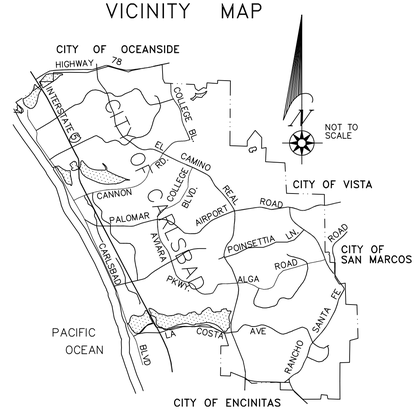
REFERENCE DRAWINGS

BASIS OF BEARINGS

DEVELOPER

NAME: _____
ADDRESS: _____
PHONE NO.: _____

VICINITY MAP



WORK TO BE DONE

THE IMPROVEMENT WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE FOLLOWING DOCUMENTS, CURRENT AT THE TIME OF CONSTRUCTION, AS DIRECTED BY THE CITY ENGINEER.

1. CARLSBAD MUNICIPAL CODE
2. CITY OF CARLSBAD ENGINEERING STANDARDS
3. THIS SET OF PLANS
4. RESOLUTION NO._____ DATED_____
5. THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION (GREEN BOOK).
6. SOILS REPORT AND RECOMMENDATIONS BY _____ _____ DATED_____
7. THE SAN DIEGO AREA REGIONAL STANDARD DRAWINGS AND AS MAY BE MODIFIED BY THE CITY OF CARLSBAD STANDARDS.
8. CALIFORNIA COASTAL COMMISSION DEVELOPMENT PERMIT CONDITIONS DATED _____
9. STORM WATER POLLUTION PREVENTION PLAN PREPARED BY _____ DATED _____ WDID NO. 9 37S _____, SW NO._____.
10. STORM WATER MANAGEMENT PLAN PREPARED BY _____ DATED _____, SWMP NO._____.
11. CALIFORNIA STORM WATER QUALITY ASSOCIATION BMP CONSTRUCTION HANDBOOK AND CALTRANS CONSTRUCTION SITE BMP MANUAL.

LEGEND

DESCRIPTION	DWG. NO.	SYMBOL	QUANTITY

ALL STANDARD DRAWINGS ARE SAND DIEGO REGIONAL STANDARD DRAWINGS (SDRSD) UNLESS NOTED OTHERWISE:
* CITY OF CARLSBAD STANDARD
** CARLSBAD MUINICIPAL WATER DISTRICT STANDARD DRAWING
*** SDRSD AS MODIFIED BY CITY OF CARLSBAD

TOTAL DISTURBED AREA =_____
(THIS AREA INCLUDES BUT IS NOT LIMITED TO OFF-SITE WORK INCLUDING PUBLIC IMPROVEMENTS AND TEMPORARY DISTURBANCE SUCH AS VEHICLE AND EQUIPMENT STAGING AREAS, CONSTRUCTION WORKER FOOT TRAFFIC, SOIL/GRAVEL PILES, UTILITY TRENCHES, BACKFILL CUTS, AND SLOPE KEYWAYS)
TOTAL REPLACED IMPERVIOUS AREA =_____
TOTAL PROPOSED IMPERVIOUS AREA =_____

CITY OF CARLSBAD FIRE DEPARTMENT
REQUIREMENTS
NO. OF F.H.(S)____ F.FLOW_____G.P.M. OUT OF____F.H.(S).
BLDG. SPRINKLED YES/NO. . . F.FLOW_____G.P.M.
FIRE MARSHAL DATE

"AS BUILT"
P.E. _____ EXP. _____ DATE
REVIEWED BY:
INSPECTOR DATE

POST-CONSTRUCTION BMP TABLE

STORMWATER REQUIREMENTS THAT APPLY:
☐ STANDARD STORMWATER REQUIREMENTS
☐ PRIORITY PROJECT REQUIREMENTS

EXEMPT FROM HYDROMODIFICATION?
☐ YES (SEE SWMP FOR DOCUMENTATION)
☐ NO

TYPE	DESCRIPTION	OWNERSHIP	MAINTENANCE AGREEMENT	SHEET NO.	MAINTENANCE FREQUENCY

DATE	INITIAL		DATE	INITIAL	DATE	INITIAL
ENGINEER OF WORK		REVISION DESCRIPTION	OTHER APPROVAL		CITY APPROVAL	

SHEET | CITY OF CARLSBAD ENGINEERING DEPARTMENT | SHEETS

IMPROVEMENT PLANS FOR:
TITLE SHEET

APPROVED: JASON S. GELDERT
CITY ENGINEER RCE 63912 EXPIRES 9/30/16 DATE

DWN BY: _____
CHKD BY: _____
RVWD BY: _____
PROJECT NO.
DRAWING NO.

PRIVATE GRADING

GRADING NOTES

(IN ADDITION TO THE REQUIREMENTS OF CHAPTER 15.16 OF THE CARLSBAD MUNICIPAL CODE.)

1. THIS PLAN SUPERSEDES ALL OTHER PLANS PREVIOUSLY APPROVED BY THE CITY OF CARLSBAD REGARDING GRADING SHOWN ON THIS SET OF PLANS.
2. APPROVAL OF THIS PLAN DOES NOT LESSEN OR WAIVE ANY PORTION OF THE CARLSBAD MUNICIPAL CODE, RESOLUTION OF CONDITIONAL APPROVAL, CITY STANDARDS OR OTHER ADDITIONAL DOCUMENTS LISTED HEREON AS THEY MAY PERTAIN TO THIS PROJECT. THE ENGINEER IN RESPONSIBLE CHARGE SHALL REVISE THESE PLANS WHEN NON-CONFORMANCE IS DISCOVERED.
3. CITY APPROVAL OF PLANS DOES NOT RELIEVE THE DEVELOPER OR ENGINEER-OF-WORK FROM RESPONSIBILITY FOR THE CORRECTION OF ERRORS AND OMISSIONS DISCOVERED DURING CONSTRUCTION. ALL PLAN REVISIONS SHALL BE PROMPTLY SUBMITTED TO THE CITY ENGINEER FOR APPROVAL.
4. A RIGHT-OF-WAY PERMIT FROM THE CITY ENGINEER WILL BE REQUIRED FOR ANY WORK IN THE PUBLIC RIGHT OF WAY. PRIOR TO PERMIT ISSUANCE, A CERTIFICATE OF INSURANCE AS WELL AS ADDITIONAL INSURED ENDORSEMENT MUST BE FILED NAMING THE CITY OF CARLSBAD AS AN ADDITIONAL INSURED ON THE PERMITTEE'S POLICY IN THE MINIMUM AMOUNT OF $1,000,000.00 FOR EACH OCCURRANCE OF LIABILITY. THE INSURANCE COMPANY WRITING THE POLICY MUST HAVE A RATING OF "A-" OR BETTER AND A SIZE CATEGORY OF CLASS VII OR BETTER AS ESTABLISHED BY "BESTS" KEY RATING GUIDE.
5. NO WORK SHALL BE COMMENCED UNTIL ALL PERMITS HAVE BEEN OBTAINED FROM THE CITY AND OTHER APPROPRIATE AGENCIES.
6. REVISION OF THESE PLANS MAY BE REQUIRED IF THE PROPOSED IMPROVEMENTS ARE NOT CONSTRUCTED PRIOR TO THE DEADLINE DATE OF THE IMPROVEMENT AGREEMENT.
7. APPROVAL OF THESE PLANS BY THE CITY ENGINEER DOES NOT AUTHORIZE ANY WORK OR GRADING TO BE PERFORMED UNTIL THE PROPERTY OWNER'S PERMISSION HAS BEEN OBTAINED AND A VALID GRADING PERMIT HAS BEEN ISSUED.
8. NO REVISIONS WILL BE MADE TO THESE PLANS WITHOUT THE WRITTEN APPROVAL OF THE CITY ENGINEER, NOTED WITHIN THE REVISION BLOCK, ON THE APPROPRIATE SHEET OF THE PLANS AND THE TITLE SHEET.
9. ORIGINAL DRAWINGS SHALL BECOME THE PROPERTY OF THE CITY UPON BEING SIGNED BY THE CITY ENGINEER.
10. THE ORIGINAL DRAWING SHALL BE REVISED TO REFLECT AS-BUILT CONDITIONS BY THE ENGINEER-OF-WORK PRIOR TO FINAL ACCEPTANCE OF THE WORK BY THE CITY.
11. ACCESS FOR FIRE AND OTHER EMERGENCY VEHICLES SHALL BE MAINTAINED TO THE PROJECT SITE AT ALL TIMES DURING CONSTRUCTION.
12. WHERE TRENCHES ARE WITHIN CITY EASEMENTS, A SOILS REPORT COMPRISED OF: (A) SUMMARY SHEET, (B) LABORATORY WORK SHEETS AND (C) COMPACTION CURVES, SHALL BE SUBMITTED BY A PROFESSIONAL ENGINEER OF THE STATE OF CALIFORNIA, PRINCIPALLY DOING BUSINESS IN THE FIELD OF APPLIED SOILS MECHANICS. THE SOILS REPORT WILL BE SUBMITTED TO THE CITY ENGINEERING INSPECTOR WITHIN TWO WORKING DAYS OF THE COMPLETION OF FIELD TESTS.
13. A SOILS COMPACTION REPORT AND COMPLIANCE VERIFICATION REGARDING ADHERENCE TO RECOMMENDATIONS OUTLINED IN THE SOILS REPORT IS REQUIRED PRIOR TO THE ISSUANCE OF A BUILDING PERMIT. ALL CONTROLLED GRADING SHALL BE DONE UNDER THE DIRECTION OF A PROFESSIONAL ENGINEER OF THE STATE OF CALIFORNIA PRINCIPALLY DOING BUSINESS IN THE FIELD OF APPLIED SOILS MECHANICS. ALL FILL OR FUTURE FILL AREAS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE CITY OF CARLSBAD STANDARD SPECIFICATIONS AND THE " EARTHWORK SPECIFICATIONS " ATTACHED TO THE PRELIMINARY SOILS INVESTIGATION. DAILY FIELD COMPACTION REPORTS WILL BE SUBMITTED TO THE PROJECT INSPECTOR.
14. A PRECONSTRUCTION MEETING SHALL BE HELD PRIOR TO THE BEGINNING OF WORK AND SHALL BE ATTENDED BY ALL REPRESENTATIVES RESPONSIBLE FOR CONSTRUCTION, INSPECTION, SUPERVISION, TESTING AND ALL OTHER ASPECTS OF THE WORK. THE CONTRACTOR WILL BE CONTACTED BY THE PROJECT INSPECTOR TO COORDINATE A DATE AND TIME FOR THE PRECONSTRUCTION MEETING. APPROVED DRAWINGS MUST BE AVAILABLE PRIOR TO SCHEDULING. THE GRADING PERMIT WILL BE PROVIDED BY THE PROJECT INSPECTOR AT THE MEETING.
15. ALL INSPECTION REQUESTS OTHER THAN FOR PRECONSTRUCTION MEETING WILL BE MADE BY CALLING THE ENGINEERING 24-HOUR INSPECTION REQUEST LINE AT (760) 438-3891. INSPECTION REQUEST MUST BE RECEIVED PRIOR TO 2:00 P.M. ON THE WORKING DAY BEFORE THE INSPECTION IS NEEDED. INSPECTIONS WILL BE MADE THE NEXT WORK DAY UNLESS YOU REQUEST OTHERWISE. REQUESTS MADE AFTER 2:00 P.M. WILL BE SCHEDULED FOR TWO FULL WORK DAYS LATER.
16. THE OWNER AND/OR APPLICANT THROUGH THE DEVELOPER AND/OR CONTRACTOR SHALL DESIGN, CONSTRUCT AND MAINTAIN ALL SAFETY DEVICES, INCLUDING SHORING, AND SHALL BE SOLELY RESPONSIBLE FOR CONFORMING TO ALL LOCAL, STATE AND FEDERAL SAFETY AND HEALTH STANDARDS, LAWS AND REGULATIONS.
17. THE CONTRACTOR SHALL CONFORM TO LABOR CODE SECTION 6705 BY SUBMITTING A DETAIL PLAN TO THE CITY ENGINEER AND/OR CONCERNED AGENCY SHOWING THE DESIGN OF SHORING, BRACING SLOPING OR OTHER PROVISIONS TO BE MADE OF WORKER PROTECTION FROM THE HAZARD OF CAVING GROUND DURING THE EXCAVATION OF SUCH TRENCH OR TRENCHES OR DURING THE PIPE INSTALLATION THEREIN. THIS PLAN MUST BE PREPARED FOR ALL TRENCHES FIVE FEET (5') OR MORE IN DEPTH AND APPROVED BY THE CITY ENGINEER AND/OR CONCERNED AGENCY PRIOR TO EXCAVATION. IF THE PLAN VARIES FROM THE SHORING SYSTEM STANDARDS ESTABLISHED BY THE CONSTRUCTION SAFETY ORDERS, TITLE 8 CALIFORNIA ADMINISTRATIVE CODE, THE PLAN SHALL BE PREPARED BY A REGISTERED ENGINEER AT THE CONTRACTORS EXPENSE. A COPY OF THE OSHA EXCAVATION PERMIT MUST BE SUBMITTED TO THE INSPECTOR PRIOR TO EXCAVATION.
18. NO BLASTING SHALL BE PERFORMED UNTIL A VALID BLASTING PERMIT HAS BEEN OBTAINED FROM THE CITY OF CARLSBAD. SUBMIT APPLICATION FOR BLASTING PERMIT WELL IN ADVANCE OF THE SCHEDULING OF BLASTING OPERATIONS.
19. IF ANY ARCHAEOLOGICAL RESOURCES ARE DISCOVERED WITHIN ANY WORK AREA DURING CONSTRUCTION, OPERATIONS WILL CEASE IMMEDIATELY, AND THE PERMITTEE WILL NOTIFY THE CITY ENGINEER. OPERATIONS WILL NOT RESTART UNTIL THE PERMITTEE HAS RECEIVED WRITTEN AUTHORITY FROM THE CITY ENGINEER TO DO SO.
20. ALL OPERATIONS CONDUCTED ON THE SITE OR ADJACENT THERETO, INCLUDING WARMING UP, REPAIR, ARRIVAL, DEPARTURE OR OPERATION OF TRUCKS, EARTHMOVING EQUIPMENT, CONSTRUCTION EQUIPMENT AND ANY OTHER ASSOCIATED GRADING EQUIPMENT SHALL BE LIMITED TO THE PERIOD BETWEEN 7:00 A.M. AND 6:00 P.M. EACH DAY, MONDAY THRU FRIDAY AND NO EARTHMOVING OR GRADING OPERATIONS SHALL BE CONDUCTED ON WEEKENDS OR HOLIDAYS. (A LIST OF CITY HOLIDAYS IS AVAILABLE AT THE ENGINEERING DEPARTMENT COUNTER.)
21. ALL OFF-SITE HAUL ROUTES SHALL BE SUBMITTED BY THE CONTRACTOR TO THE CITY INSPECTOR FOR APPROVAL TWO FULL WORKING DAYS PRIOR TO BEGINNING OF WORK. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DEBRIS OR DAMAGE OCCURRING ALONG THE HAUL ROUTE OR ADJACENT STREETS AS A RESULT OF THE GRADING OPERATION.
22. IMPORT MATERIAL SHALL BE OBTAINED FROM, AND WASTE MATERIAL SHALL BE DEPOSITED AT, A SITE APPROVED BY THE CITY ENGINEER. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DEBRIS OR DAMAGE OCCURRING ALONG THE HAUL ROUTES OR ADJACENT STREETS AS A RESULT OF THE GRADING OPERATION.
23. BRUSH SHALL BE REMOVED ONLY WITHIN THE AREA TO BE GRADED. NO TREES ARE TO BE REMOVED UNLESS SPECIFICALLY NOTED ON THE PLAN.
24. ALL AREAS SHALL BE GRADED TO DRAIN. GRADING RESULTING IN THE PONDING OF WATER IS NOT PERMITTED. ALL EARTHEN SWALES AND DITCHES SHALL HAVE A MINIMUM ONE PERCENT SLOPE.
25. THESE PLANS ARE SUBJECT TO A SIGNED AND APPROVED SWPPP AND/OR SET OF EROSION CONTROL PLANS. EROSION CONTROL SHALL BE AS SHOWN AND AS APPROVED BY THE CITY ENGINEER OR AS DIRECTED BY THE PROJECT INSPECTOR.
26. ALL SLOPES SHALL BE TRIMMED TO A FINISH GRADE TO PRODUCE A UNIFORM SURFACE AND CROSS SECTION. THE SITE SHALL BE LEFT IN A NEAT AND ORDERLY CONDITION. ALL STONES, ROOTS OR OTHER DEBRIS SHALL BE REMOVED AND DISPOSED OF AT A SITE APPROVED OF BY THE CITY ENGINEER.
27. ALL SLOPES SHALL BE IRRIGATED, STABILIZED, PLANTED AND/OR HYDROSEEDED WITHIN TEN (10) DAYS OF THE TIME WHEN EACH SLOPE IS BROUGHT TO GRADE AS SHOWN ON THE APPROVED GRADING PLANS.
28. LANDSCAPING SHALL BE ACCOMPLISHED ON ALL SLOPES AND PADS AS REQUIRED BY THE CITY OF CARLSBAD LANDSCAPE MANUAL, THE LANDSCAPING PLANS FOR THIS PROJECT, DRAWING NO. ________, AND/OR AS DIRECTED BY THE CITY ENGINEER OR PLANNING DIRECTOR.
29. THE OWNER/APPLICANT SHALL INSURE THAT ALL CONTRACTORS SHALL COORDINATE THE WORK OF THESE GRADING PLANS WITH THAT SHOWN ON BOTH THE LANDSCAPE AND IRRIGATION PLANS AND THE IMPROVEMENT PLANS AS REQUIRED FOR THIS WORK IN ACCORDANCE WITH THE LANDSCAPE MANUAL TIME REQUIREMENTS.
30. WHERE AN EXISTING PIPE LINE IS TO BE ABANDONED AS A RESULT OF THE GRADING OPERATION, IT SHALL BE REMOVED WITHIN TWENTY FEET OF BUILDING OR STREET AREAS AND REPLACED WITH PROPERLY COMPACTED SOILS. IN OTHER AREAS THE PIPE WILL BE PLUGGED WITH CONCRETE OR REMOVED AS APPROVED BY THE CITY ENGINEER.
31. THE EXISTENCE AND LOCATION OF UTILITY STRUCTURES AND FACILITIES SHOWN ON THE CONSTRUCTION PLANS WERE OBTAINED BY A SEARCH OF THE AVAILABLE RECORDS. ATTENTION IS CALLED TO THE POSSIBLE EXISTENCE OF OTHER UTILITY FACILITIES OR STRUCTURES NOT SHOWN OR IN A LOCATION DIFFERENT FROM THAT SHOWN ON THE PLANS. THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURES TO PROTECT THE UTILITIES SHOWN ON THE PLANS AND ANY OTHER EXISTING FACILITIES OR STRUCTURES NOT SHOWN.
32. THE CONTRACTOR SHALL VERIFY THE LOCATION OF ALL EXISTING FACILITIES (ABOVE GROUND AND UNDER GROUND) WITHIN THE PROJECT SITE SUFFICIENTLY AHEAD OF GRADING TO PERMIT THE REVISION OF THE GRADING PLANS IF IT IS FOUND THAT THE ACTUAL LOCATIONS ARE IN CONFLICT WITH THE PROPOSED WORK.
33. THE CONTRACTOR SHALL NOTIFY AFFECTED UTILITY COMPANIES (SEE BELOW) AT LEAST 2 FULL WORKING DAYS PRIOR TO STARTING GRADING NEAR THEIR FACILITIES AND SHALL COORDINATE THE WORK WITH A COMPANY REPRESENTATIVE.

UNDERGROUND SERVICE ALERT	(800)422-4133
SDG&E	(800)411-7343
AT&T	(800)892-0123
TIME WARNER CABLE	(760)438-7741
COX COMMUNICATIONS	(619)262-1122
CITY OF CARLSBAD(STREETS & STORM DRAIN)	(760)434-2980
*CITY OF CARLSBAD(SEWER,WATER & RECLAIMED WATER)	(760)438-2722
*SAN DIEGUITO WATER DISTRICT	(760)633-2650
*LEUCADIA WASTEWATER DISTRICT	(760)753-0155
*VALLECITOS WATER DISTRICT	(760)744-0460
*OLIVENHAIN WATER DISTRICT	(760)753-6466
*BUENA SANITATION DISTRICT	(760)726-1340 x1330

*AS APPROPRIATE

34. PERMIT COMPLIANCE REQUIREMENTS:
    A. FOR CONTROLLED GRADING – THE APPLICANT HIRES A CIVIL ENGINEER, SOILS ENGINEER, AND/OR GEOLOGIST TO GIVE TECHNICAL ADVICE, OBSERVE AND CONTROL THE WORK IN PROGRESS {15.16.120 A.8} CARLSBAD MUNICIPAL CODE.
    B. PRIOR TO FINAL APPROVAL OF A GRADING PERMIT – THE FOLLOWING REPORTS MUST BE SUBMITTED TO THE CITY ENGINEER VIA THE PROJECT INSPECTOR {15.16.120 A.10} CARLSBAD MUNICIPAL CODE:
       (1) FINAL REPORT BY SUPERVISING GRADING ENGINEER STATING ALL GRADING IS COMPLETE. ALL EROSION CONTROL, SLOPE PLANTING AND IRRIGATION ARE INSTALLED IN CONFORMANCE WITH CITY CODE AND THE APPROVED PLANS (OBTAIN SAMPLE OF COMPLIANCE LETTER FROM CITY ENGINEERING DEPARTMENT).
       (2) AS-BUILT GRADING PLAN.
       (3) REPORT FROM THE SOILS ENGINEER, WHICH INCLUDES RECOMMENDED SOIL BEARING CAPACITIES, A STATEMENT AS TO THE EXPANSIVE QUALITY OF THE SOIL, AND SUMMARIES OF FIELD AND LABORATORY TESTS AND PLOTTED TEST POINTS THE REPORT SHALL ALSO INCLUDE A STATEMENT BY THE SOILS ENGINEER THAT THE GRADING WAS DONE IN ACCORDANCE WITH THE REQUIREMENTS AND RECOMMENDATIONS OUTLINED IN THE PRELIMINARY SOILS REPORT AND ANY SUPPLEMENTS THERETO.
       (4) REPORT WITH AS-BUILT GEOLOGIC PLAN, IF REQUIRED BY THE CITY.
35. UNLESS A GRADING PERMIT FOR THIS PROJECT IS ISSUED WITHIN ONE (1) YEAR AFTER THE CITY ENGINEER'S APPROVAL, THESE PLANS MAY BE REQUIRED TO BE RESUBMITTED FOR PLANCHECK. PLANCHECK FEES WILL BE REQUIRED FOR ANY SUCH RECHECK.
35. IN ACCORDANCE WITH THE CITY STORM WATER STANDARDS, ALL STORM DRAIN INLETS CONSTRUCTED BY THIS PLAN SHALL INCLUDE "STENCILS" BE ADDED TO PROHIBIT WASTEWATER DISCHARGE DOWNSTREAM. STENCILS SHALL BE ADDED TO THE SATISFACTION OF THE CITY ENGINEER.

"DECLARATION OF RESPONSIBLE CHARGE"

I HEREBY DECLARE THAT I AM THE ENGINEER OF WORK FOR THIS PROJECT, THAT I HAVE EXERCISED RESPONSIBLE CHARGE OVER THE DESIGN OF THE PROJECT AS DEFINED IN SECTION 6703 OF THE BUSINESS AND PROFESSIONS CODE, AND THAT THE DESIGN IS CONSISTENT WITH CURRENT STANDARDS.
I UNDERSTAND THAT THE CHECK OF PROJECT DRAWINGS AND SPECIFICATIONS BY THE CITY OF CARLSBAD DOES NOT RELIEVE ME, AS ENGINEER OF WORK, OF MY RESPONSIBILITIES FOR PROJECT DESIGN.

FIRM: ____________
ADDRESS: ____________
CITY, STATE: ____________
TELEPHONE: ____________
BY: ____________ DATE: ____________
(NAME OF ENGINEER)
R.C.E. NO.: ____________
REGISTRATION EXPIRATION DATE: ____________

SOILS ENGINEER'S CERTIFICATE

I, ____________, A REGISTERED (CIVIL/ GEOTECHNICAL) ENGINEER OF THE STATE OF CALIFORNIA, PRINCIPALLY DOING BUSINESS IN THE FIELD OF APPLIED SOILS MECHANICS, HEREBY CERTIFY THAT A SAMPLING AND STUDY OF THE SOIL CONDITIONS PREVALENT WITHIN THIS SITE WAS MADE BY ME OR UNDER MY DIRECTION BETWEEN THE DATES OF ________, 20____ AND ________, 20____. TWO COPIES OF THE SOILS REPORT COMPILED FROM THIS STUDY, WITH MY RECOMMENDATIONS, HAS BEEN SUBMITTED TO THE OFFICE OF THE CITY ENGINEER.

SIGNED: ____________
G.E./P.E. NO.: ____________
DATE: ____________
LICENSE EXPIRATION DATE: ____________

OWNER'S CERTIFICATE

I (WE) HEREBY CERTIFY THAT A REGISTERED SOILS ENGINEER OR GEOLOGIST HAS BEEN OR WILL BE RETAINED TO SUPERVISE OVER-ALL GRADING ACTIVITY AND ADVISE ON THE COMPACTION AND STABILITY OF THIS SITE. IF THIS PROJECT/DEVELOPMENT IS SUBJECT TO A STATE-REGULATED SWPPP, I (WE) ALSO AGREE A QUALIFIED SWPPP PRACTITIONER (QSP) HAS BEEN OR WILL BE RETAINED TO SUPERVISE IMPLEMENTATION OF THE SWPPP IN ACCORDANCE WITH THE CALIFORNIA CONSTRUCTION ORDER AND MUNICIPAL PERMIT, LATEST VERSION.

____
(PRINT NAME BELOW LINE) DATE

EROSION CONTROL NOTES

1. IN CASE EMERGENCY WORK IS REQUIRED, CONTACT ____________ AT ____________ (PHONE NUMBER)
2. EQUIPMENT AND WORKERS FOR EMERGENCY WORK SHALL BE MADE AVAILABLE AT ALL TIMES DURING THE RAINY SEASON. ALL NECESSARY MATERIALS SHALL BE STOCKPILED ON SITE AT CONVENIENT LOCATIONS TO FACILITATE RAPID CONSTRUCTION OF TEMPORARY DEVICES WHEN RAIN IS EMINENT.
3. FOR PROJECTS COVERED BY STATE SWPPP/WDID, IN ACCORDANCE WITH THE CONSTRUCTION ORDER ISSUED BY THE CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD, THE CONTRACTOR'S QUALIFIED SWPPP PRACTITIONER (QSP) SHALL UPDATE AND MAINTAIN THE WATER POLLUTION CONTROL (WPC) PLAN TO ADDRESS UPDATED SITE CONDITIONS OF THE PROJECT. THE UPDATED WPC PLAN AND UPDATED SWPPP SHALL BE KEPT AT THE PROJECT SITE AND MADE AVAILABLE TO THE CITY INSPECTOR. ADDITIONAL CONSTRUCTION BMP'S BEYOND THE ORIGINAL APPROVED SWPPP SHALL BE PROVIDED TO ADDRESS SITE CONDITIONS NOT ANTICIPATED. THE QSP SHALL REPORT BMP DEFICIENCIES TO THE CITY INSPECTOR. THE QSP SHALL OBTAIN APPROVAL FROM THE CONTRACTOR'S QUALIFIED SWPPP DEVELOPER AND THE CITY INSPECTOR REGARDING ANY SIGNIFICANT CHANGES TO BMP DEPLOYMENT.
4. THE CONTRACTOR SHALL RESTORE ALL EROSION CONTROL DEVICES TO WORKING ORDER TO THE SATISFACTION OF THE CITY ENGINEER AFTER EACH RUN-OFF PRODUCING RAINFALL.
5. THE CONTRACTOR SHALL INSTALL ADDITIONAL EROSION CONTROL MEASURES AS MAY BE REQUIRED BY THE CITY ENGINEER AND/OR CITY INSPECTOR DUE TO UNCOMPLETED GRADING OPERATIONS OR UNFORESEEN CIRCUMSTANCES WHICH MAY ARISE.
6. THE CONTRACTOR SHALL BE RESPONSIBLE AND SHALL TAKE NECESSARY PRECAUTIONS TO PREVENT PUBLIC TRESPASS ONTO AREAS WHERE IMPOUNDED WATERS CREATE A HAZARDOUS CONDITION.
7. ALL EROSION CONTROL MEASURES PROVIDED PER THE APPROVED SWPPP AND/OR EROSION CONTROL PLAN SHALL BE INCORPORATED HEREON.
8. GRADED AREAS AROUND THE PROJECT PERIMETER MUST DRAIN AWAY FROM THE FACE OF SLOPE AT THE CONCLUSION OF EACH WORKING DAY.
9. ALL REMOVABLE PROTECTIVE DEVICES SHOWN SHALL BE IN PLACE AT THE END OF EACH WORKING DAY WHEN THE FIVE (5) DAY RAIN PROBABILITY FORECAST EXCEEDS FORTY PERCENT (40%). SILT AND OTHER DEBRIS SHALL BE REMOVED AFTER EACH RAINFALL.
10. ALL GRAVEL BAGS SHALL BE BURLAP TYPE WITH 3/4 INCH MINIMUM AGGREGRATE.
11. SHOULD GERMINATION OF HYDROSEEDED SLOPES FAIL TO PROVIDE EFFECTIVE COVERAGE OF GRADED SLOPES (90% COVERAGE) PRIOR TO NOVEMBER 15, THE SLOPES SHALL BE STABILIZED BY PUNCH STRAW INSTALLED IN ACCORDANCE WITH SECTION 35.023 OF THE EROSION AND SEDIMENT CONTROL HANDBOOK OF THE DEPARTMENT OF CONSERVATION, STATE OF CALIFORNIA.

TEMPORARY EROSION CONTROL PLANTING AND IRRIGATION

ALL PERMANENT AND TEMPORARY EROSION CONTROL PLANTING AND IRRIGATION SHALL BE INSTALLED AND MAINTAINED AS REQUIRED IN SECTION 212 OF THE STANDARD SPECIFICATIONS AND THE FOLLOWING:

A. HYDROSEEDING SHALL BE APPLIED TO:
   1. ALL SLOPES THAT ARE GRADED 6:1 (HORIZONTAL TO VERTICAL) OR STEEPER WHEN THEY ARE:
      a. THREE FEET OR MORE IN HEIGHT AND ADJACENT TO A PUBLIC WALL OR STREET.
      b. ALL SLOPES 4 FEET OR MORE IN HEIGHT.
   2. AREAS GRADED FLATTER THAN 6:1 WHEN ANY OF THE FOLLOWING CONDITIONS EXIST:
      a. NOT SCHEDULED FOR IMPROVEMENTS(CONSTRUCTION OR GENERAL LANDSCAPING) WITHIN 60 DAYS OF ROUGH GRADING.
      b. IDENTIFIED BY THE PARKS AND RECREATION DIRECTOR AS HIGHLY VISIBLE TO THE PUBLIC.
      c. HAVE ANY SPECIAL CONDITION IDENTIFIED BY THE CITY ENGINEER THAT WARRANTS IMMEDIATE TREATMENT.
B. HYDROSEEDED AREAS SHALL BE IRRIGATED IN ACCORDANCE WITH THE FOLLOWING CRITERIA:
   1. ALL SLOPES THAT ARE GRADED 6:1 OR STEEPER AND THAT ARE:
      a. THREE TO EIGHT FEET IN HEIGHT SHALL BE IRRIGATED BY HAND WATERING FROM QUICK COUPLERS/HOSE BIBS OR A CONVENTIONAL SYSTEM OF LOW PRECIPITATION SPRINKLER HEADS PROVIDING 100% COVERAGE.
      b. GREATER THAN 8 FEET IN HEIGHT SHALL BE WATERED BY A CONVENTIONAL SYSTEM OF LOW PRECIPITATION SPRINKLER HEADS PROVIDING 100% COVERAGE.
   2. AREAS SLOPED LESS THAN 6:1 SHALL BE IRRIGATED AS APPROVED BY THE CITY ENGINEER, PRIOR TO HYDROSEEDING. THE DEVELOPER SHALL SUBMIT A PROPOSED SCHEME TO PROVIDE IRRIGATION TO THE CITY ENGINEER. THE PROPOSAL SHALL BE SPECIFIC REGARDING THE NUMBERS, TYPES AND COSTS OF THE ELEMENTS OF THE THE PROPOSED SYSTEM.
   3. IRRIGATION SHALL MAINTAIN THE MOISTURE LEVEL OF THE SOIL AT THE OPTIMUM LEVEL FOR THE GROWTH OF THE HYDROSEEDED GROWTH.
C. HYDROSEEDING MIX SHALL CONSIST OF ALL OF THE FOLLOWING:
   1. SEED MIX SHALL CONSIST OF NO LESS THAN:
      a. 20 lbs. PER ACRE OF ROSE CLOVER
      b. 20 lbs. PER ACRE OF ZORRO FESCUE
      c. 3 lbs. PER ACRE OF E SCHOOL CIA CALIFORNICA
      d. 4 lbs. PER ACRE OF ACHILLEA MILLEFOLIA
      e. 3 lbs. PER ACRE OF ALYSSUM (CARPET OF SNOW)
      f. 1/2 lb. PER ACRE OF DIMORPHOLECA
      g. ITEMS c,d,e, AND f OF THIS SUBSECTION MAY BE OMITTED ON LOCATIONS WHERE THE AREA BEING HYDROSEEDED IS NOT VISIBLE FROM EITHER A PUBLIC STREET OR RESIDENTIAL STRUCTURES.
      h. ITEM a OF THIS SUBSECTION MUST BE INOCULATED WITH A NITROGEN FIXING BACTERIA AND APPLIED DRY EITHER BY DRILLING OR BROADCASTING BEFORE HYDROSEEDING.
      i. ALL SEED MATERIALS SHALL BE TRANSPORTED TO THE JOBSITE IN UNOPENED CONTAINERS WITH THE CALIFORNIA DEPARTMENT OF FOOD AND AGRICULTURE CERTIFICATION TAG ATTACHED TO, OR PRINTED ON SAID CONTAINERS.
      j. NON-PHYTO-TOXIC WETTING AGENTS MAY BE ADDED TO THE HYDROSEED SLURRY AT THE DISCRETION OF THE CONTRACTOR.
   2. TYPE 1 MULCH APPLIED AT THE RATE OF NO LESS THAN 2000 lbs PER ACRE. TYPE 6 MULCH (STRAW) MAY BE SUBSTITUTED, ALL OR PART, FOR HYDRAULICALLY APPLIED FIBER MATERIAL. WHEN STRAW IS USED IT MUST BE ANCHORED TO THE SLOPE BY MECHANICALLY PUNCHING NO LESS THAN 50% OF THE STRAW INTO THE SOIL.
   3. FERTILIZER CONSISTING OF AMMONIUM PHOSPHATE SULFATE, 16-20-0, WITH 15% SULPHUR APPLIED AT THE RATE OF 500 lbs. PER ACRE.
D. AREAS TO BE HYDROSEEDED SHALL BE PREPARED PRIOR TO HYDROSEEDING BY:
   1. ROUGHENING THE SURFACE TO BE PLANTED BY ANY OR A COMBINATION OF:
      a. TRACK WALKING SLOPES STEEPER THAN 6:1
      b. HARROWING AREAS 6:1 OR FLATTER THAT ARE SUFFICIENTLY FRIABLE.
      c. RIPPING AREAS THAT WILL NOT BREAK UP USING ITEMS a OR b ABOVE.
   2. CONDITIONING THE SOILS SO THAT IT IS SUITABLE FOR PLANTING BY:
      a. ADJUSTING THE SURFACE SOIL MOISTURE TO PROVIDE A DAMP BUT NOT SATURATED SEED BED.
      b. THE ADDITION OF SOIL AMENDMENTS, PH ADJUSTMENT, LEACHING COVERING SALINE SOILS TO PROVIDED VIABLE CONDITIONS FOR GROWTH.
E. HYDROSEEDED AREAS SHALL BE MAINTAINED TO PROVIDE A VIGOROUS GROWTH UNTIL THE THE PROJECT IS PERMANENTLY LANDSCAPED OR, FOR AREAS WHERE HYDROSEEDING IS THE THE PERMANENT LANDSCAPING, UNTIL THE PROJECT IS COMPLETED AND ALL BONDS RELEASED.

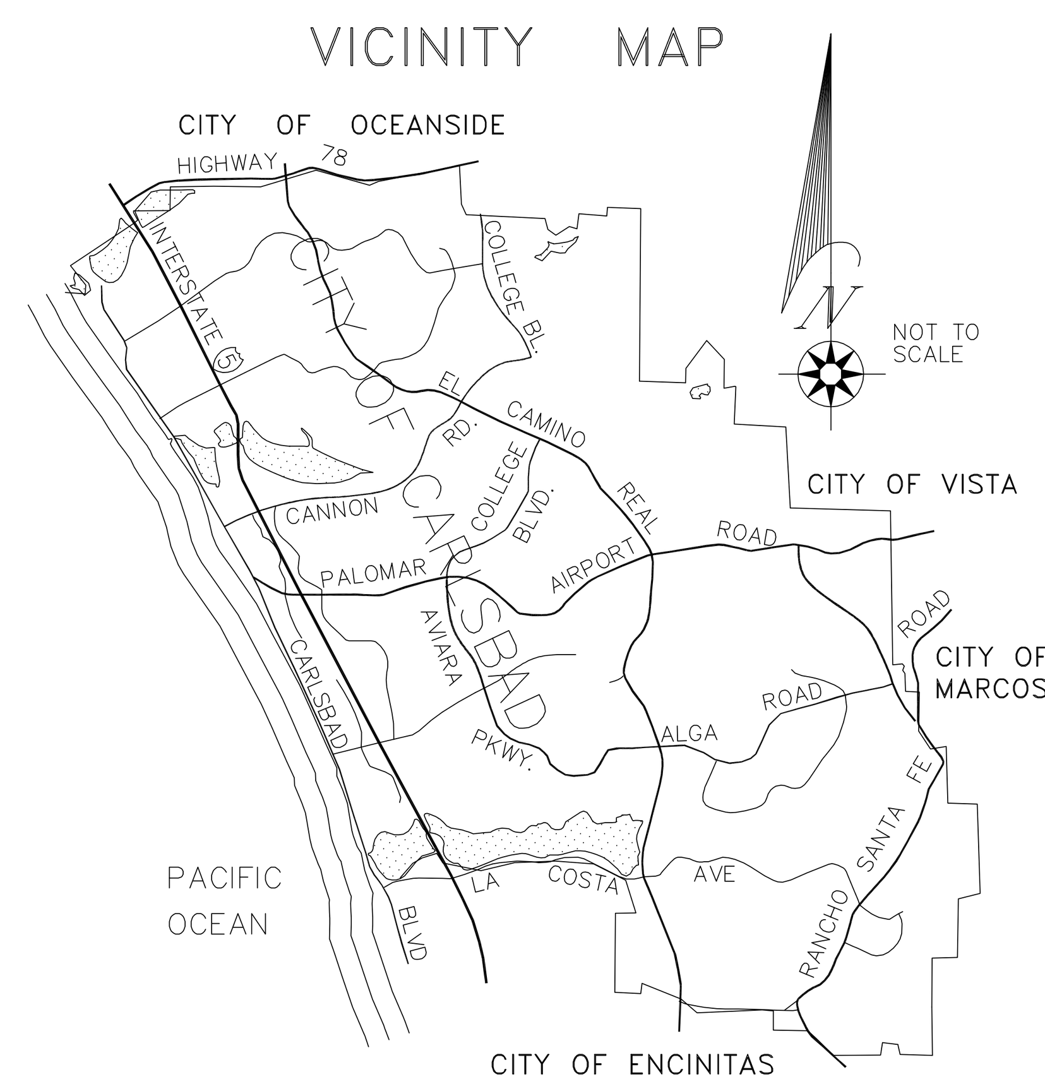
SOURCE OF TOPOGRAPHY

TOPOGRAPHY SHOWN ON THESE PLANS WAS GENERATED BY ________ METHODS FROM INFORMATION GATHERED ON ____________, 20____ BY ____________.
TOPOGRAPHY SHOWN HEREON CONFORMS TO NATIONAL MAP ACCURACY STANDARDS.

PROJECT LOCATION

THIS PROJECT IS LOCATED WITHIN ASSESSORS PARCEL NUMBER(S) ____________

THE CALIFORNIA COORDINATE INDEX OF THIS PROJECT IS: N ____________ E ____________.



INDEX OF SHEETS

LEGAL DESCRIPTION

PROJECT ADDRESS

DEVELOPER

NAME: ____________
ADDRESS: ____________
PHONE NO.: ____________

REFERENCE DRAWINGS

EARTHWORK QUANTITIES

CUT: ________ CY
FILL: ________ CY
IMPORT: ________ CY
EXPORT: ________ CY
REMEDIAL: ________ CY

BENCH MARK

DESCRIPTION: ____________
LOCATION: ____________
RECORDED: ____________
ELEVATION: ____________ DATUM: NGVD 29

WORK TO BE DONE

THE GRADING WORK SHALL CONSIST OF THE CONSTRUCTION OF ALL CUTS AND FILLS, REMEDIAL GRADING, DRAINAGE FACILITIES, EROSION CONTROL FACILITIES, AND PLANTING OF PERMANENT LANDSCAPING AND PREPARATION OF AS-BUILT GRADING PLANS, AS-BUILT GEOLOGIC MAPS AND REPORTS, ALL AS SHOWN OR REQUIRED ON THIS SET OF PLANS AND THE CITY STANDARDS, SPECIFICATIONS, REQUIREMENTS, RESOLUTIONS AND ORDINANCES CITED ON THESE PLANS.

THE GRADING WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE FOLLOWING DOCUMENTS, CURRENT AT THE TIME OF CONSTRUCTION, AS DIRECTED BY THE CITY ENGINEER.

1. CARLSBAD MUNICIPAL CODE
2. CITY OF CARLSBAD ENGINEERING STANDARDS
3. THIS SET OF PLANS
4. RESOLUTION NO. ________ DATED ________
5. THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION (GREEN BOOK).
6. SOILS REPORT AND RECOMMENDATIONS BY ____________ DATED ________
7. THE SAN DIEGO REGIONAL STANDARD DRAWINGS AND AS MAY BE MODIFIED BY THE CITY OF CARLSBAD STANDARDS.
8. CALIFORNIA COASTAL COMMISSION DEVELOPMENT PERMIT CONDITIONS DATED ____________
9. ENVIRONMENTAL APPROVAL DOCUMENTS DATED ____________
10. STORM WATER POLLUTION PREVENTION PLAN PREPARED BY ____________ DATED ________ SW NO. ________ WDID NO. 9 375 ____________
11. STORM WATER MANAGEMENT PLAN PREPARED BY ____________ DATED ________ SWMP NO. ________
12. CALIFORNIA STORM WATER QUALITY ASSOCIATION BMP CONSTRUCTION HANDBOOK AND CALTRANS CONSTRUCTION SITE BMP MANUAL.

ABANDONMENT NOTES

PARTIALLY COMPLETED PROJECTS SEEKING TO INDEFINITELY STOP WORK AND CLOSE THE GRADING PERMIT MUST IMPLEMENT APPROPRIATE ACCESS RESTRICTION AND EROSION AND SEDIMENT CONTROL MEASURES TO THE SATISFACTION OF THE CITY, INCLUDING BUT NOT LIMITED TO THE FOLLOWING:

1) PERMANENTLY STABILIZE ALL SLOPES (>5%) – 70% COVER WITH WELL-ESTABLISHED, SUSTAINABLE, NON-WEED VEGETATION (SEE CITY LANDSCAPE MANUAL FOR GUIDELINES) IS CONSIDERED ADEQUATE.
2) PERMANENTLY STABILIZE FLAT AREAS (≤5%) – 70% COVER WITH WELL-ESTABLISHED, SUSTAINABLE, NON-WEED VEGETATION (SEE CITY LANDSCAPE MANUAL FOR GUIDELINES) OR 2 INCHES (MINIMUM) OF PERMEABLE COVER (E.G., GRAVEL) IS CONSIDERED ADEQUATE.
3) RESTRICT ACCESS TO SITE – COORDINATE WITH CITY STAFF TO DETERMINE APPROPRIATE FENCING TYPE.
4) SIGNAGE ALONG FRONTAGE ROAD(S) POSTING THAT DUMPING, LITTERING, AND TRESPASSING ARE PROHIBITED.
5) TRESPASS ENFORCEMENT AUTHORIZATION LETTER MUST BE SENT FROM THE OWNER TO THE CITY OF CARLSBAD POLICE DEPARTMENT.
6) NOTARIZE AND RECORD AGAINST THE PROPERTY AN AGREEMENT STATING THAT OWNER IS RESPONSIBLE FOR MAINTAINING FENCING AND SIGNAGE, ADHERING TO THE FIRE PREVENTION ORDINATION, KEEPING THE SITE FREE FROM LITTER ACCUMULATION AND VEGETATION GROWTH, AND REMOVING ANY ILLEGALLY DUMPED MATERIALS AT THE SITE UNTIL THE PROPERTY IS DEVELOPED IN THE FUTURE.

LEGEND

DESCRIPTION	DWG.NO.	SYMBOL	QUANTITY

POST-CONSTRUCTION BMP TABLE

STORMWATER REQUIREMENTS THAT APPLY:
☐ STANDARD STORMWATER REQUIREMENTS
☐ PRIORITY PROJECT REQUIREMENTS

EXEMPT FROM HYDROMODIFICATION?
☐ YES (SEE SWMP FOR DOCUMENTATION)
☐ NO

TYPE	DESCRIPTION	OWNERSHIP	MAINTENANCE AGREEMENT	SHEET NO.	MAINTENANCE FREQUENCY

TOTAL LOT AREA = ____________
TOTAL DISTURBED AREA = ____________
(THIS AREA INCLUDES BUT IS NOT LIMITED TO OFF-SITE WORK INCLUDING PUBLIC IMPROVEMENTS AND TEMPORARY DISTURBANCE SUCH AS VEHICLE AND EQUIPMENT STAGING AREAS, CONSTRUCTION WORKER FOOT TRAFFIC, SOIL/GRAVEL PILES, UTILITY TRENCHES, BACKFILL CUTS AND SLOPE KEYWAYS)
TOTAL REPLACED IMPERVIOUS AREA = ________
TOTAL PROPOSED IMPERVIOUS AREA = ________

"AS BUILT"

____________ ________
RCE ______ EXP. ______ DATE

REVIEWED BY:
____________ ________
INSPECTOR DATE

DATE	INITIAL	REVISION DESCRIPTION	DATE	INITIAL	DATE	INITIAL
ENGINEER OF WORK			OTHER APPROVAL		CITY APPROVAL	

SHEET | CITY OF CARLSBAD ENGINEERING DEPARTMENT | SHEETS

GRADING PLANS FOR:

TITLE SHEET

APPROVED: JASON S. GELDERT
CITY ENGINEER RCE 63912 EXPIRES 9/30/16 DATE

DWN BY: ______
CHKD BY: ______
RVWD BY: ______

PROJECT NO. | DRAWING NO.

D:\DRAWING FILES\TITLE SHEETS\GRADING TITLE SHEET.DWG REVISED: 01/05/16

RECYCLED WATER SYSTEM (PRIVATE)

PROJECT NAME

(PROJECT ADDRESS)

RW XXXX

PRIVATE RECYCLED WATER SYSTEM

SHEET TITLE	SHEET NUMBER
TITLE SHEET	
IRRIG. LEGEND & NOTES	
IRRIGATION PLANS	
IRRIGATION DETAILS	

GENERAL NOTES

RECYCLED WATER NOTES

1. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE CARLSBAD MUNICIPAL WATER DISTRICT'S RULES AND REGULATIONS.
2. DRINKING WATER FOUNTAINS AND DESIGNATED OUTDOOR EATING AREAS SHALL BE PROTECTED AGAINST CONTACT WITH RECYCLED WATER SPRAY, MIST OR MISTING.
3. BEST MANAGEMENT PRACTICES SHALL BE USED TO ELIMINATE OR CONTROL TO THE BEST EXTENT POSSIBLE PONDING, RUN-OFF, OVER-SPRAY, AND MISTING.
4. HOSE BIBS ARE STRICTLY PROHIBITED.
5. CROSS-CONNECTIONS BETWEEN RECYCLED WATER LINES AND POTABLE WATER LINES ARE STRICTLY PROHIBITED.
6. NO SUBSTITUTION OF PIPE MATERIALS WILL BE ALLOWED WITHOUT PRIOR APPROVAL OF THE CITY OF CARLSBAD MUNICIPAL WATER DISTRICT.
7. ALL MAINLINE PIPES SHALL HAVE WARNING TAPE PER CARLSBAD MUNICIPAL WATER DISTRICT'S RULES AND REGULATIONS.
8. HOURS FOR IRRIGATION WITH RECYCLED WATER ARE FROM 9:00 P.M. TO 6:00 A.M. THE HOURS FOR IRRIGATION WITH DISINFECTED TERTIARY RECYCLED WATER MAY BE MODIFIED BY THE LOCAL AUTHORITY. IRRIGATION DURING PUBLIC USE PERIODS WITH DISINFECTED TERTIARY RECYCLED WATER SHALL BE UNDER THE SUPERVISION OF THE DESIGNATED USER SUPERVISOR. IRRIGATION WITH WATER OF A LESSER QUALITY THAN DISINFECTED TERTIARY RECYCLED WATER SHALL BE BETWEEN THE HOURS OF 9:00 P.M. TO 6:00 A.M.
9. BURIAL OF ALL WIRING AND PIPING SHALL MEET CARLSBAD MUNICIPAL WATER DISTRICT'S RULES AND REGULATIONS.
10. NON-DESIGNATED USE AREAS SHALL BE PROTECTED FROM CONTACT WITH RECYCLED WATER, WHETHER BY WIND BLOWN SPRAY OR BY DIRECT APPLICATION THROUGH IRRIGATION OR OTHER USE. LACK OF PROTECTION, WHETHER BY DESIGN, CONSTRUCTION PRACTICE OR SYSTEM OPERATION IS STRICTLY PROHIBITED.
11. IRRIGATION HEADS SHALL BE RELOCATED OR ADJUSTED TO MINIMIZE OR ELIMINATE OVER-SPRAYING ON SIDEWALKS, STREETS AND NON-DESIGNATED USE AREAS.
12. RECYCLED WATER QUICK COUPLING VALVES SHALL BE OF A TYPE DESIGNED FOR THE USE ON RECYCLED WATER DISTRIBUTION SYSTEMS PER CARLSBAD MUNICIPAL WATER DISTRICT'S RULES AND REGULATIONS.
13. ON RECYCLED WATER SYSTEMS, ALL APPURTENANCES (SPRINKLER HEADS, VALVE BOXES, ETC.) SHALL BE COLOR-CODED PURPLE PER AWWA GUIDELINES AND SECTION 116815 OF THE CALIFORNIA HEALTH AND SAFETY CODE.
14. ALL IRRIGATION PIPE SHALL BE STENCILED WITH WARNING, "NON-POTABLE OR RECYCLED WATER", COLOR-CODED (PURPLE) AND LAID WITH WARNING TAPE AND STENCILING ORIENTED TOWARD THE TOP OF THE TRENCH PER THE CARLSBAD MUNICIPAL WATER DISTRICT'S RULES AND REGULATIONS.
15. ON NEW ON-SITE SYSTEMS (POST-METER), POTABLE WATER, CONSTANT PRESSURE RECYCLED WATER AND SEWER LINES SHOULD BE PLACED A MINIMUM OF FOUR FEET APART OR AS DIRECTED BY THE PROJECT ENGINEER AND/OR REGULATORY AGENCY. MEASUREMENTS SHALL BE BETWEEN FACING SURFACES, NOT PIPE CENTERLINES.
16. CONSTANT PRESSURE RECYCLED WATER LINES SHALL CROSS AT LEAST TWELVE INCHES BELOW POTABLE WATER LINES AND MAINTAIN AT LEAST TWELVE INCHES CROSSING SEPARATION BETWEEN OTHER UTILITIES.
17. IF A CONSTANT PRESSURE RECYCLED WATER LINE MUST BE INSTALLED ABOVE A POTABLE WATER LINE OR LESS THAN TWELVE INCHES BELOW A POTABLE WATER LINE, THEN THE RECYCLED WATER LINE SHALL BE INSTALLED WITHIN AN APPROVED PROTECTIVE SLEEVE AS PER THE CARLSBAD MUNICIPAL WATER DISTRICT'S RULES AND REGULATIONS.
18. THE REQUIRED CROSS-CONNECTION SHUTDOWN TEST SHALL BE DONE BY THE CARLSBAD MUNICIPAL WATER DISTRICT AND THE SAN DIEGO COUNTY DEPARTMENT OF ENVIRONMENTAL HEALTH.
19. THE REQUIRED CROSS-CONNECTION INSPECTION SHALL BE DONE BY EITHER THE CARLSBAD MUNICIPAL WATER DISTRICT AND/OR THE SAN DIEGO COUNTY DEPARTMENT OF ENVIRONMENTAL HEALTH. COPIES OF INSPECTION REPORTS WILL BE FORWARDED TO THE NON-INSPECTING PARTY.
20. THE DESIGN AND LOCATIONS PROPOSED FOR RECYCLED WATER "DO NOT DRINK" SIGN SHALL BE CALLED OUT ON THE PLANS.
21. WHEN RECYCLED WATER BECOMES AVAILABLE, AN ON-SITE USER SUPERVISOR SHALL BE DESIGNATED IN WRITING. THIS INDIVIDUAL SHALL BE FAMILIAR WITH PLUMBING SYSTEM WITHIN THE PROPERTY, WITH THE BASIC CONCEPTS OF BACKFLOW/CROSS-CONNECTION PROTECTION, THE RECYCLED PUREYOR'S RULES AND REGULATIONS AND THE SPECIFIC REQUIREMENTS OF A RECYCLED WATER SYSTEM. COPIES OF THE DESIGNATION, WITH CONTACT PHONE NUMBERS SHALL BE PROVIDED TO THE CARLSBAD MUNICIPAL WATER DISTRICT.

    IN CASE OF EMERGENCY CONTACT AT

    OR AFTER HOURS CONTACT AT

22. ALL PUBLIC AND PRIVATE POTABLE WATER MAINS INCLUDING FIRE MAINS AND ANY WATER WELLS AND WATER COURSES WITHIN THE RECYCLED WATER PROJECT SHALL BE SHOWN ON THE PLANS.
23. CALL OUT ON THE PLANS IF THERE ARE OR ARE NOT DRINKING FOUNTAINS AND/OR DESIGNATED OUTDOOR EATING AREAS ON THE SITE.
24. A PHYSICAL SEPARATION SHALL BE PROVIDED BETWEEN ADJACENT AREAS IRRIGATED WITH RECYCLED WATER AND POTABLE WATER. SEPARATION SHALL BE PROVIDED BY DISTANCE, CONCRETE MOW STRIPS OR OTHER APPROVED METHODS.
25. ALL IRRIGATION BACKFLOW PREVENTERS SHALL BE TESTED BY A CERTIFIED TESTER AND RESULTS MUST BE GIVEN TO THE CITY AND THE CARLSBAD MUNICIPAL WATER DISTRICT. PIPE BETWEEN THE METER AND BACKFLOW PREVENTER SHALL BE "SCHEDULE K HARD COPPER". APPROVED CONTRACT BACKFLOW TESTERS CAN BE FOUND ON THE CITY WEB SITE AT WWW.CI.CARLSBAD.CA.US/PDFDOC.HTML?PID=340.

SIGNAGE NOTES

THE FOLLOWING GUIDELINES FOR THE USE OF RECYCLED WATER ARE TO BE PERMANENTLY POSTED INSIDE THE DOOR OF EACH CONTROLLER WHERE THEY ARE EASILY VISIBLE. PLACE ON 8-1/2" X 11" SIZED SIGN.

COLOR: PURPLE BACKGROUND WITH BLACK LETTERING.

1. GUIDELINES FOR RECYCLED WATER USE
   - A. IRRIGATE BETWEEN THE HOURS OF 10:00 P.M. AND 6:00 A.M. ONLY. WATERING OUTSIDE THIS TIME FRAME MUST BE DONE MANUALLY WITH QUALIFIED SUPERVISORY PERSONNEL ON-SITE. NO SYSTEM SHALL AT ANY TIME BE LEFT UNATTENDED DURING USE OUTSIDE THE NORMAL SCHEDULE.
   - B. IRRIGATE IN A MANNER THAT WILL MINIMIZE RUN-OFF, POOLING, AND PONDING. THE APPLICATION RATE SHALL NOT EXCEED THE INFILTRATION RATE OF THE SOIL. TIMERS MUST BE ADJUSTED SO AS TO BE COMPATIBLE WITH THE LOWEST SOIL INFILTRATION RATE PRESENT. THIS PROCEDURE MAY BE FACILITATED BY THE EFFICIENT SCHEDULING OF THE AUTOMATIC CONTROL CLOCKS, (I.E., EMPLOYING THE REPEAT FUNCTION TO BREAK UP THE TOTAL IRRIGATION TIME INTO CYCLES THAT WILL PROMOTE MAXIMUM SOIL ABSORPTION).
   - C. ADJUST SPRAY HEADS TO ELIMINATE OVERSPRAY ONTO AREAS NOT UNDER THE CONTROL OF THE CUSTOMER. FOR EXAMPLE, POOL DECKS, PRIVATE PATIOS AND LOTS, AND STREETS AND SIDEWALKS.
   - D. MONITOR AND MAINTAIN THE SYSTEM TO MINIMIZE EQUIPMENT AND MATERIAL FAILURE. BROKEN SPRINKLER HEADS, LEAKS, UNRELIABLE VALVES, ETC., SHOULD BE REPAIRED AS SOON AS THEY BECOME APPARENT.
   - E. THE LANDSCAPE CONTRACTOR IS RESPONSIBLE FOR EDUCATING EACH EMPLOYEE AND ALL MAINTENANCE PERSONNEL ON A CONTINUOUS BASIS, REGARDING THE PRESENCE OF RECYCLED WATER. MAINTENANCE PERSONNEL MUST BE INFORMED THAT WATER IS FOR IRRIGATION PURPOSES ONLY AND IS NOT APPROVED FOR DRINKING OR FOR HAND AND TOOL WASHING, ETC.
   - F. OBTAIN PRIOR APPROVAL OF ALL PROPOSED CHANGES AND MODIFICATIONS TO ANY PRIVATE ON-SITE FACILITIES. SUCH CHANGES MUST BE SUBMITTED TO, AND APPROVED BY, THE DISTRICT ENGINEERING OFFICE AND DESIGNED IN ACCORDANCE WITH DISTRICT STANDARDS.
     1. ALL RECYCLED WATER SPRINKLER CONTROL VALVES SHALL BE TAGGED WITH IDENTIFICATION TAGS.
        - A. TAGS SHALL BE WEATHERPROOF PLASTIC, 3"x 4", PURPLE IN COLOR, WITH THE WORDS "WARNING RECYCLED WATER – DO NOT DRINK" IMPRINTED ON ONE SIDE, AND "AVISO – AGUA IMPURA– NO TOMAR" IMPRINTED ON THE OTHER SIDE. IMPRINTING SHALL BE PERMANENT AND BLACK IN COLOR. USE TAGS AS MANUFACTURED BY T. CHRISTY ENTERPRISES OR APPROVED EQUAL.
        - B. ONE TAG SHALL BE ATTACHED TO EACH VALVE AS FOLLOWS:
          1. ATTACH TO VALVE STEM DIRECTLY OR WITH PLASTIC TIE-WRAP OR
          2. ATTACH TO SOLENOID WIRE DIRECTLY OR WITH PLASTIC TIE-WRAP OR
          3. ATTACH TO VALVE COVER WITH EXISTING VALVE COVER BOLT.
     2. ALL SPRINKLER HEADS SHALL BE IDENTIFIED AS RECYCLED WATER SPRINKLER HEADS.
   - G. EACH AUTOMATIC CONTROLLER AND ITS ASSOCIATED EQUIPMENT SHALL BE IDENTIFIED WITH A SIGN BEARING THE WORDS "RECYCLED WATER USED FOR IRRIGATION" IN ENGLISH AND SPANISH, WITH BLACK LETTERS 1" HIGH ON A PURPLE BACKROUND. THE SIGN SHALL BE PLACED SO THAT IT CAN BE READILY SEEN BY ANY OPERATIONS PERSONNEL UTILIZING THE EQUIPMENT.

DECLARATION OF RESPONSIBLE CHARGE:

I HEREBY DECLARE THAT I AM _____ OF WORK FOR THIS PROJECT, THAT I HAVE EXERCISED RESPONSIBLE CHARGE OVER THE DESIGN OF THIS PROJECT AS DEFINED IN SECTION 6703 OF THE BUSINESS AND PROFESSIONS CODE AND THAT THE DESIGN IS CONSISTENT WITH CURRENT STANDARDS.

I UNDERSTAND THAT THE CHECK OF PROJECT DRAWINGS AND SPECIFICATIONS BY THE CITY OF CARLSBAD AND SAN DIEGO COUNTY DEPARTMENT OF HEALTH SERVICES IS CONFINED TO A REVIEW ONLY AND DOES NOT RELIEVE ME, AS _____ OF WORK, OF MY RESPONSIBILITIES FOR PROJECT DESIGN.

FIRM NAME & ADDRESS:

_____

_____

_____

PHONE NO: (____) _____

REGISTRATION NO: _____ EXPIRATION DATE: _____

PROJECT MAP

SHOW ON MAP:

STREETS & STREET NAMES, SHEET & SHEET NUMBERS, DWELLING UNITS, DRINKING FOUNTAINS, LIMIT LINE OF RECYCLED WATER USE, MAIN LINE GATE VALVES, METERS, LAKES & RECREATIONAL AREAS, OPEN SPACE AREAS, NORTH ARROW, SCALE OF MAP, BOUNDARY LIMITS, MATCH LINES, SCALE, ASSESSORS PARCEL NUMBER, INDEX OF SHEETS, RESERVOIRS, SHOW POINTS OF CONNECTION AND LOCATION OF "DO NOT DRINK" SIGNS.

REGARDING THE FOLLOWING SHEETS:

THE NEXT ONE OR MORE SHEETS SHOULD BE THE IRRIGATION & LANDSCAPE NOTES, SYMBOLS, LEGENDS, ETC. AFTER THESE SHEETS WILL BE YOUR ACTUAL CONSTRUCTION (IRRIGATION) PLANS. LAST SHEET/S WILL BE YOUR DETAIL SHEETS.

KEEP IN MIND THE OBJECTIVE IS TO HAVE A PLAN THAT IS UNDERSTANDABLE TO OPERATION AND MAINTENANCE PEOPLE. THE INDEX-KEY MAP SHOULD ENABLE A PERSON TO EASILY LOCATE THE CONTROL VALVES AND QUICKLY GAIN AN UNDERSTANDING OF THE ENTIRE RECYCLED SYSTEM AND IT'S LIMITS.

IMPROVEMENT PLANS INCLUDE:

A DESCRIPTION & LOCATION OF WATER SERVICES INCLUDING TYPE (DOMESTIC OR RECYCLED). DESIGN P.S.I. AND INSTALLATION REQUIREMENTS, MINIMUM VERTICAL DEPTH, HORIZONTAL SEPARATION, IDENTIFICATION, AND CROSS CONNECTION CONTROL. LOCATE ALL PUBLIC FACILITIES INCLUDING DRINKING FOUNTAINS, FOOD SERVICE AND PICNIC AREAS, SWIMMING POOLS, SIDEWALK AREAS, EATING TABLES AND AREAS, WALLS, TOPOGRAPHY OF SITE, DIRECTION OF DRAINAGE, LOCATION OF WELLS, STREAMS, LIMIT LINE OF 100 YEAR FLOOD PLAIN, EXISTING/PROPOSED SEWER, EXISTING & PROPOSED RECYCLED AND POTABLE WATER SYSTEMS.

LEGEND

- (W) POTABLE WATER METER
- (R) RECYCLED WATER METER
- BACKFLOW PREVENTION DEVICE INSTALL PER CMWD
- —W— POTABLE WATER LINE
- —RW— RECYCLED WATER LINE
- —RC— RECYCLED WATER PRESSURE SUPPLY LINE
- —FS— FIRE SERVICE LINE
- RECYCLED WATER USE AREA
- △ DO NOT DRINK SIGN
- OUTDOOR EATING AREA (PROTECTED AGAINST CONTACT WITH RECYCLED WATER)

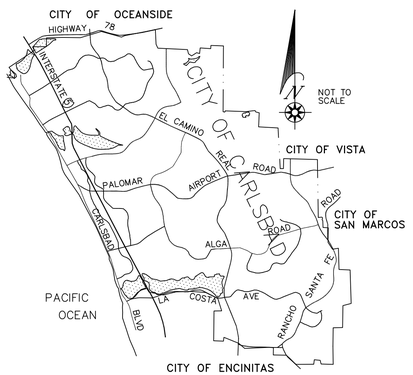
INSPECTION PROCEDURES

1. CITY CONSTRUCTION INSPECTION SHALL INCLUDE:
   - A. LOCATION OF PIPE LINES.
   - B. TRENCH DEPTH.
   - C. REQUIRED SEPARATION (HORIZONTALLY AND VERTICALLY).
   - D. PIPE IDENTIFICATION.
   - E. POINTS-OF-CONNECTION (POC'S).
   - F. LOCATION AND IDENTIFICATION OF SPRINKLER HEADS.
   - G. WARNING SIGNS AT THE SITE AND ON THE TRUCKS HAULING RECYCLED WATER (IF RECYCLED WATER IS USED FOR CONSTRUCTION).

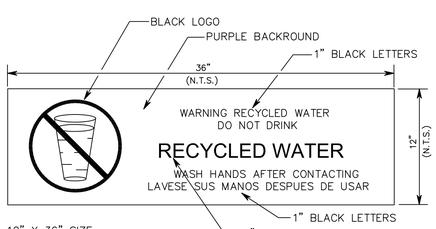
   AN APPROVAL LETTER REGARDING THE INSPECTION OF THE PROJECT SHALL BE OBTAINED FROM THE CITY AND THE DISTRICT, AND BE FORWARDED TO THE COUNTY HEALTH DEPARTMENT PRIOR TO FINAL INSPECTION APPROVAL.
2. DISTRICT FINAL INSPECTION SHALL INCLUDE:
   - A. COVERAGE TEST, AFTER COMPLETION OF THE SPRINKLER SYSTEM, TO DETERMINE THE ADEQUACY OF COVERAGE ON THE APPROVED USE AREA AND PROTECTION OF AREAS NOT APPROVED FOR RECEIVING RECYCLED WATER.
   - B. WARNING SIGNS AND LABELS.
   - C. QUICK COUPLING VALVES.
   - D. ALL ASPECTS OF THE IRRIGATION CONDITIONS INCLUDING WINDBLOWN SPRAY, RUNOFF, AND PONDING.
   - E. REQUIRED PROTECTION OF ALL RESIDENTIAL AREAS.
   - F. REQUIRED PROTECTION OF WELL, STREAMS, RESERVOIRS, ETC.
   - G. CROSS-CONNECTION.
3. ANNUAL INSPECTION SHALL INCLUDE:

   A COMPLETE INSPECTION WHICH SHOULD COVER PART A, PART B AND PART G OF THE DISTRICT FINAL INSPECTION.

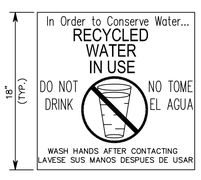
   REVISIONS MUST BE APPROVED BY PUBLIC HEALTH ENGINEER, CITY ENGINEER & DISTRICT ENGINEER PRIOR TO IMPLEMENTATION IN FIELD.



VICINITY MAP



12" X 36" SIZE
.032 ALUMINUM, .060 ABS PLASTIC
OR STICK-ON VINYL SIGNS



18" X 18" SIZE
.032 ALUMINUM, .060 ABS PLASTIC
OR STICK-ON VINYL SIGNS

TYPICAL SIGNS

DIGALERT

DIAL TOLL FREE
1 - 800 - 422 - 4133
AT LEAST TWO DAYS BEFORE YOU DIG

UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

DEVELOPER

NAME: _____

ADDRESS: _____

PHONE NO.: _____

ARCHITECT/ ENGINEERS STAMP SEAL

Expiration Date: _____

CARLSBAD MUNICIPAL WATER DISTRICT

_____ _____

WILLIAM E. PLUMMER DATE

DEPUTY CITY ENGINEER R.C.E.28176 EXP.3/31/10

DEVELOPERS NAME: _____

ADDRESS: _____

TELEPHONE: _____

DATE PLAN PREPARED: _____

BY: _____

	DATE	INITIAL
ENGINEER OF WORK		

REVISION DESCRIPTION	DATE	INITIAL	DATE	INITIAL
	OTHER APPROVAL		CITY APPROVAL	

COUNTY OF SAN DIEGO
DEPARTMENT OF ENVIRONMENTAL HEALTH
LAND AND WATER QUALITY DIVISION

_____ _____

GLENN LEEKS DATE
ENVIRONMENTAL HEALTH SPECIALIST

APPROVED

_____ _____

ENGINEERING PLANCHECKER DATE

"AS BUILT"

_____ _____

TITLE DATE

REVIEWED BY:

_____ _____

INSPECTOR DATE

CARLSBAD MUNICIPAL WATER DISTRICT

SHEET | CITY OF CARLSBAD PLANNING DEPARTMENT | SHEETS

PRIVATE (ONSITE) RECYCLED WATER SYSTEM FOR:

APPROVED

_____ _____

ASSISTANT PLANNING DIRECTOR DATE

DRWN BY:	PROJECT NO.	DRAWING NO.
CHCKD BY:		

CITY OF CARLSBAD
ENGINEERING STANDARDS

VOLUME 3 – STANDARD DRAWINGS AND SPECIFICATIONS

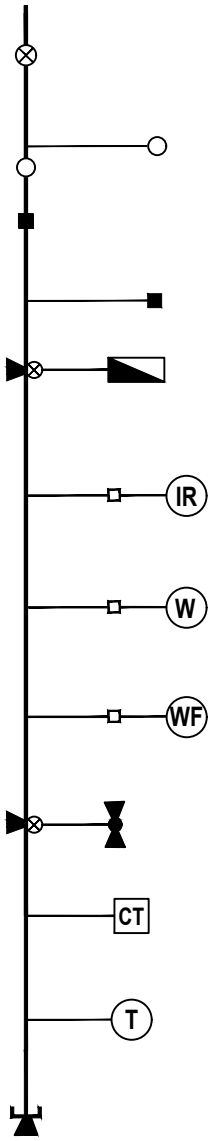
CHAPTER 4 – POTABLE & RECYCLED WATER STANDARD DRAWINGS

TABLE OF CONTENTS

CHAPTER 4 – POTABLE & RECYCLED WATER STANDARD DRAWINGS

TABLE OF CONTENTS (CONTINUED)

DESCRIPTION	ABBREVIATION	C.M.W.D. DWG. NO.	SYMBOL
WATER PIPELINE (Size Per Plan)	W	W-2	
RECYCLED WATER PIPELINE (Size Per Plan)	RW	W-2	
GATE VALVE	GV	W-21	
BUTTERFLY VALVE	BFV	W-22	
BLOW-OFF ASSEMBLY (Over main or lateral installation)	BO	W-15, W-16	
MANUAL AIR RELEASE ASSEMBLY	MAR	W-10	
AIR VACUUM ASSEMBLY	AVA	W-11, W-12	
DOUBLE CHECK DETECTOR ASSEMBLY	DCDA	W-8, W-9	
REDUCED PRESSURE PRINCIPLE ASSEMBLY	RP		
IRRIGATION SERVICE (2" unless shown otherwise)	IR	W-3, W-4	
WATER SERVICE (1" unless shown otherwise)	W	W-3, W-4, W-7	
WATER SERVICE WITH FIRE SPRINKLER (1" unless shown otherwise)	WF	W-5	
FIRE HYDRANT	FH	W-17, W-18	
CATHODIC TEST STATION	CT	WC-1 through WC-16	
TRACER WIRE	T	W-28	
END CAP ASSEMBLY WITH THRUST BLOCK		W-19	



REV.	APPROVED	DATE

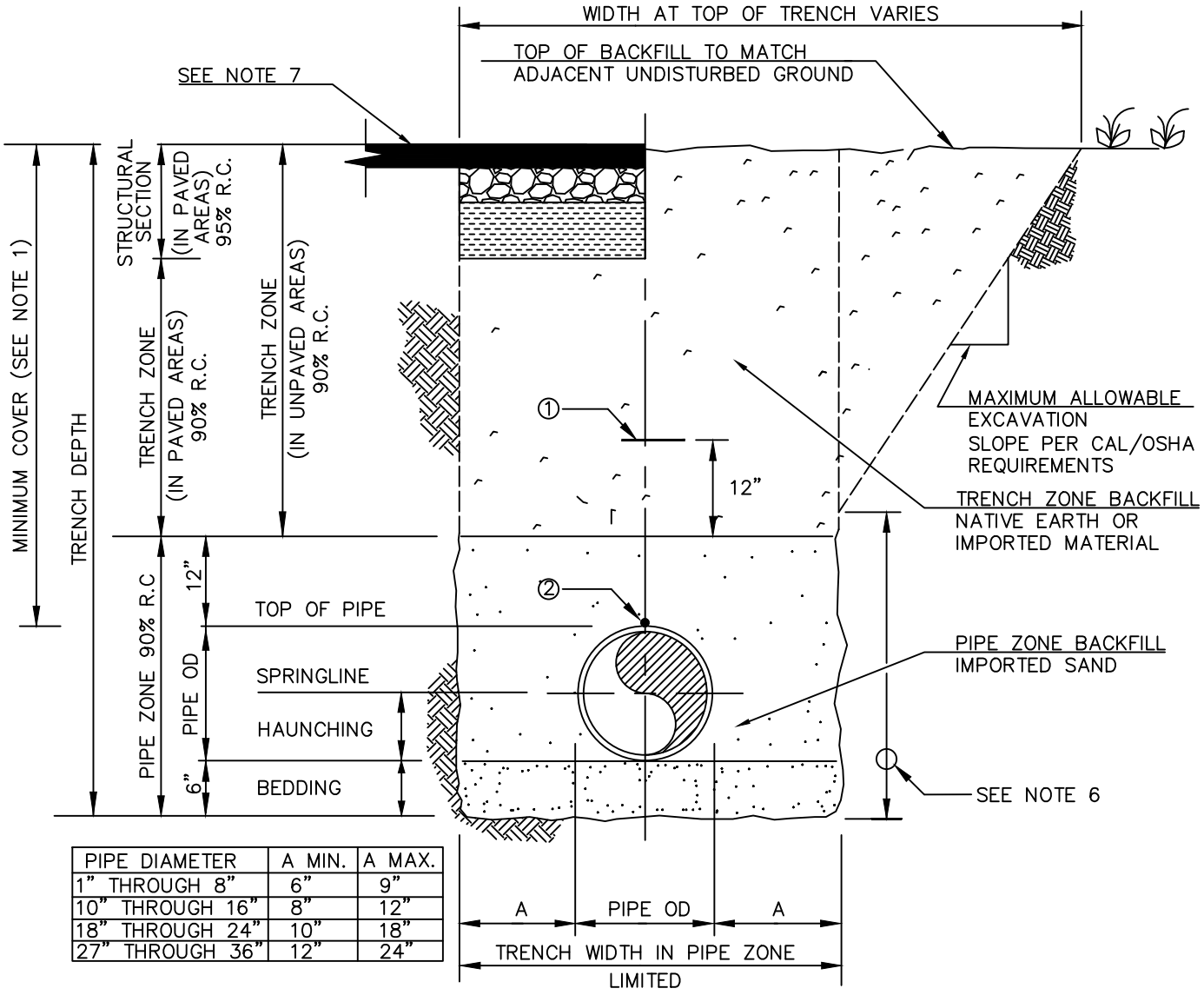
CARLSBAD MUNICIPAL WATER DISTRICT

STANDARD SYMBOLS FOR IMPROVEMENT PLANS

DISTRICT ENGINEER
RCE 55974

4/29/22
DATE

STANDARD DWG. NO. W-1



PIPE DIAMETER	A MIN.	A MAX.
1" THROUGH 8"	6"	9"
10" THROUGH 16"	8"	12"
18" THROUGH 24"	10"	18"
27" THROUGH 36"	12"	24"

NOTES:

1. PIPE MINIMUM COVER PER SPEC. 02223.
2. PERCENTAGES SHOWN EQUAL MINIMUM RELATIVE COMPACTION.
3. MINIMUM DEPTH OF COVER FROM TOP OF PIPE TO FINISH GRADE SHALL BE 3 FEET. FOR COVER LESS THAN 3', SPECIAL DESIGN AND APPROVAL REQUIRED.
4. TRENCH ZONE AND PIPE ZONE BACKFILL MATERIALS SHALL BE PER SECTION 02223. ROCKS LARGER THAN 4" IN ANY DIMENSION, ASPHALT OR CONCRETE CHUNKS WILL NOT BE ALLOWED.
5. CITY SHALL INSPECT TRENCH BOTTOMS PRIOR TO PLACEMENT OF BEDDING.
6. REFER TO TITLE 8, CCR, SECTION 1541.1 FOR ALLOWABLE LIMIT OF VERTICALLY-SIDED LOWER PORTION AND OTHER PROTECTIVE SYSTEM CONFIGURATIONS.
7. REFER TO GS SERIES STD. DWGS. FOR PAVEMENT RESTORATION REQUIREMENTS.

NO SCALE

ITEM	DESCRIPTION	SPEC/DWG
1	WARNING/ID TAPE	15000/W-28
2	TRACER WIRE FOR NON-METALLIC PIPE	15000/W-28

REV.	APPROVED	DATE

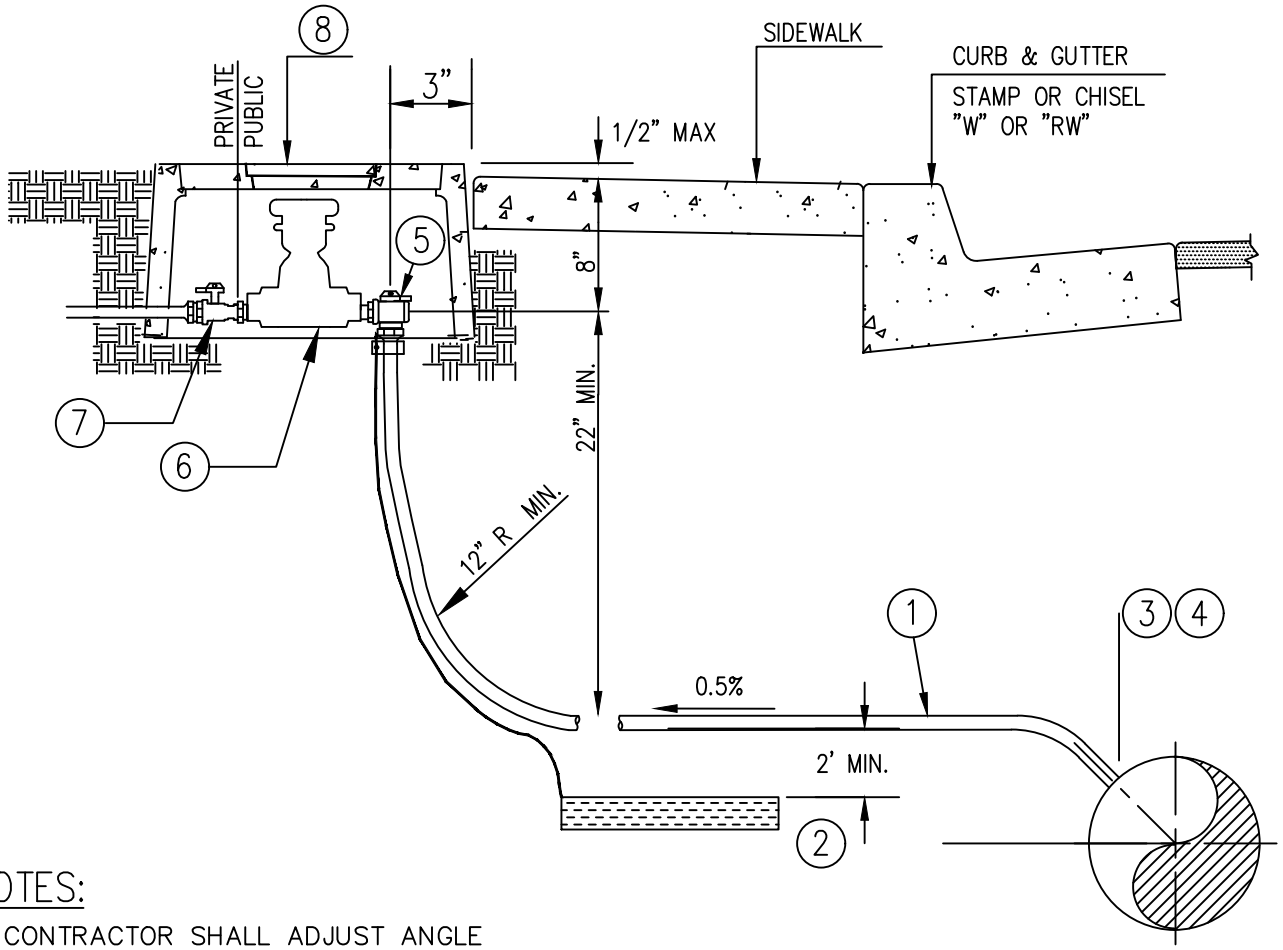
CARLSBAD MUNICIPAL WATER DISTRICT

TYPICAL TRENCH SECTION

DISTRICT ENGINEER
RCE 55974

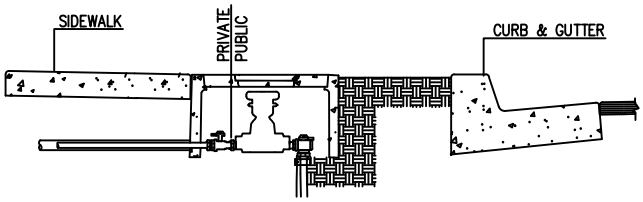
4/29/22
DATE

STANDARD DWG. NO. W-2



NOTES:

1. CONTRACTOR SHALL ADJUST ANGLE VALVE & METER BOX TO F.G. AFTER SIDEWALK IS INSTALLED & APPROVED.
2. DISTRICT WILL SET METER AND BALL VALVE
3. PIPING SHALL BE SOLID COPPER WITH NO JOINTS OR REPAIR COUPLINGS.
4. TAP TO MAIN TO BE MINIMUM OF 24" FROM NEAREST COUPLING, FITTING, VALVE, BELL OR OTHER TAPS.
5. POSITION ANODE MIDWAY BETWEEN PIPELINE AND METER BOX.
6. INTERIOR OF METER BOX SHALL BE CLEAR OF DEBRIS AND ANGLE METER STOP FULLY EXPOSED.
7. ALL METERS SHALL HAVE SEPARATE SERVICE TO MAIN.
8. DO NOT INSTALL METER BOXES OR SERVICE IN DRIVEWAYS.



DETAIL
NON–CONTIGUOUS SIDEWALK

ITEM	DESCRIPTION	SPEC/DWG
1	COPPER (TYPE 'K' SOFT)	15057
2	30 LB. ZINC ANODE WITH ANODE LEAD WIRE	WC–8
3	OUTLET ON AC OR PVC MAIN	W–13
4	OUTLET ON DUCTILE IRON OR STEEL MAIN	W–14
5	1" ANGLE METER STOP	15099
6	METER (BY DISTRICT)	
7	BALL VALVE (BY DISTRICT)	15099
8	METER BOX AND COVER	15000

REV.	APPROVED	DATE

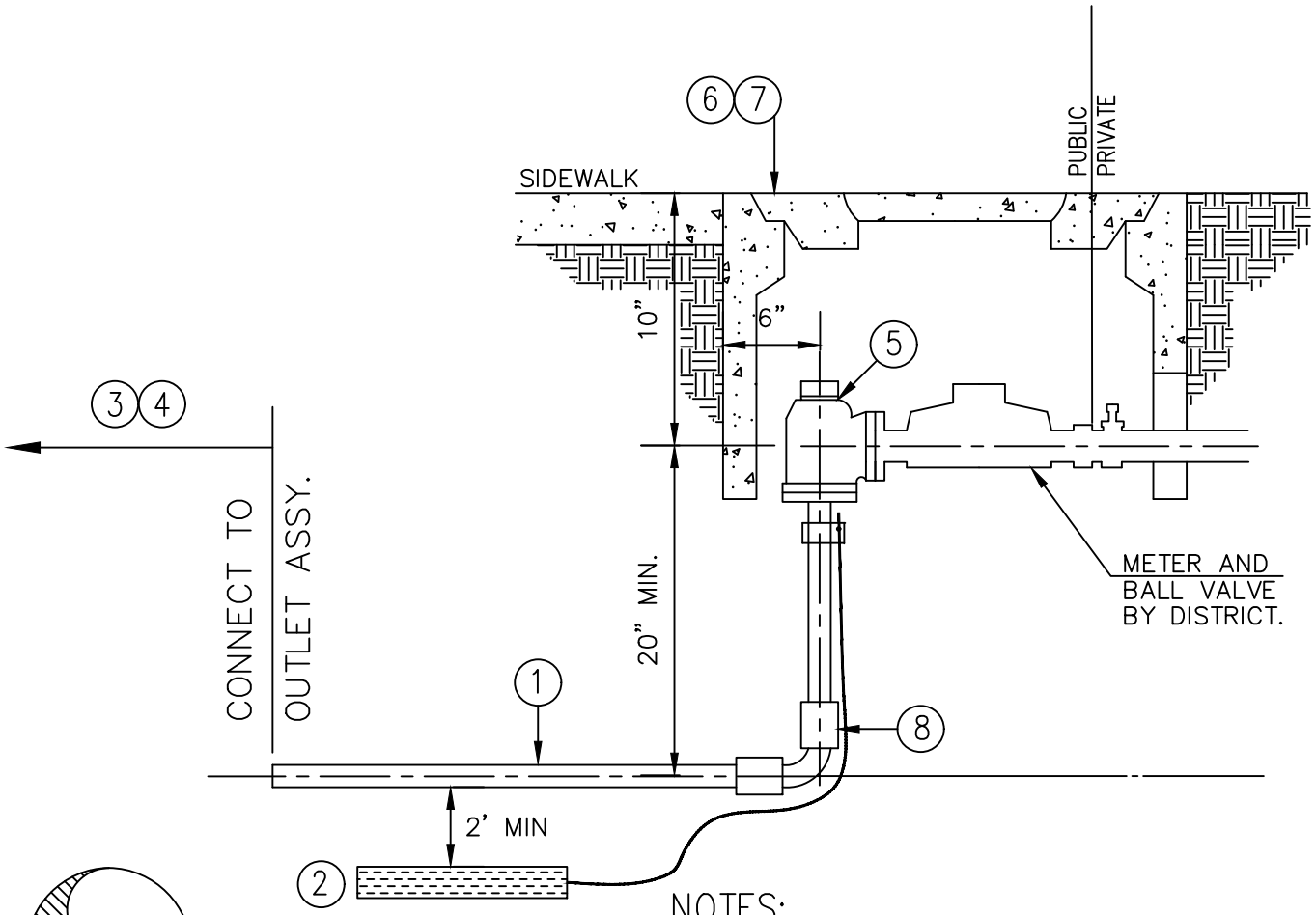
CARLSBAD MUNICIPAL WATER DISTRICT

1" WATER SERVICE CONNECTION FOR 5/8", 3/4" & 1" METERS

DISTRICT ENGINEER
RCE 55974

4/29/22
DATE

STANDARD DWG. NO. W-3



NOTES:

1. DISTRICT WILL SET METER AND BALL VALVE.
2. COPPER JOINTS SHALL BE COMPRESSION IN CONFORMANCE WITH SPECIFICATIONS.
3. TAP TO MAIN TO BE MINIMUM OF 24" FROM NEAREST COUPLING, FITTING, VALVE, BELL OR OTHER TAPS.
4. POSITION ANODE MIDWAY BETWEEN PIPELINE AND METER BOX.
5. FOR NON-CONTIGUOUS SIDEWALK, SEE STD. W-3

ITEM	DESCRIPTION	SPEC/DWG
①	2" COPPER (TYPE K STRAIGHT SOFT TUBE)	15057
②	30 LB. ZINC ANODE WITH ANODE LEAD WIRE	WC-8
③	OUTLET ON AC OR PVC MAIN	W-13
④	OUTLET ON DUCTILE IRON OR STEEL MAIN	W-14
⑤	2" ANGLE METER STOP	15099
⑥	METER BOX AND COVER (TRAFFIC AREA)	15000
⑦	METER BOX AND COVER (NON-TRAFFIC AREA)	15000
⑧	2" 90° ELL	15057

REV.	APPROVED	DATE

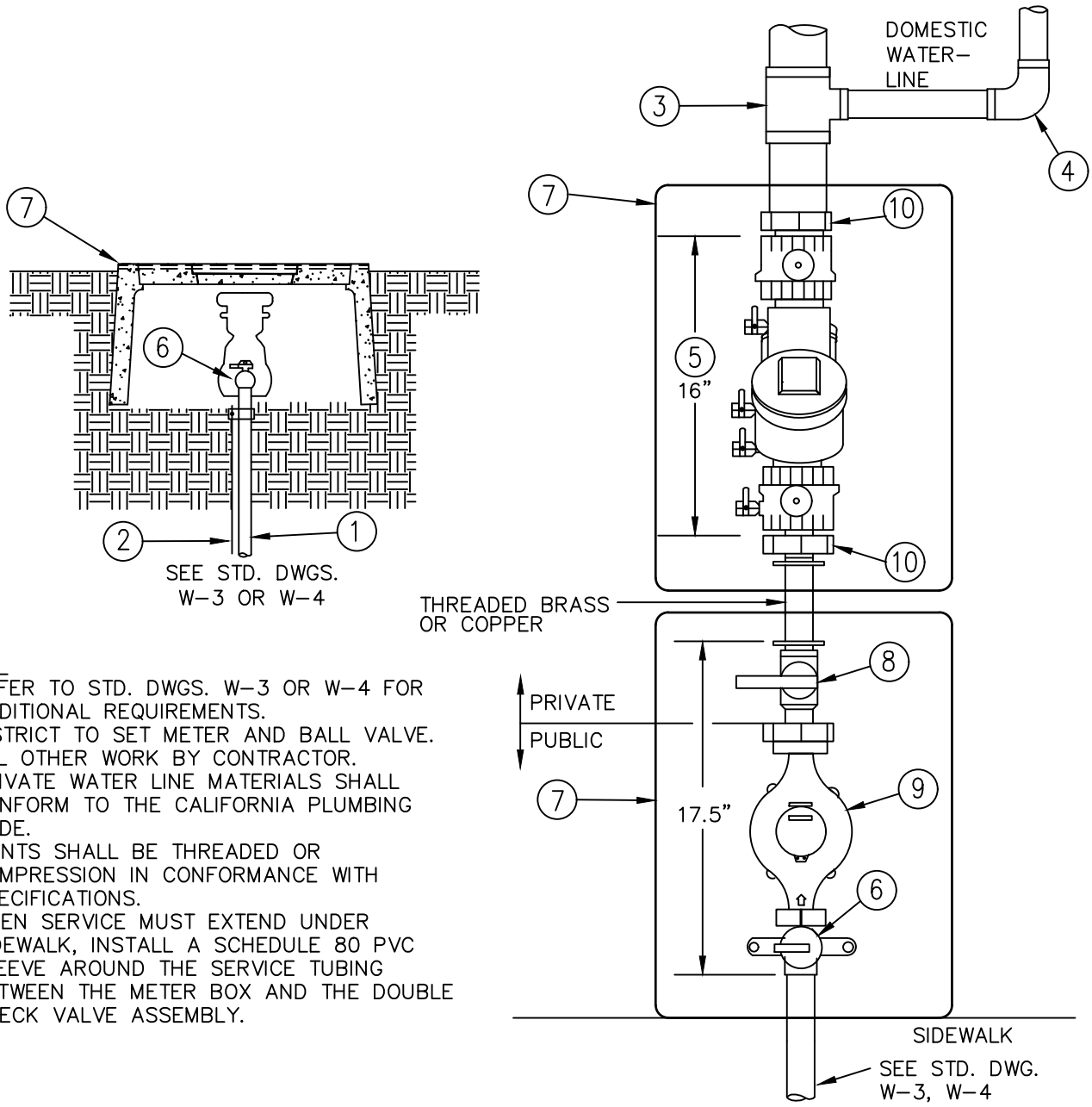
CARLSBAD MUNICIPAL WATER DISTRICT

2" WATER SERVICE CONNECTION FOR 1-1/2" & 2" METERS

DISTRICT ENGINEER
RCE 55974

4/29/22
DATE

STANDARD DWG. NO. W-4



NOTES:

1. REFER TO STD. DWGS. W–3 OR W–4 FOR ADDITIONAL REQUIREMENTS.
2. DISTRICT TO SET METER AND BALL VALVE. ALL OTHER WORK BY CONTRACTOR.
3. PRIVATE WATER LINE MATERIALS SHALL CONFORM TO THE CALIFORNIA PLUMBING CODE.
4. JOINTS SHALL BE THREADED OR COMPRESSION IN CONFORMANCE WITH SPECIFICATIONS.
5. WHEN SERVICE MUST EXTEND UNDER SIDEWALK, INSTALL A SCHEDULE 80 PVC SLEEVE AROUND THE SERVICE TUBING BETWEEN THE METER BOX AND THE DOUBLE CHECK VALVE ASSEMBLY.

ITEM	DESCRIPTION	SPEC/DWG
1	COPPER (TYPE 'K' SOFT)	15057
2	30 LB. ZINC ANODE AND LEAD WIRE	16640/WC–8
3	TEE (MATCH REQUIRED FIRE & DOMESTIC BRANCH SERVICE SIZE)	15057
4	1" 90° BEND	15057
5	USC APPROVED DOUBLE CHECK VALVE ASSEMBLY W/ 1/4 TURN BALL VALVES AND TEST COCKS (LEAD FREE)	15112
6	1" ANGLE METER STOP	15099
7	METER BOX	15000
8	1" BALL VALVE	15099
9	1" WATER METER (BY DISTRICT)	
10	BRASS UNION	15057

REV.	APPROVED	DATE
1		7/22

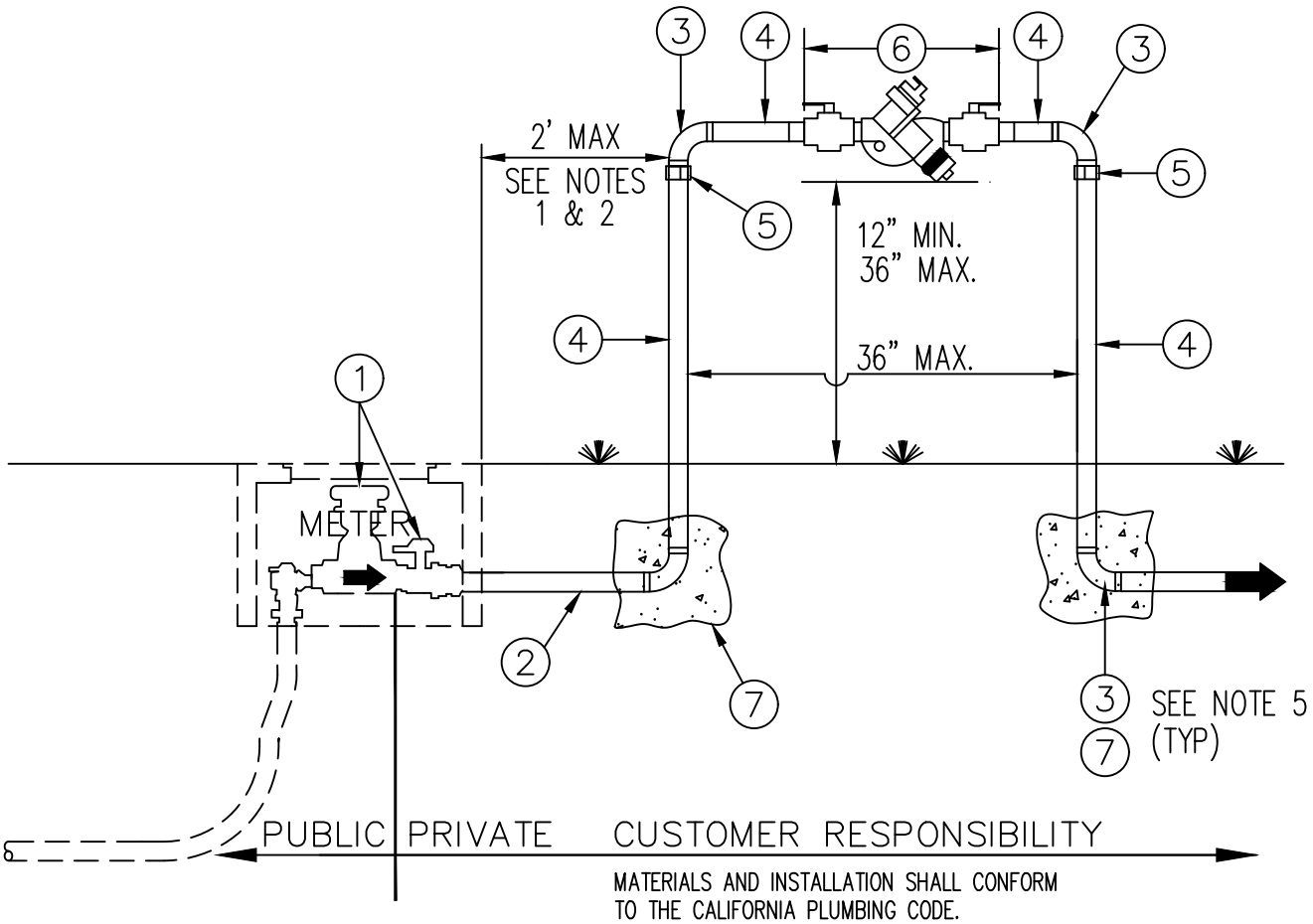
CARLSBAD MUNICIPAL WATER DISTRICT

1" DOMESTIC WATER SERVICE CONNECTION WITH FIRE SPRINKLER SYSTEM

DISTRICT ENGINEER
RCE 55974

4/29/22
DATE

STANDARD DWG. NO. W-5



NOTES:

1. DO NOT INSTALL PLASTIC PIPE, OR PLASTIC FITTINGS BETWEEN THE METER AND BACKFLOW ASSEMBLY.
2. WHEN SERVICE MUST EXTEND UNDER SIDEWALK, INSTALL A SCHEDULE 80 PVC SLEEVE AROUND THE SERVICE TUBING BETWEEN THE METER BOX AND THE BACKFLOW PREVENTION DEVICE.
3. CONSTRUCT 2' HIGH RETAINING WALL ON 3 SIDES OF BACKFLOW PREVENTER WHEN INSTALLED ON 4:1 OR GREATER SLOPE. OPEN END SHALL BE AT DOWNHILL SIDE OF SLOPE. PROVIDE 2' HORIZONTAL CLEARANCE BETWEEN WALL AND BACKFLOW PREVENTER.
4. DO NOT INSTALL IN AREA SUBJECT TO FLOODING.
5. WRAP COPPER OR BRASS TUBING WITH 10 MIL UTILITY TAPE WHEN ENCASED IN CONCRETE.

ITEM	DESCRIPTION	SPEC/DWG
1	METER AND BALL VALVE (BY DISTRICT)	
2	THREADED BRASS OR COPPER PIPE	15057
3	BRASS 90° ELBOW (THREADED)	15057
4	THREADED BRASS PIPE	15057
5	BRASS UNION	15057
6	USC APPROVED BACKFLOW PREVENTION DEVICE	15112
7	FOUNDATION ANCHOR BLOCK	03000

REV.	APPROVED	DATE
1		7/22

CARLSBAD MUNICIPAL WATER DISTRICT

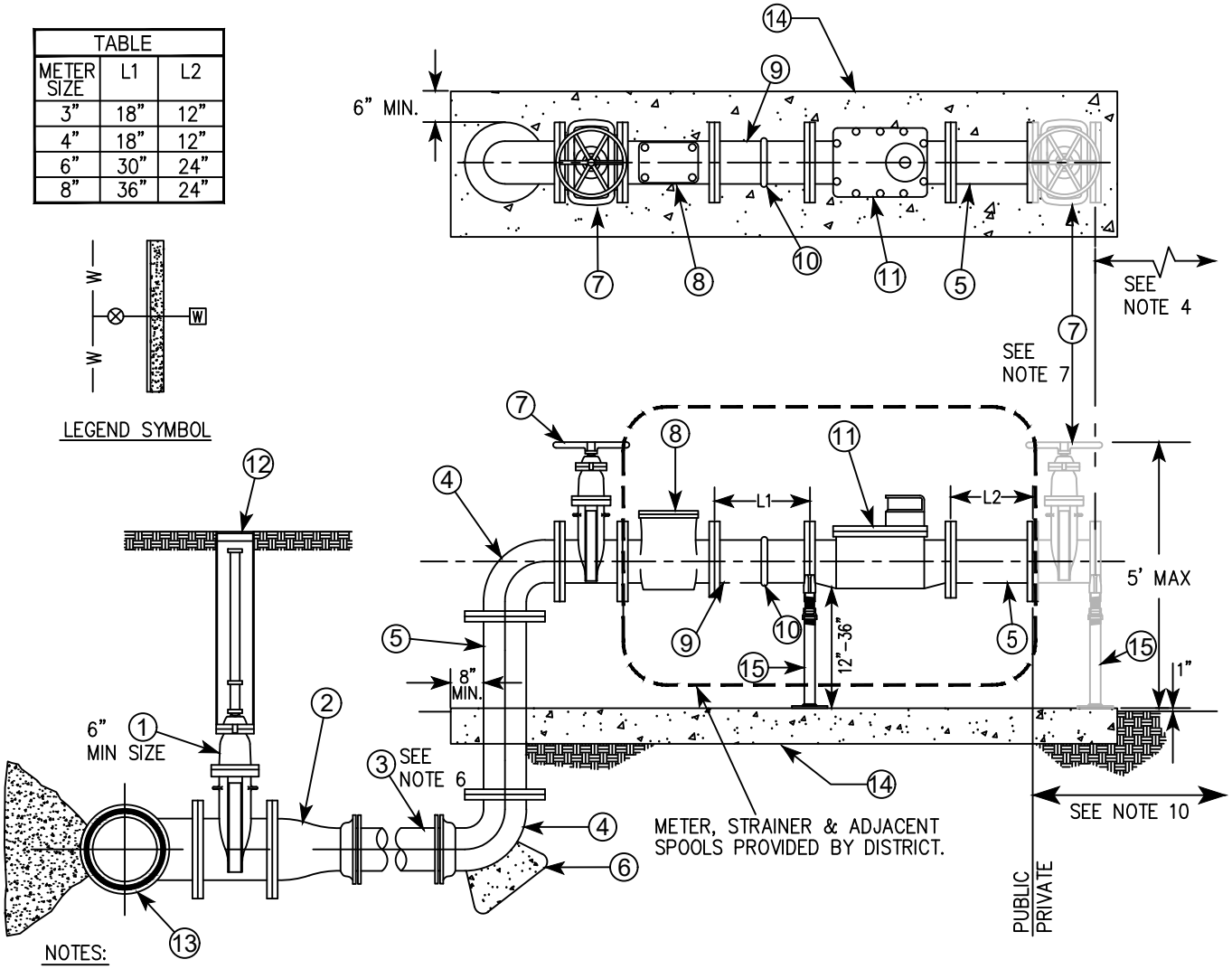
2" & SMALLER BACKFLOW PREVENTION INSTALLATION

DISTRICT ENGINEER
RCE 55974

4/29/22
DATE

STANDARD DWG. NO. W-6

TABLE		
METER SIZE	L1	L2
3"	18"	12"
4"	18"	12"
6"	30"	24"
8"	36"	24"



NOTES:

1. MATERIAL SUBSTITUTIONS SHALL NOT BE MADE WITHOUT DISTRICT APPROVAL.
2. ASSEMBLY LOCATION AND LAYOUT SHALL BE FIELD VERIFIED.
3. ALL PIPING AND FITTING JOINTS SHALL BE FULLY RESTRAINED.
4. REFER TO STANDARD DRAWING W-8 FOR INSTALLATION OF BACKFLOW PREVENTION DEVICE.
5. BRASS BOLTS AND NUTS SHALL BE USED FOR ALL CONNECTIONS TO THE WATER METER AND STRAINER.
6. PIPING DIAMETER TO MATCH METER SIZE.
7. THIS GATE VALVE IS PART OF THE ADJACENT BACKFLOW ASSEMBLY. SEE STD. DWG. W-8.
8. INSTALL PROTECTION POSTS PER STD. DWG. W-25 AT LOCATIONS APPROVED BY THE DISTRICT.
9. ALL BURIED NUTS AND BOLTS SHALL BE WAX TAPE COATED PER SPEC 09902.
10. CUSTOMER RESPONSIBILITY. INSTALL PURSUANT TO CMC SECTION 11.16.050, TITLE 17 OF THE CALIFORNIA ADMINISTRATIVE CODE, AND THE LATEST ADOPTED CROSS CONNECTION CONTROL POLICY HANDBOOK.

ITEM	DESCRIPTION	SPEC./DWG.	ITEM	DESCRIPTION	SPEC./DWG.
1	GATE VALVE, FLG'D OR FLG X MJ	15100	9	DI OR STL PIPE SPOOL, FLG X GROOVE	15056/15061
2	REDUCER (AS REQUIRED)	15056			
3	DI OR PVC PIPE WITH RESTRAINED JOINTS	15056/15064	10	GROOVED COUPLING	15000
			11	METER (TURBO OR COMPOUND)	
4	90° DI BEND, FLG'D OR FLG X MJ	15056	12	VALVE BOX ASSEMBLY	15000 / W-23
5	DIP SPOOL	15056	13	DI TEE W/TB, MJ X MJ X FLG	15056/03000
6	THRUST BLOCK	03000	14	REINF. CONCRETE PAD (560-C-3250)	03000
7	GATE VALVE WITH HAND WHEEL	15100	15	PIPE SUPPORT W/ SADDLE TOP	15000
8	STRAINER				

REV.	APPROVED	DATE

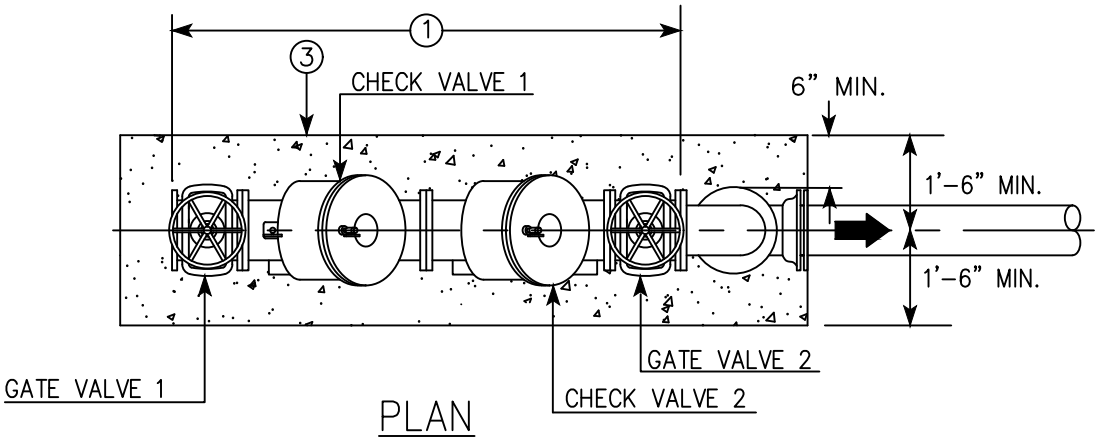
CARLSBAD MUNICIPAL WATER DISTRICT

3" & LARGER WATER SERVICE CONNECTION

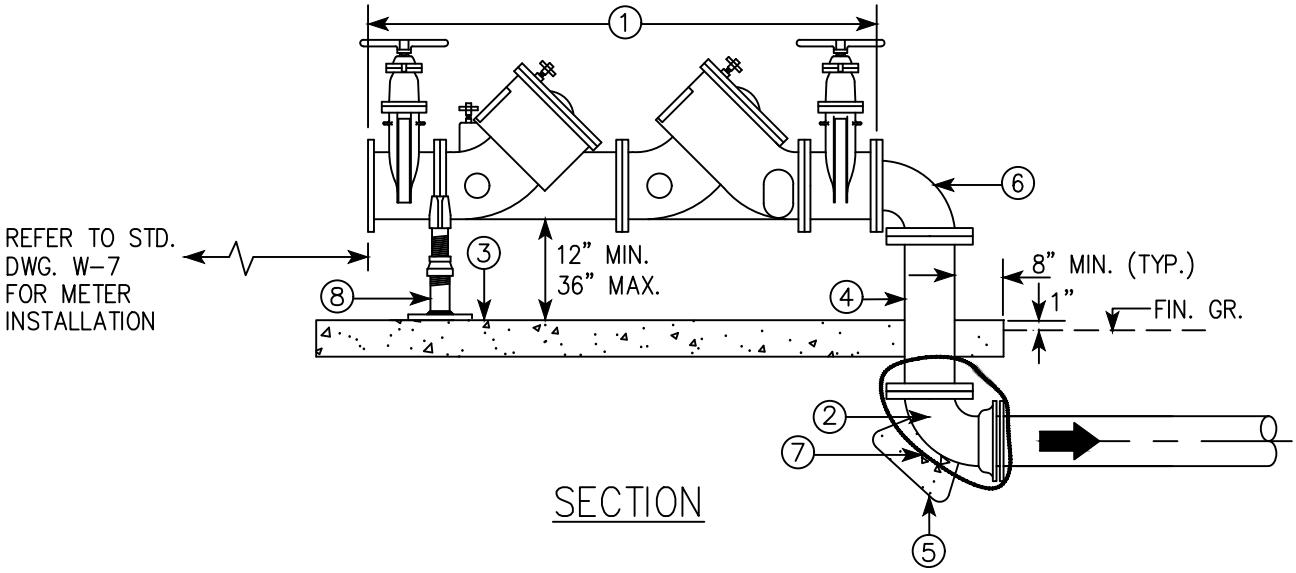
DISTRICT ENGINEER
RCE 55974

4/29/22
DATE

STANDARD DWG. NO. W-7



PLAN



SECTION

CUSTOMER RESPONSIBILITY

INSTALL PURSUANT TO CMC SECTION 11.16.050,
TITLE 17 OF THE CALIFORNIA ADMINISTRATIVE CODE, AND THE
LATEST ADOPTED CROSS CONNECTION CONTROL POLICY HANDBOOK.

NOTES:

1. INSTALL PROTECTION POSTS PER STD. DWG. W-25.
2. ASSEMBLY LOCATION AND LAYOUT TO BE APPROVED BY THE DISTRICT. LENGTH TO BE FIELD VERIFIED.
3. REFER TO STD. DWG. W-7 FOR PUBLIC/PRIVATE SEPARATION OF RESPONSIBILITY.
4. ALL BURIED NUTS AND BOLTS SHALL BE WAX TAPE COATED PER SPEC 09902.

ITEM	DESCRIPTION	SPEC/DWG
1	USC APPROVED DOUBLE CHECK OR REDUCED PRESSURE PRINCIPLE ASSEMBLY, HORIZONTAL OR N-TYPE	15112
2	DI FLG'D x PO/MJ 90° BEND (SIZE PER PLAN)	15056
3	4" THICK REINFORCED CONCRETE PAD	03000
4	DIP SPOOL	15056
5	THRUST BLOCK	03000
6	DI FLG x FLG 90° BEND (SIZE PER PLAN)	15056
7	WAX TAPE & POLYETHYLENE ENCASEMENT	09902/15000
8	GALV. PIPE SUPPORT W/SADDLE TOP	15000

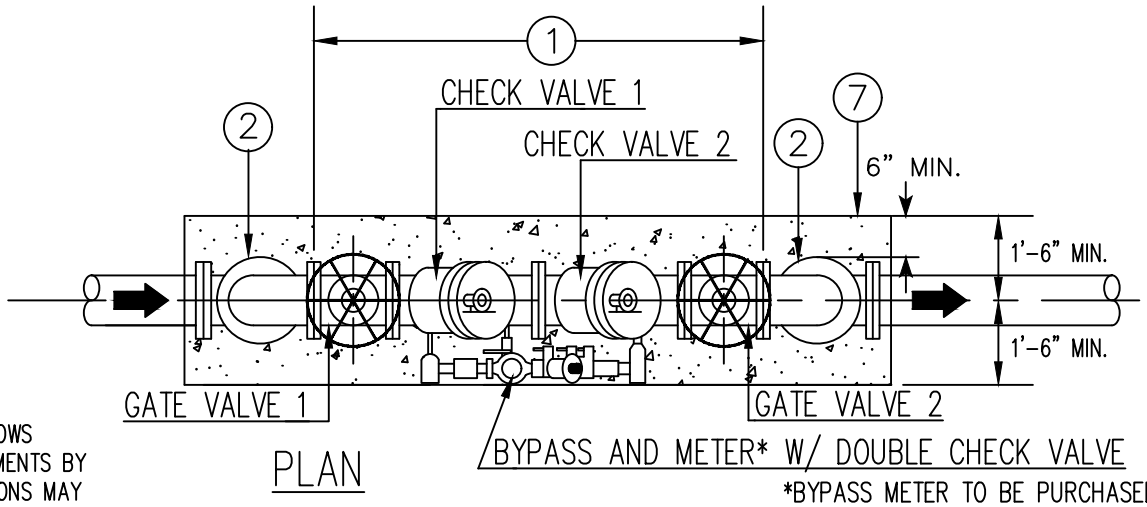
REV.	APPROVED	DATE

CARLSBAD MUNICIPAL WATER DISTRICT

3" & LARGER METERED BACKFLOW INSTALLATION

David Rubin 4/29/22
DISTRICT ENGINEER RCE 55974 DATE

STANDARD DWG. NO. W-8

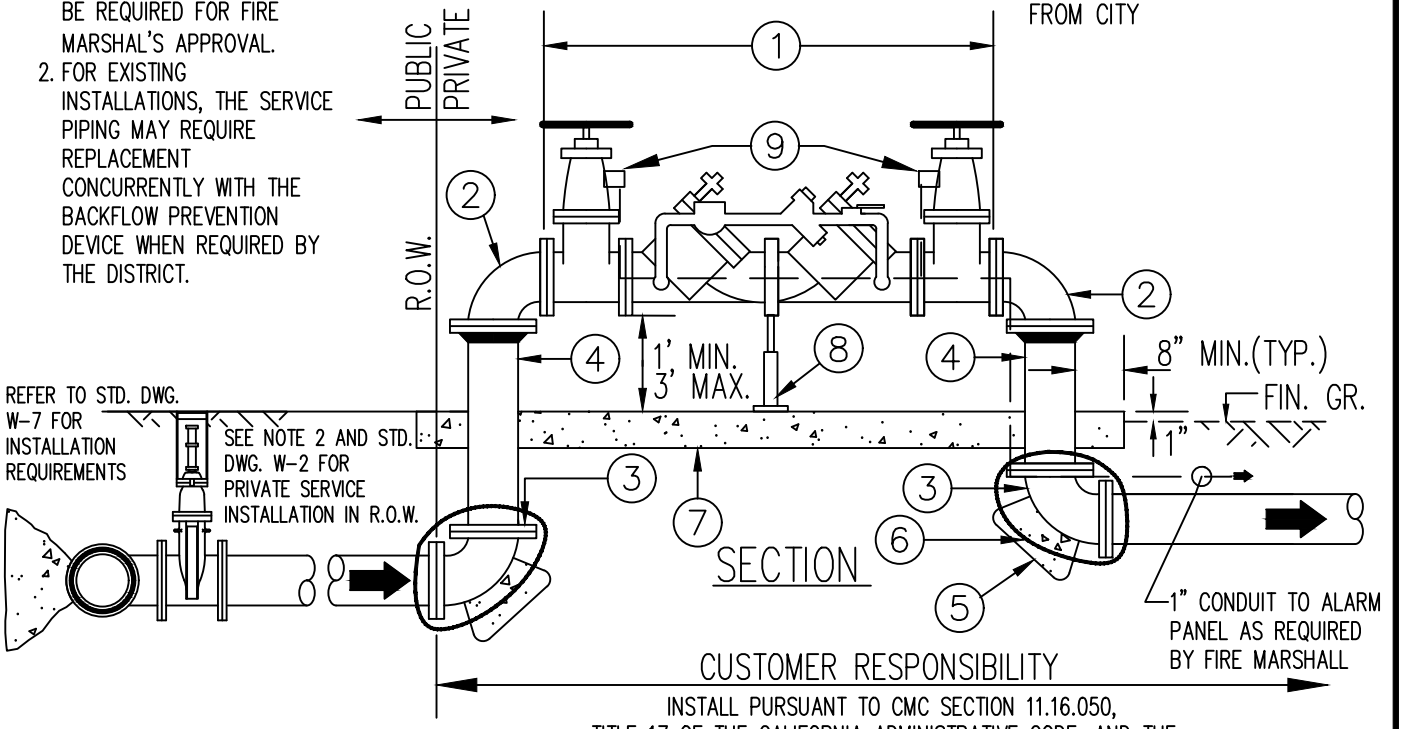


PLAN

*BYPASS METER TO BE PURCHASED FROM CITY

NOTES:

1. THIS DRAWING SHOWS MINIMUM REQUIREMENTS BY CMWD. MODIFICATIONS MAY BE REQUIRED FOR FIRE MARSHAL'S APPROVAL.
2. FOR EXISTING INSTALLATIONS, THE SERVICE PIPING MAY REQUIRE REPLACEMENT CONCURRENTLY WITH THE BACKFLOW PREVENTION DEVICE WHEN REQUIRED BY THE DISTRICT.



SECTION

CUSTOMER RESPONSIBILITY

INSTALL PURSUANT TO CMC SECTION 11.16.050, TITLE 17 OF THE CALIFORNIA ADMINISTRATIVE CODE, AND THE LATEST ADOPTED CROSS CONNECTION CONTROL POLICY HANDBOOK.

NOTES, CONT'D:

3. THIS STANDARD APPLIES TO FIRE PROTECTION SERVICES ONLY. ASSEMBLY LOCATION AND LAYOUT TO BE APPROVED BY DISTRICT.
4. INSTALL PROTECTION POSTS AS REQ'D PER STD DWG. W-25.
5. ABOVE GROUND APPURTENANCES SHALL BE PAINTED AND IDENTIFIED AS CALLED FOR BY THE FIRE DEPARTMENT.
6. ALL BURIED NUTS AND BOLTS SHALL BE WAX TAPE COATED PER SPEC. 09902.

ITEM	DESCRIPTION	SPEC/DWG
1	USC APPROVED DOUBLE CHECK DETECTOR OR RP DETECTOR ASSEMBLY	15112
2	FLG'D 90° DI BEND	15056
3	FLG X FLG/PO/MJ 90° DI BEND	15056
4	FLG'D DI SPOOL	15056
5	THRUST BLOCK	03000
6	POLYETHYLENE ENCASEMENT	15000
7	4 INCH THICK REINFORCED CONCRETE PAD (560-C-3250)	03000
8	GALV. PIPE SUPPORT	15000
9	TAMPER SWITCH, SIGNAGE AND SECURITY AS REQ'D BY FIRE MARSHAL	

REV.	APPROVED	DATE
1		7/22

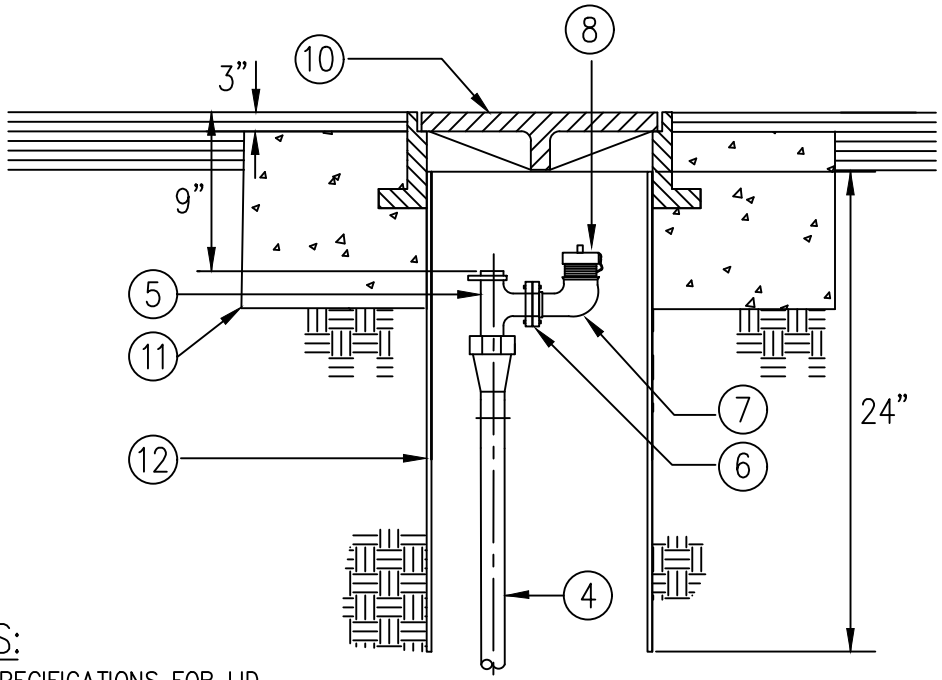
CARLSBAD MUNICIPAL WATER DISTRICT

3" & LARGER BACKFLOW PREVENTION ASSEMBLY

DISTRICT ENGINEER
RCE 55974

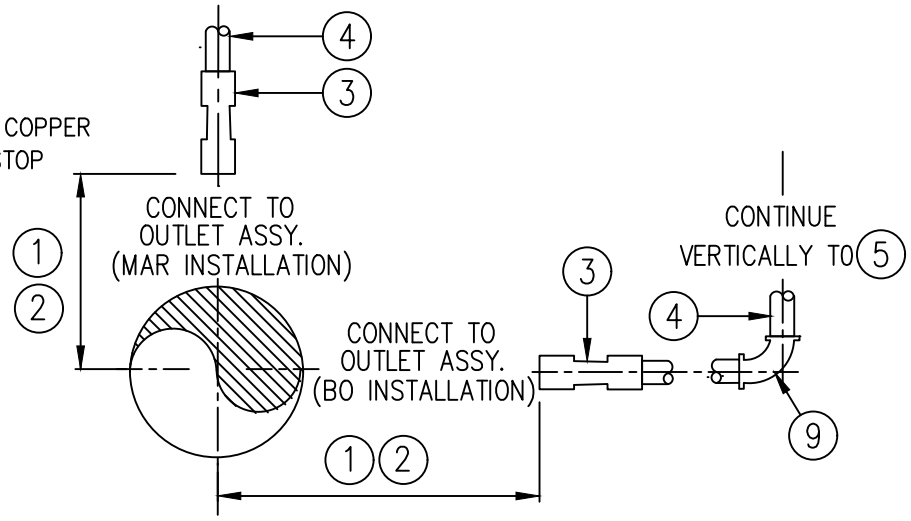
4/29/22
DATE

STANDARD DWG. NO. W-9



NOTES:

1. SEE SPECIFICATIONS FOR LID PAINTING REQUIREMENTS.
2. SEE IMPROVEMENT PLANS FOR ASSEMBLY SIZE.
3. POYLETHYLENE WRAP BURIED COPPER TUBING FROM CORPORATION STOP TO THE VALVE BOX.
4. BLOW OFF LOCATION TO BE DETERMINED BY THE CITY.



ITEM	DESCRIPTION	SPEC/DWG
1	OUTLET ON AC OR PVC MAIN FOR 1" THRU 2" ASSEMBLIES	W-13
2	OUTLET ON DI OR STEEL MAIN FOR 1" THRU 2" ASSEMBLIES	W-14
3	2" COUPLING, COMP X FNPT	15057
4	2" COPPER PIPE (TYPE 'K' SOFT)	15057
5	2" ANGLE METER STOP, COMP X METER FLG	15099
6	2" METER COMPANION FLANGE (BRASS NUTS AND BOLTS)	15057
7	2" BRASS STREET ELL	15057
8	2" MNPT X 2-1/2" NSHT ADAPTER W/ 2-1/2" CAP	
9	2" 90° BEND, COMP X COMP	15057
10	12" DIA. VALVE BOX ASSEMBLY	15000
11	30" DIAMETER X 8" THICK CONCRETE RING (560-C-3250)	03000
12	12" PVC PIPE SDR 35	15063

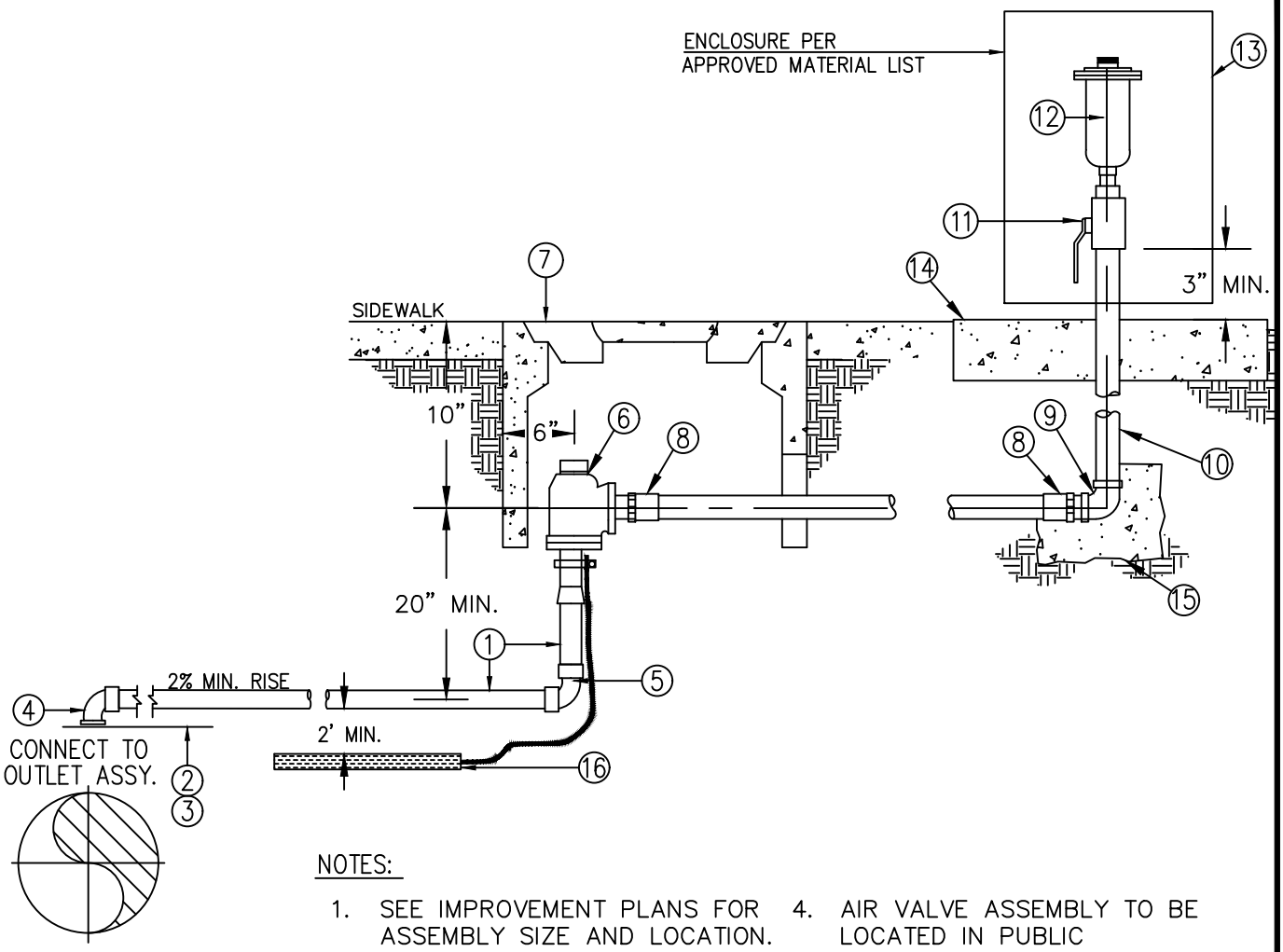
REV.	APPROVED	DATE

CARLSBAD MUNICIPAL WATER DISTRICT

2" MANUAL AIR RELEASE / 2" BLOW OFF ASSEMBLY

David Rubin 4/29/22
DISTRICT ENGINEER DATE
RCE 55974

STANDARD DWG. NO. W-10



NOTES:

1. SEE IMPROVEMENT PLANS FOR ASSEMBLY SIZE AND LOCATION.
2. ALL VALVES AND FITTINGS SHALL BE THE SAME SIZE AS AIR VENT INLET.
3. POSITION ANODE MIDWAY BETWEEN PIPELINE AND VALVE BOX.
4. AIR VALVE ASSEMBLY TO BE LOCATED IN PUBLIC RIGHT-OF-WAY WITH LATERAL PIPING PERPENDICULAR TO THE MAIN.
5. CONCRETE ENCASED FITTINGS AND TUBING SHALL BE POLYETHYLNENE ENCASED.

ITEM	DESCRIPTION	SPEC/DWG
1	2" COPPER PIPE. (TYPE "K" SOFT)	
2	OUTLET ON AC OR PVC MAIN	W-13
3	OUTLET ON DI OR STEEL MAIN	W-14
4	2" 90° ELBOW, COMP. X FNPT	15057
5	2" 90° ELBOW, COMP.	15057
6	2" ANGLE METER STOP, COMP X METER FLG	15057
7	METER BOX & COVER (H-20 RATED IN TRAFFIC AREA)	15000
8	2" COMP X MNPT ADAPTER	15057
9	2" BRONZE 90° ELBOW, FNPT	15057

ITEM	DESCRIPTION	SPEC/DWG
10	2" BRASS PIPE, REGULAR WALL, MNPT	
11	2" BONZE BALL VALVE, FNPT	15057
12	2" COMB. AIR RELEASE AND VACUUM VALVE, FNPT AND CLOSE NIPPLE	15108
13	AVA ENCLOSURE	15108
14	30"X30"X6" REINF. CONCRETE PAD	03000
15	CONCRETE ANCHOR BLOCK 2 CUBIC FEET	03000
16	30 LB. ZINC ANODE WITH ANODE LEAD WIRE	WC-8

REV.	APPROVED	DATE

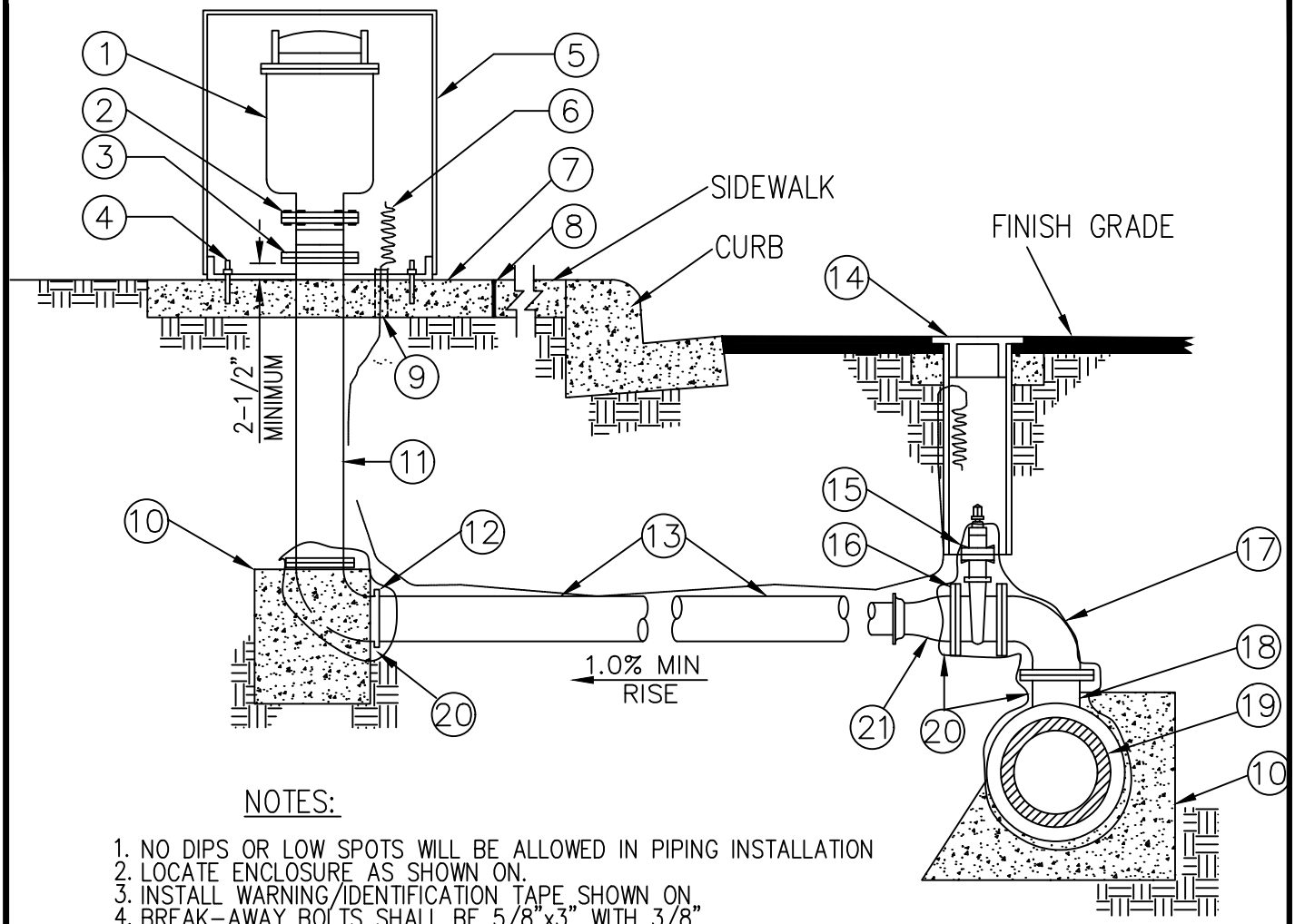
CARLSBAD MUNICIPAL WATER DISTRICT

2" AIR-VACUUM VALVE ASSEMBLY

DISTRICT ENGINEER
RCE 55974

4/29/22
DATE

STANDARD DWG. NO. W-11



NOTES:

1. NO DIPS OR LOW SPOTS WILL BE ALLOWED IN PIPING INSTALLATION
2. LOCATE ENCLOSURE AS SHOWN ON.
3. INSTALL WARNING/IDENTIFICATION TAPE SHOWN ON.
4. BREAK-AWAY BOLTS SHALL BE 5/8"x3" WITH 3/8" HOLE DRILLED IN THE SHAFT OF THE BOLT. INSTALL WITH NUTS ON TOP OF THE FLANGE. BOLTS SHAFT SHALL BE FILLED WITH SILICONE SEALANT.
5. AIR AND VACUUM VALVES INSTALLED FOR THE USE OF RECYCLED WATER SHALL BE IDENTIFIED IN ACCORDANCE WITH THE SPECIFICATIONS
6. CONNECTIONS TO STEEL MAINS SHALL BE IN ACCORDANCE WITH SECTION 15061
7. MATERIALS SHALL BE SELECTED FROM THE APPROVED MATERIALS LIST

ITEM	DESCRIPTION
1	AUTOMATIC COMBINATION AIR RELEASE & AIR/VACUUM VALVE, SIZE PER PLAN
2	BREAK-AWAY BOLTS
3	4"x8" LONG FLG'D SPOOL WITH BREAK-OFF GROOVES
4	1/2"x3" STAINLESS STEEL DROP-IN ANCHORS (MIN. 3 EA @ 120° APART)
5	AVA ASSEMBLY ENCLOSURE
6	TRACER WIRE
7	42"x42"x6" THICK REINFORCED CONCRETE SLAB
8	EXPANSION JOINT FILLER
9	1" PVC CONDUIT FOR TRACER WIRE

ITEM	DESCRIPTION
10	CONCRETE THRUST/ANCHOR BLOCK
11	FLG'D DI PIPE x REQUIRED LENGTH
12	FLG x MJ/PO 90° DI BEND
13	DI OR PVC C900 PIPE
14	VALVE BOX
15	6" FLG x MJ/PO/FLG RWGV
16	FLG x MJ/PO DI ADAPTER (IF REQUIRED)
17	6" FLG'D 90° BEND
18	MJ/PO/FLG x FLG TEE W/6" OUTLET
19	WATER MAIN
20	POLYETHYLENE ENCASEMENT & WAX TAPE WRAP BURIED NUTS & BOLTS PER SPEC. 09902
21	FLG X MJ/PO DI REDUCER (FOR < 6" PIPING)

REV.	APPROVED	DATE

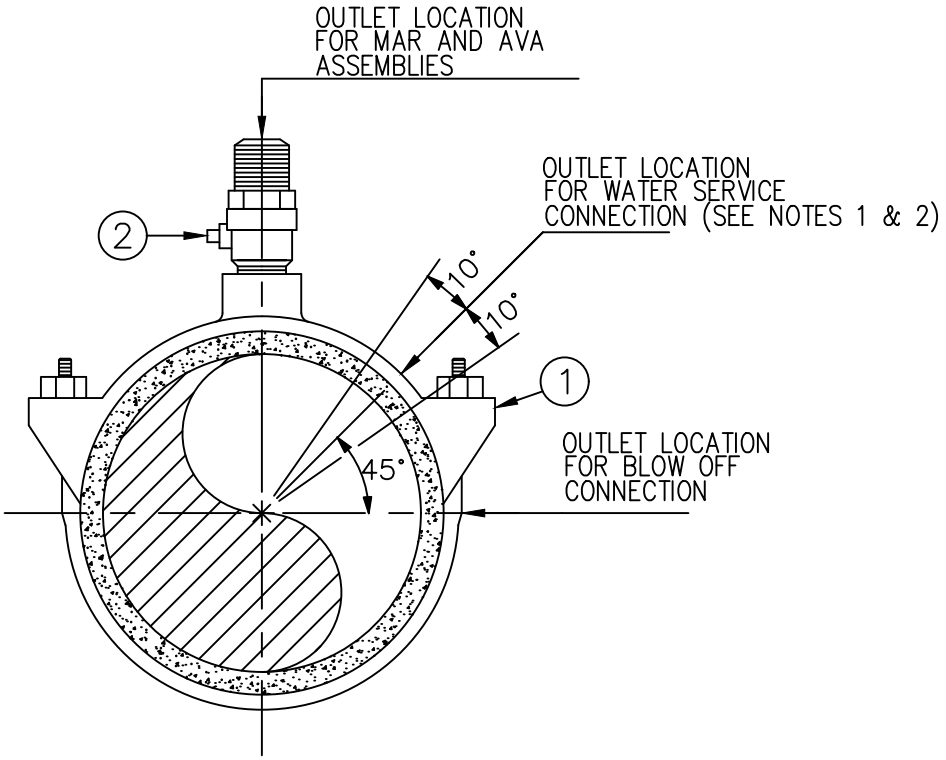
CARLSBAD MUNICIPAL WATER DISTRICT

3" & LARGER COMBINATION AIR RELEASE & AIR/VACUUM VALVE

DISTRICT ENGINEER
RCE 55974

4/29/22
DATE

STANDARD DWG. NO. W-12



A.C. OR P.V.C. MAIN

NOTES:

1. FOR 2 OR MORE SERVICE CONNECTIONS ON EXISTING AC PIPE, REPLACE THE AC PIPE TO THE NEAREST PIPE JOINTS WITH C900 PVC PIPE, DR 14.

2. ORIENT MULTIPLE TAPS AT A 10–DEGREE STAGGERED RADIAL OFFSET FROM A 45–DEGREE PLANE.

3. SADDLES SHALL HAVE A MINIMUM OF 24" SEPARATION FROM ADJACENT SADDLES, PIPE JOINTS, VALVES OR FITTINGS.

ITEM	DESCRIPTION	SPEC/DWG
1	BRONZE DOUBLE STRAP SERVICE SADDLE, FNPT	15057
2	1" OR 2" CORP. STOP, MNPT X MNPT	15099

REV.	APPROVED	DATE

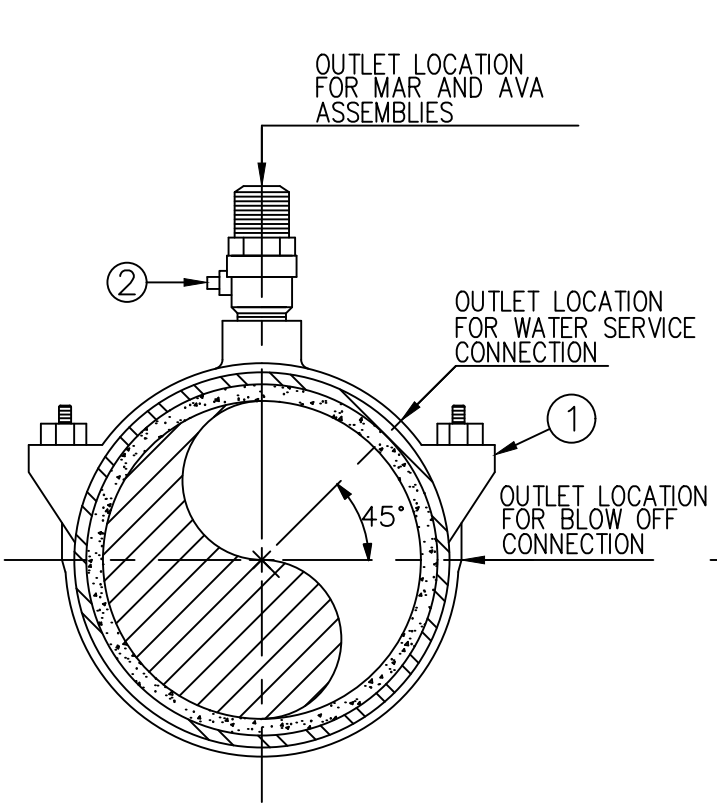
CARLSBAD MUNICIPAL WATER DISTRICT

OUTLET ON A.C. OR P.V.C. MAIN FOR 1" & 2" ASSEMBLIES

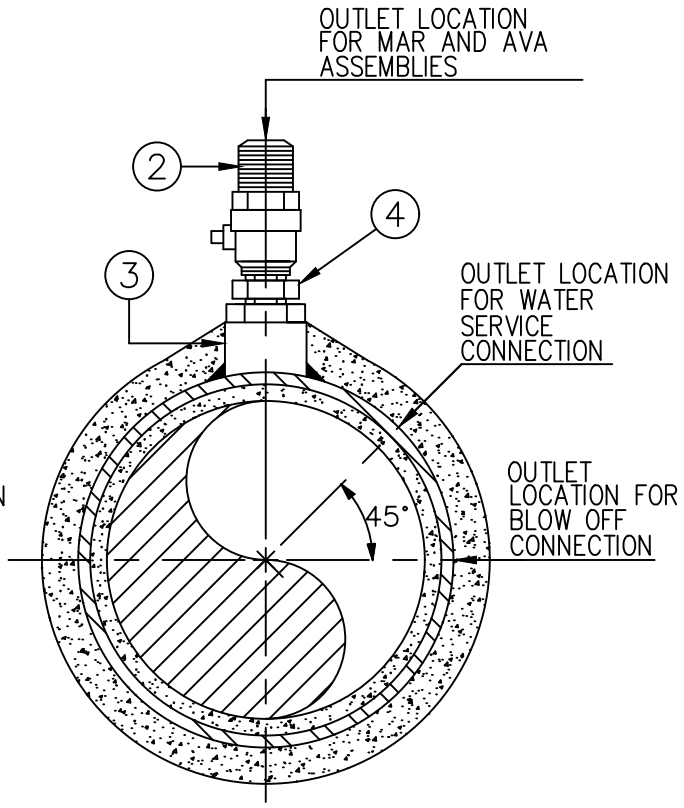
DISTRICT ENGINEER
RCE 55974

4/29/22
DATE

STANDARD DWG. NO. W-13



D.I. MAIN



STEEL MAIN

NOTES:

1. OUTLETS SHALL HAVE A MINIMUM OF 24" SEPARATION FROM ADJACENT OUTLETS, PIPE JOINTS, VALVES OR FITTINGS.
2. APPLY FIELD MORTAR COATING PER SPEC SECTION 15061.

ITEM	DESCRIPTION	SPEC/DWG
1	DOUBLE BAND SERVICE SADDLE, FNPT	15057
2	1" OR 2" CORP. STOP, MNPT X MNPT	15099
3	3000-LB THREADED HALF COUPLING, WELDED TO PIPE	15000
4	1" OR 2" INSULATING UNION, MNPT X FNPT, CLASS 3000	15000

REV.	APPROVED	DATE
1		7/22

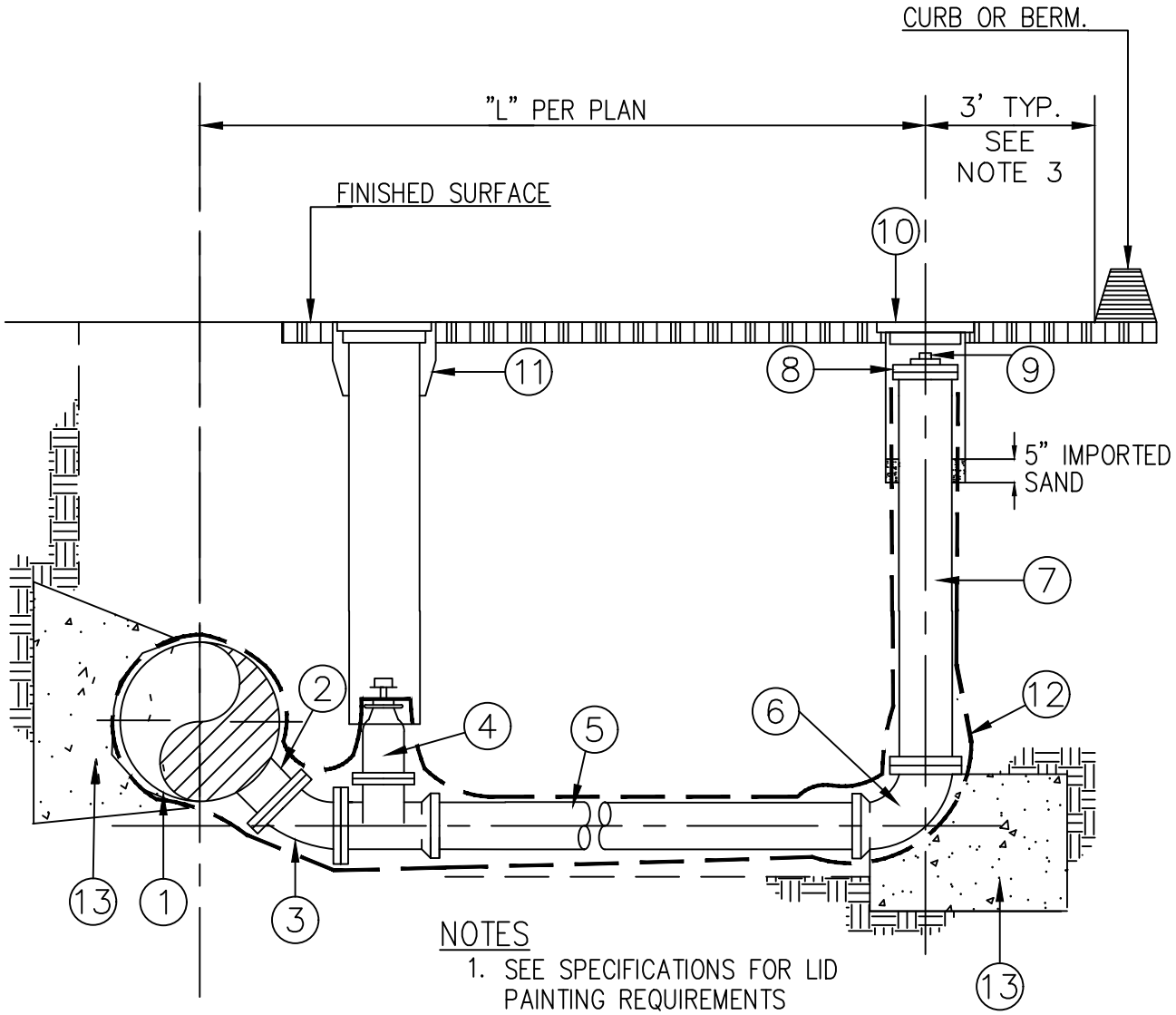
CARLSBAD MUNICIPAL WATER DISTRICT

OUTLET ON D.I. OR STEEL MAIN FOR 1" & 2" ASSEMBLIES

DISTRICT ENGINEER
RCE 55974

4/29/22
DATE

STANDARD DWG. NO. W-14



NOTES

1. SEE SPECIFICATIONS FOR LID PAINTING REQUIREMENTS
2. ALL BURIED NUTS AND BOLTS SHALL BE WAX TAPE COATED PER SPEC. 09902.
3. BLOW OFF LOCATION TO BE DETERMINED BY CITY

ITEM	DESCRIPTION	SPEC/DWG
1	PVC OR DI MAIN	
2	DI TEE W/ 6" FLG'D OUTLET	15061
3	45° DI BEND, FLG'D	15056
4	6" FL X PO OR MJ GATE VALVE	15100
5	C900 PVC OR DI PIPE	15064/15056
6	90° BEND PO OR MJ X FLG	15056
7	DI SPOOL FLG'D	15056
8	DI COMPANION FLANGE DRILLED AND TAPPED FOR ITEM 9.	15056
9	4" DI THREADED PLUG	15056
10	12" VALVE BOX ASSEMBLY	15000
11	VALVE BOX ASSEMBLY	W-23
12	POLYETHYLENE ENCASEMENT	15000
13	CONCRETE THRUST BLOCK	03000

REV.	APPROVED	DATE

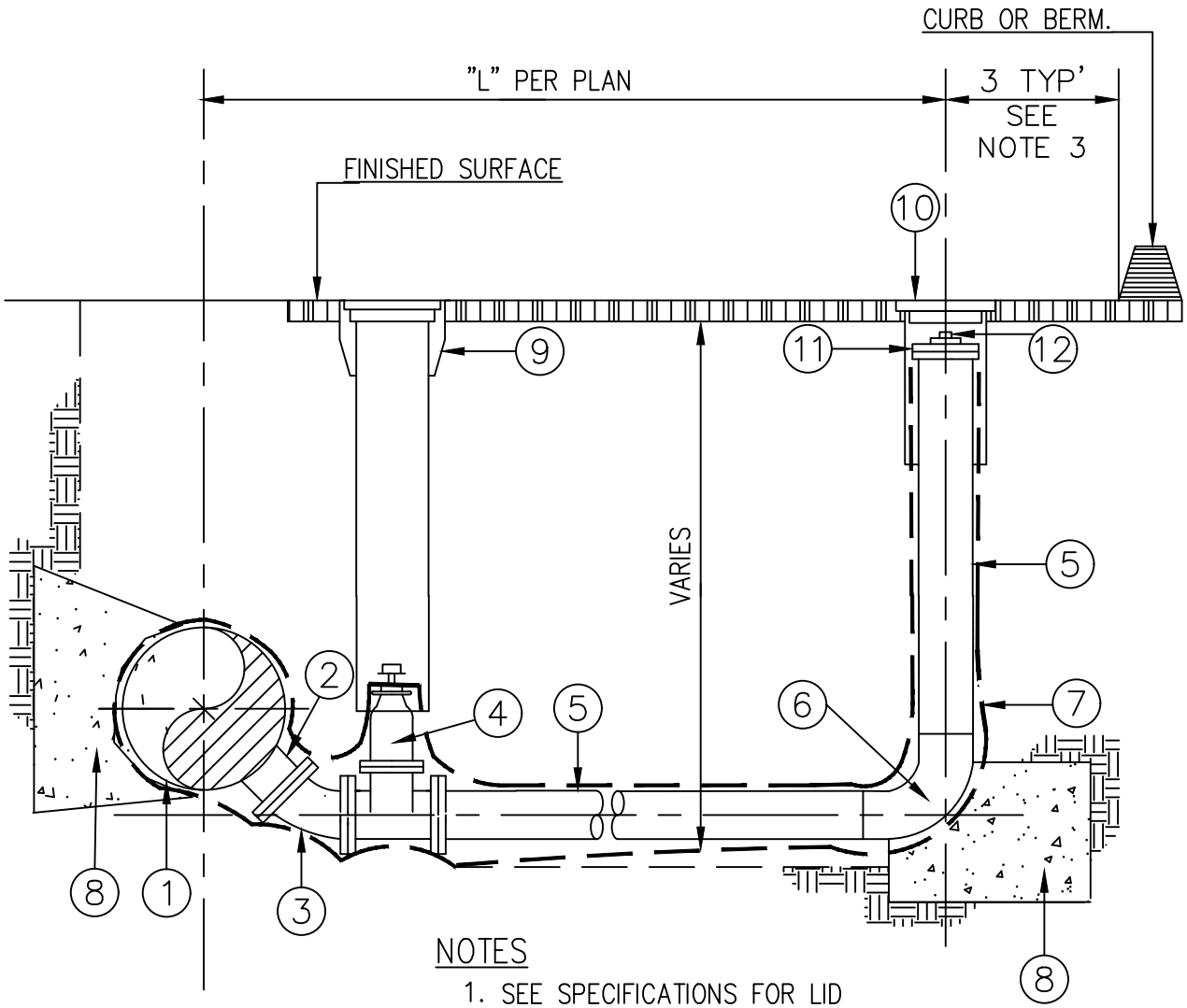
CARLSBAD MUNICIPAL WATER DISTRICT

6" BLOW-OFF ASSEMBLY FOR PVC AND DI PIPE

DISTRICT ENGINEER
RCE 55974

4/29/22
DATE

STANDARD DWG. NO. W-15



NOTES

1. SEE SPECIFICATIONS FOR LID PAINTING REQUIREMENTS
2. ALL BURIED NUTS AND BOLTS SHALL BE WAX TAPE COATED PER SPEC. 09902
3. BLOW OFF LOCATION TO BE DETERMINED BY CITY

ITEM	DESCRIPTION	SPEC/DWG
1	STEEL PIPE MAIN	15061
2	STEEL TEE W/ 6" FLG'D OUTLET	09870/15061
3	45° STEEL BEND, FLG X FLG	09870/15061
4	GATE VALVE, FLG X FLG	15100
5	STEEL SPOOL, FLG X PE	09870/15061
6	STEEL 90° BEND	09870/15061
7	POLYETHYLENE WRAP	15000
8	CONCRETE THRUST BLOCK	03000
9	VALVE BOX ASSEMBLY	W-23
10	12" VALVE BOX ASSEMBLY	15000
11	COMPANION FLANGE DRILLED AND TAPPED FOR ITEM 12	15061
12	4" THREADED STEEL PLUG, CLASS 150	

REV.	APPROVED	DATE

CARLSBAD MUNICIPAL WATER DISTRICT

6" BLOW-OFF ASSEMBLY FOR STEEL PIPE

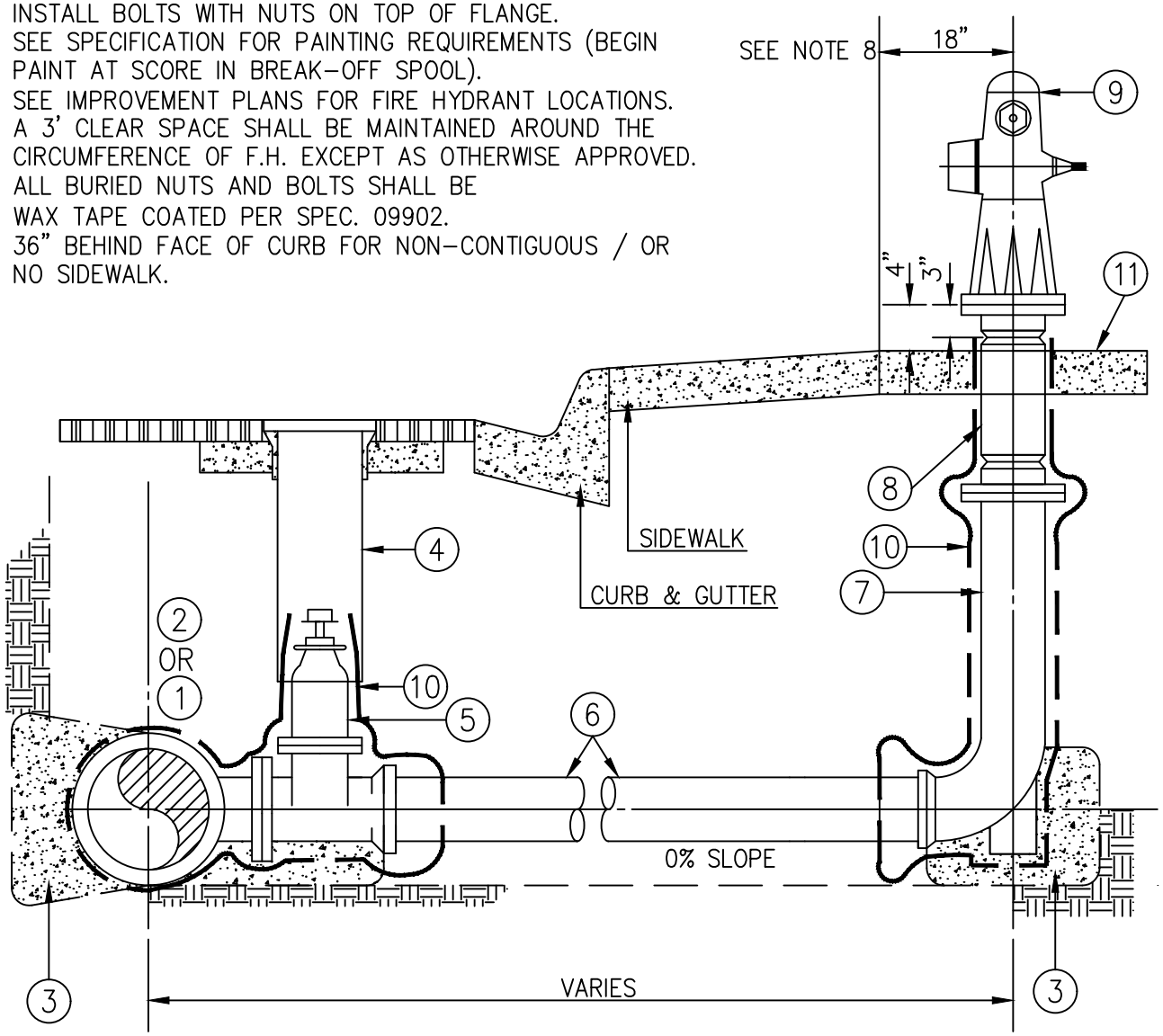
DISTRICT ENGINEER
RCE 55974

4/29/22
DATE

STANDARD DWG. NO. W-16

NOTES:

1. FOR INSTALLATIONS ON ACP WATER MAINS, REPLACE THE ACP WITH C900 PVC DR 18 PIPE.
2. BOLTS & NUTS – 3/4" X 3" HEX HEADS.
3. INSTALL BOLTS WITH NUTS ON TOP OF FLANGE.
4. SEE SPECIFICATION FOR PAINTING REQUIREMENTS (BEGIN PAINT AT SCORE IN BREAK–OFF SPOOL).
5. SEE IMPROVEMENT PLANS FOR FIRE HYDRANT LOCATIONS.
6. A 3' CLEAR SPACE SHALL BE MAINTAINED AROUND THE CIRCUMFERENCE OF F.H. EXCEPT AS OTHERWISE APPROVED.
7. ALL BURIED NUTS AND BOLTS SHALL BE WAX TAPE COATED PER SPEC. 09902.
8. 36" BEHIND FACE OF CURB FOR NON–CONTIGUOUS / OR NO SIDEWALK.



ITEM	DESCRIPTION	SPEC/DWG
1	DUCTILE IRON OR PVC PIPE – D.I. TEE WITH 6" FLG OUTLET (PO OR MJ X FL)	15056
2	STEEL PIPE – 6" STEEL FLG OUTLET	09870/15061
3	THRUST BLOCK	03000
4	VALVE BOX ASSEMBLY	15100
5	6" FLG X PO GATE VALVE	W–21
6	6" C900 PVC DR18 PIPE	15064
7	6" X 30" PO X FLG BURY ELL	15056
8	VARIABLE LENGTH FLG'D BREAK OFF SPOOL	15139
9	6" FIRE HYDRANT, 6 HOLE	15139
10	POLYETHYLENE ENCASEMENT	15000
11	4'X4'X4"THICK REINFORCED CONCRETE PAD	03000

REV.	APPROVED	DATE

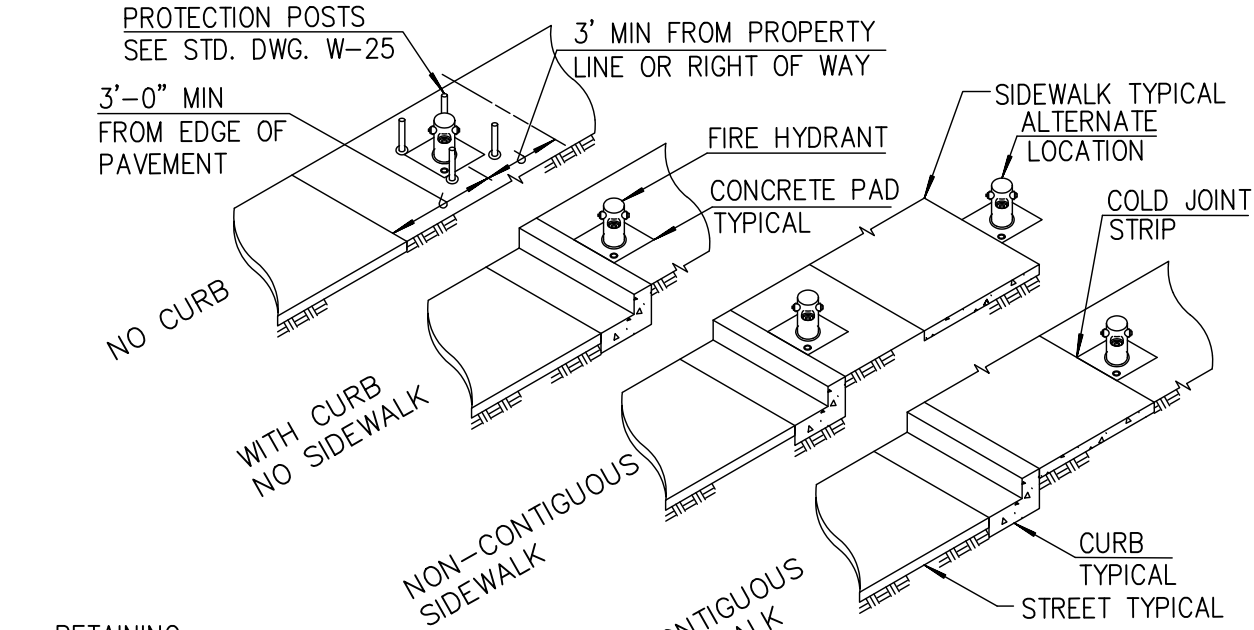
CARLSBAD MUNICIPAL WATER DISTRICT

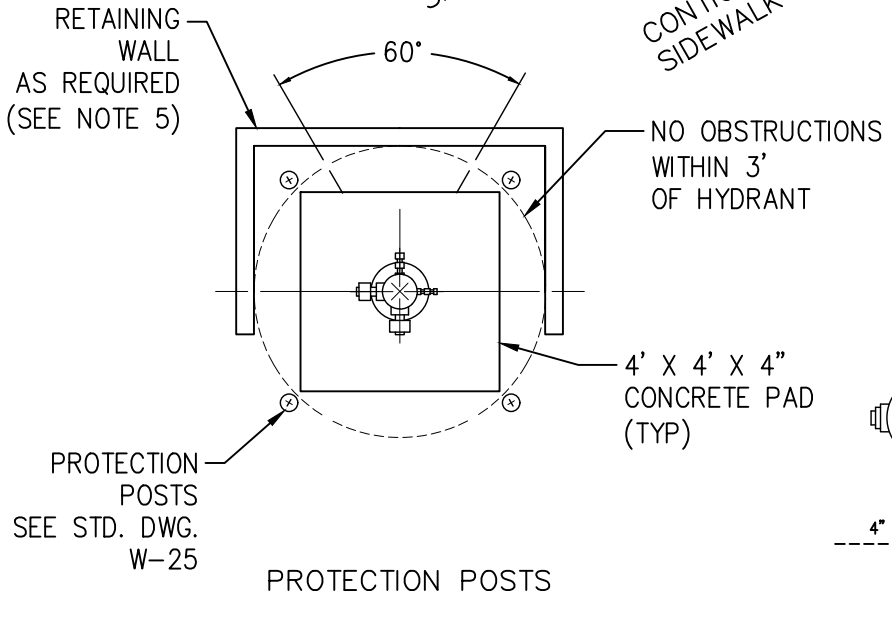
FIRE HYDRANT ASSEMBLY

DISTRICT ENGINEER
RCE 55974

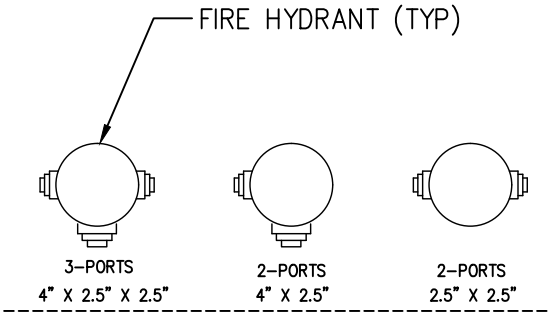
4/29/22
DATE

STANDARD DWG. NO. W-17





PROTECTION POSTS



STREET OR FIRE ACCESS SIDE
PORT ORIENTATION – PLAN

FIRE HYDRANT LOCATIONS

NOTES:

1. LOCATE FIRE HYDRANT AS SHOWN ABOVE OR AS DIRECTED BY THE ENGINEER OR FIRE MARSHALL
2. FIRE HYDRANTS SHALL BE INSTALLED WITH THE LARGEST PORT PERPENDICULAR TO THE STREET.
3. INSTALL EXPANSION JOINT FILLER BETWEEN CONCRETE PAD AND CURB OR SIDEWALK.
4. CONCRETE APRON SHALL BE REQUIRED WHERE THE FIRE HYDRANT IS INSTALLED IN AN UNPAVED LOCATION. THE APRON SHALL BE 4" THICK 520-C-2500 REINFORCED CONCRETE.
5. WHEN DISTANCE FROM THE FIRE HYDRANT TO THE TOP OR TOE OF THE SLOPE OR WALLS IS LESS THAN 2', SPECIAL HYDRANT LAYOUT DETAIL SHALL BE SHOWN ON THE PLANS.
6. NUMBER OF PROTECTION POSTS AND LOCATIONS TO BE SHOWN ON THE PLANS.

REV.	APPROVED	DATE

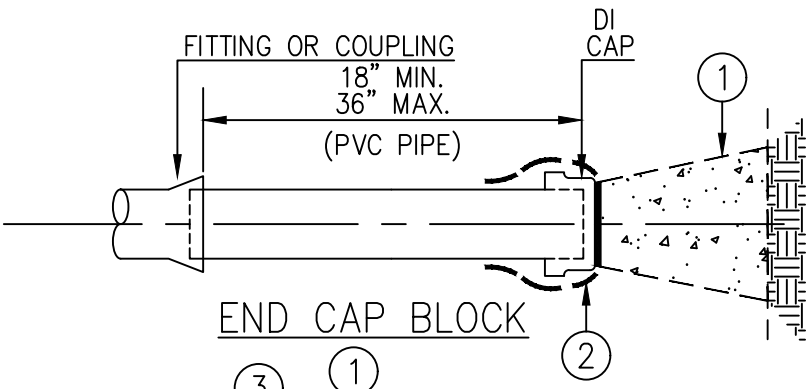
CARLSBAD MUNICIPAL WATER DISTRICT

FIRE HYDRANT INSTALLATION

DISTRICT ENGINEER
RCE 55974

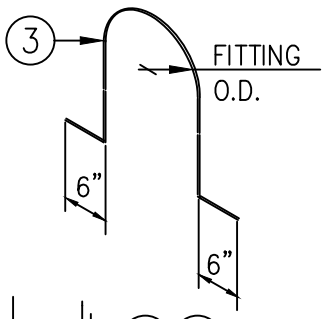
4/29/22
DATE

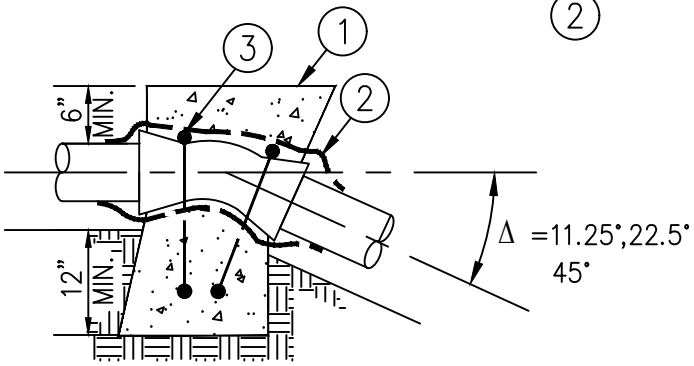
STANDARD DWG. NO. W-18



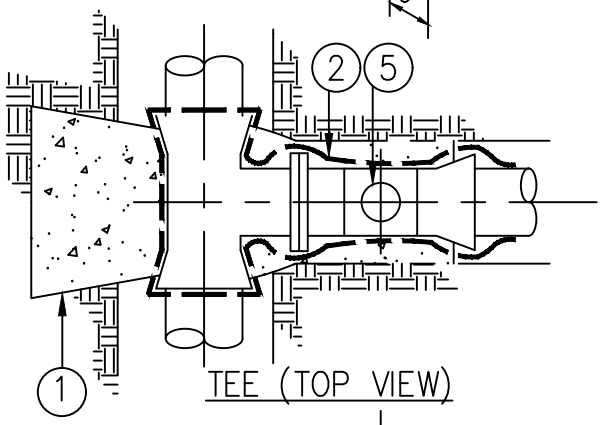
END CAP BLOCK

REINFORCING STEEL DETAIL

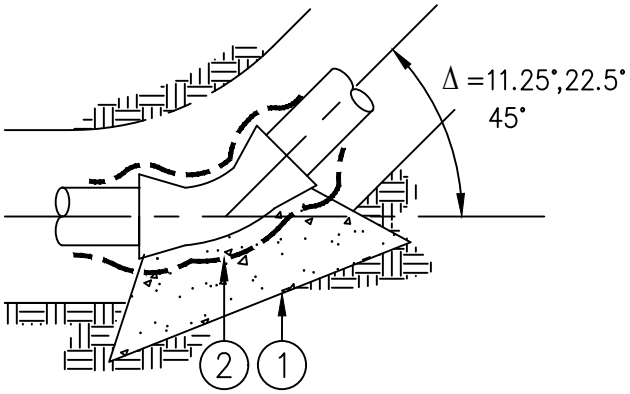




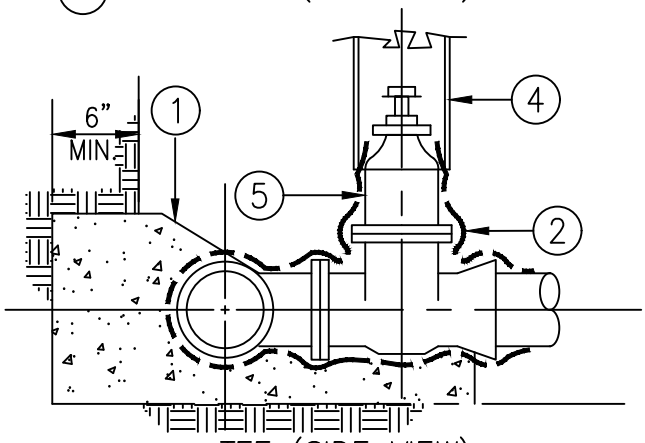
VERTICAL DOWN BEND



TEE (TOP VIEW)



HORIZONTAL & VERTICAL UP BEND



TEE (SIDE VIEW)

NOTES:

1. FITTINGS SHALL BE DUCTILE IRON FOR DI & PVC PIPE.
2. CONCRETE MINIMUM CURING TIME PER SPEC. 03000.
3. SEE STD. DWG. W-22 FOR PLUG & BUTTERFLY VALVE THRUST BLOCKS.
4. ENGINEER TO PROVIDE CALCULATIONS FOR THRUST/ANCHOR BLOCK SIZE.
5. ALL BURIED NUTS AND BOLTS REQUIRE APPLICATION OF NON-OXIDE GREASE AND WAX TAPE COATING PER SPEC 09902.
6. RESTRAINED JOINTS MAY BE ALLOWED IN LIEU OF THRUST BLOCKS.

ITEM	DESCRIPTION	SPEC/DWG
1	CONCRETE THRUST BLOCK	03000
2	POLYETHYLENE ENCASEMENT	15000
3	NO. 4 REINFORCING STEEL (2 EA. TYP.)	03000
4	VALVE BOX ASSEMBLY	15000
5	FLG X PO OR FLG X MJ GATE VALVE	15100

REV.	APPROVED	DATE

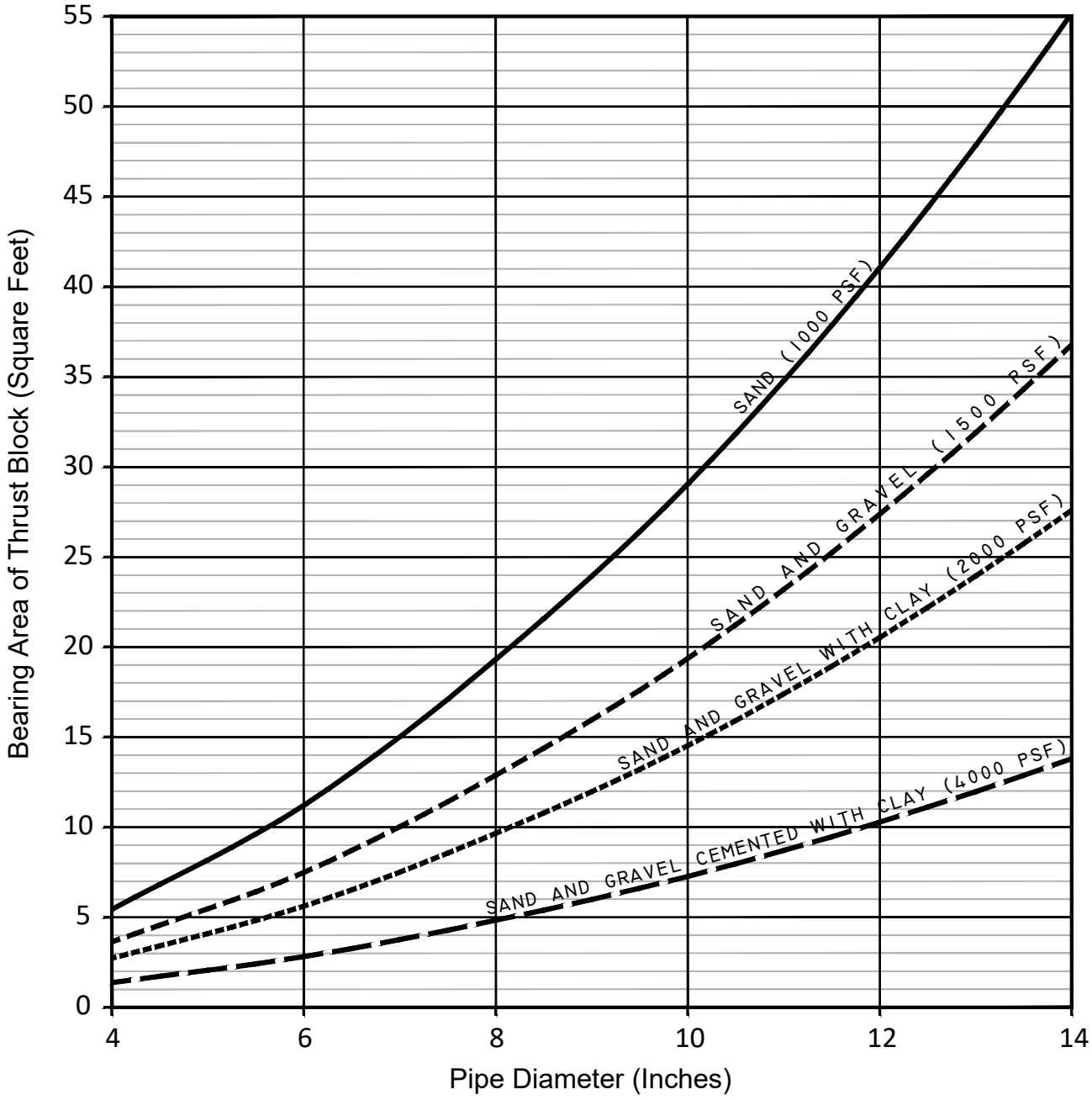
CARLSBAD MUNICIPAL WATER DISTRICT

CONCRETE THRUST BLOCKS

DISTRICT ENGINEER
RCE 55974

4/29/22
DATE

STANDARD DWG. NO. W-19



NOTES:

1. THE CHART DOES NOT APPLY TO ANCHOR BLOCKS FOR VERTICAL BENDS. SUBMIT CALCULATIONS FOR RESTRAINED JOINT DESIGN.
2. ASSUMES 200 PSI HYDROSTATIC TEST PRESSURE AND UNSATURATED SOIL CONDITIONS. FOR OTHER CONDITIONS, SUBMIT CALCULATIONS.
3. THE CHART REPRESENTS STRAIGHT–LINE THRUST (DEAD END, LINE VALVE OR TEE). USE THE FOLLOWING BEARING AREA FACTORS FOR HORIZONTAL BENDS:

BEARING AREA FACTORS FOR HORIZONTAL BENDS:

90–DEG. BEND:	1.4
45–DEG. BEND:	0.8
22.5–DEG. BEND:	0.4
11.25–DEG. BEND:	0.2

REV.	APPROVED	DATE

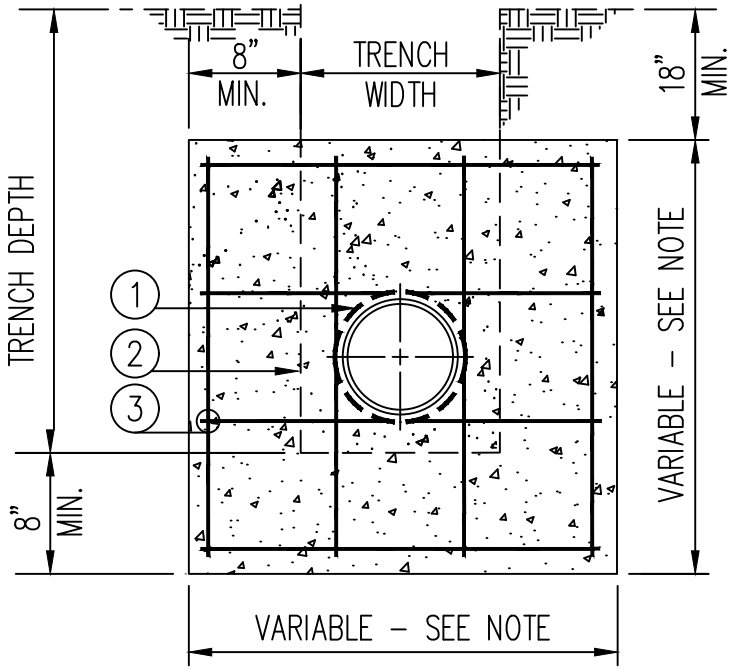
CARLSBAD MUNICIPAL WATER DISTRICT

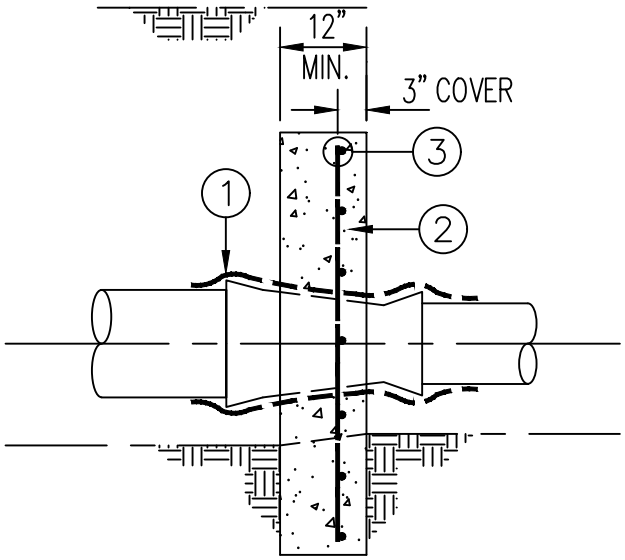
THRUST BLOCK BEARING AREAS

DISTRICT ENGINEER
RCE 55974

7/22/22
DATE

STANDARD DWG. NO. W-19A





NOTES:

1. BEARING AREA SHALL BE THE DIFFERENCE BETWEEN THE BEARING AREAS REQUIRED FOR THRUST ANCHORAGE OF MAINS ON EACH SIDE OF REDUCER PLUS THE AREA OF THE TRENCH OPENING.
2. MINIMUM DIMENSIONS SHOWN SHALL BE ADHERED TO.
3. FOR PIPE DIAMETERS LARGER THAN 12", ENGINEER TO PROVIDE CALCULATIONS FOR THRUST BLOCK SIZE.
4. FITTINGS SHALL BE DUCTILE IRON FOR DI & PVC PIPE.
5. CONCRETE MINIMUM CURING TIME PER SPEC. 03000.
6. RESTRAINED JOINTS MAY BE ALLOWED IN LIEU OF THRUST BLOCKS.

ITEM	DESCRIPTION	SPEC/DWG
1	POLYETHYLENE ENCASEMENT	15000
2	CONCRETE THRUST BLOCK (560-C-3250 CONCRETE)	03000
3	NO. 4 BAR 9" ON CENTER EACH WAY	03000

REV.	APPROVED	DATE

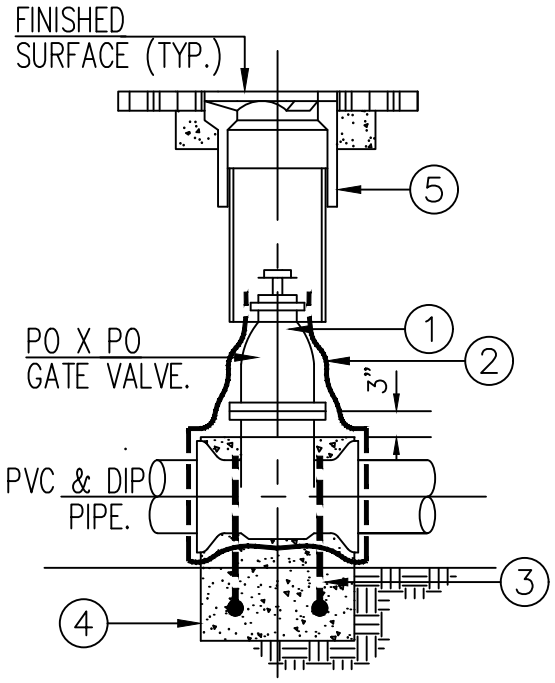
CARLSBAD MUNICIPAL WATER DISTRICT

THRUST BLOCK FOR REDUCER 4" THRU 12"

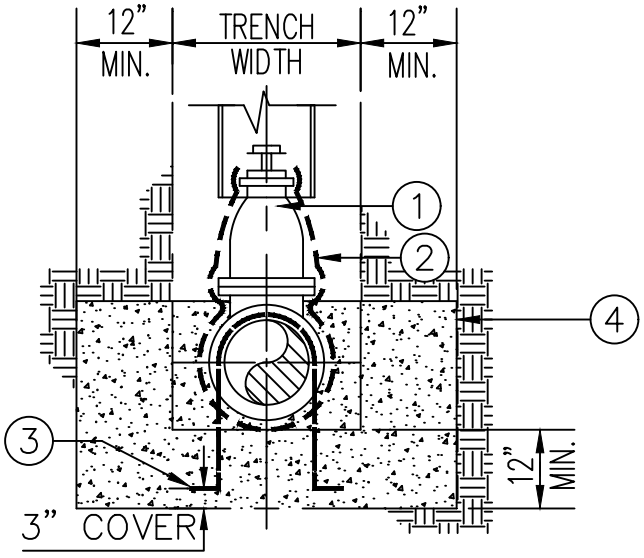
DISTRICT ENGINEER
RCE 55974

4/29/22
DATE

STANDARD DWG. NO. W-20



TRENCH ELEVATION
PVC & DIP PIPE

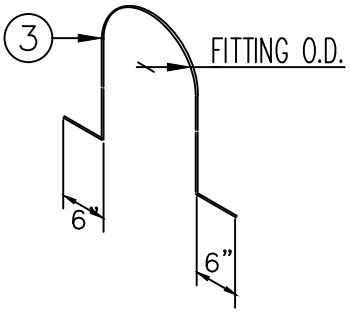


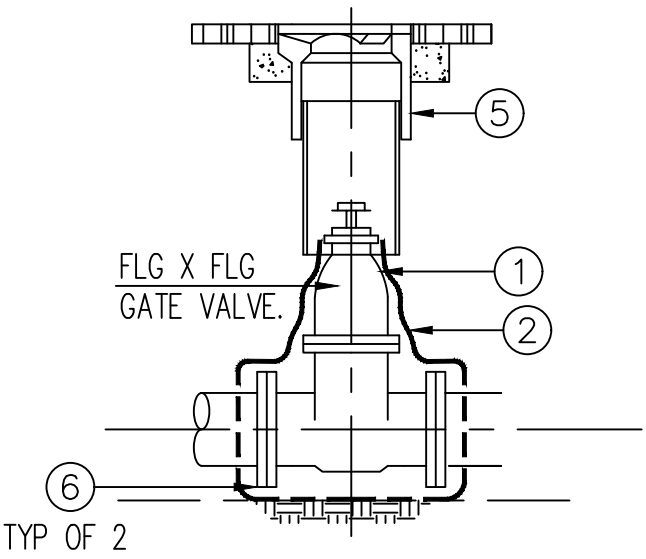
TRENCH SECTION
(TYPICAL)

NOTES:

1. SEE SPECIFICATIONS FOR BURIED FLANGE AND VALVE REQUIREMENTS.
2. THRUST BLOCK BEARING AREA PER ENGINEER CALCULATIONS TO BE SHOWN ON THE APPROVED PLANS.
3. ALL BURIED NUTS AND BOLTS REQUIRE APPLICATION OF NON-OXIDE GREASE AND WAX TAPE COATING PER SPEC 09902.

REINFORCING
STEEL DETAIL.





TRENCH ELEVATION
STEEL PIPE

ITEM	DESCRIPTION	SPEC/DWG
1	GATE VALVE	15100
2	POLYETHYLENE ENCASEMENT	15000
3	NO. 4 REINFORCING STEEL (2 EA. TYP)	03000
4	CONCRETE THRUST/ANCHOR BLOCK (560-C-3250)	03000
5	VALVE BOX ASSEMBLY	W-23
6	STEEL FLG, FIELD WELDED	09870/15061

REV.	APPROVED	DATE

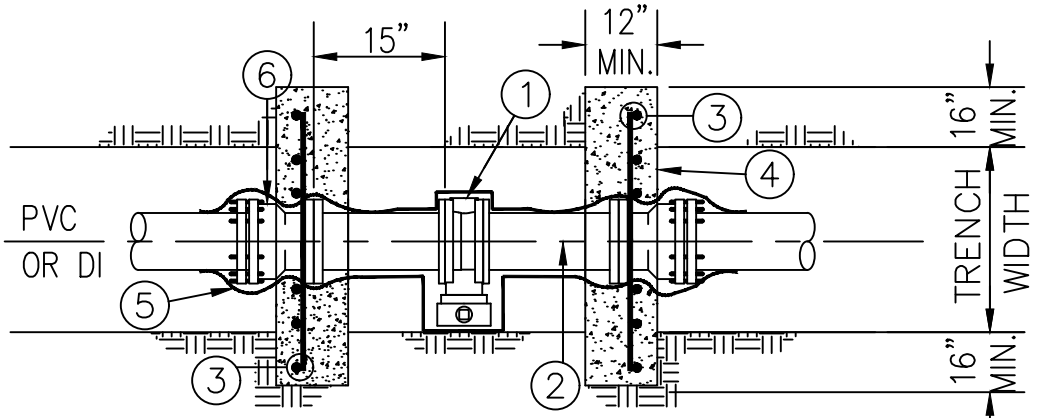
CARLSBAD MUNICIPAL WATER DISTRICT

GATE VALVE INSTALLATION

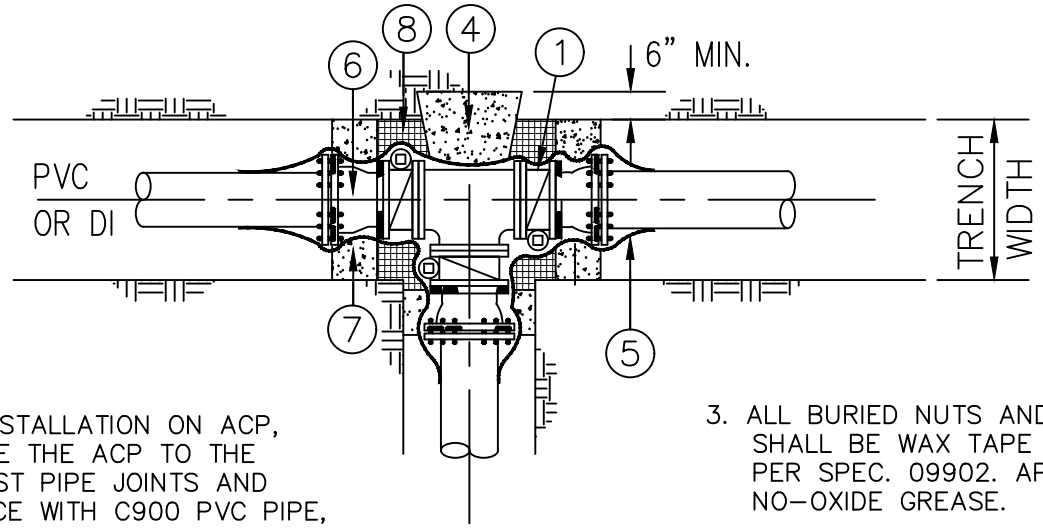
DISTRICT ENGINEER
RCE 55974

4/29/22
DATE

STANDARD DWG. NO. W-21



LINE VALVE INSTALLATION



TEE ASSEMBLY

NOTES:

1. FOR INSTALLATION ON ACP, REMOVE THE ACP TO THE NEAREST PIPE JOINTS AND REPLACE WITH C900 PVC PIPE, DR 14.
2. FOR VALVE INSTALLATION ON STEEL PIPE, USE SLIP–ON WELDED FLANGES AND INSTALL PER SPEC 09870 AND 15061.
3. ALL BURIED NUTS AND BOLTS SHALL BE WAX TAPE COATED PER SPEC. 09902. APPLY NO–OXIDE GREASE.

ITEM	DESCRIPTION	SPEC/DWG
1	BUTTERFLY VALVE	15102
2	DI FLG'D SPOOL	15056
3	NO. 4 REINFORCING STEEL 6" O.C. EACH WAY	03000
4	CONCRETE THRUST BLOCK (560–C–3250)	03000
5	POLYETHYLENE ENCASEMENT	15000
6	FL X MJ ADAPTER	15056
7	CONCRETE SUPPORT	03000
8	SANDBAGS	

REV.	APPROVED	DATE

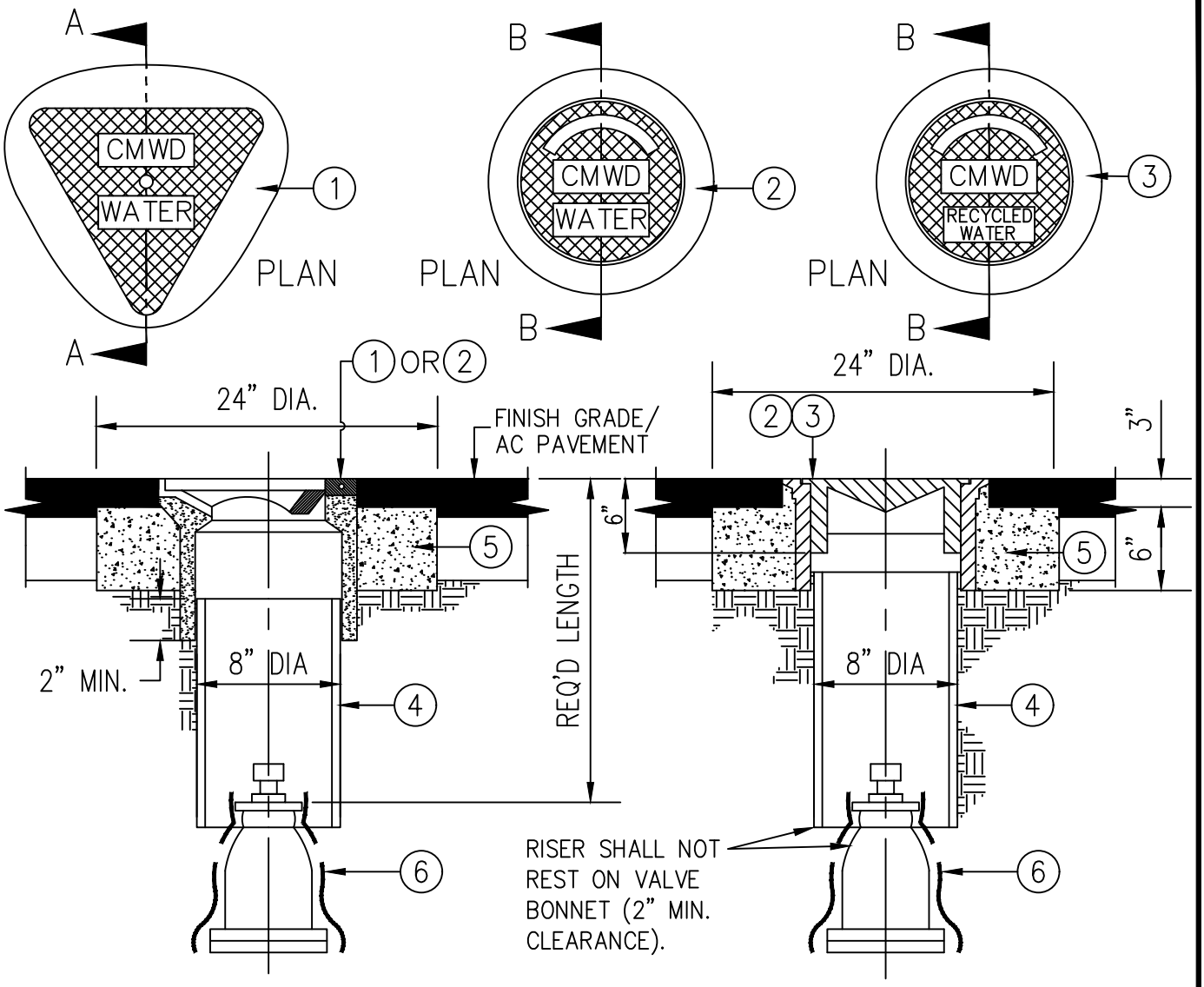
CARLSBAD MUNICIPAL WATER DISTRICT

BUTTERFLY VALVE INSTALLATION

DISTRICT ENGINEER
RCE 55974

4/29/22
DATE

STANDARD DWG. NO. W-22



SECTION A–A
POTABLE WATER

SECTION B–B
RECLAIMED WATER

NOTES:

1. IN UNPAVED AREAS PLACE MARKER POST NEXT TO VALVE BOX ASSEMBLY AS DIRECTED BY THE ENGINEER. (SEE STD. DWG. W–26).
2. ALL BURIED NUTS AND BOLTS SHALL BE WAX TAPE COATED PER SPEC. 09902.
3. SEE STD. DWG. W–24 FOR VALVE EXTENSION STEM.
4. LID TO RECEIVE 2 COATS OF PAINT. SEE SPECIFICATIONS FOR PAINTING REQUIREMENTS.
5. VALVE BOX AND COVER TO BE A MANUFACTURED SET.

ITEM	DESCRIPTION	SPEC/DWG
1	VALVE BOX & COVER WITH NON–SKID C.I. COVER AND LIFT HOLE	15000
2	VALVE BOX & COVER FOR NORMALLY CLOSED VALVE	15000
3	VALVE BOX & COVER FOR RECYCLED WATER	15000
4	8" PVC	15000
5	CONCRETE COLLAR (560–C–3250)	03000
6	POLYETHYLENE ENCASEMENT	15000

REV.	APPROVED	DATE

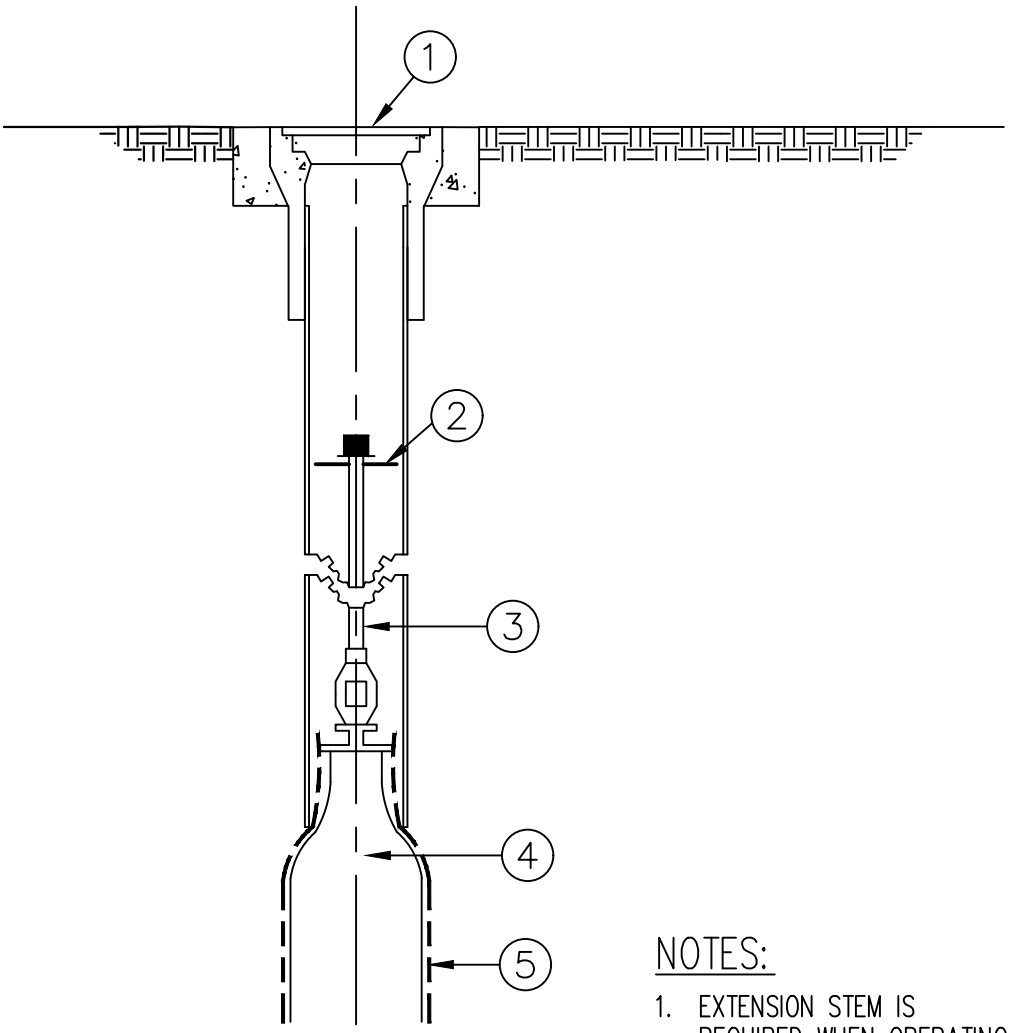
CARLSBAD MUNICIPAL WATER DISTRICT

VALVE BOX ASSEMBLY

DISTRICT ENGINEER
RCE 55974

4/29/22
DATE

STANDARD DWG. NO. W-23



NOTES:

1. EXTENSION STEM IS REQUIRED WHEN OPERATING NUT IS 5' OR MORE BELOW TOP OF VALVE COVER.
2. ALL BURIED NUTS AND BOLTS SHALL BE WAX TAPE COATED PER SPEC. 09902.

ITEM	DESCRIPTION	SPEC/DWG
1	VALVE BOX ASSEMBLY	15000/W-23
2	DISC GUIDE WELDED TO EXTENSION STEM	15000
3	EXTENSION STEM W/ SQUARE NUT (COUPLE PER MFGR. SPECS.)	15000
4	GATE OR BUTTERFLY VALVE	15100/15102
5	POLYETHYLENE ENCASEMENT	15000

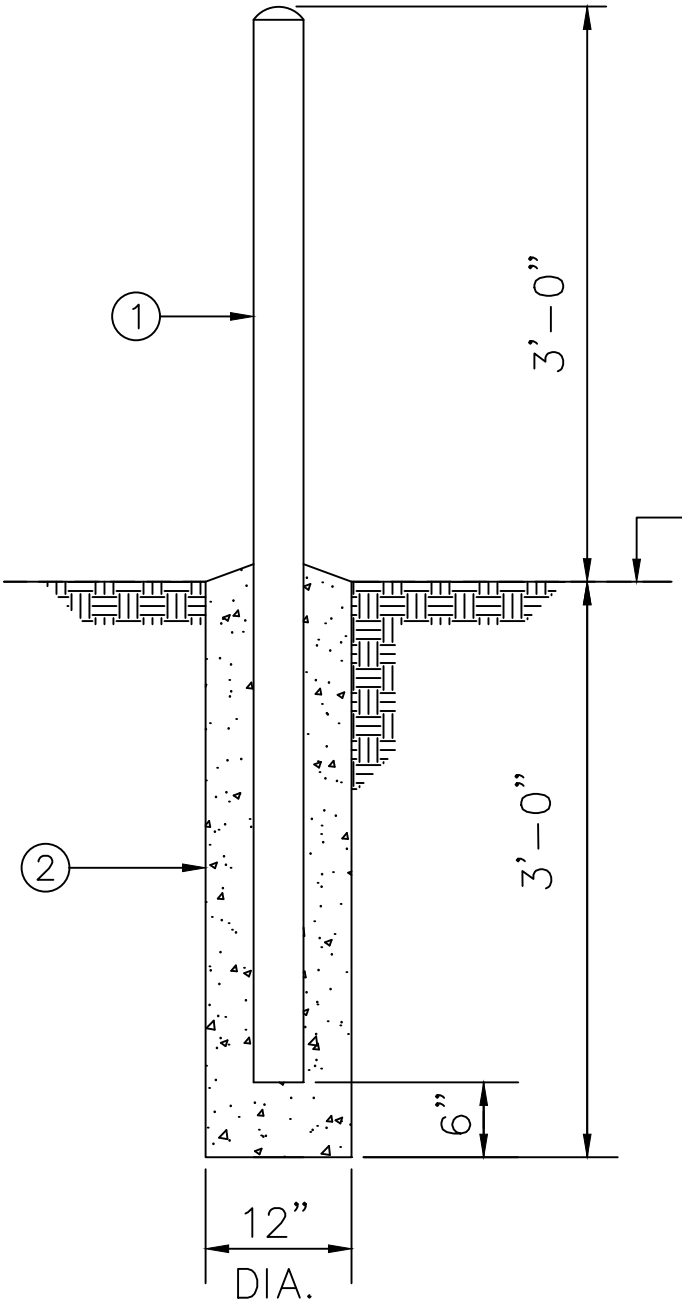
REV.	APPROVED	DATE

CARLSBAD MUNICIPAL WATER DISTRICT

VALVE OPERATOR EXTENSION STEM

David Rubio 4/29/22
DISTRICT ENGINEER DATE
RCE 55974

STANDARD DWG. NO. W-24



NOTES:

1. PIPE SHALL BE PAINTED IN CONFORMANCE WITH DISTRICT SPECIFICATIONS.
2. FILL PIPE WITH CONCRETE.

ITEM	DESCRIPTION	SPEC/DWG
1	4" SCH. 40 STEEL PIPE, PAINTED (ASTM A36)	
2	CONCRETE FOOTING (470-C-2000)	03000

REV.	APPROVED	DATE

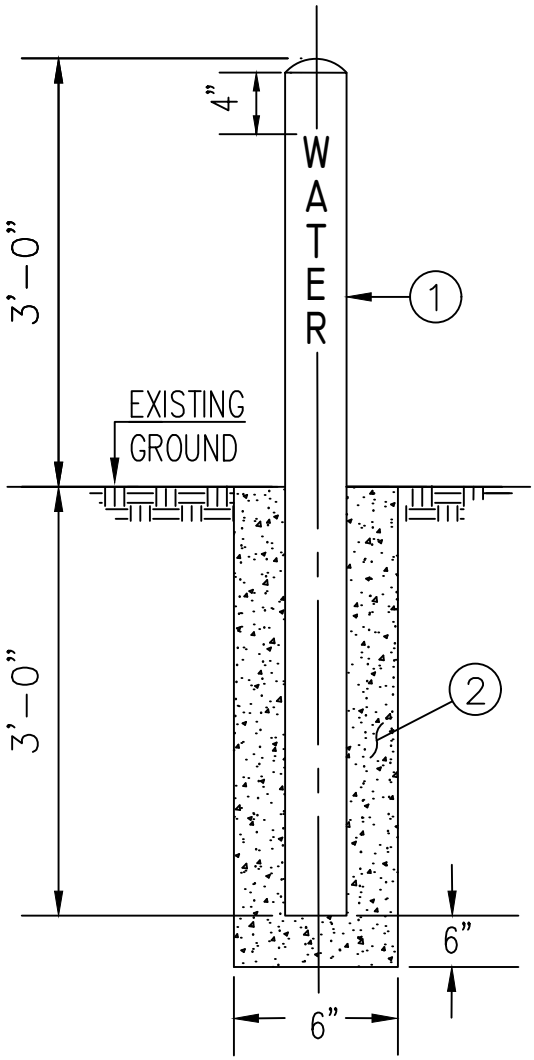
CARLSBAD MUNICIPAL WATER DISTRICT

PROTECTION POST

David Rolla
DISTRICT ENGINEER
RCE 55974

4/29/22
DATE

STANDARD DWG. NO. W-25



NOTE:

1. MARKER POST COLOR AND STENCILING SHALL CONFORM WITH APWA UNIFORM COLOR CODE FOR TYPE OF SERVICE.

ITEM	DESCRIPTION	SPEC/DWG
1	PIPELINE MARKER POST	AML
2	CONTROLLED LOW STRENGTH MATERIAL (CLSM)	03000

REV.	APPROVED	DATE

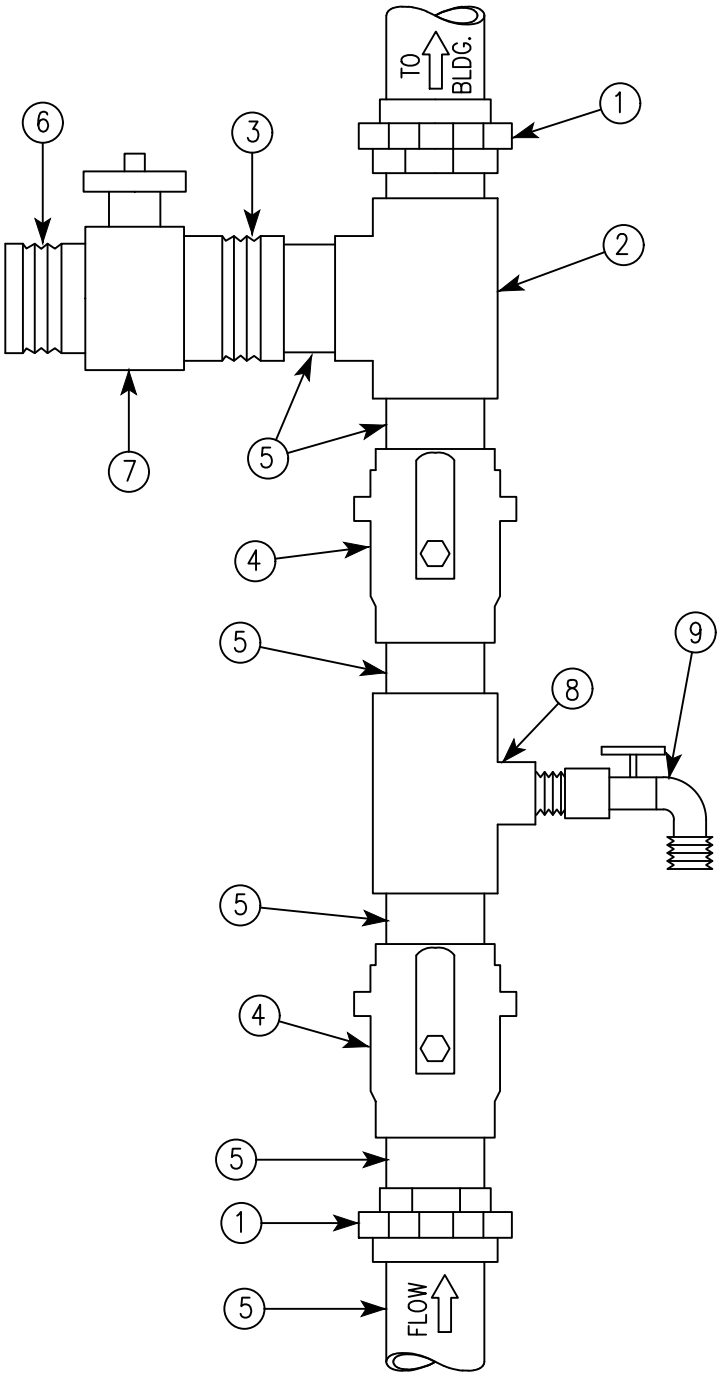
CARLSBAD MUNICIPAL WATER DISTRICT

MARKER POST

DISTRICT ENGINEER
RCE 55974

4/29/22
DATE

STANDARD DWG. NO. W-26



NOTES:

1. UNLESS SPECIFIED OTHERWISE, FITINGS AND PIPE SIZES SHALL MATCH WATER SERVICE DIAMETER.
2. THREADED JOINT FITTINGS (NPT) MAY BE USED IN PLACE OF SOLDERED JOINTS.

ITEM	DESCRIPTION	SPEC/DWG
1	COPPER x COPPER UNION	15057
2	COPPER TEE	15057
3	MNPT x COPPER ADAPTER	15057
4	BALL VALVE WITH HAND LEVER	15099
5	TYPE L COPPER	15057
6	1.5" FIRE HOSE FITTING	
7	BALL VALVE WITH PADLOCK WING	15099
8	COPPER REDUCING TEE	15057
9	3/4" HOSE BIB OR TEST COCK	

REV.	APPROVED	DATE

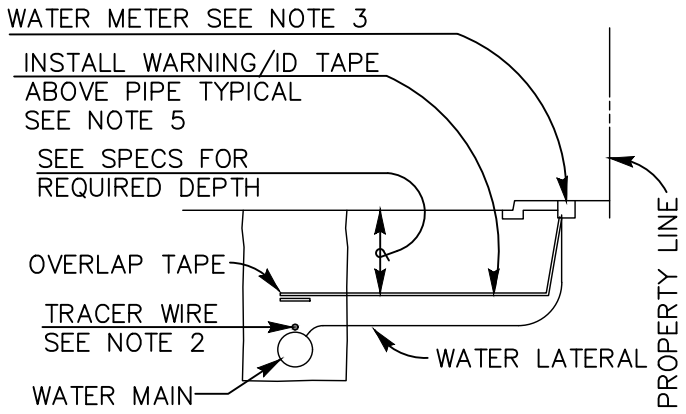
CARLSBAD MUNICIPAL WATER DISTRICT

BYPASS TEE FOR CROSS CONNECTION TESTING

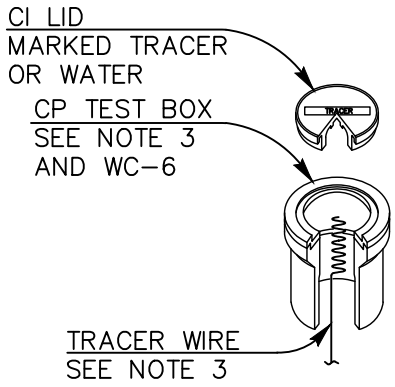
DISTRICT ENGINEER
RCE 55974

4/29/22
DATE

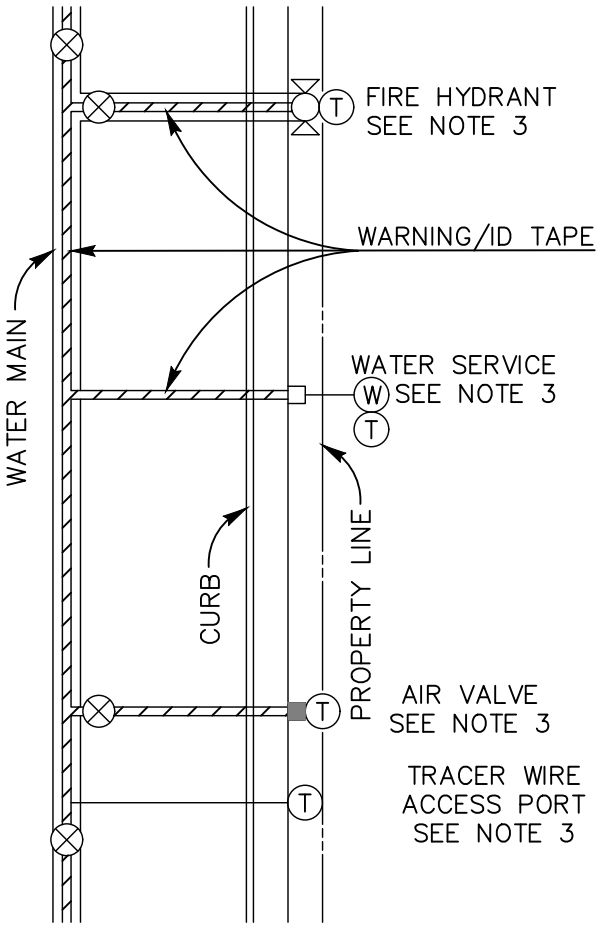
STANDARD DWG. NO. W-27



SECTION AT WATER LATERALS



TRACER WIRE ACCESS PORT (CP BOX) DETAIL



PLAN

NOTES:

1) MATERIALS SHALL BE SELECTED FROM THE APPROVED MATERIALS LIST.
2) TRACER WIRE FOR NON METALLIC PIPE AND OR WARNING ID TAPE TO RUN CONTINUOUSLY ALONG THE ENTIRE LENGTH OF WATER MAINS AND APPURTENANCES. SECURE WIRE TO THE PIPE AND MAINTAIN ON PIPE CENTERLINE DURING TRENCH BACKFILL.
3) TRACER WIRE ACCESS PORTS SHALL BE INSTALLED WITHIN THE CONCRETE SPLASH PAD OF ALL FIRE HYDRANTS IN ACCORDANCE WITH THE STANDARD DRAWINGS. TRACER WIRE MAY TERMINATE WITHIN METER BOX, BLOWOFF BOX OR AIR VALVE PER THE SPECIFICATIONS. TRACER WIRE MAY TERMINATE IN A CP TEST ONLY IF NO OTHER APPURTENANCE EXISTS WITHIN THE REQUIRED 1,000' INTERVAL. ALL BURIED WIRES THAT REQUIRE TRENCHING TO A TEST BOX LOCATION SHALL BE INSTALLED, WITHOUT SPLICE, IN A CONDUIT IN THE TRENCH AT MINIMUM DEPTH OF 24".
4) WIRE SPLICE CONNECTORS SHALL BE SILICONE FILLED TYPE AND BE USED FOR TRACER WIRE REPAIR ONLY. SPLICING FOR NEW INSTALLATIONS WILL NOT BE ALLOWED.

(T) LEGEND ON PLANS (TRACER WIRE)

REV.	APPROVED	DATE

CARLSBAD MUNICIPAL WATER DISTRICT

WARNING/IDENTIFICATION TAPE AND TRACER WIRE INSTALLATION

DISTRICT ENGINEER RCE 55974 — 4/29/22 DATE

STANDARD DWG. NO. W-28

MATERIALS LIST: (STEEL PIPE THICKNESS = t = 1/4")

(1) 1 EACH 10" PRESSURE REDUCING AND PRESSURE SUSTAINING VALVE, CLA-VAL 92G-01, BCSKCY, C.I. BODY, SS TRIM, CL 125 FLANGES, EPOXY LINED AND COATED, X101 INDICATOR (SEE MISC. UNDER TELEMETRY SYSTEM COMPONENT LIST).

(2) 1 EACH 6" PRESSURE REDUCING AND PRESSURE SUSTAINING VALVE. (SAME DESCRIPTION AS ITEM NO. 1).

(3) 1 EACH 6" PRESSURE RELIEF VALVE, 50A-01 BCKOGY, C.I. BODY, SS TRIM, CL 125 FLANGES, EPOXY LINED AND COATED, CRL 20-200 PSI RANGE. INSTALL FLANGE INSULATION KIT AT FLANGE CONNECTION TO 6" STEEL DISCHARGE PIPE.

(4) 2 EACH 12" GATE VALVES, CL 125 FLANGES, WITH HAND WHEEL.

(5) 2 EACH 8" GATE VALVES, CL 125 FLANGES, WITH HAND WHEEL.

(6) 1 EACH 6" GATE VALVE, CL 125 FLANGES, WITH HAND WHEEL.

(7) 2 EACH 12 X 12 X 8" FABRICATED 10 GA. STEEL COMBINATION TEE, BEND, REDUCER, WELDED JOINTS, CL150 FLANGES.

(8) 1 EACH 8X6" DI TEE, CL125 FLANGES

(9) 1 EACH 6" FABRICATED 10 GA. STEEL DISCHARGE LINE WITH BEND, CL150 FLANGES, MECHANICAL COUPLINGS.

(10) 2 EACH 12 X 10" CL125 FLANGED REDUCER.

(11) 1 EACH 12" CL150 FLANGED SPOOL.

(12) 1 EACH 12" CL150 FLG X GROOVE SPOOL.

(13) 1 EACH 8" CL150 FLANGED SPOOL.

(14) 1 EACH 8" CL150 FLG X GROOVE SPOOL.

(15) 3 EACH STYLE 77 VICTAULIC COUPLINGS.

(16) 1 EACH SUMP PUMP "LITTLE GIANT" 1/3 HP AUTOMATIC, CAT.#506909.

(17) 1 EACH 1-1/2" SCH 80 PVC DISCHARGE WITH CHECK VALVE AND COMPRESSION COUPLING. 1-1/2" GALVANIZED SUPPORT BRACKET.

(18) 9 EACH ADJUSTABLE PIPE SUPPORT. GALVANIZED WITH DRAIN HOLE - MOUNTED ON RAISED CEMENT.

(19) 1 EACH PRE-CAST CONCRETE VAULT (H-20 LOADING).

(20) 1 EACH 36 X 36" HATCH, BILCO TYPE J-4AL. RUN HATCH DRAIN TUBE TO DAYLIGHT OR CURB.

(21) 1 EACH GALVANIZED STEEL LADDER, ALHAMBRA FDRY. MODEL NO. A-3400 WITH LADDER-UP.

(22) 2 EACH 6" SCH 80 PVC VENT PIPES. LOCATION PER PLAN

(23) 3 EACH 6" SCH 80 PVC 90° BENDS.

(24) 2 EACH 6" SCH 80 PVC FLG ADAPTER.

(25) 2 EACH 6" 10 GA. STEEL VENT PIPE, PRIME AND PAINT.

(26) 2 EACH 6" STEEL INTAKE AIR CAP, ALHAMBRA FDRY. MODEL NO. A-2163, PRIME AND PAINT.

(27) 2 EACH CONCRETE VENT PIPE ENCASEMENTS.

(28) 1 EACH SDRSD TYPE G-1 CATCH BASIN. LOCATION PER LOCATION PER CIVIL DRAWINGS.

(29) 1 EACH GALVANIZED STEEL GRATE, FRAME AND GRATE, SDRSD STD DWGS D-13 AND D-15.

(30) 1 EACH 6" FABRICATED 10 GA. STEEL DISCHARGE WITH 180° LONG RADIUS BEND, CL150 FLANGES, EPOXY LINED AND PAINT COATED.

(31) NOT USED.

(32) FLG X MJ BEND, RESTRAINED (WHERE REQ'D, ALTERNATE INLET/OUTLET).

(33) 2 EACH 8" SLIP ON/WELD ON FLANGES (SHIP LOOSE). INSTALL FLANGE INSULATION KIT.

(34) 2 EACH 12" SLIP ON/WELD ON FLANGES (SHIP LOOSE). INSTALL FLANGE INSULATION KIT.

(35) PRESSURE GUAGE AND PRESSURE TRANSDUCER WITH FLUSH PORT PER GUAGE AND TRANSDUCER DETAIL THIS SHEET.

(36) 12" PVC SDR 35 DRAIN PIPE TO STORM DRAIN.

(37) 5/8" LIFTING EYE BOLT WITH EMBED OVER GATE VALVE OR CONTROL VALVE 8" AND LARGER.

(38) NOT USED.

(39) FRP GRATE.

(40) 1 EACH 6" CL150 FLANGE.

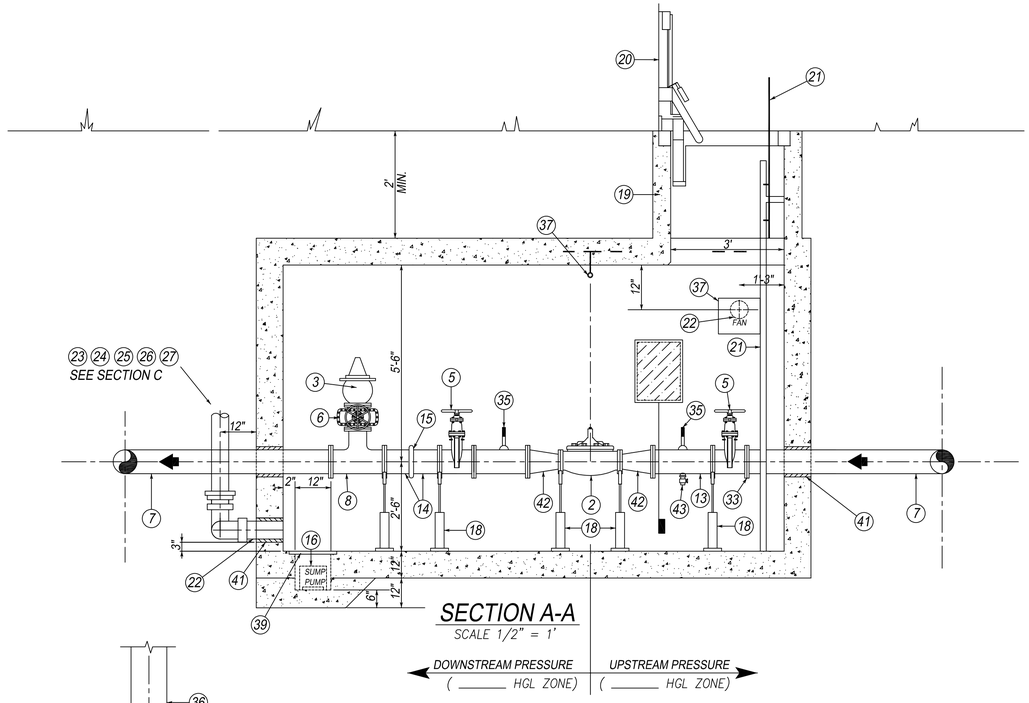
(41) WALL SLEEVES PER WALL SLEEVE DETAIL THIS SHEET.

(42) 2 EACH 8 X 6" CL125 FLANGED REDUCER.

(43) 1 EACH 2" 3000-LB HALF COUPLING AND BALL VALVE W/ TEE HANDLE TO BE LOCATED ON 12" DIAMETER SPOOL, AS DIRECTED.

(44) 3\4" BALL VALVE WITH MNPT x MGHT ADAPTER AT BODY PLUG LOCATION.

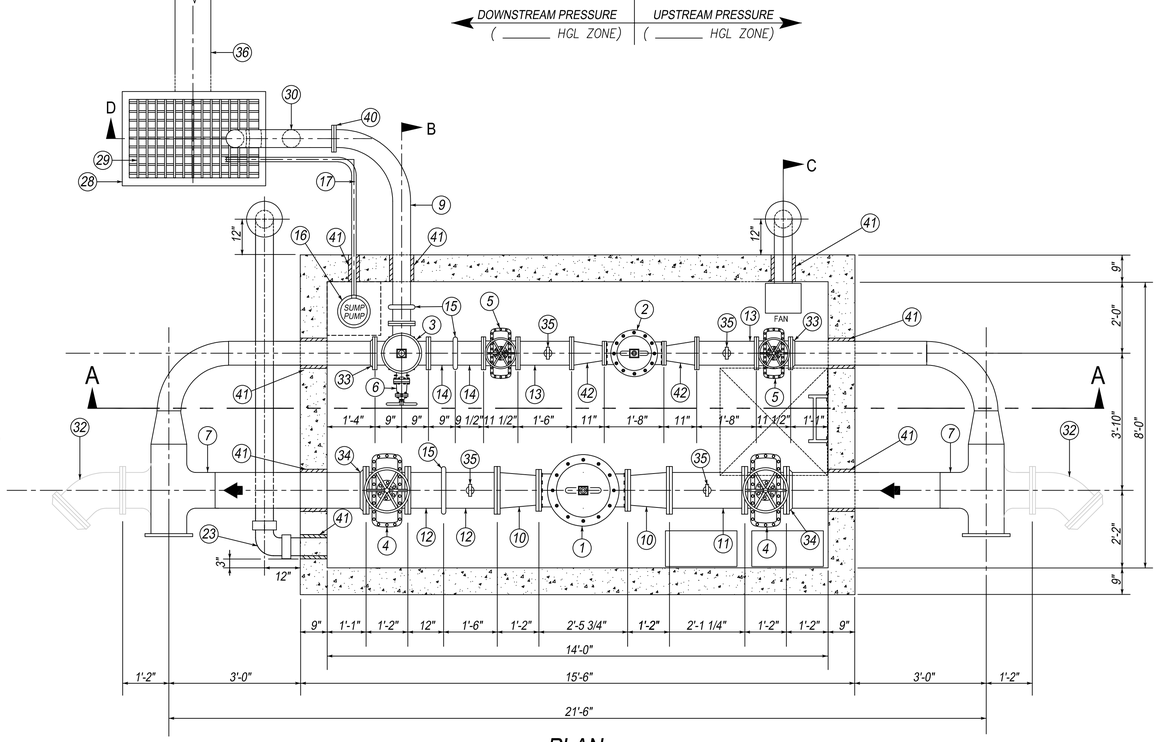
(45) TELEMETRY ENCLOSURE WITH FLOAT SWITCH WIRED TO 110v RELAY.



SECTION A-A
SCALE 1/2" = 1'

DOWNSTREAM PRESSURE (_____ HGL ZONE)

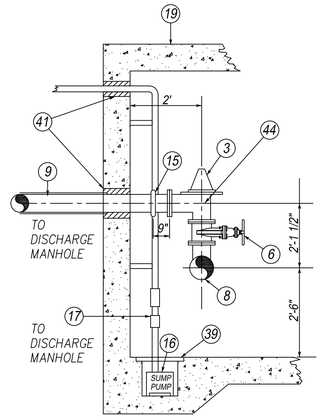
UPSTREAM PRESSURE (_____ HGL ZONE)



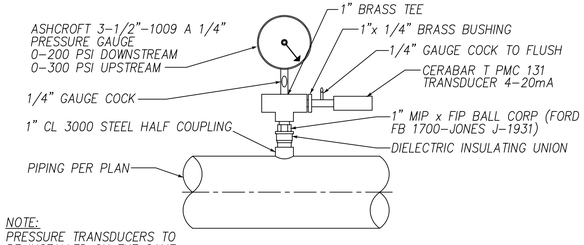
PLAN
SCALE 1/2" = 1'

GENERAL NOTES:

1. ALL WORK SHALL CONFORM TO THE PLANS AND SPECIFICATIONS OF THE CARLSBAD MUNICIPAL WATER DISTRICT AND ALL WORK SHALL BE EXECUTED IN CONFORMANCE WITH APPROVED SHOP DRAWINGS.
2. ALL MATERIALS SHALL BE AS SHOWN OR DISTRICT APPROVED EQUALS.
3. PIPING DIMENSIONS ARE NOMINAL. ALLOWANCES FOR END CAPS AND GASKETS SHALL BE MADE AS NECESSARY BY FABRICATOR. CONTRACTOR/FABRICATOR, SHALL SUBMIT SHOP DRAWINGS FOR APPROVAL OF ALL PIPING AND VAULTS PRIOR TO FABRICATION.
4. ALTERNATE PRS INLET/OUTLET PIPING CONFIGURATION OR ACCESS HATCH LOCATION MAY BE REQUIRED TO SUIT FIELD CONDITIONS.
5. VAULT, RISER AND MANHOLE FRAME AND COVER SHALL BE DESIGNED IN CONFORMANCE WITH AASHTO STANDARDS FOR H-20 LOADING AND APPLICABLE SURCHARGE LOADS. VAULT SHALL BE OF A PRECAST TYPE DESIGN. SUBMIT SHOP DRAWINGS AND CALCULATIONS TO THE DISTRICT, FOR APPROVAL.
6. IN UNPAVED AREAS, EXTEND ACCESS RISER 6" ABOVE FINISH GRADE.
7. ALL INTERIOR PIPING, VALVES AND FITTINGS SHALL BE, EPOXY LINED AND COATED PER DISTRICT STANDARDS.
8. BURIED STEEL PIPE SHALL BE CEMENT MORTAR COATED OR EPOXY COATED AND PE WRAPPED PER DISTRICT STANDARDS.
9. ALL ACCESSORY PIPING, TUBING, CONDUIT AND OTHER COMPONENTS SHALL BE SECURED WITH MOUNTING CLIPS, BRACKETS AND ANCHOR BOLTS AS APPROVED.
10. SEAL ALL CONDUIT PENETRATIONS AND JOINT SURFACES WITH CEMENT GROUT. ALL WALL SURFACES SHALL BE FINISHED SMOOTH PER DISTRICT STANDARDS.

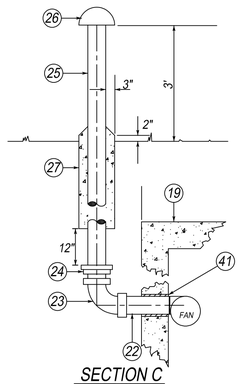


NOTE:
PRESSURE TRANSDUCERS TO BE INSTALLED ON THE SAME SIDE OF VAULT AS THE CONTROL ENCLOSURE

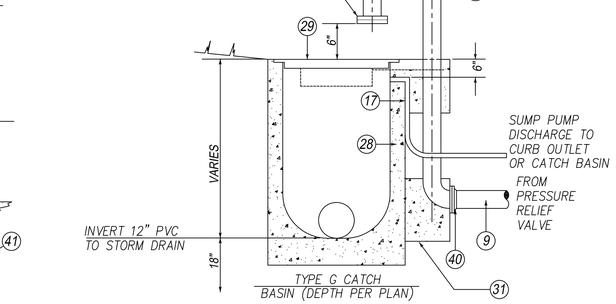


GAUGE & TRANSDUCER DETAIL
N.T.S.

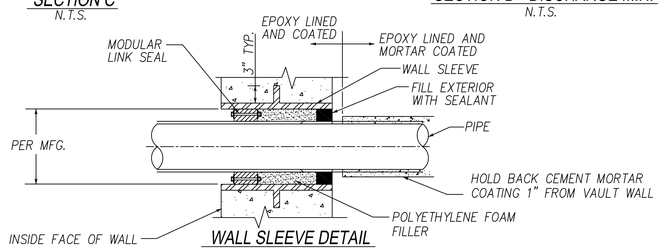
SECTION B
N.T.S.



SECTION C
N.T.S.



SECTION D - DISCHARGE M.H.
N.T.S.



WALL SLEEVE DETAIL
N.T.S.

DATE	INITIAL	REVISION DESCRIPTION	DATE	INITIAL	DATE	INITIAL
ENGINEER OF WORK			OTHER APPROVAL		CITY APPROVAL	

SHEET 1 | CITY OF CARLSBAD, ENGINEERING DEPARTMENT | SHEETS 4

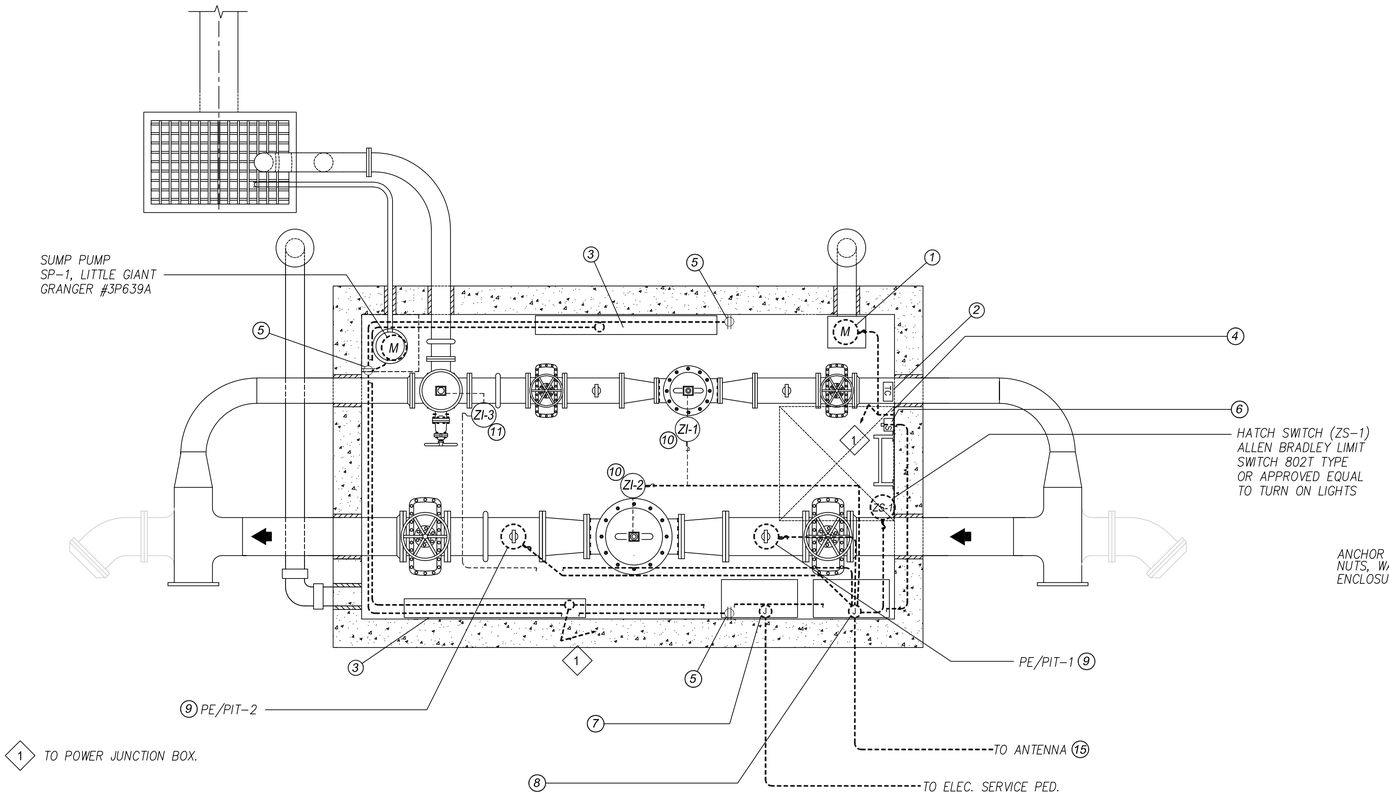
CARLSBAD MUNICIPAL WATER DISTRICT PRESSURE REDUCING STATION STANDARD DRAWING

APPROVED _____ 4/29/22
DISTRICT ENGINEER RCE 55974 DATE

DWN BY: _____
CHKD BY: _____
RVWD BY: _____

PROJECT NO.

DRAWING NO. W-29A



GENERAL NOTES

1. SUBMIT SHOP DRAWINGS FOR POWER AND CONTROL PANEL FABRICATION.
2. INSTALL POWER AND CONTROL ENCLOSURES AT LOCATIONS APPROVED BY THE DISTRICT. MOUNT TO WALL WITH UNI-STRUT.
3. CONTRACTOR SHALL SUBMIT APPLICATION FOR SERVICE AND PAY ALL FEES AND COSTS FOR INSTALLATION OF ELECTRIC SERVICE PEDESTAL AND DEDICATED LEASED COMMUNICATION LINE.
4. ALL ELECTRICAL EQUIPMENT SHALL BE SUITABLE FOR USE IN WET LOCATION. INSTALL WEATHERPROOF COVERS ON SWITCHES AND RECEPTACLES.
5. TELEMETRY SYSTEM COMPONENTS REPRESENT A TYPICAL INSTALLATION. ADDITIONAL PARTS MAY BE NEEDED PER JOB REQUIREMENTS. SEE PLANS.

ALLEN BRADLEY PLC PARTS LIST - CITY TO SUPPLY

QTY.	CATALOG NO.	DESCRIPTION
1	5069-L310 ERMK	COMPACTLOGIX 5380 CONTROLLER
1	5069-ECR	END CAP
1	5069-RTB64-SCREW	POWER TERMINAL RTB KIT FOR COMPACTLOGIX CONTAINS BOTH 4 AND 6 PIN SCREW TYPE RT
1	5069-IB16	5069 COMPACT I/O 16 CHANNEL 24VDC SINK INPUT MODULE
2	5069-RTB18-SCREW	5069 COMPACT I/O 18 PINS SCREW TYPE TERMINAL BLOCK KIT
1	5069-ARM	5069 COMPACT I/O ADDRESS RESERVE MODULE, OCCUPY ONE SLOT ADDRESS.
1	5069-IF8	5069 COMPACT I/O 8 CHANNEL VOLTAGE/CURRENT ANALOG INPUT MODULE

CELLULAR COMMUNICATIONS - CITY TO SUPPLY:

CISCO IR110-1 INTEGRATED SERVICES ROUTER
CISCO IRM-1100-SP EXPANSION MODULE
CISCO IRM-1100-4A2T EXPANSION MODULE
CISCO PWR-IE50W-AC-IEC POWER SUPPLY
CISCO ANT-4-5G4-0 ANTENNA

MATERIALS LIST

(1) 1 EACH DAYTON SHADED POLE INTAKE BLOWER AUTO RESET, MODEL NO. GRANGER #4C943 OR #4Y533.

(2) 1 EACH BLOWER TIMER- INTERMATIC #2T2500GA

(3) 4' LED FIXTURE 120V, 50W - LITHONIA CAT# FEM L48 4L MVOLT 5K, WALL MOUNT.

(4) FAN SWITCH AUTO OFF TIMER, SPRING WOUND, 15 MIN.,SPST WITH HOLD, INTERMATIC FF15MH. MOUNT NEAR TOP OF LADDER WITH LIGHT SWITCH IN DUPLEX BOX.

(5) 3 EACH DUPLEX OUTLETS (42" MIN. ABOVE FLOOR).

(6) LIGHT SWITCH, AUTO OFF TIMER, SAME AS ITEM 4.

(7) POWER ENCLOSURE - NEMA 4X-316 STAINLESS LOCKABLE (20"x20"x8" MINIMUM)(24"x30"x12" MAXIMUM)(AUSTIN) OR EQUAL.

(8) CONTROL ENCLOSURE - NEMA 4X-316 SS LOCKABLE

(9) CERABAR T PMC131 PRESSURE TRANSDUCER (FOR 0-146 PSI USE 0-10 BAR)(FOR 0-365 PSI USE 0-25 BAR)

(10) VALVE POSITION TRANSMITTER, CLA VALVE (X117C VALVE POSITION TRANSMITTER) WITH 4-20ma OUTPUT

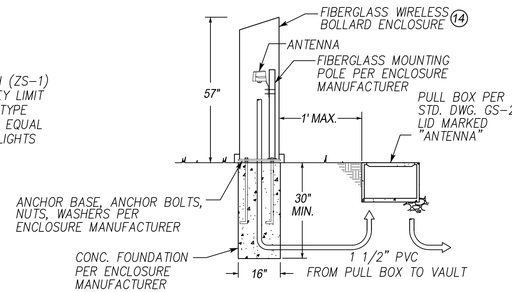
(11) LIMIT SWITCH ON PRESSURE RELIEF VALVE, CLA VALVE MODEL #X105LCW, RECLAIM WATER ONLY.

(12) (1) PHOENIX CONTACT - QUINT4-UPS/1AC/1AC/500VA/USB - 1067327, QUINT UPS, IQ TECHNOLOGY, DIN RAIL MOUNTING, INPUT 120V AC, OUTPUT 120V AC
(1) PHOENIX CONTACT - ENERGY STORAGE - UPS-BAT/PB/24DC/4AH - 1274117

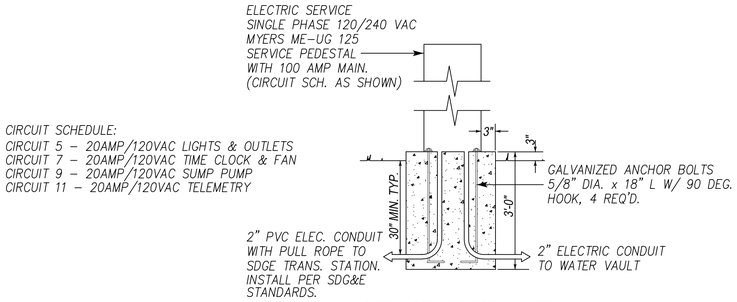
(13) (2) 1606-XLP120EQ - POWER SUPPLY, 24-28VDC, 5A

(14) (1) OBERON NETPOINT 3030, 12.5" HEAVY DUTY FIBERGLASS WI-FI ACCESS POINT BOLLARD W/ 39-303X-FOOTING-KIT

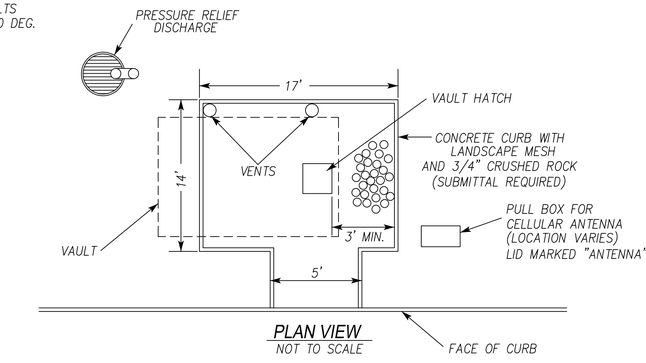
(15) LMR-200 & CONNECTOR



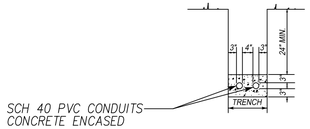
ANTENNA ENCLOSURE DETAIL
(FOR SITES WITH CELLULAR COMMUNICATIONS)
N.T.S.



SERVICE PEDESTAL DETAIL
N.T.S.



PLAN VIEW
NOT TO SCALE



TRENCH DETAIL - PRIVATE
N.T.S.

PRESSURE REDUCING STATION CONDUIT SCHEDULE

CONDUIT NO.	CONDUIT SIZE	FROM	TO	CABLE QTY.	CABLE SIZE	CABLE GND.*	VOLTAGE	TYPE	REMARKS
P0100	2"	METER PEDESTAL	POWER ENCLOSURE	10	#12	5 #12	120V	POWER	
P0101	2"	METER PEDESTAL	POWER ENCLOSURE						SPARE
P0102	1"	METER PEDESTAL	POWER ENCLOSURE						SPARE
P0103	3/4"	POWER ENCLOSURE	CONTROL ENCLOSURE	2	#12	#12	120V	POWER	CONTROL ENCLOSURE POWER
P0104	3/4"	POWER ENCLOSURE	LIGHTS & OUTLETS	4	#12	#12	120V	POWER	LIGHTS/OUTLETS & SUMP PUMP
P0105	3/4"	POWER ENCLOSURE	TIME CLOCK & FAN	2	#12	#12	120V	POWER	FAN
C0100	3/4"	CONTROL ENCLOSURE	PIT-1	2	#18TSP	#14	24VDC	SIGNAL	INFLUENT PRESSURE TRANSMITTER
C0101	3/4"	CONTROL ENCLOSURE	PIT-2	2	#18TSP	#14	24VDC	SIGNAL	EFFLUENT PRESSURE TRANSMITTER
C0102	3/4"	CONTROL ENCLOSURE	ZI-1 & ZI-2	4	#18TSP	#14	24VDC	SIGNAL	VALVE POSITION TRANSMITTERS
C0103	3/4"	CONTROL ENCLOSURE	ZS-1	2	#14	#14	24VDC	CONTROL	VAULT INTRUSION SWITCH
C0104	3/4"	CONTROL ENCLOSURE	LS-1	2	#14	#14	24VDC	CONTROL	SINGLE POINT LEVEL DETECTION
C0105	3/4"	CONTROL ENCLOSURE	ZS-3	2	#14	#14	24VDC	CONTROL	PRESSURE REFLIEF POSTION SWITCH
C0106	2"	CONTROL ENCLOSURE	ANTENNA	1				COMM	CELLULAR ANETNNA CABLE

INPUT/OUTPUT (I/O) SCHEDULE

PRESSURE REDUCING STATION

OUTPUT	INPUT	ANA.	DISC.	POINT DESCRIPTION	LOCATION	REMARKS
	X		X	UPS FAIL	YI-1 IN CP	UPS FAIL
	X		X	UPS ON BATTERY	YI-2 IN CP	AC POWER FAIL
	X		X	CABINET INSTRUSION	ZS-2	CONTROL PANEL INTRUSION
	X	X		UPSTREAM PRESSURE PIPE 2	PE/PIT-1	PRESSURE TRANSDUCER
	X	X		DOWN STREAM PRESSURE PIPE 2	PE/PIT-2	PRESSURE TRANSDUCER
	X		X	VAULT INTRUSION	ZS-1	HATCH SWITCH
	X	X		PRV VALVE NO: 1 POSITION	ZI-1	POS. TRANSMITTER
	X	X		PRV VALVE NO: 2 POSITION	ZI-2	POS. TRANSMITTER
	X		X	SINGLE POINT LEVEL DETECTION	BELOW CONTROL ENCLOSURE	FLOAT SWITCH/VAULT FLOOD
	X		X	PRESS RELIEF OPEN	ZI-3	LIMIT SWITCH

DATE	INITIAL	REVISION DESCRIPTION	DATE	INITIAL	DATE	INITIAL
ENGINEER OF WORK			OTHER APPROVAL		CITY APPROVAL	

SHEET 2 | CITY OF CARLSBAD, ENGINEERING DEPARTMENT | SHEETS 4

CARLSBAD MUNICIPAL WATER DISTRICT
PRESSURE REDUCING STATION DETAILS

APPROVED _____ 4/29/22
DISTRICT ENGINEER RCE 55974 DATE

DWN BY: _____
CHKD BY: _____
RVWD BY: _____

PROJECT NO.

DRAWING NO. W-29B

ELECTRICAL

PART 1 – GENERAL

1.1 DESCRIPTION

A. WORK INCLUDED: PROVIDE COMPLETE ELECTRICAL AND CONTROL SYSTEM AS SHOWN ON THE DRAWINGS, AS SPECIFIED HEREIN, AND AS NEEDED FOR A COMPLETE AND PROPER INSTALLATION INCLUDING, BUT NOT NECESSARILY LIMITED TO:

1. POWER/TEL. PEDESTAL AND METER PEDESTAL FOR METERING FACILITIES, MAIN CIRCUIT BREAKER ETC.;
2. FEEDER SYSTEM, IN CONDUIT TO BRANCH CIRCUITS;
3. BRANCH CIRCUIT WIRING, IN CONDUIT, FOR LIGHTING, RECEPTACLES, JUNCTION BOXES AND MOTORS;
4. HANGERS, ANCHORS, SLEEVES, CHASES, SUPPORTS FOR FIXTURES, AND OTHER ELECTRICAL MATERIALS AND EQUIPMENT IN ASSOCIATION THEREWITH;
5. LIGHTING FIXTURES AND LAMPS;
6. WIRING SYSTEM, IN CONDUIT, FOR EQUIPMENT AND CONTROLS PROVIDED UNDER OTHER SECTIONS OF THESE SPECIFICATIONS;
7. MOTOR STARTERS AND CONTROLS FOR MOTORS PROVIDED UNDER THE CONTRACT, BUT FOR WHICH MOTOR STARTERS AND CONTROLS ARE NOT OTHERWISE PROVIDED;
8. TELEMETRY SYSTEM, INCLUDING INSTALLATION OF A RADIO AND ETHERNET SWITCH;
9. OTHER ITEMS AND SERVICES REQUIRED TO COMPLETE THE SYSTEMS.

1.2 QUALITY ASSURANCE

A. USE SKILLED WORKMEN WHO ARE THOROUGHLY TRAINED AND EXPERIENCED IN THE NECESSARY CRAFTS AND WHO ARE COMPLETELY FAMILIAR WITH THE SPECIFIED REQUIREMENTS AND THE METHODS NEEDED FOR PROPER PERFORMANCE OF THE WORK OF THIS SECTION. THE REDUCING STATION HAS BEEN CLASSIFIED AS WET LOCATION. ALL ELECTRICAL WORK SHALL COMPLY WITH THE LATEST EDITION OF THE NATIONAL ELECTRICAL CODE (NFPA70), MUST BE UL RATED PANEL FOR TELEMETRY EQUIPMENT. CONTROL ENCLOSURE MUST BE CONSTRUCTED BY A CERTIFIED UL508A PANEL SHOP AND CONTAIN A UL CERTIFICATION.

B. WITHOUT ADDITIONAL COST TO THE OWNER, PROVIDE SUCH OTHER LABOR AND MATERIALS AS ARE REQUIRED TO COMPLETE THE WORK OF THIS SECTION IN ACCORDANCE WITH THE REQUIREMENTS OF GOVERNMENTAL AGENCIES HAVING JURISDICTION, REGARDLESS OF WHETHER SUCH MATERIALS AND ASSOCIATED LABOR ARE CALLED FOR ELSEWHERE IN THESE CONTRACT DOCUMENTS.

1.3 SUBMITTALS

A. PRODUCT DATA: WITHIN 35 CALENDAR DAYS AFTER THE CONTRACTOR HAS RECEIVED THE OWNER'S NOTICE TO PROCEED, SUBMIT SIX (6) COPIES OF:

1. MATERIALS LIST OF ITEMS PROPOSED TO BE PROVIDED UNDER THIS SECTION;
2. MANUFACTURER'S SPECIFICATIONS AND OTHER DATA NEEDED TO PROVE COMPLIANCE WITH THE SPECIFIED REQUIREMENTS;
3. MANUFACTURER'S RECOMMENDED INSTALLATION PROCEDURES WHICH, WHEN APPROVED BY THE OWNER WILL BECOME THE BASIS FOR ACCEPTING OR REJECTING ACTUAL INSTALLATION PROCEDURES USED ON THE WORK.
4. ELECTRICAL AND CONTROL ENCLOSURE SHOP DRAWINGS.

B. MANUAL: UPON COMPLETION OF THIS PORTION OF THE WORK, AND AS A CONDITION OF ITS ACCEPTANCE, DELIVER TO THE OWNER TWO (2) COPIES OF AN OPERATION AND MAINTENANCE MANUAL. INCLUDE WITHIN EACH MANUAL:

1. COPY OF APPROVED RECORD DOCUMENTS FOR THIS PORTION OF THE WORK;
2. COPIES OF ALL CIRCUIT DIRECTORIES;
3. COPIES OF ALL WARRANTIES AND GUARANTIES;
4. CONTROL SCHEMATICS AND WRITTEN STEP–BY–STEP DESCRIPTION OF THE CONTROL FUNCTIONS.

1.4 WARRANTY

A. PROVIDE 1 YEAR WARRANTY ON ALL LABOR AND MATERIALS FROM THE DATE OF COMMISSIONING.

PART 2 – PRODUCTS

2.1 GENERAL

WHERE UNDERWRITER'S LABORATORIES, INC. HAVE ESTABLISHED STANDARDS FOR SUCH MATERIALS, PROVIDE ONLY MATERIALS BEARING THE UL LABEL.

A. TEMPORARY POWER:

1. THE CONTRACTOR, AT HIS OWN EXPENSE, WILL PROVIDE TEMPORARY POWER AND PAY THE COSTS FOR INSTALLING PERMANENT ELECTRICAL METER OR METERS AS REQUIRED.

2.2 SERVICE ENTRANCE (METER PEDESTAL)

A. PEDESTAL: MYERS 120/240 VAC ME–UG 125 WITH 100 AMP MAIN CIRCUIT BREAKER

B. METERING SECTION AND EQUIPMENT SHALL BE IN ACCORDANCE WITH SAN DIEGO GAS & ELECTRIC COMPANY (SDG&E) REQUIREMENTS.

2.3 GROUNDING SYSTEM

A. GROUND ALL EQUIPMENT, INCLUDING SWITCHBOARDS, TRANSFORMERS, CONDUIT SYSTEMS, MOTORS, AND OTHER APPARATUS, BY CONDUIT OR CONDUCTOR TO COLD WATER MAIN OR TO INDEPENDENT GROUNDING ELECTRODE AS SHOWN ON THE DRAWINGS, USING GROUND CLAMPS MANUFACTURED BY BURNDY OR T&B AND APPROVED BY THE OWNER.

B. USE GROUND RODS IF WATER MAINS OR PIPING ARE NOT METALLIC, OR IF ISOLATION COUPLINGS HAVE BEEN USED.

1. LOCATE GROUND RODS IN PLANTERS OR SIMILAR AREAS WHICH WILL RECEIVE WATER REGULARLY, AND DRIVE TO A DEPTH OF AT LEAST 8'–0.
2. MAKE MEG GROUND TESTS TO MEASURE GROUND RESISTANCE, AND PROVIDE NOT MORE THAN 5 OHMS RESISTANCE, ADDING GROUND RODS AS REQUIRED TO ACHIEVE THAT LEVEL.
3. MAKE GROUND RODS ACCESSIBLE FOR INSPECTION.

2.4 DISTRIBUTION SYSTEM

A. IDENTIFICATION:

1. IDENTIFY ALL APPARATUS USED FOR OPERATION AND CONTROL OF CIRCUITS, APPLIANCES, AND EQUIPMENT
2. PROVIDE PHENOLIC NAMEPLATES, BLACK FACE WITH WHITE CORE LETTERS, SHOWING PROPER AND COMPLETE IDENTIFICATION TO FIT 2" x 1" HIGH NAMEPLATE.

B. WIRING DEVICES:

1. PROVIDE DUPLEX RECEPTACLES OF 3–POLE GROUNDING TYPE WITH THE THIRD POLE U–SHAPED AND GROUNDED TO THE CONDUIT SYSTEM, UL APPROVED.

C. RACEWAYS:

1. PROVIDE SCH 80 PVC WHERE ENCASED IN CONCRETE OR MASONRY OR BURIED.
   A. WHERE CONDUIT IS INSTALLED IN THE FLOOR SLAB, CONDUIT SHALL EMERGE ABOVE THE SLAB AS PVC–COATED RIGID STEEL CONDUIT.
2. ALL FLEXIBLE CONDUITS SHALL BE SEALTITE TYPE OR EQUAL.
3. OUTLETS, JUNCTION BOXES, AND SWITCH BOXES: PROVIDE STANDARD ONE–PIECE UNITS, GALVANIZED OR CAST METAL, OF SHAPE AND SIZE BEST SUITED TO THAT PARTICULAR LOCATION, OF SUFFICIENT SIZE TO CONTAIN ENCLOSED WIRES WITHOUT CROWDING. EXACT LOCATION OF ELECTRICAL COMPONENTS TO BE DETERMINED BY DISTRICT REPRESENTATIVE DURING CONSTRUCTION. 110V OUTLETS SHALL BE MOUNTED 42"ABOVE FLOOR. INSTALL WEATHER PROOF COVERS ON RECEPTACLES AND SWITCHES LOCATED IN VAULTS.
4. CONDUIT SYSTEMS SHALL BE PROVIDED WITH AN "APPROVED MEANS" TO PREVENT ACCUMULATION OF CONDENSATION AND PERMIT DRAINAGE OF LIQUIDS.

D. CONDUCTORS:

1, FOR LINE VOLTAGES, PROVIDE 600V INSULATED COPPER WIRE AND CABLE, NEC STANDARD, OF TYPES SPECIFIED BELOW FOR DIFFERENCE APPLICATIONS, WITH UL LABEL, AGENCIES HAVING JURISDICTION.
2. WITH CONDUCTORS, PROVIDE INSULATING BUSHINGS OR INSULATING SLEEVES.
3. FOR WIRE AND CABLE, PROVIDE XHHW OR THHN/THWN.
   A. IDENTIFY FEEDER NEUTRALS WITH WHITE TAPE OR WHITE PAINT.
   B. USE ONLY COPPER WIRES AND CABLES.

2.5 LIGHTING FIXTURES

A. PROVIDE FIXTURES OF THE TYPES SHOWN ON THE DRAWINGS, COMPLETE WITH LAMPS AND MOUNTING HARDWARE.

2.6 MOTOR STARTERS

A. GENERAL: PROVIDE WESTINGHOUSE UNITS, OR EQUAL AS APPROVED IN ADVANCE BY THE OWNER OF THE SIZES AND TYPES NEED FOR THE OPERATIONS SHOWN ON THE DRAWINGS, SPECIFIED HEREIN, AND OTHERWISE REQUIRED FOR THE FACILITY, AND WITH THE FOLLOWING:

1. COMPLY WITH PERTINENT REQUIREMENTS OF NEMA AND NFPA–70.
2. INCLUDE REQUIRED ACCESSORY ITEMS.
3. HORSEPOWER RATED, WITH THERMAL OVERLOADS.
4. NORMALLY RESET WITHOUT ENTERING THE STARTER ENCLOSURE.
5. EQUIPPED WITH OVERLOADS IN EACH UNDERGROUND LEG.

2.7 TOP MOUNTED FLOAT LEVEL

A. 4RK04 FLOAT SWITCH (SINGLE POINT DETECTION).

2.8 ELECTRONIC PRESSURE TRANSMITTERS

A. ELECTRONIC PRESSURE TRANSMITTERS SHALL BE CERABAR T PMC 131 (FOR 0–146 PSI USE 0–10 BAR) DOWNSTREAM AND (FOR 0–365 PSI USE 0–25 BAR) UPSTREAM. ACCURACY SHALL BE PLUS OR MINUS 0.25 PERCENT OF CALIBRATED SPAN. PROCESS WETTED AND BODY MATERIALS SHALL BE 316 SS. PROCESS CONNECTIONS SHALL BE 1/2–INCH NPT.

2.9 OTHER MATERIALS

A. PROVIDE OTHER MATERIALS, NOT SPECIFICALLY DESCRIBED BUT REQUIRED FOR A COMPLETE AND PROPER INSTALLATION, AS SELECTED BY THE CONTRACTOR SUBJECT TO THE APPROVAL OF THE OWNER.

PART 3 – EXECUTION

3.1 SURFACE CONDITIONS

A. EXAMINE THE AREAS AND CONDITIONS UNDER WHICH WORK OF THIS SECTION WILL BE PERFORMED. CORRECT CONDITIONS DETRIMENTAL TO TIMELY AND PROPER COMPLETION OF THE WORK. DO NOT PROCEED UNTIL UNSATISFACTORY CONDITIONS ARE CORRECTED.

3.2 PREPARATION

A. COORDINATION:

1. COORDINATE AS NECESSARY WITH OTHER TRADES TO ASSURE PROPER AND ADEQUATE PROVISION IN THE WORK OF THOSE TRADES FOR INTERFACE WITH THE WORK THIS SECTION.
2. COORDINATE THE INSTALLATION OF ELECTRICAL ITEMS WITH THE SCHEDULE FOR WORK OF OTHER TRADES TO PREVENT UNNECESSARY DELAYS IN THE TOTAL WORK.
3. WHERE LIGHTING FIXTURES AND OTHER ELECTRICAL ITEMS ARE SHOWN IN CONFLICT WITH LOCATIONS OF STRUCTURAL MEMBERS AND MECHANICAL OR OTHER EQUIPMENT, PROVIDE REQUIRED SUPPORTS AND WIRING TO CLEAR THE ENCROACHMENT.

B. DATA INDICATED ON THE DRAWINGS AND IN THESE SPECIFICATIONS ARE APPROXIMATE, BUT THEIR ACCURACY IS NOT WARRANTED. THE EXACT LOCATIONS, DISTANCES, LEVELS, AND OTHER CONDITIONS WILL BE GOVERNED BY ACTUAL CONSTRUCTION AND THE DRAWINGS AND SPECIFICATIONS SHOULD BE USED ONLY FOR GUIDANCE IN SUCH REGARD.

C. WHERE OUTLETS ARE NOT SPECIFICALLY LOCATED ON THE PLAN, LOCATE AS DETERMINED IN THE FIELD BY THE OWNER. WHERE OUTLETS ARE INSTALLED WITHOUT SUCH SPECIFIC DIRECTION, RELOCATE AS DIRECTED BY THE OWNER AND AT NO ADDITIONAL COST TO THE OWNER.

D. VERIFY ALL MEASUREMENTS. NO EXTRA COMPENSATION WILL BE ALLOWED BECAUSE OF DIFFERENCES BETWEEN WORK SHOWN ON THE DRAWINGS AND ACTUAL MEASUREMENTS AT THE SITE CONSTRUCTION.

E. BRANCH CIRCUIT WIRING AND ARRANGEMENT OF HOME RUNS HAVE BEEN DESIGNED FOR MAXIMUM ECONOMY CONSISTENT WITH ADEQUATE SIZING FOR VOLTAGE DROPS AND OTHER CONSIDERATIONS. INSTALL THE WIRING WITH CIRCUITS ARRANGED EXACTLY AS SHOWN ON THE DRAWINGS, EXCEPT AS OTHERWISE APPROVED IN ADVANCE BY THE OWNER.

F. THE ELECTRICAL DRAWINGS ARE DIAGRAMMATIC, BUT ARE REQUIRED TO BE FOLLOWED AS CLOSELY AS ACTUAL CONSTRUCTION AND WORK OF OTHER TRADES WILL PERMIT. WHERE DEVIATIONS ARE REQUIRED TO CONFORM WITH ACTUAL CONSTRUCTION AND THE WORK OF OTHER TRADES, MAKE SUCH DEVIATIONS WITHOUT ADDITIONAL COST TO THE OWNER.

3.3 INSTALLATION OF RACEWAYS AND FITTINGS

A. WHERE CONDUIT IS INSTALLED, OR EXPOSED IN WORK AREAS, PROVIDE RIGID GALVANIZED CONDUIT.

1. SEAL JOINTS TO PREVENT ENTRANCE OF WATER.
2. PROVIDE GROUND WIRE OF PROPER SIZE.
3. USE NYLON (RATHER THAN STEEL) FISH TAPE.

B. USE FLEXIBLE CONDUIT ONLY FOR SHORT MOTOR CONNECTIONS, OR WHERE SUBJECT TO VIBRATION.

3.4 INSTALLATION OF POWER EQUIPMENT

A. PROVIDE POWER AND CONTROL WIRING FOR MOTOR STARTERS AND SWITCHES AS SHOWN ON THE DRAWINGS.

B. CONNECTIONS TO MISCELLANEOUS EQUIPMENT

1. WIRE TO, AND CONNECT TO, ALL EQUIPMENT NOT SPECIFICALLY DESCRIBED BUT TO WHICH ELECTRICAL POWER IS REQUIRED.
2. COORDINATE AS NECESSARY WITH OTHER TRADES AND SUPPLIERS TO VERIFY TYPES, NUMBERS, AND LOCATIONS OF EQUIPMENT.

3.5 INSTALLATION OF CONDUCTORS

A. UNLESS OTHERWISE SHOWN ON THE DRAWINGS, USE NO. 12 TYPE THWH/THHN CONDUCTORS FOR ALL BRANCH CIRCUITS, PROTECTED BY 20 AMP CIRCUIT BREAKERS. WHERE SO INDICATED ON THE DRAWINGS, USE LARGER WIRES TO LIMIT VOLTAGE DROPS.

B. INSTALLATION OF CONDUITS

1. WHERE CONDUIT SIZE IS NOT SHOWN, INSTALL 3/4" CONDUIT.
2. PROVIDE CODE SIZE CONDUIT FOR NUMBER AND SIZE WIRES SHOWN OR REQUIRED, UNLESS A LARGER SIZE CONDUIT IS SHOWN ON THE DRAWINGS.

C. USE IDENTIFIED (WHITE) NEUTRALS AND COLOR CODED PHASE WIRES FOR ALL BRANCH CIRCUIT WIRING.

1. MAKE SPLICES ELECTRICALLY AND MECHANICALLY SECURE WITH PRESSURE TYPE CONNECTORS, OR BY SOLDERING.
   A. FOR WIRES SIZE 6 AWG AND SMALLER, PROVIDE "SCOTCH–LOCK" CONNECTORS.
   B. FOR WIRE SIZE 4 AWG AND LARGER, PROVIDE BURNDY "VERSITAPS" AND HEAVY DUTY CONNECTORS, OR T&B "LOCK–TITE" CONNECTORS.
2. INSULATE SPLICES WITH A MINIMUM OF TWO HALF–LAPPED LAYERS OF SCOTCH BRANCH NO. 33 VINYL–PLASTIC ELECTRICAL TAPE WHERE INSULATION IS REQUIRED.

D. TAPE ALL JOINTS WITH RUBBER TAPE 1 1/2 TIMES THE THICKNESS OF THE CONDUCTOR INSULATION, THEN COVER WITH THE FRICTION TAPE OR THE VINYL–PLASTIC ELECTRICAL TAPE SPECIFIED ABOVE.

E. THE DRAWINGS INDICATE THE GENERAL DIRECTION OF HOME RUNS. CONTINUE ALL SUCH HOME RUNS TO THE PANEL AS THOUGH THE ROUTES WERE SHOWN COMPLETELY.

3.6 INSTALLATION OF POWER AND METER PEDESTALS

A. INSTALL AS SHOWN ON THE DRAWINGS.

B. MOUNT A TYPEWRITTEN DIRECTORY BEHIND GLASS OR PLASTIC ON THE INSIDE OF EACH PANEL DOOR AND, ON THE DIRECTORY, SHOW THE CIRCUIT NUMBER AND COMPLETE DESCRIPTION OF ALL DEVICES ON EACH CIRCUIT.

C. INSTALL TELEMETRY COMPONENTS PER CMWD REQUIREMENTS. SEE SHEET 2.

3.7 TESTING AND INSPECTOR

A. PROVIDE PERSONNEL AND EQUIPMENT, MAKE REQUIRED TESTS, AND SECURE REQUIRED APPROVALS FROM THE OWNER AND GOVERNMENTAL AGENCIES HAVING JURISDICTION.

B. MAKE WRITTEN NOTICE TO THE OWNER ADEQUATELY IN ADVANCE OF EACH OF THE FOLLOWING STAGES OF CONSTRUCTION:

1. IN THE UNDERGROUND CONDITION PRIOR TO PLACING CONCRETE FLOOR SLAB, WHEN ALL ASSOCIATED ELECTRICAL WORK IS IN PLACE;
2. WHEN ALL ROUGH–IN IS COMPLETE, BUT NOT COVERED;
3. AT COMPLETION OF THE WORK OF THIS SECTION.

C. WHEN MATERIAL AND/OR WORKMANSHIP IS FOUND TO NOT COMPLY WITH THE SPECIFIED REQUIREMENTS, WITHIN THREE DAYS AFTER RECEIPT OF NOTICE OF SUCH NONCOMPLIANCE, REMOVE THE NON–COMPLYING ITEMS FROM THE JOB SITE AND REPLACE THEM WITH ITEMS COMPLYING WITH THE SPECIFIED REQUIREMENTS, ALL AT NO ADDITIONAL COST TO THE OWNER.

D. IN THE OWNER'S PRESENCE:

1. TEST ALL PARTS OF THE ELECTRICAL SYSTEM AND PROVE THAT ALL SUCH ITEMS PROVIDED UNDER THIS SECTION FUNCTION ELECTRICALLY IN THE REQUIRED MANNER.
2. IMMEDIATELY SUBMIT TO THE OWNER A REPORT OF MAXIMUM AND MINIMUM VOLTAGES.
3. ALSO, MEASURE VOLTAGES BETWEEN PHASES AND BETWEEN PHASE WIRES AND NEUTRALS, AND REPORT THESE VOLTAGES TO THE OWNER.

3.8 PROJECT COMPLETION

A. UPON COMPLETION OF THE WORK OF THIS SECTION, THOROUGHLY CLEAN ALL EXPOSED PORTIONS OF THE ELECTRICAL INSTALLATION, REMOVING ALL TRACES OF SOIL, LABELS, GREASE, OIL, AND OTHER FOREIGN MATERIAL, AND USING ONLY THE TYPE CLEANER RECOMMENDED BY THE MANUFACTURER OF THE ITEM BEING CLEANED.

B. THOROUGHLY INDOCTRINATE THE OWNER'S OPERATION AND MAINTENANCE PERSONNEL IN THE CONTENTS OF THE OPERATIONS AND MAINTENANCE MANUAL REQUIRED TO BE SUBMITTED UNDER THESE SPECIFICATIONS.

C. ON THE FIRST DAY THE FACILITY IS IN OPERATION, FOR AT LEAST EIGHT HOURS AT A TIME AS DIRECTED BY THE OWNER. PROVIDE A QUALIFIED FOREMAN AND CREW TO PERFORM SUCH ELECTRICAL WORK AS MAY BE REQUIRED BY THE OWNER.

DATE	INITIAL	REVISION DESCRIPTION	DATE	INITIAL	DATE	INITIAL
ENGINEER OF WORK			OTHER APPROVAL		CITY APPROVAL	

SHEET 3 | CITY OF CARLSBAD, ENGINEERING DEPARTMENT | SHEETS 4

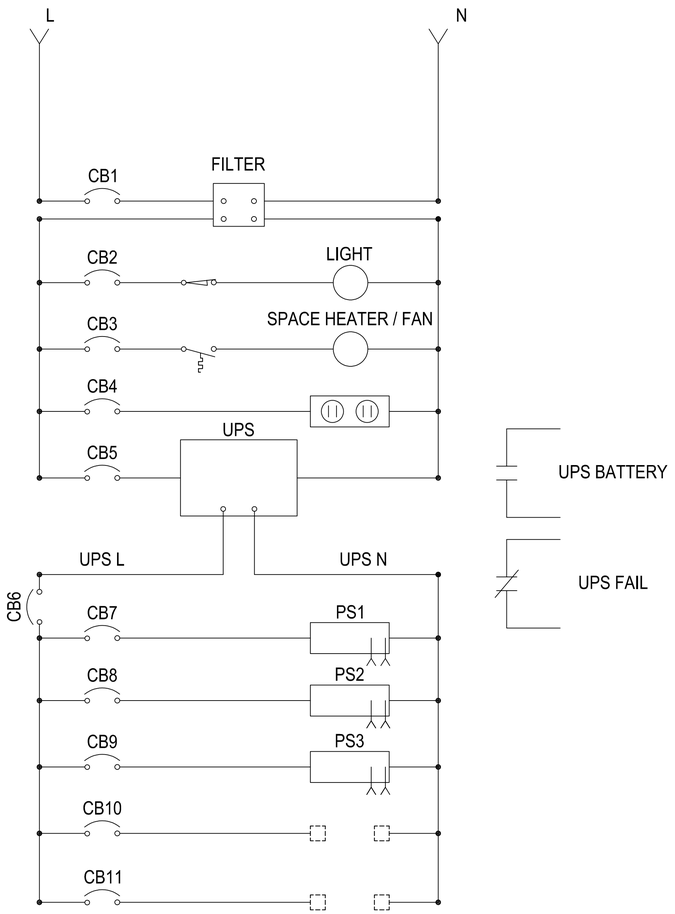
CARLSBAD MUNICIPAL WATER DISTRICT
PRESSURE REDUCING STATION
NOTES

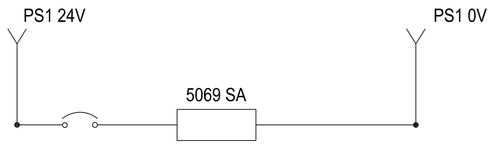
APPROVED _____ 4/29/22
DISTRICT ENGINEER RCE 55974 DATE

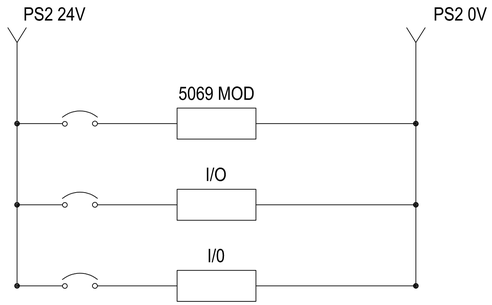
DWN BY: _____
CHKD BY: _____
RVWD BY: _____

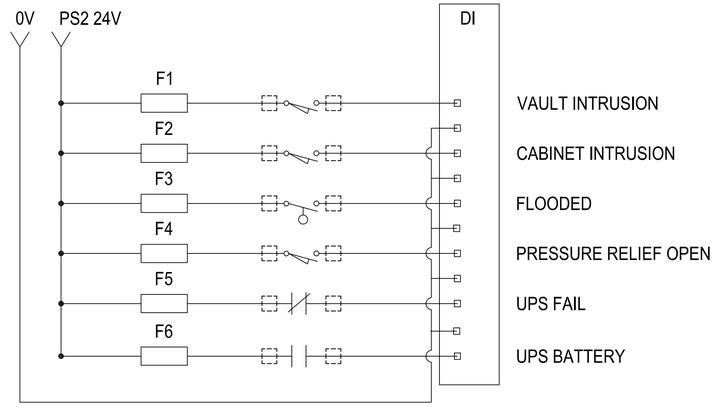
PROJECT NO.

DRAWING NO. W-29C





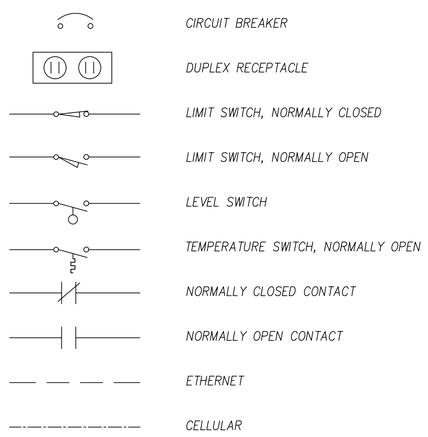




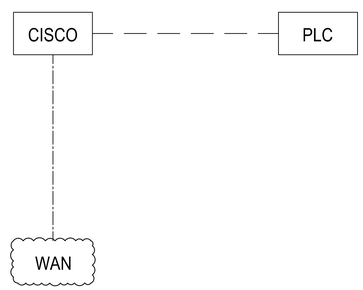
ABBREVIATIONS

CB	CIRCUIT BREAKER
DI	DIRECT INPUT
MOD	MODULE
POE	POWER OVER ETHERNET
PS	POWER SUPPLY
UPS	UNINTERRUPTIBLE POWER SUPPLY

LEGEND



NETWORK DRAWING



DATE	INITIAL	REVISION DESCRIPTION	DATE	INITIAL	DATE	INITIAL
ENGINEER OF WORK			OTHER APPROVAL		CITY APPROVAL	

SHEET 4 | CITY OF CARLSBAD ENGINEERING DEPARTMENT | SHEETS 4

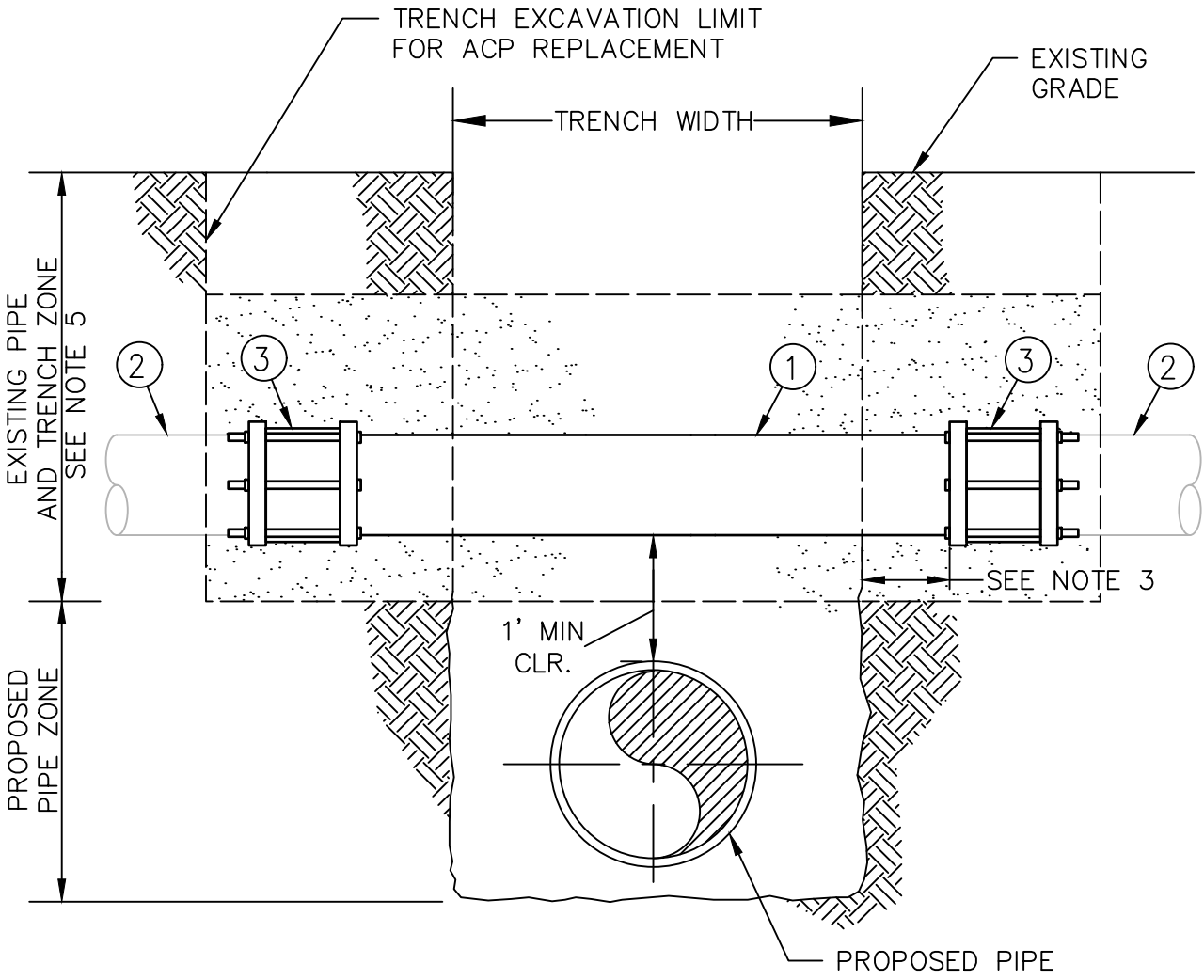
CARLSBAD MUNICIPAL WATER DISTRICT
PRESSURE REDUCING STATION
ELECTRICAL SINGLE LINE DIAGRAM

APPROVED _____ 4/29/22
DISTRICT ENGINEER RCE 55974 DATE

DWN BY: _____
CHKD BY: _____
RVWD BY: _____

PROJECT NO.

DRAWING NO. W-29D



NOTES:

1. SUBMIT SHUTDOWN/CONNECTION REQUEST FOR DISTRICT APPROVAL IN ACCORDANCE WITH DISTRICT STANDARDS.
2. EXISTING AC PIPE SHALL BE REPLACED WHEN TRENCH WIDTH EXCEEDS 18 INCHES.
3. REPLACE AC PIPE TO NEAREST JOINT LOCATED OUTSIDE OF 2 FEET MIN. DIMENSION FROM TRENCH. AC PIPE LENGTH MAY VARY FROM 7 FEET TO 13 FEET.
4. DISINFECT NEW PIPE AND COUPLINGS IN ACCORDANCE WITH SPEC SECTION 15041.
5. SEE CMWD STD. DWG. W–2 FOR SURFACE RESTORATION AND PIPE INSTALLATION REQUIREMENTS OF UNDERCUT WATER MAIN. PIPE BEDDING MATERIAL SHALL BE PLACED BY HAND AND COMPACTED UNDER PIPE AND HAUNCHES.

ITEM	DESCRIPTION	SPEC/DWG
1	NEW PVC PIPE, NO INTERMEDIATE JOINTS OR FITTINGS	15064
2	EXISTING AC WATER MAIN	
3	TRANSITION COUPLING	15000

REV.	APPROVED	DATE

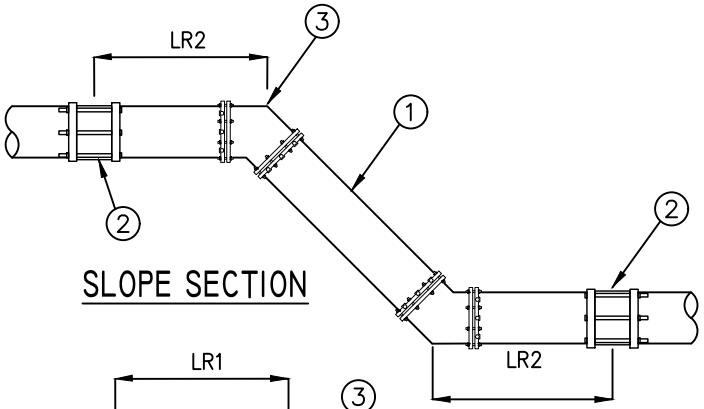
CARLSBAD MUNICIPAL WATER DISTRICT

UNDERCUT ACP WATER MAIN REPLACEMENT

DISTRICT ENGINEER
RCE 55974

7/22/22
DATE

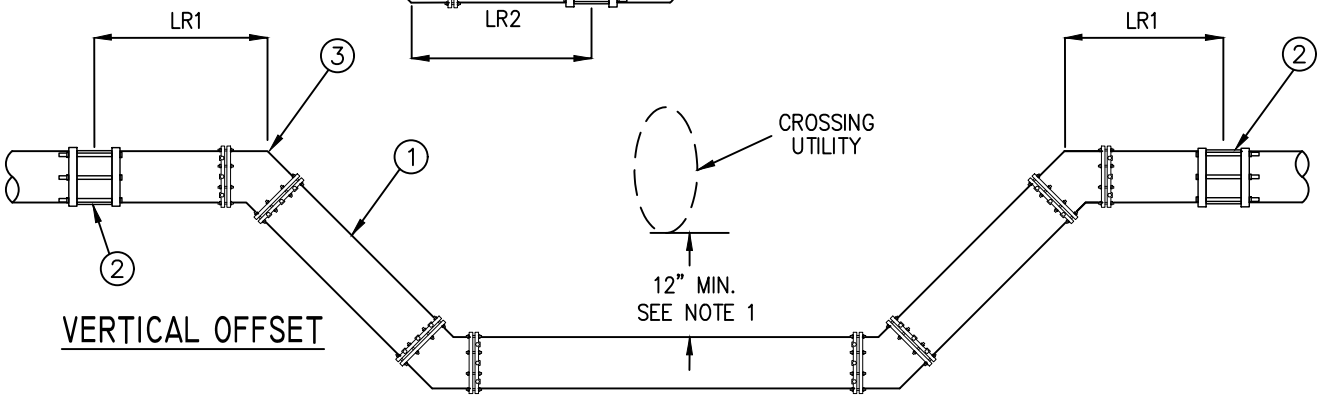
STANDARD DWG. NO. W-30



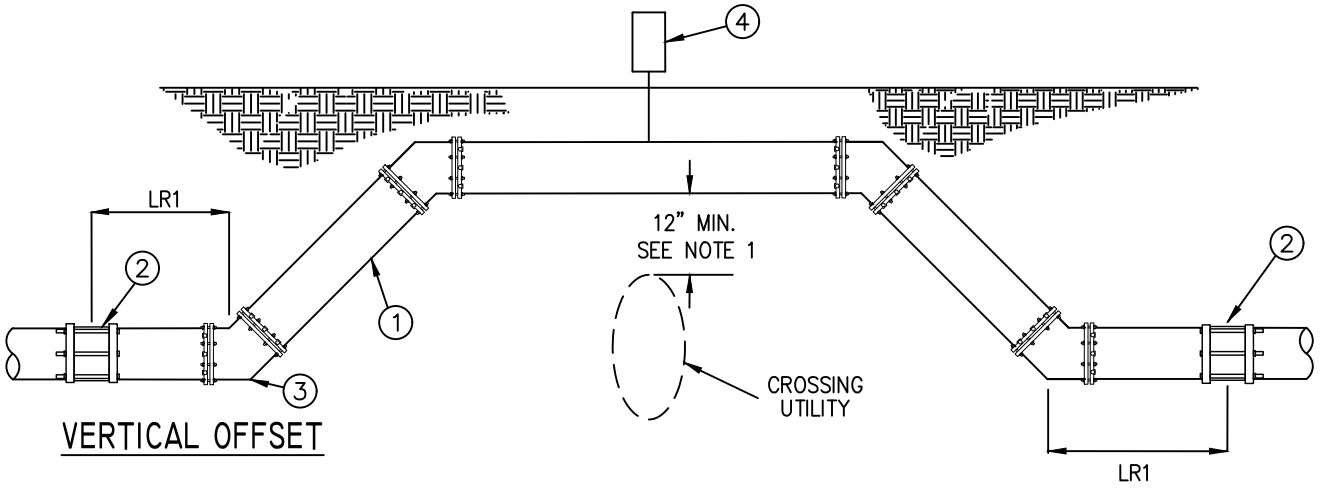
SLOPE SECTION

NOTE:

RESTRAINED LENGTH DIMENIONS (LR1 AND LR2) SHALL BE CALCULATED BY ENGINEER OF RECORD AND SUBMITTED FOR APPROVAL



VERTICAL OFFSET



VERTICAL OFFSET

NOTES:

1. SEPARATION, SLEEVING OR NO-JOINT REQUIREMENTS FOR POTABLE PIPELINES BELOW NON-POTABLE FLUID PIPELINES SHALL APPLY. (SECTION 64572, CA. WATERWORKS STANDARDS).
2. ALL PIPE JOINTS BETWEEN FITTINGS SHALL BE RESTRAINED.
3. INSTALL AIR-VACUUM VALVE ASSEMBLY UNLESS OTHERWISE APPROVED.
4. ALL METALLIC FITTINGS AND HARDWARE SHALL BE POLYETHYLENE ENCASED.

ITEM	DESCRIPTION	SPEC/DWG
①	DI OR PVC PIPE	15056/15064/15065
②	TRANSITION OR FLEXIBLE PIPE COUPLING	15000
③	RESTRAINED DI FITTING (11.25°, 22.5° OR 45°) MJ OR PUSH ON	15056/15064
④	2" AIR VALVE	W-11

REV.	APPROVED	DATE

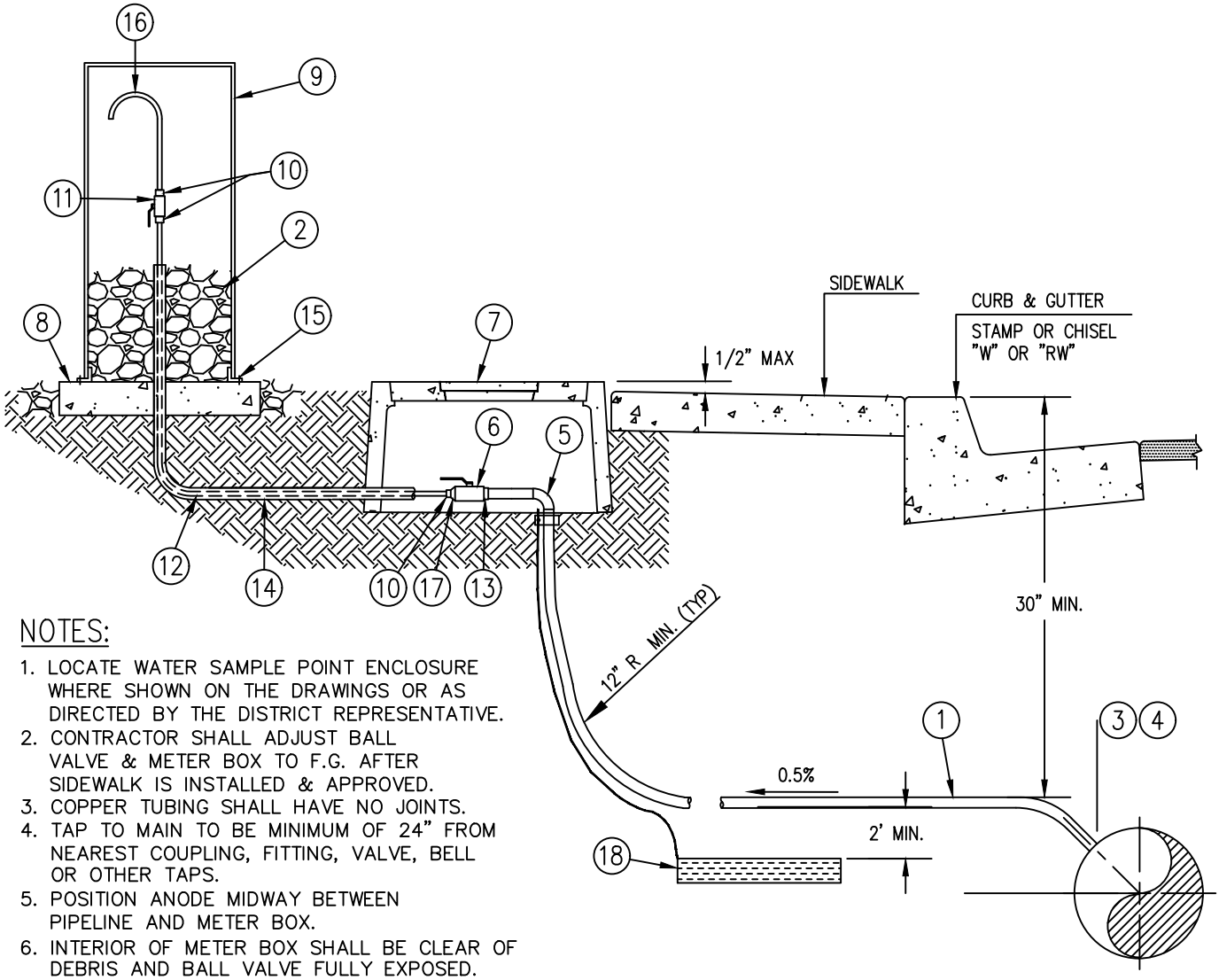
CARLSBAD MUNICIPAL WATER DISTRICT

VERTICAL OFFSET AT UTILITY CROSSING

David Rubio 7/22/22

DISTRICT ENGINEER RCE 55974 DATE

STANDARD DWG. NO. W-31



NOTES:

1. LOCATE WATER SAMPLE POINT ENCLOSURE WHERE SHOWN ON THE DRAWINGS OR AS DIRECTED BY THE DISTRICT REPRESENTATIVE.
2. CONTRACTOR SHALL ADJUST BALL VALVE & METER BOX TO F.G. AFTER SIDEWALK IS INSTALLED & APPROVED.
3. COPPER TUBING SHALL HAVE NO JOINTS.
4. TAP TO MAIN TO BE MINIMUM OF 24" FROM NEAREST COUPLING, FITTING, VALVE, BELL OR OTHER TAPS.
5. POSITION ANODE MIDWAY BETWEEN PIPELINE AND METER BOX.
6. INTERIOR OF METER BOX SHALL BE CLEAR OF DEBRIS AND BALL VALVE FULLY EXPOSED.
7. FOR NON-CONTIGUOUS SIDEWALK, SEE STD. DWG. W-3 FOR METER BOX PLACEMENT.

ITEM	DESCRIPTION	SPEC/DWG
1	1" COPPER (TYPE 'K' SOFT)	15057
2	3/4" ROCK, ADD'L 6" X 6" DEPTH SURROUNDING CONCRETE PAD	
3	OUTLET ON AC OR PVC MAIN	W-13
4	OUTLET ON DUCTILE IRON OR STEEL MAIN	W-14
5	1" COPPER 90 DEGREE ELBOW	15057
6	1" BRASS BALL VALVE WITH FEMALE IPT	15099
7	METER BOX	AML
8	2' x 2' x 6" THICK REINFORCED CONCRETE PAD	03000
9	GALVANIZED WATER SAMPLING STATION ENCLOSURE	AML
10	3/8" COMP X MALE IPT ADAPTER	15057
11	3/8" BRASS BALL VALVE WITH FEMALE IPT	15099
12	3/8" COPPER (TYPE K SOFT)	15057
13	1" COMP X MIPT ADAPTER	15057
14	1" SCHEDULE 40 PVC CONDUIT SLEEVE WITH SWEEP BEND	15064
15	3/8" STAINLESS STEEL ANCHOR BOLTS W/ NUTS & INSULATING WASHERS	15000
16	3/8" STAINLESS STEEL TUBE	
17	1" MALE IPT X 3/8" FEMALE IPT BUSHING	15057
18	30 LB ZINC ANODE(S) WITH ANODE LEAD WIRE	WC-8

REV.	APPROVED	DATE

CARLSBAD MUNICIPAL WATER DISTRICT

WATER SAMPLING STATION

DISTRICT ENGINEER
RCE 55974

7/22/22
DATE

STANDARD DWG. NO. W-32

ABBREVIATIONS:

AL	ALUMINUM
APWA	AMERICAN PUBLIC WORKS ASSOCIATION
AWWA	AMERICAN WATER WORKS ASSOCIATION
BLK	BLACK
BLU	BLUE
BOC	BACK OF CURB
CML&TW	CEMENT-MORTAR LINED AND TAPE WRAPPED
CP	CATHODIC PROTECTION
CI	CAST IRON
CoC	CITY OF CARLSBAD
CTS	CORROSION TEST STATION
Cu	COPPER
DI	DUCTILE IRON
DW	DOMESTIC WATER
EOP	EDGE OF PAVEMENT
EXIST	EXISTING
HMWPE	HIGH MOLECULAR WEIGHT POLYETHYLENE
IJ	ISOLATION JOINT
INSUL	INSULATING
LB	POUND
Mg	MAGNESIUM
Mn	MANGANESE
MAX	MAXIMUM
MIN	MINIMUM
Ni	NICKEL
No.	NUMBER
PE	POLYETHYLENE
PW	POTABLE WATER
PSI	POUNDS PER SQUARED INCH
PVC	POLYVINYL CHORIDE
QTY.	QUANTITY
RECOM	RECOMMENDATION
REF	REFERENCE
REQ	REQUIRED
RHH-RHW	RUBBER INSULATED HIGH HEAT, AND RUBBER INSULATED HEAT AND WATER RESISTANT
SCH	SCHEDULE
Si	SILICON
SPECS	SPECIFICATIONS
STA	STATION
STRD	STRANDED
TYP	TYPICAL
VAR	VARIOUS
YLW	YELLOW

REV.	APPROVED	DATE

CARLSBAD MUNICIPAL WATER DISTRICT

CATHODIC PROTECTION ABBREVIATIONS

DISTRICT ENGINEER
RCE 55974

4/29/22
DATE

STANDARD DWG. NO. WC-1

GENERAL NOTES

1. ALL MATERIALS AND INSTALLATION METHODS SHALL BE IN ACCORDANCE WITH THESE DRAWINGS AND TECHNICAL SPECIFICATIONS.
2. UNLESS OTHERWISE NOTED, DRAWINGS ARE NOT SHOWN TO SCALE.
3. CORROSION TEST STATIONS:
   A. INSTALL TEST STATION BOXES AS SHOWN IN THE PLANS AND PERPENDICULAR TO THE PIPELINE AT THE TEST WIRE CONNECTION POINT. TEST STATION LOCATIONS MAY BE MOVED ±5' FROM THE STATIONS SHOWN TO AVOID DRIVEWAYS OR INTERFERENCE WITH OTHER STRUCTURES. COORDINATE INSTALLATION OF TEST STATION CONDUIT WITH POSTS AND OTHER FIXTURES TO AVOID DAMAGE TO CONDUIT. INSTALL TEST STATION BOXES A MIN OF 4' FROM EOP OR BOC.
   B. ALL WIRES SHALL HAVE ENOUGH SLACK TO ALLOW TERMINAL BOARD TO BE REMOVED 24" FROM THE OPENING OF BOX.
   C. INSTALL REINFORCED CONCRETE PAD (24" SQ. OR 24" DIA. x 6" THICK) AROUND TEST BOXES IN UNPAVED AREAS. USE No. 4 REBAR. SEE STANDARD DRAWING WC-6.
   D. IDENTIFY TEST LEADS WITH HEAT SHRINK SLEEVE.
   E. WIRE SIZE, INSULATION, AND COLORS SCHEDULE

• PIPELINE LEADS	- No. 8 AWG STRANDED HMWPE BLACK
• ANODE LEAD	- No. 12 AWG STRANDED HMWPE BLACK
• CASING LEAD	- No. 10 AWG STRANDED HMWPE BLACK
• BOND WIRE	- No. 4 AWG STRANDED HMWPE BLACK

   F. PLACE ALL WIRE RUNS IN SCH 80 PVC CONDUIT WITH SOLVENT WELDED JOINTS @ A MIN OF 3 FEET BELOW FINISHED GRADE. CONDUIT AND WIRES NOT SHOWN IN ALL DETAILS FOR CLARITY.
4. ANODE INSTALLATION NOTES:
   A. INSTALL ANODES ACCORDING TO THE PLANS AND SPECIFICATIONS.
   B. INSTALL PLASTIC WARNING TAPE ALONG ENTIRE HORIZONTAL RUN OF WIRES. USE 6" WIDE 4 MIL THICK INERT PLASTIC TAPE PRINTED WITH "CAUTION CATHODIC PROTECTION CABLE BELOW."
   C. PLACE ALL HORIZONTAL AND VERTICAL WIRE RUNS IN SCH 40 PVC CONDUIT WITH SOLVENT WELDED JOINTS @ A MIN OF 3 FEET BELOW FINISHED GRADE. CONDUIT NOT SHOWN IN ALL DETAILS FOR CLARITY.
   D. NUMBER OF ANODES AND TYPE VARIES. ANODES MAY BE INSTALLED ON EITHER SIDE OF THE PIPE MIN 8' FROM PIPE. DO NOT EXCEED THE BOUNDS OF CoC RIGHT-OF-WAY.
   E. BACKFILL ANODES WITH CLEAN NATIVE SOIL IN 6" LIFTS. BACKFILL SHALL BE SCREENED AND FREE OF ROCKS LARGER THAN 2 INCHES IN DIAMETER.
   F. AT CASINGS PLACE ANODES ADJACENT TO NON-ENCASED CARRIER PIPE.
5. BURIED MECHANICAL JOINTS, I.E., VALVES, FLANGES OR COUPLINGS, EXCEPT INSULATING FLANGES, MUST BE BONDED PER STANDARD DRAWING WC-4 AND WAX TAPED, PER AWWA C217.
6. NO WIRE SPLICES ARE PERMITTED.
7. WIRE CONNECTIONS TO PIPE SHALL BE MADE BY THE EXOTHERMIC WELD OR PIN BRAZING PROCESS. ATTACH 1 WIRE PER ATTACHMENT POINT. ALL WELDS MUST BE SEPARATED BY 6" MIN. SEE STANDARD DRAWING WC-5.
8. CONTRACTOR SHALL DOCUMENT ALL CHANGES FROM THE PROJECT DRAWINGS AND SUBMIT "AS-BUILT" DRAWINGS TO THE OWNER'S REPRESENTATIVE PRIOR TO COMPLETION OF WORK.

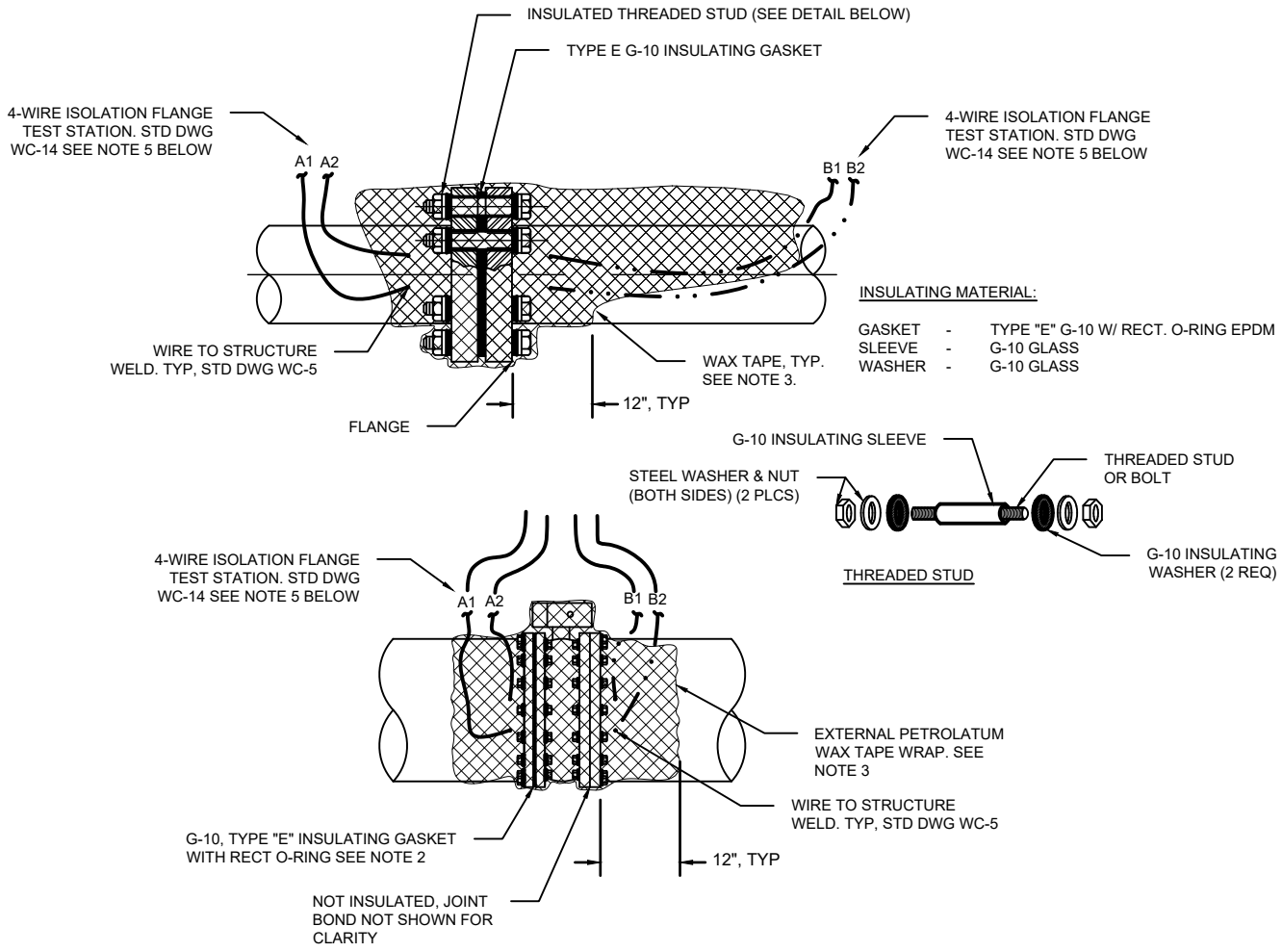
REV.	APPROVED	DATE

CARLSBAD MUNICIPAL WATER DISTRICT

CATHODIC PROTECTION GENERAL NOTES

David Rubin 4/29/22
DISTRICT ENGINEER DATE
RCE 55974

STANDARD DWG. NO. WC-2



NOTES:

1. FULL LENGTH INSULATING SLEEVES REQUIRED AT ALL THRU-FLANGE BOLTS OR STUDS.
2. VALVE AND INSULATING FLANGE KIT TO BE ASSEMBLED AND TESTED BY THE CONTRACTOR'S CORROSION ENGINEER AND VERIFIED BY CoC REPRESENTATIVE PRIOR TO BURIAL. RE-TEST AFTER FINAL INSTALLATION. SEE SPECIFICATION SECTION 16640.
3. BURIED INSULATING FLANGES ARE TO BE WRAPPED WITH WAX TAPE. DAMAGED COATINGS WHERE INSULATING FLANGES ARE INSTALLED IN VAULTS ARE TO BE REPAIRED PER PROJECT COATING SPECIFICATIONS.
4. WIRES EXTEND TO TEST STATION (NOT SHOWN FOR CLARITY).
5. ALL INSULATED FLANGES REQUIRE A TEST STATION. SEE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
6. FOR NOMINAL PIPE DIAMETERS UP TO AND INCLUDING 36", PROVIDE ONE INSULATING WASHER AND ONE STEEL WASHER ON EACH SIDE OF THE FLANGE FOR EACH FLANGE BOLT. FOR NOMINAL PIPE DIAMETERS GREATER THAN 36", THE INSULATING WASHERS SHALL BE INSTALLED SANDWICHED BETWEEN A PAIR OF MATCHING STEEL WASHERS (NOT SHOWN FOR CLARITY) ON EACH SIDE OF THE FLANGE FOR EACH FLANGE BOLT.

REV.	APPROVED	DATE

CARLSBAD MUNICIPAL WATER DISTRICT

INSULATING FLANGE KIT

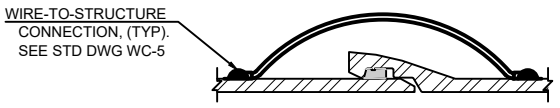
DISTRICT ENGINEER
RCE 55974

4/29/22
DATE

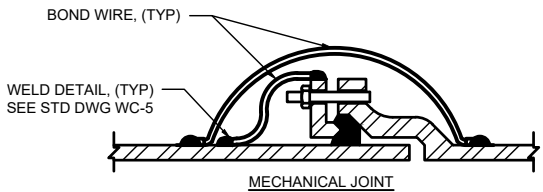
STANDARD DWG. NO. WC-3

NOTES:

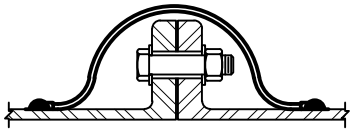
1. DEPICTED BOND LOCATIONS ARE DIAGRAMMATIC IN NATURE. INSTALL BONDS AT LOCATIONS PER SECTION VIEW BELOW.
2. ALL BOND WIRES SHALL BE STRD. COPPER WIRE W/HMWPE INSULATION, INSTALLED AT MIN. LENGTH BUT ACCOUNTING FOR FULL ALLOWABLE JOINT MOVEMENT.
3. TWO No.4 BOND WIRES ARE REQUIRED PER JOINT FOR PIPE DIAMETERS 24" AND SMALLER. THREE No.4 BOND WIRES ARE REQUIRED PER JOINT FOR PIPE DIAMETERS GREATER THAN 24".
4. BOND WIRES SHALL BE SPACED 6" APART MIN.
5. ALL WIRE CONNECTIONS SHALL BE MADE BY THE EXOTHERMIC WELD OR PIN BRAZING PROCESS.
6. WAX TAPE ALL BURIED BOLTED FITTINGS PER AWWA C217.
7. HEAT SHRINKABLE POLYOLEFIN COATING FOR CONNECTIONS NOT SHOWN FOR CLARITY.
8. APPLY BONDS BEFORE HEAT SHRINK COATING.



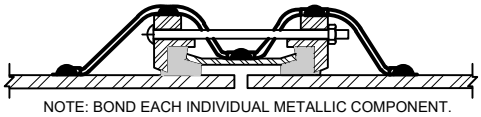
PUSH-ON JOINT



MECHANICAL JOINT

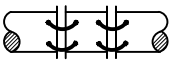


FLANGED JOINT (NON-INSULATING)

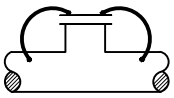


NOTE: BOND EACH INDIVIDUAL METALLIC COMPONENT.

MECHANICAL SLEEVE COUPLING



ADAPTER

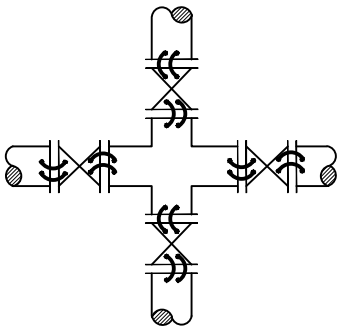


BLIND FLANGE

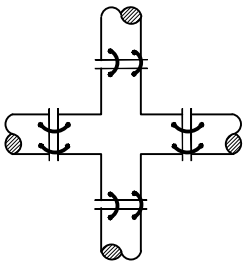
VALVE

DISMANTLING JOINT WITH VALVE

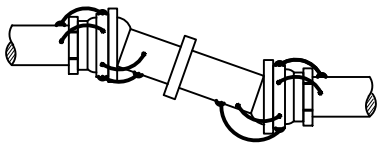
VICTAULIC COUPLING



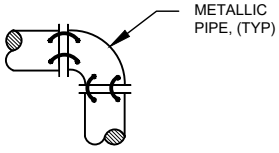
VALVE CROSSING



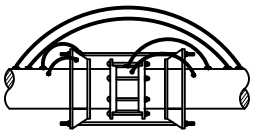
CROSS



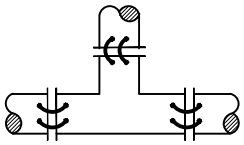
FLEXIBLE JOINT



BEND



FLEX COUPLING WITH RESTRAINER



TEE

REV.	APPROVED	DATE

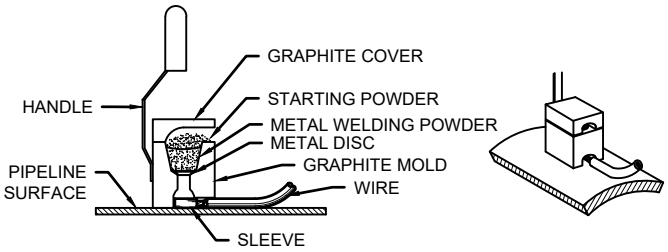
CARLSBAD MUNICIPAL WATER DISTRICT

JOINT BOND FOR NON-WELDED DIP AND STEEL JOINTS

DISTRICT ENGINEER
RCE 55974

4/29/22
DATE

STANDARD DWG. NO. WC-4



STEP 1. GRIND STRUCTURE CONNECTION AREA (3"x3") TO BARE SHINY METAL AND CLEAN WITHOUT REMOVING EXCESS METAL.

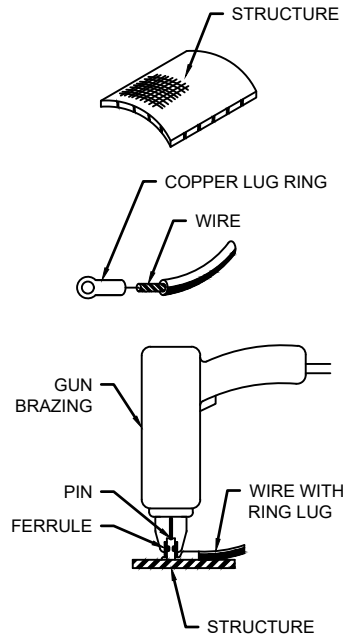
STEP 2. STRIP INSULATION FROM WIRE. ATTACH SLEEVE

STEP 3. HOLD MOLD FIRMLY WITH OPENING AWAY FROM OPERATOR & IGNITE.

STEP 4. REMOVE SLAG FROM CONNECTION & STRIKE WITH 2 LB. HAMMER TO TEST FOR SOUNDNESS.

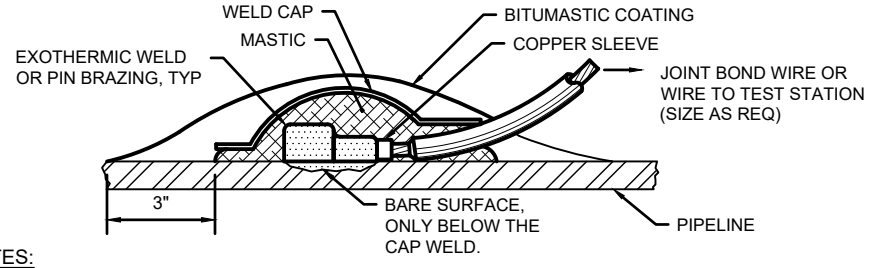
STEP 5. COVER CONNECTION AND EXPOSED STRUCTURE SURFACE WITH A WELD CAP AND BITUMINOUS COATING COMPOUND.

EXOTHERMIC WELD



PIN BRAZING

1. DEGREASE AND CLEAN STRUCTURE TO BARE, BRIGHT METAL WITH MECHANICAL DEVICES WITHOUT REMOVING EXCESS METAL.
2. STRIP WIRE INSULATION AND ATTACH FROM WIRE AND ATTACH A BAC M1 COMPRESSION TERMINAL OR APPROVED EQUAL.
3. LOAD THE BRAZING GUN WITH A DIRECT BRAZING PIN AND FERRULE. USE A THREADED, TYPE CONNECTION FOR ABOVE-GROUND USE ONLY.
4. BRAZE THE WIRE TO THE PIPE. EXTRA MATERIAL REQUIRED FOR DI OR CI PIPE.
5. TEST BRAZE BY BREAKING OFF THE SHANK OF THE PLAIN PIN WITH A HAMMER.
6. COVER CONNECTION WITH MASTIC FILLED WELD CAP AND BITUMASTIC COATING 80% SOLIDS BY VOLUME OVER WELD CAP AND ALL EXPOSED METAL.
7. ALLOW WELD COATING TO CURE PER MANUF RECOM BEFORE BURIAL.



NOTES:

1. PROCEDURE SHOWN ABOVE IS TO BE USED AS A GENERAL GUIDE ONLY. CONSULT MANUFACTURER'S LITERATURE FOR SPECIFIC INSTALLATION INSTRUCTIONS.
2. ALL WELDS SHALL BE A MIN OF 6" APART UNLESS OTHERWISE INDICATED IN MANUFACTURER'S INSTRUCTIONS.
3. SEE STANDARD DRAWINGS WC-1 & WC-2 FOR GENERAL NOTES AND ABBREVIATIONS.

REV.	APPROVED	DATE

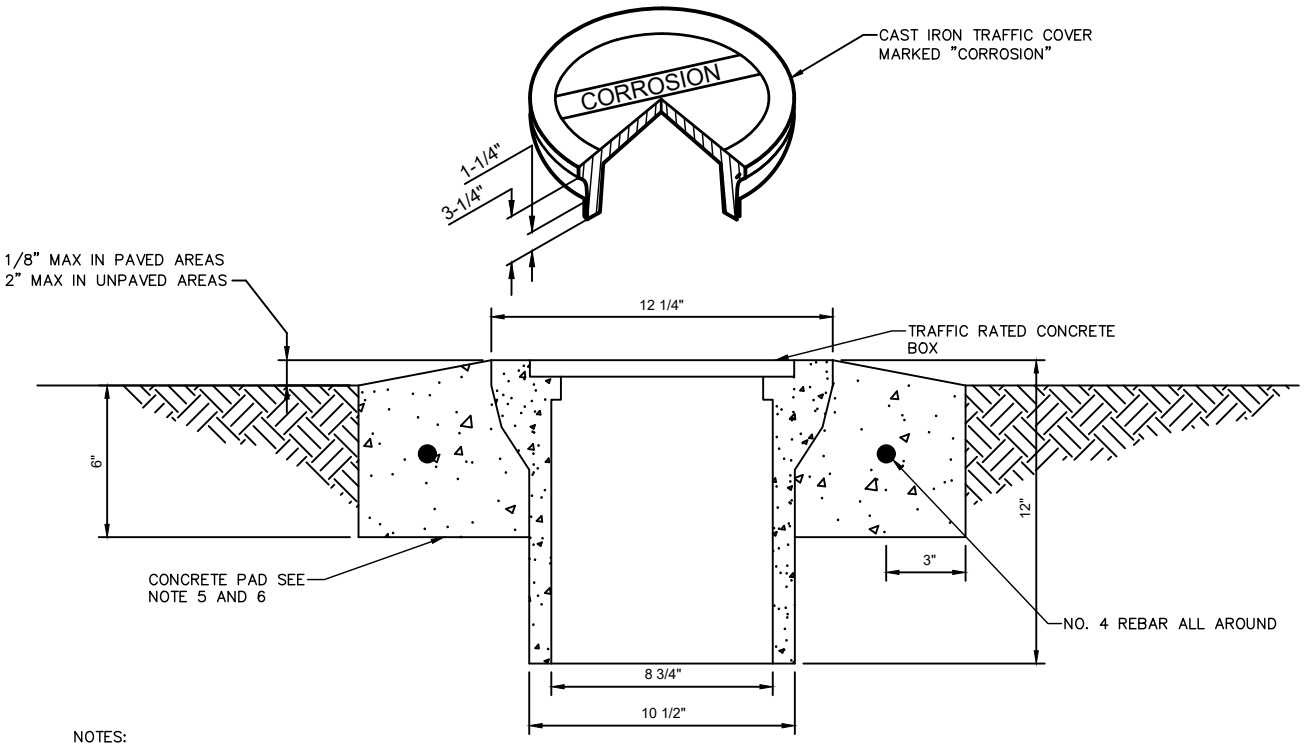
CARLSBAD MUNICIPAL WATER DISTRICT

WIRING-TO-STRUCTURE WELD DETAIL

DISTRICT ENGINEER
RCE 55974

4/29/22
DATE

STANDARD DWG. NO. WC-5



NOTES:

1. CONCRETE BODY, H–20 TRAFFIC RATED – BROOKS 1–RT OR APPROVED EQUAL.
2. BOTTOM OF TEST BOX SHALL BE NATIVE SOIL. DO NOT PLACE ROCK, GRAVEL OR SAND IN TEST BOX.
3. TEST BOX TO BE FIELD LOCATED ±5' FROM LOCATION GIVEN ON PLAN SHEETS. DO NOT INSTALL TEST STATION IN TRAFFIC LANES OR PARKING STALLS.
4. PROVIDE 2' X 2' X 6" OR 2' DIA. X 6" THICK STEEL REINFORCED CONCRETE PAD AROUND TEST BOX AT UNPAVED SITES.
5. PROVIDE SUFFICIENT SLOPING IN THE CONCRETE PAD OR SURROUNDING PAVEMENT TO PROVIDE DRAINAGE AWAY FROM THE CONCRETE TEST BOX.
6. FOR FLUSH MOUNTED TEST STATIONS INSTALLED IN UNPAVED SITES INSTALL MARKER POST PER W–26.
7. SEE STANDARD DRAWINGS WC–1 & WC–2 FOR GENERAL NOTES AND ABBREVIATIONS.

REV.	APPROVED	DATE

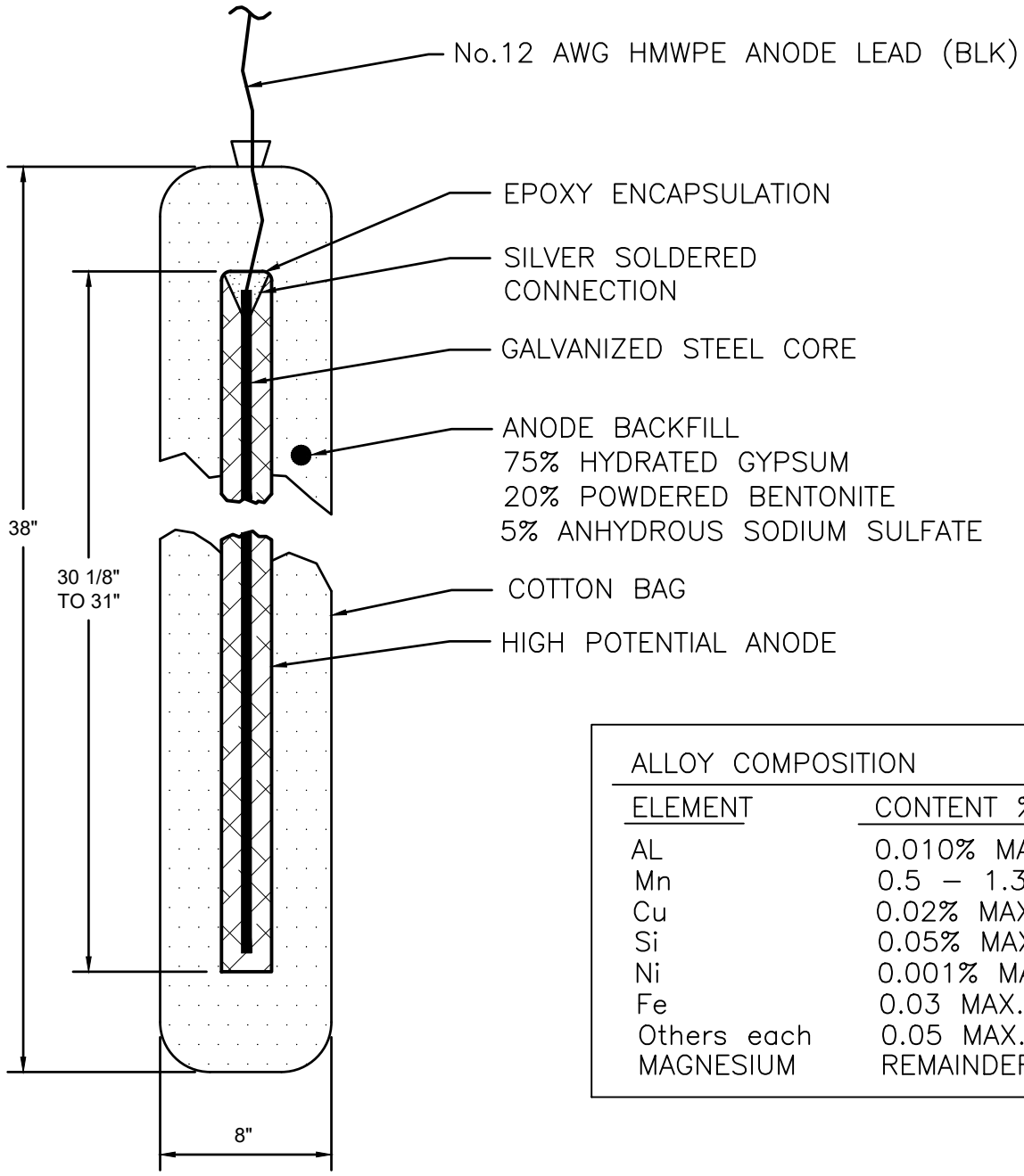
CARLSBAD MUNICIPAL WATER DISTRICT

FLUSH MOUNTED TEST BOX

DISTRICT ENGINEER
RCE 55974

4/29/22
DATE

STANDARD DWG. NO. WC-6



ALLOY COMPOSITION

ELEMENT	CONTENT %
AL	0.010% MAX.
Mn	0.5 – 1.3%
Cu	0.02% MAX.
Si	0.05% MAX.
Ni	0.001% MAX.
Fe	0.03 MAX.
Others each	0.05 MAX.
MAGNESIUM	REMAINDER

REV.	APPROVED	DATE

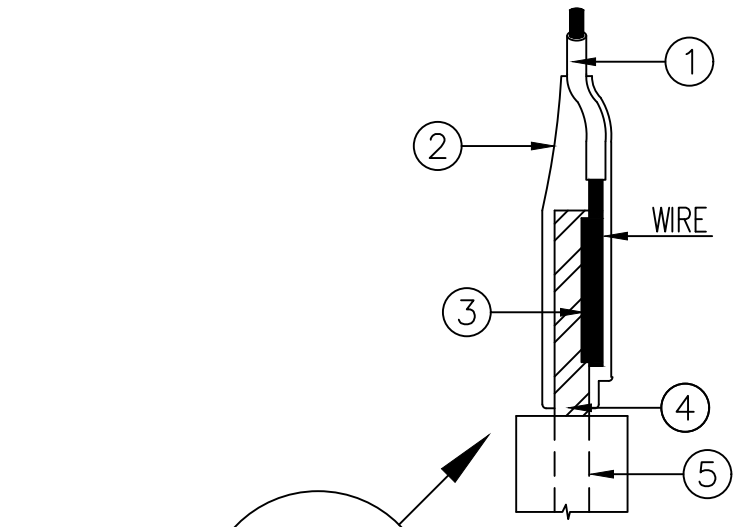
CARLSBAD MUNICIPAL WATER DISTRICT

48 LB HIGH POTENTIAL MAGNESIUM ANODE

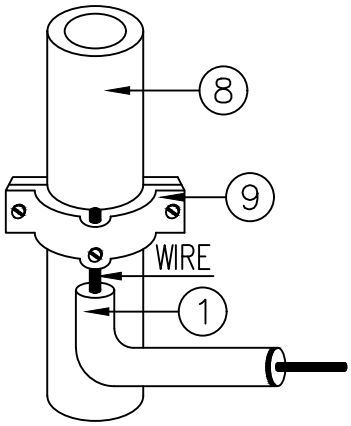
DISTRICT ENGINEER
RCE 55974

4/29/22
DATE

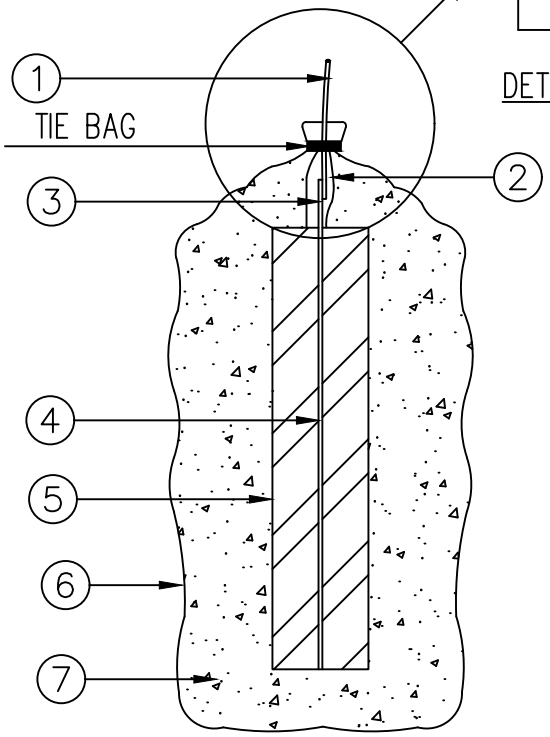
STANDARD DWG. NO. WC-7



DETAIL A



ANODE LEAD
ABOVE GRADE
CONNECTION



ZINC ANODE

ABOVE GRADE CONNECTION NOTES:

1. RISER PIPE SHALL BE WIRE BRUSHED TO CLEAN BRIGHT METAL.
2. PIPE CLAMP SHALL BE LOCATED ON RISER PIPE.
3. WIRE INSULATION SHALL BE STRIPPED TO A MINIMUM LENGTH TO CONNECT WIRE TO PIPE CLAMP.

PACKAGED BACKFILL COMPOSITION:

75% GYPSUM
20% BENTONITE
5% SODIUM SULFATE

INGOT WEIGHT: 30 LBS.
PKGD. WEIGHT: 70 LBS. APPROX.

ITEM	DESCRIPTION	SPEC/DWG
1	ANODE LEAD NO.12 AWG STRD. COPPER WIRE W/ HMWPE INSULATION.	
2	HEAT SHRINKABLE SLEEVE.	
3	SILVER SOLDER CONNECTION.	
4	1/4" DIAMETER GALVANIZED STEEL CORE.	
5	2"X2"X30" ZINC ALLOY INGOT.	
6	CLOTH BAG.	
7	PACKAGED BACKFILL.	
8	BRASS OR COPPER RISER PIPE.	
9	BRASS OR COPPER PIPE CLAMP WITH SCREW TERMINAL.	

REV.	APPROVED	DATE

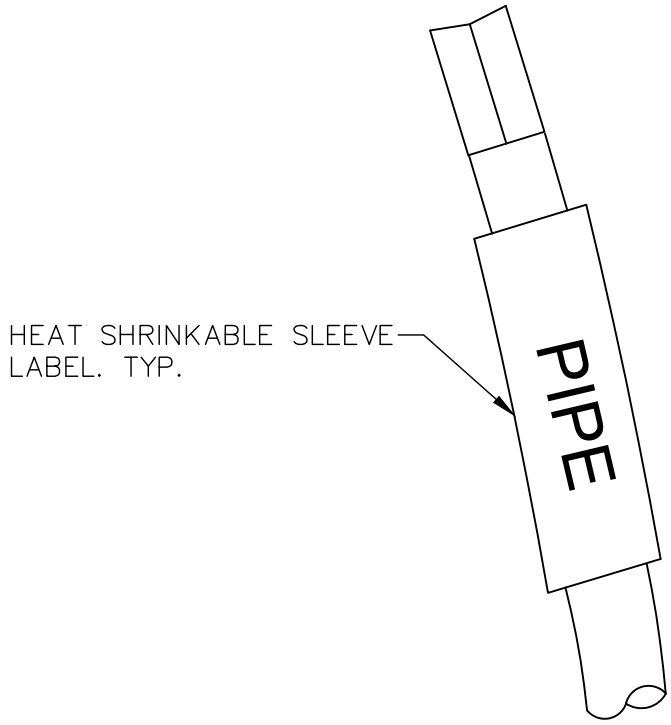
CARLSBAD MUNICIPAL WATER DISTRICT

ZINC ANODE FOR 1" AND 2" WATER SERVICE

DISTRICT ENGINEER
RCE 55974

4/29/22
DATE

STANDARD DWG. NO. WC-8



Legend:

ANODE LEADS	– ANODE No.
PROTECTED PIPE	– PIPE
UNPROTECTED PIPE	– UNPROTECTED PIPE
LINE CURRENT TEST STATION WIRE	– STA XX+XX
CASING	– CASING
AIR VAC	– AVAC
BLOW OFF	– BO

NOTES:

1. WIRE LABELS SHALL IDENTIFY THE STRUCTURE OR DEVICE CONNECTED TO THE WIRE.

REV.	APPROVED	DATE

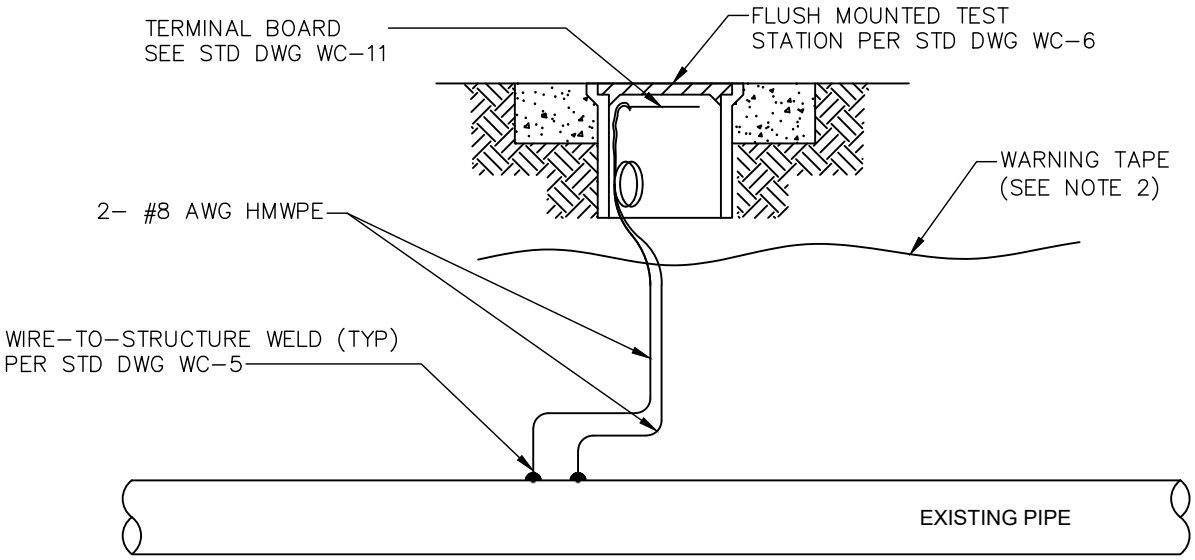
CARLSBAD MUNICIPAL WATER DISTRICT

HEAT SHRINKABLE LABEL

DISTRICT ENGINEER
RCE 55974

4/29/22
DATE

STANDARD DWG. NO. WC-9



NOTES:

1. INSTALL TEST STATION AT EACH LOCATION SHOWN ON DRAWING.
2. INSTALL PLASTIC WARNING TAPE 12" BELOW FINISH GRADE, ALONG THE ENTIRE LENGTH OF WIRES. USE 6" WIDE BY 4 MIL THICK INERT PLASTIC TAPE PRINTED WITH "CAUTION CATHODIC PROTECTION CABLE BELOW".
3. INSTALL ALL LEAD WIRE(S) IN TRENCH WITH MIN. 36" COVER. ROUTE WIRES IN SCH. 40 PVC CONDUIT.
4. AT PAVED LOCATIONS REPAIR SURFACES PER ENCROACHMENT PERMIT.
5. ALL WIRES INSIDE TEXT BOX SHALL HAVE MIN. 24" SLACK.
6. SEE STANDARD DRAWINGS WC–1 & WC–2 FOR GENERAL NOTES AND ABBREVIATIONS.

REV.	APPROVED	DATE

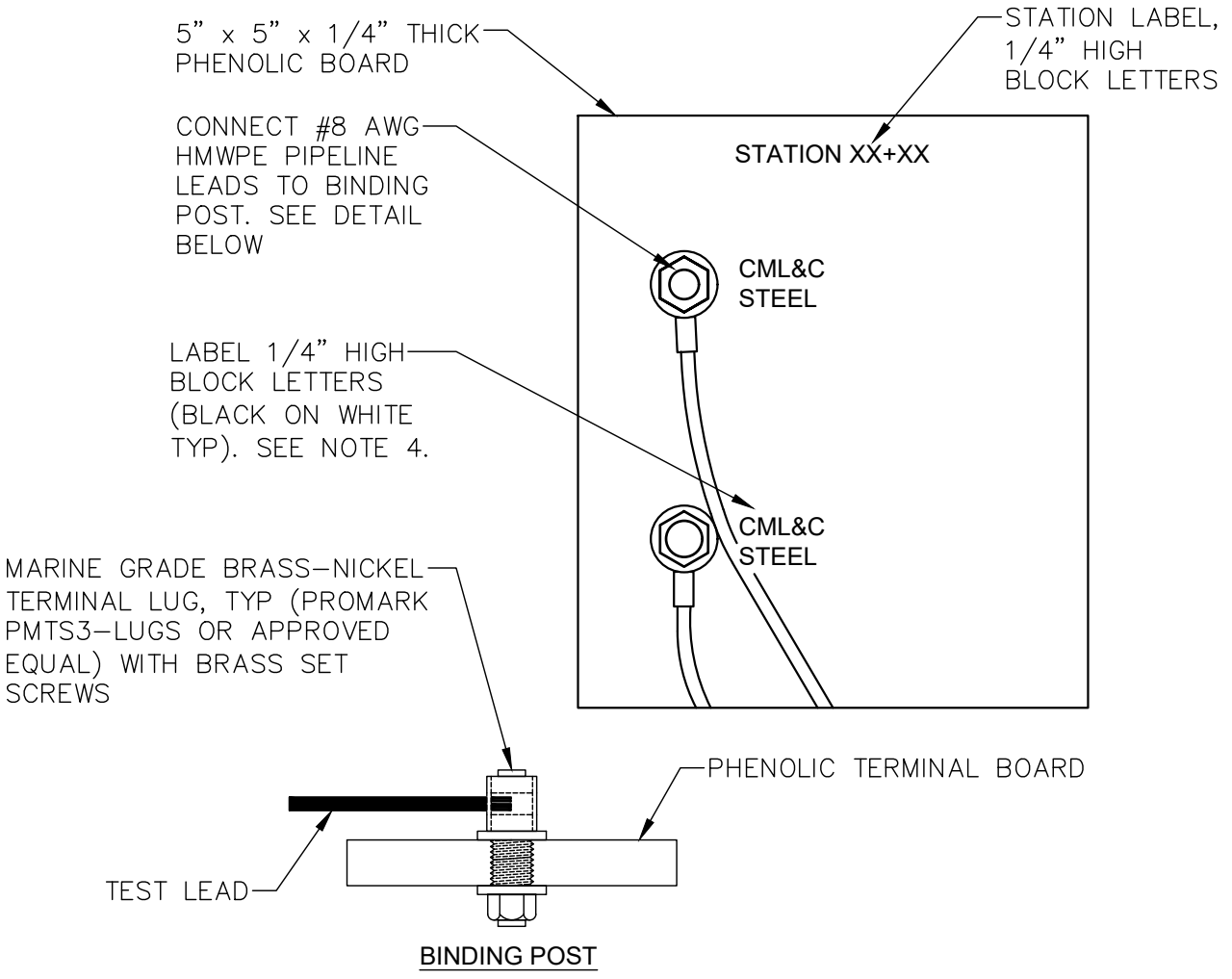
CARLSBAD MUNICIPAL WATER DISTRICT

TEST STATION
CORROSION MONITORING

DISTRICT ENGINEER
RCE 55974

4/29/22
DATE

STANDARD DWG. NO. WC-10



BINDING POST

NOTE:

1. CONNECT EACH WIRE ON A SEPARATE TERMINAL LUG.
2. FOR TEST STATIONS WITH MULTIPLE PIPELINES, ADD ADDITIONAL BINDING POSTS AND WIRES.
3. SEE STANDARD DRAWINGS WC-1 & WC-2 FOR GENERAL NOTES AND ABBREVIATIONS.
4. LABEL SHALL IDENTIFY WHAT STRUCTURE WIRE IS CONNECTED TO. DETAIL PROVIDES EXAMPLE FOR CML&C STEEL PIPE

REV.	APPROVED	DATE

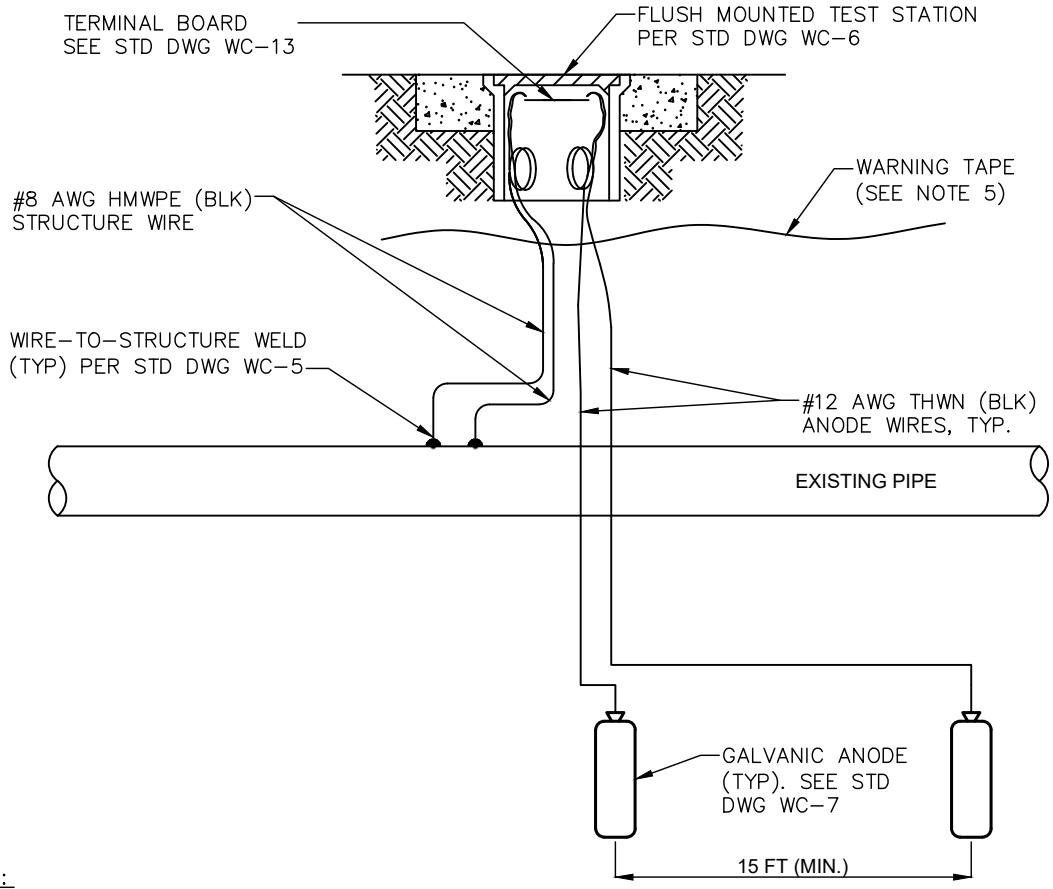
CARLSBAD MUNICIPAL WATER DISTRICT

2-WIRE TEST STATION WIRING

DISTRICT ENGINEER
RCE 55974

4/29/22
DATE

STANDARD DWG. NO. WC-11



NOTES:

1. INSTALL TEST STATION AT EACH LOCATION SHOWN ON DRAWING.
2. NUMBER OF ANODES VARIES.
3. ANODES SHALL BE INSTALLED A MIN. OF 8' FROM PIPE. ANODES TO REMAIN WITHIN THE BOUNDS OF CMWD'S EASEMENT, OR PUBLIC RIGHT-OF-WAY.
4. INSTALL ANODES A MINIMUM OF 12' BELOW FINISHED GRADE.
5. INSTALL PLASTIC WARNING TAPE 12" BELOW FINISH GRADE, ALONG THE ENTIRE LENGTH OF WIRES. USE 6" WIDE BY 4 MIL THICK INERT PLASTIC TAPE PRINTED WITH "CAUTION CATHODIC PROTECTION CABLE BELOW".
6. INSTALL ALL LEAD WIRE(S) IN TRENCH WITH MIN. 36" COVER. ROUTE WIRES IN SCH. 40 PVC CONDUIT.
7. AT PAVED LOCATIONS REPAIR SURFACES PER ENCROACHMENT PERMIT.
8. ALL WIRES INSIDE TEXT BOX SHALL HAVE MIN. 24" SLACK.
9. SEE STANDARD DRAWINGS WC-1 & WC-2 FOR GENERAL NOTES AND ABBREVIATIONS.

REV.	APPROVED	DATE

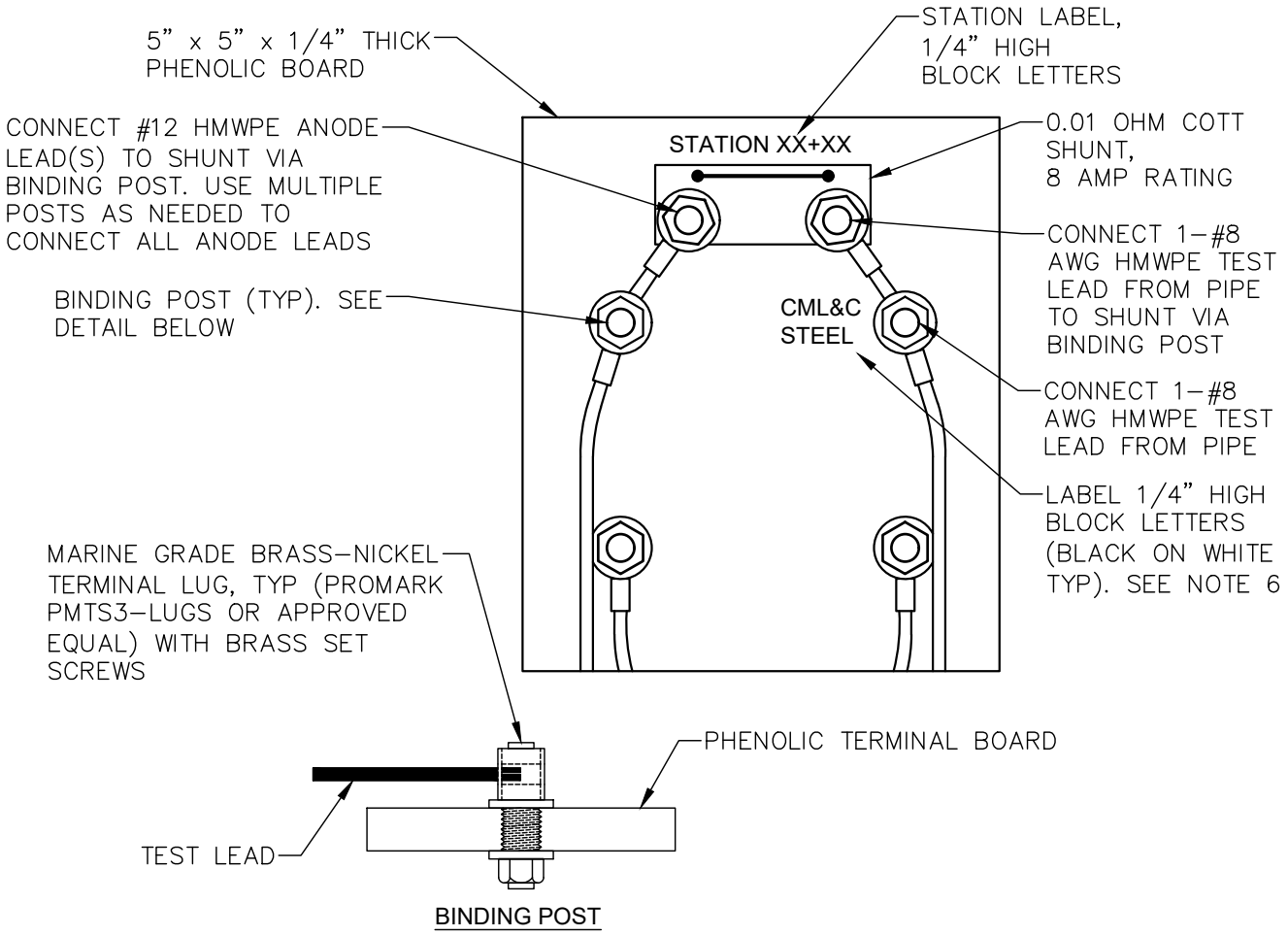
CARLSBAD MUNICIPAL WATER DISTRICT

TEST STATION WITH ANODES

DISTRICT ENGINEER
RCE 55974

4/29/22
DATE

STANDARD DWG. NO. WC-12



NOTES:

1. NUMBER OF WIRES VARIES. CONNECT EACH WIRE ON A SEPARATE TERMINAL LUG EXCEPT FOR ANODE WIRES. CONNECT 4 ANODE WIRES PER TERMINAL LUG.
2. FOR TEST STATIONS WITH MORE THAN 4 ANODES, ADDITIONAL BUSBAR WILL BE REQUIRED (NOT SHOWN ON DETAIL).
3. NUMBER OF ANODES VARIES.
4. DO NOT CONNECT SHUNT BETWEEN PIPE AND ANODES DURING CONSTRUCTION. SHUNT TO BE CONNECTED BY THE CONTRACTOR'S CORROSION ENGINEER DURING OPERATIONAL TESTING PER SPECS.
5. SEE STANDARD DRAWINGS WC-1 & WC-2 FOR GENERAL NOTES AND ABBREVIATIONS.
6. LABEL SHALL IDENTIFY WHAT STRUCTURE WIRE IS CONNECTED TO. DETAIL PROVIDES EXAMPLE FOR CML&C STEEL PIPE.

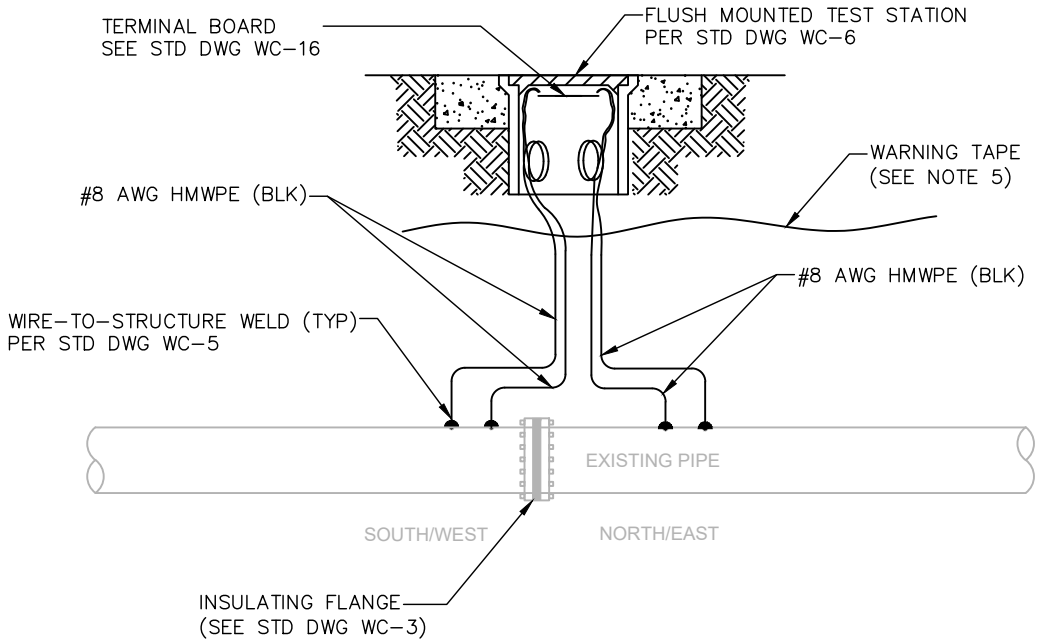
REV.	APPROVED	DATE

CARLSBAD MUNICIPAL WATER DISTRICT

TEST STATION WITH ANODES WIRING

David Rolls 4/29/22
DISTRICT ENGINEER RCE 55974 DATE

STANDARD DWG. NO. WC-13



NOTES:

1. INSTALL TEST STATION AT EACH LOCATION SHOWN ON DRAWING.
2. INSTALL PLASTIC WARNING TAPE 12" BELOW FINISH GRADE, ALONG THE ENTIRE LENGTH OF WIRES. USE 6" WIDE BY 4 MIL THICK INERT PLASTIC TAPE PRINTED WITH "CAUTION CATHODIC PROTECTION CABLE BELOW".
3. INSTALL ALL LEAD WIRE(S) IN TRENCH WITH MIN. 36" COVER. ROUTE WIRES IN SCH. 40 PVC CONDUIT.
4. AT PAVED LOCATIONS REPAIR SURFACES PER ENCROACHMENT PERMIT.
5. ALL WIRES INSIDE TEXT BOX SHALL HAVE MIN. 24" SLACK.
6. SEE STANDARD DRAWINGS WC-1 & WC-2 FOR GENERAL NOTES AND ABBREVIATIONS.

REV.	APPROVED	DATE
1		7/22

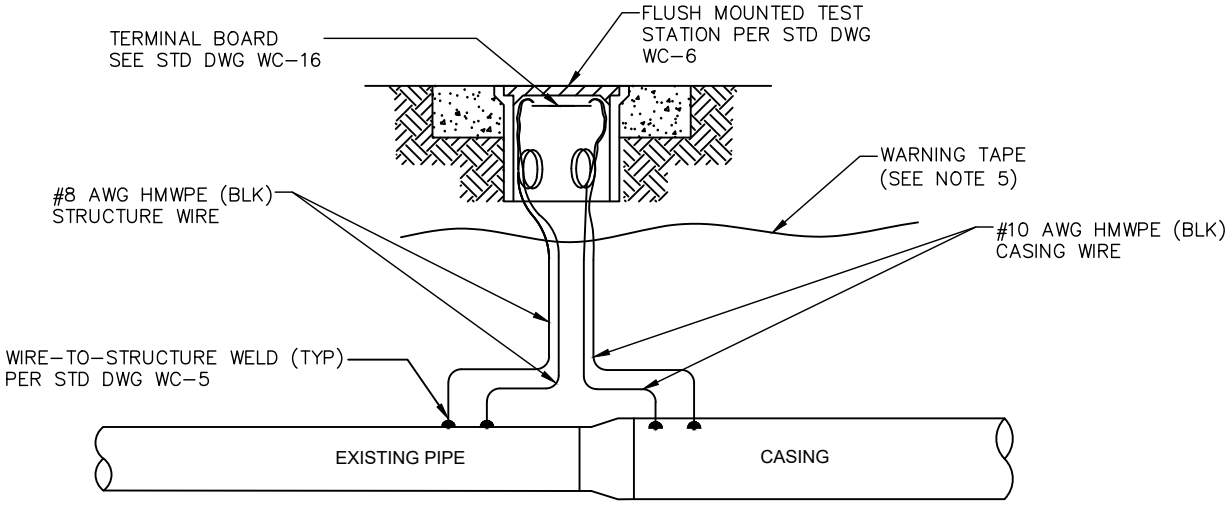
CARLSBAD MUNICIPAL WATER DISTRICT

TEST STATION - INSULATING FLANGE

DISTRICT ENGINEER
RCE 55974

4/29/22
DATE

STANDARD DWG. NO. WC-14



NOTES:

1. INSTALL TEST STATION AT EACH LOCATION SHOWN ON DRAWING.
2. INSTALL PLASTIC WARNING TAPE 12" BELOW FROM FINISH GRADE, ALONG THE ENTIRE LENGTH OF WIRES. USE 6" WIDE BY 4 MIL THICK INERT PLASTIC TAPE PRINTED WITH "CAUTION CATHODIC PROTECTION CABLE BELOW".
3. INSTALL ALL LEAD WIRE(S) IN TRENCH WITH MIN. 36" COVER. ROUTE WIRES IN SCH. 40 PVC CONDUIT.
4. AT PAVED LOCATIONS REPAIR SURFACES PER ENCROACHMENT PERMIT.
5. ALL WIRES INSIDE TEST BOX SHALL HAVE MIN. 24" SLACK.
6. SEE STANDARD DRAWINGS WC-1 & WC-2 FOR GENERAL NOTES AND ABBREVIATIONS.

REV.	APPROVED	DATE

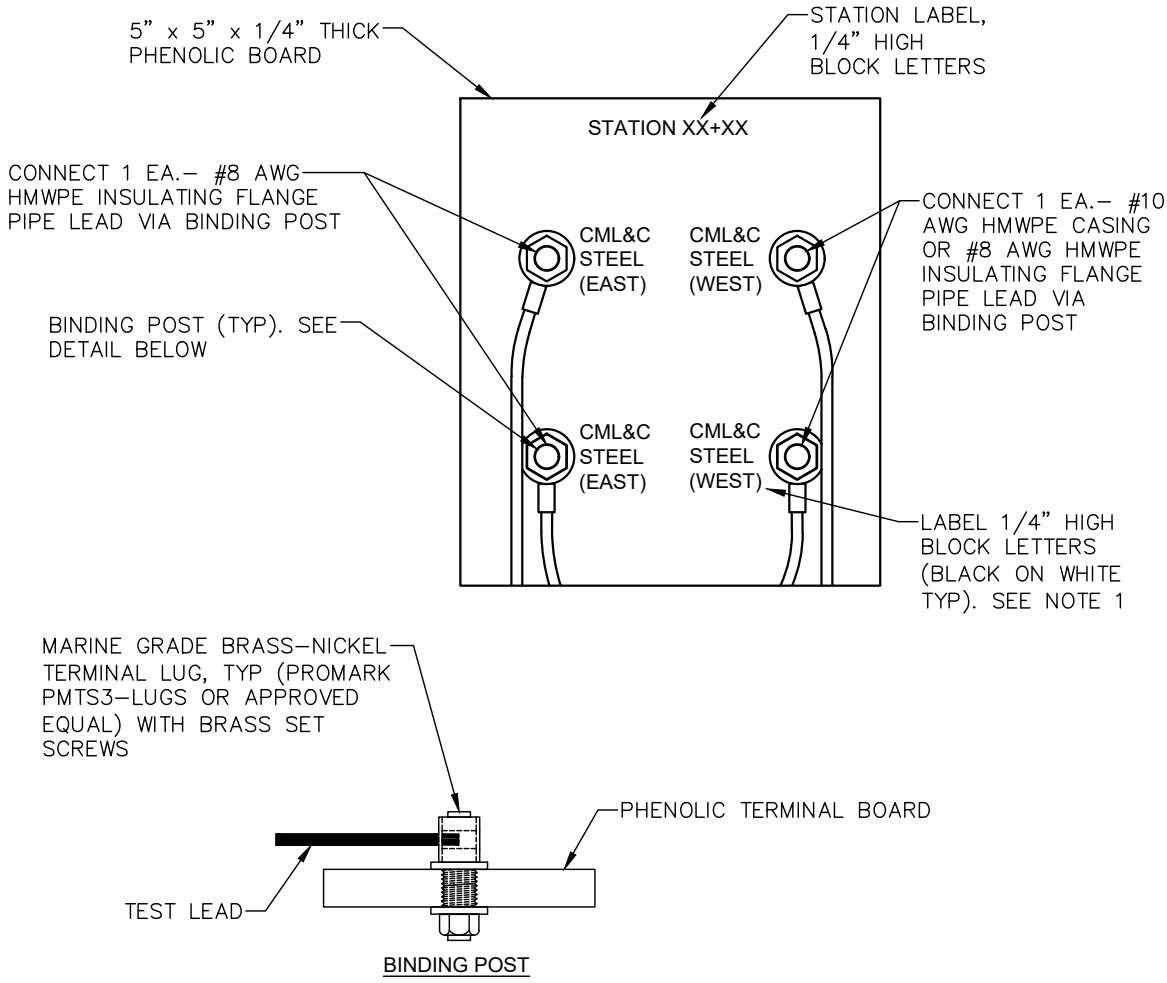
CARLSBAD MUNICIPAL WATER DISTRICT

TEST STATION - NEW CASING

DISTRICT ENGINEER
RCE 55974

4/29/22
DATE

STANDARD DWG. NO. WC-15



NOTES:

1. LABEL SHALL IDENTIFY WHAT STRUCTURE WIRE IS CONNECTED TO. DETAIL PROVIDES EXAMPLE FOR CML&C STEEL PIPE ON EITHER SIDE OF AN EAST/WEST ORIENTED INSULATION FLANGE.
2. SEE STANDARD DRAWINGS WC–1 & WC–2 FOR GENERAL NOTES AND ABBREVIATIONS.

REV.	APPROVED	DATE

CARLSBAD MUNICIPAL WATER DISTRICT

INSULATING FLANGE OR CASING TEST STATION WIRING

DISTRICT ENGINEER
RCE 55974

4/29/22
DATE

STANDARD DWG. NO. WC-16

VOLUME 3 – STANDARD DRAWINGS AND SPECIFICATIONS

CHAPTER 5 – STANDARD SPECIFICATIONS FOR POTABLE WATER, RECYCLED WATER AND SEWER FACILITIES

TABLE OF CONTENTS

CHAPTER 5 – STANDARD SPECIFICATIONS FOR POTABLE WATER, RECYCLED WATER AND SEWER FACILITIES

TABLE OF CONTENTS (CONTINUED)

SECTION 02060 – ASBESTOS CEMENT PIPE REMOVAL AND DISPOSAL

PART 1 GENERAL

1.1 DESCRIPTION

A. The work of this Section includes the repair, removal, transport and disposal of asbestos cement pipe (ACP) or asbestos containing material (ACM) typically encountered in water distribution systems.

B. This section includes a summary of the incidental procedures and equipment required to protect workers and the public from exposure to airborne asbestos fibers. This document is not a comprehensive manual on the state-of-the-art practice for asbestos abatement procedures, equipment, or materials. The selected contractor represents, by acceptance of this work, that the Contractor is aware of the various state-of-the-art practice procedures, equipment, and materials acceptable by regulatory agencies that are also efficient, effective, and protective of human health and the environment.

1.2 REFERENCED SPECIFICATIONS AND STANDARDS

A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section.

AWWA C110	Ductile-Iron and Gray-Iron Fittings
AWWA C111	Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C115	Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
AWWA C150	Thickness Design of Ductile-Iron Pipe
AWWA C151	Ductile-Iron Pipe, Centrifugally Cast
AWWA C153	Ductile-Iron Compact Fittings for Water Service
AWWA C213	Fusion-Bonded Epoxy Coatings and Linings for Steel Water Pipe and Fittings
AWWA C219	Bolted, Sleeve-Type Couplings for Plain-End Pipe
AWWA C800	Underground Service Line Valves and Fittings

Code of California Regulations, Title 8, Section 1529. Asbestos 29 CFR 1926.1101 – Asbestos

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Section 02223 – Trenching, Excavation, Backfilling and Compacting

B. Section 02262 – Asbestos Cement Pipe Testing

C. Section 15000 – General Piping Systems and Appurtenances

1.4 REGULATORY REQUIREMENTS

A. Except to the extent that more explicit or more stringent requirements are written directly into the Contract Documents, all applicable Federal, State, and local codes, regulations, and standards have the same force and effect (and are made a part of the contract documents) as if copied directly into the Contract Documents, or as if published copies are bound here within. Regulation references in the text are Federal regulations except where the State of California codes are listed in this section. Where the Federal and State regulations differ, the more stringent regulation shall be relevant to this Specification.

B. The Contractor shall assume full responsibility and liability for compliance with all applicable Federal, State, and local regulations pertaining to work practices, hauling, disposal, and protection of workers, visitors to the site, and persons occupying areas adjacent to the site

C. The Contractor is responsible for providing medical examinations and maintaining medical records of personnel as required by the applicable Federal, State, and local regulations.

D. The Contractor shall hold the Agency and Agency's consultants harmless for failure to comply with any applicable work, hauling, disposal, safety, health, or other regulation on the part of the Contractor, the Contractor's employees, and the Contractor's subcontractors.

E. Federal Requirements:

1. Occupational Safety and Health Administration (OSHA), including, but not limited to Code of Federal Regulations (CFR) – Occupational Exposure to Asbestos, Tremolite, Anthophyllite, and Actinolite Final Rules:

    29 CFR 1910.1001 – General Industry Standard

    29 CFR 1926.1101 – Construction Industry Standard

    29 CFR 1910.134 – Respiratory Protection

    29 CFR 1910.20 – Access to Employee Exposure and Medical Records

    29 CFR 1910.1200 – Hazard Communication

    29 CFR 1910.145 – Specifications for Accident Prevention, Signs and Tags

2. United States Department of Transportation (DOT), including, but not limited to:

    49 CFR 171 and 172 – Hazardous Substances

3. United States Environmental Protection Agency (US EPA), including, but not limited to:

40 CFR 763 Subpart E – Asbestos Abatement Projects, Worker Protection Rule

40 CFR 763 Subpart E – Asbestos Hazard Emergency Response Act (AHERA) Regulation, Asbestos-Containing Materials in Schools Final Rule and Notice

40 CFR 763 Subpart E, Appendix C – Training Requirements of AHERA Regulation, Asbestos-Containing Materials in Schools Final Rule and Notice

40 CFR 61 Subpart A and Subpart M (Revised Subpart B)– National Emission Standards for Hazardous Air Pollutants (NESHAP), National Emission Standard for Asbestos

Public Law 101-637 – Asbestos School Hazard Abatement Reauthorization Act (ASHARA), enacted November 28, 1990

F. State Requirements

1. Cal/OSHA, including but not limited to:

Title 8 CCR 341.17-Asbestos Trainer and Training Requirements

Title 8 California Code of Regulations (CCR) 1529 – Construction Standard

Title 8 CCR 2303 – Injury and Illness Prevention Plan

Title 8 CCR 5144 – Respiratory Protection

Title 8 CCR 5194 – Hazard Communication

Title 8 CCR 5208 – General Industry Safety Orders, Asbestos Regulations

Title 8, Article 2.5 – Asbestos-Related Work Registration

Title 22, Division 4, Chapter 30 – Minimum Standards for Management of Hazardous and Extremely Hazardous Waste

2. California Department of Toxic Substances Control (DTSC) – Transport and Disposal Regulations

G. Local Requirements

Abide by all local requirements which govern asbestos abatement work or hauling and disposal of asbestos waste materials, including:

1. San Diego County Air Pollution Control District (APCD) Rule 1206 – Asbestos Removal, Renovation, and Demolition

1.5 DEFINITIONS

A. Asbestos – includes chrysotile, amosite, crocidolite, tremolite asbestos, anthophyllite asbestos, actinolite asbestos, and any of these minerals that has been chemically treated and/or altered. Asbestos includes PACM, as defined herein.

B. Asbestos-Containing Material (ACM) – any material containing more than one percent asbestos.

C. Asbestos-Containing Waste Material (ACWM) – Any material, which is or is suspected of being ACM, or any material contaminated with an asbestos, which is to be removed from a work area for disposal.

D. Authorized Person – any person authorized by the employer and required by work duties to be present in regulated areas.

E. Class I Asbestos Work – activities involving the removal of thermal system insulation (TSI) and surfacing ACM and PACM.

F. Class II Asbestos Work – activities involving the removal of ACM which is not thermal system insulation or surfacing material. This includes, but is not limited to, the removal of asbestos-containing wallboard, floor tile and sheeting, roofing and siding shingles, and construction mastics. Removal of ACP is considered Class II asbestos work.

G. Class III Asbestos Work – repair and maintenance operations where ACM, including TSI and surfacing ACM and PACM, is likely to be disturbed. Repair and maintenance of ACP is considered Class III asbestos work.

H. Class IV Asbestos Work – maintenance and custodial activities during which employees contact but do not disturb ACM or PACM and activities to clean up dust, waste and debris resulting from Class I, II, and III activities.

I. Competent Person – one who is capable of identifying existing asbestos hazards in the workplace and selecting the appropriate control strategy for asbestos exposure, who has the authority to take prompt corrective measures to eliminate them: in addition, for Class I and Class II, work who is specially trained in a training course which meets the criteria of EPA's Model Accreditation Plan (40 CFR part 763) for supervisor, or its equivalent and, for Class III and Class IV work, who is trained in a manner consistent with EPA requirements for training of local education agency maintenance and custodial staff as set forth at 40 CFR 763.92 (a)(2). Note: For operations involving more than 100 square feet of asbestos containing construction material as defined in Title 8, CCR, Section 1529 (r), the competent person may fulfill the requirement contained in Section 341.9 to specify a certified supervisor for asbestos related work.

J. Consultant – assigned to record and report on the progress of asbestos abatement work. The Consultant is retained to conduct site visits, pre- and post-abatement visual surveys, and baseline, area, and clearance air monitoring.

K. Demolition – the wrecking or taking out of any load-supporting structural member and any related razing, removing, or stripping of asbestos products.

L. Disturbance – activities that disrupt the matrix or crumble or pulverize ACM or PACM or generate visible debris from ACM or PACM. Disturbance includes cutting away small amounts of ACM and PACM, no greater than the amount which can be contained in one standard sized glove bag or waste bag. In no event shall the amount of ACM or PACM so disturbed exceed that which can be contained in one glove bag or waste bag which shall not exceed 60 inches in length and width.

M. Glove Bag – an impervious plastic bag-like enclosure affixed around not more than a 60 x 60-inch asbestos-containing material, with glove-like appendages through which material and tools may be handled. Glove bags shall be seamless at the bottom.

N. HEPA Filter Vacuum Collection Equipment (or vacuum cleaner) – High efficiency particulate air filtered vacuum collection equipment with a filter system capable of collecting and retaining asbestos fibers. Filters should be of 99.97% efficiency for retaining fibers of 0.3 microns or larger. See P100 Filter Vacuum Collection Equipment (or vacuum cleaner).

O. HEPA Filter – A high efficiency particulate air filter capable of trapping and retaining 99.97% of mono-dispersed particles greater than 0.3 microns in diameter. See P100 Filter below.

P. Intact – the ACM has not crumbled, been pulverized, or otherwise deteriorated so that the asbestos is no longer likely to be bound with its matrix.

Q. Most Contaminated Worker – The employee assigned the breathing zone air sample representing the highest daily exposure in each work area (8-hour TWA).

R. Negative Initial Exposure Assessment – A demonstration by the Contractor, which complies with the criteria in 29 CFR 1926-1101 (f)(2)(iii), that employee exposure during an operation is expected to be consistently below the PEL.

S. Permissible Exposure Limit (PEL)-Asbestos – The airborne concentration of asbestos (0.1 f/cc) at which the Contractor shall ensure that no employee is exposed. Where the PEL is exceeded, the Contractor shall establish and implement a written program to reduce employee exposure to or below the limit by (1) engineering and work practice controls, and (2) use of required proper respiratory protection. No employee shall be exposed at any time to airborne concentrations of asbestos in excess of 1.0 fibers/cc during any 30-minute period, which is the Excursion Limit.

T. P100 Filter Vacuum Collection Equipment (or vacuum cleaner) – High efficiency particulate air filter (formerly known as a HEPA filter, currently known as a P100 filter) vacuum collection equipment with a filter system capable of collecting and retaining asbestos fibers. Filters should be of 99.97% efficiency for retaining fibers of 0.3 microns or larger.

U. P100 Filter – A high efficiency particulate air filter (formerly known as a HEPA filter, currently known as a P100 filter) capable of trapping and retaining 99.97% of mono-dispersed particles greater than 0.3 microns in diameter.

V. PACM – presumed asbestos-containing material, or thermal system insulation and surfacing material found in buildings constructed no later than 1980 unless the designation of a material as PACM is rebutted pursuant to Title 8, CCR, Section 1529 (k)(5).

W. Regulated Area – an area established by the employer to demarcate areas where Class I, II, and III asbestos work is conducted, and any adjoining area where debris and waste from such asbestos work accumulate; and a work area within which airborne concentrations of asbestos, exceed or there is a reasonable possibility they may exceed the permissible exposure limit (as defined in Title 8, CCR, Section 1529). Requirements for regulated areas are defined in Title 8, CCR, Section 1529 (e).

X. Removal – all operations where ACM and/or PACM is taken out or stripped from structures or substrates and includes demolition operations.

Y. Wetting Agents – amended water (surfactant) used for asbestos removal and disposal activities. Airless sprayers are used to apply amended water during removal procedures.

Z. Work Area – the area where asbestos-related work is performed which is defined and/or isolated to prevent the spread of asbestos fibers and entry by unauthorized personnel. Work area is a Regulated Area as defined by 29 CFR 1926.

1.6 QUALITY ASSURANCE

A. Laboratory Qualification

The laboratory shall be regularly engaged in asbestos testing, and personnel used for monitoring airborne concentrations of asbestos fibers shall be proficient in this field. This proficiency shall be demonstrated by current acceptable participation in the Proficiency Analytical Testing (PAT) program and each analyst shall have completed the National Institute for Occupational Safety and Health (NIOSH) 582 Course (Sampling and Analysis for Asbestos) or the equivalent. The laboratory that performs PCM or TEM sample analysis must be accredited by National Voluntary Laboratory Accreditation Program (NVLAP).

B. Contractor and/or Contractor’s Certified Industrial Hygienist

1. The Contractor or Contractor's CIH is responsible for the following:

a. Review of this Specification;

b. Assign air monitoring personnel to sample Contractor’s employee exposures and an analytical laboratory that conforms to this Section;

c. Maintain complete air sampling records, keep a daily activity log, and provide a report, which contains all personal air sampling results; and

d. Monitor air fiber concentrations inside and outside the regulated area daily.

2. The Contractor shall conduct, on a regular basis, observations regarding the integrity of all barriers constructed to protect outside environment from asbestos fiber release; work and safety plans; and proper performance of measures used to protect employees, including removal, encapsulation, disposal. The Engineer shall be informed immediately of operational problems or deviations from this Specification, initially by telephone and then in writing.

3. If, at any time the Contractor's Competent Person or CIH determines that practices are in violation of pertinent and applicable regulations or that air results exceed specified allowable levels, they will notify the City Engineer immediately. All work activity in the affected area(s) will cease until corrective actions have been taken. Any cost resulting from such a stop work order issued by the CIH or the City Engineer will be borne by the Contractor and will not be considered as a basis for an increase in the contract amount.

4. The Contractor is responsible for the safety of all persons in or around the regulated area or within the areas the Contractor is using for ingress and egress.

1.7 ASBESTOS FIBER CONCENTRATION CONTROL LIMITS

A. Inside Enclosed Work Area

Air concentrations of asbestos shall not exceed an 8-hour TWA of 0.1 f/cc of air by PCM for personnel selected as Most Contaminated Worker. Air concentrations of asbestos shall not exceed the 30-minute excursion level of 1.0 f/cc of air.

B. Outside Asbestos Work Area

Air concentrations of asbestos fibers shall be maintained at an 8-hour TWA at or below 0.01 f/cc of air (by PCM). This applies to all areas outside the contained work areas while work is in progress, except for the asbestos Work Area.

C. Area Clearance Sampling

Asbestos abatement clearance may be conducted by the City Engineer and will include visual inspection only.

1.8 TITLE OF WASTE MATERIAL

ACWMs resulting from abatement activities, except as specified otherwise, shall be the property of the Owner and shall be disposed of by the Contractor as required by applicable Federal, State and local regulations. Waste manifests will be signed by the Owner or Owner's Representative. Copies of all waste manifests are to be maintained by the Contractor as part of the required "close-out" documents. Contractor will submit the waste

disposal site name, location, and US EPA identification number where asbestos waste will be disposed. In addition, the Contractor will submit a letter from the disposal site certifying that the disposal site is legally authorized to receive ACM scheduled to be removed from the work area.

1.9 MEDICAL REQUIREMENTS

The Contractor shall provide workers with a comprehensive medical examination as required in 8 CCR 1529 (m). The Contractor shall submit one copy of most recent physical examination for each employee the Contractor will employ on the project. Physician's certificate must permit employee to work using a respirator and be dated within the last 12 months.

1.10 TRAINING

The Contractor shall certify that all workers performing asbestos abatement activities shall have successfully completed training provided by a Cal/OSHA approved training provider as defined in 8 CCR Section 341.17 within the past 12 months and have in their possession a valid Asbestos Worker Training Certificate or Contractor/Supervisor Certificate, issued by a Cal/OSHA-accredited trainer within the past 12 months. All certifications must comply with the recent Model Accreditation Plan (MAP) provisions (8 CCR 1529 (k)(9)). Contractor will be required to submit a copy of each employee's training records prior to start of project and maintain a copy of all certifications on site for the duration of the project.

1.11 PERMITS, LICENSES, NOTIFICATIONS, AND PATENTS

The Contractor will secure necessary permits and pay fees for asbestos removal, hauling, and disposal and provide timely notification of such actions as may be required by Federal, State, and local authorities. Copies of such notification shall be provided to the City Engineer prior to commencement and following completion of work. Post all notices required by applicable Federal, State, and local regulations at the job site where asbestos abatement work will be performed. One copy of all notices shall also be kept on file in Contractor's office.

1.12 SAFETY COMPLIANCE

A. Contractor will comply with laws, ordinances, rules, and regulations of Federal, State, and local authorities regarding handling, storing, transporting, and disposing of asbestos waste materials. Submit matters of interpretation of standards to the appropriate administrative agency for resolution before starting the work.

B. The Contractor shall develop and keep on site an Emergency Evacuation Plan for each work area in which the Contractor expects to use for ingress and egress. The Emergency Evacuation Plan shall be distributed and read by all personnel required to enter the work area. The Contractor shall post this plan at the entrance to the work area.

C. Post warning signs and labels and ensure the employees are properly trained and outside contractors are properly notified. Contractor will conduct "tail-gate" health

and safety meetings prior to work each shift to review the Contractor's Health and Safety Plan and discuss new hazards, if applicable.

D. The Contractor will institute all necessary precautions so that no unauthorized personnel enter the regulated areas by mistake or design. When the work Site is unattended, the regulated area shall be secured so that unauthorized personnel cannot enter the area.

1.13 RESPIRATORY PROTECTION

The Contractor shall provide and ensure the proper use and selection of respirators, perform required respiratory fit tests and institute a respiratory program. The Contractor will be required to submit one copy of most recent fit test results for each employee who the Contractor will employ on the project. Evidence of successful fit test within the last year (from the start date of the project) must be provided for each employee.

PART 2 PRODUCTS

2.1 AMENDED WATER

A mixture of surfactant and water for wetting of the ACP and retardation of fiber release equal to or greater than that provided using one ounce of a surfactant consisting of 50% polyoxyethylene ester and 50% polyoxyethylene ether mixed with five gallons of water.

2.2 DISPOSABLE CONTAINERS

Waste containers shall be suitable to receive and retain any asbestos-containing or asbestos-contaminated materials until disposal at an approved site. Separate waste bins shall be utilized for hazardous and non-hazardous wastes. The containers shall be labeled in accordance with Federal, State and local regulations. Containers must be lockable, closed top bins, which are both airtight and watertight.

2.3 EYE PROTECTION

Full-face masks or goggles must be provided to personnel engaged in asbestos operations. Eye protection must be worn during operations that may present risk or damage to the eyes.

2.4 FITTINGS

A. Fittings (bends, tees, sleeves) used in connection or repair work shall be ductile iron conforming to AWWA C110, C111, C115, C150, C151, and C153 as applicable.

B. Couplings for joining plain end pipe shall conform with the requirements of Section 15000 and be selected from the Approved Materials List.

2.5 GLOVES

Gloves shall be disposable poly or rubber gloves to protect hands. Cloth gloves may be worn inside poly or rubber gloves for comfort but shall not be used alone.

2.6 PIPE

A. Pipe for ACP connection or repair work shall consist of Polyvinyl Chloride (PVC) pipe per Section 15064 and conforming to AWWA C900 for 16 inch and smaller pipe diameters. For larger pipe diameters, pipe type shall be as approved by the City Engineer and may consist of either PVC pipe conforming to AWWA C900, ductile iron pipe conforming to AWWA C151 or steel pipe conforming to AWWA C200 (submittal required).

B. Pipe linings and coatings for ductile iron or steel pipe shall conform to CMWD Standards.

2.7 SERVICE SADDLES

A. Use bronze double strap service saddles per Section 15057 and the Approved Material List for 2” and smaller service or appurtenance connections on mains with pipe diameters 6” through 16”.

B. Use fabricated steel saddles per the Approved Material List for 3” and larger connections on mains with pipe diameters 18” or greater.

C. Wet taps will not be allowed where the outlet is the same size as the main. Cut-in tee installations shall be used for size-on-size taps or at the discretion of the City Engineer.

2.8 POLYETHYLENE BAGS

Polyethylene bags shall be a minimum 6-mil thickness and transparent, printed with warning labels per DOT and US EPA regulations and 8 CCR 1529 (k)(8).

2.9 POLYETHYLENE SHEETING

Sheeting must be fire retardant and shall be sized in lengths and widths to minimize the frequency of joints. Drop sheets used inside a negative pressure enclosure must be fire retardant material. The minimum thickness shall be as follows:

A. Wall and floor barriers – 6-mil

B. Ceiling barriers – 6-mil

C. All others (critical barriers, etc.) – 6-mil

2.10 RESPIRATORS

Respirators shall be selected in accordance with the requirements of Title 8, CCR, Section 1529 and shall conform to not less than the following minimum requirements:

A. Half-mask air purifying respirator equipped with a high efficiency P100 filter.

2.11 SIGNS AND LABELS

A. Warning signs and labels shall be printed in letters of sufficient size and contrast so as to be readily visible and legible. Signs shall be visible from a distance of 20 feet.

B. Warning signs shall bear the following information:

DANGER
ASBESTOS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
AUTHORIZED PERSONNEL ONLY
WEAR RESPIRATORY PROTECTION AND
PROTECTIVE CLOTHING IN THIS AREA

C. Labels of bags or containers of protective clothing and equipment, scrap, waste, and debris containing asbestos fibers bear the following information:

DANGER
CONTAINS ASBESTOS FIBERS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
DO NOT BREATHE DUST
AVOID CREATING DUST

D. The DOT requires the following language on waste containers:

HAZARDOUS WASTE, SOLID N.O.S., ORM-E, NA 9188 (ASBESTOS)(RQ)

2.12 WATER SPRAYERS

Water sprayer shall be an airless or other low-pressure type emitting a fine mist for amended water application.

PART 3 EXECUTION

3.1 GENERAL

A. All work involved in the removal, salvage or disposal of ACP shall be the responsibility and performed at the expense of the Contractor.

B. Contractor will be responsible for submitting a Shut Down/Connection Request and scheduling the work with the City and CMWD and confirming that the water system has been shut down or otherwise isolated prior to starting work.

C. Contractor shall furnish and utilize all required protective respirators, clothing and equipment, as applicable, in the performance of the work in accordance with applicable regulations.

D. Connections and repairs to ACP systems shall be as approved by the City Engineer. All pipe connections shall be made at existing joints. Field cutting of ACP with high speed saws or grinders shall not be permitted.

E. The Contractor shall install all repair and connection pipe, closure sections, fittings, valves and appurtenances as shown on the Plans including bolts, nuts, gaskets, and jointing materials.

F. The Contractor shall maintain the inside of the pipe clean, sanitary, and free from foreign materials. At all times when the work of installing pipe is not in progress, all openings into the pipe and the ends of the pipe in the trenches shall be kept tightly closed to prevent the entrance of animals and foreign materials.

G. Where closure sections are required, the sections shall be installed in accordance with the manufacturer's installation guide and shall only be used with the approval of the Engineer.

H. Combined deflections at rubber gasket or flexible coupling joints shall not exceed 2-1/2 degrees or the maximum allowed by the coupling manufacturer, whichever is less. Bending of PVC pipe will not be allowed.

I. Use of pipe sections less than 5 feet long shall only be permitted with the approval of the Engineer.

Any ACP water line(s) being abandoned shall be abandoned in place in accordance with CMWD Standards unless otherwise approved.

3.2 REGULATED AREAS

A. ACP removal or repair work shall be conducted in a regulated area demarcated in any manner that minimizes the number of persons within the area and protects persons outside the area from exposure to airborne asbestos. Signs shall be provided and displayed pursuant to the requirements of this section.

B. The Contractor shall ensure that all asbestos work performed within regulated areas is supervised by a competent person.

C. The Contractor shall limit access to the work area to authorized representatives of the Owner. At no time shall any personnel enter a work area without notifying the on-site competent person first and signing the site entry log.

3.3 VISITOR COMMUNICATIONS

A. All inquiries concerning work involving ACP shall be directed to the on-site competent person. The Contractor shall notify the Engineer of visitors (i.e., regulatory inspectors, law enforcement, press, etc.) that visit the site during the work.

B. The Contractor shall immediately notify the Engineer if a regulatory agency issues a citation to the Contractor.

3.4 SIGNS AND LABELS

A. Warning signs that demarcate the regulated area shall be provided and displayed at each location. Signs shall be posted at such a distance from such a location that an employee may read the signs and take necessary protective steps before entering the area marked by the signs.

B. Labels shall be affixed to all products containing asbestos and to all containers containing such products, including waste containers.

3.5 ACP ABANDONMENT

A. ACP to be abandoned in-place shall be filled with CLSM conforming to Section 03000 and in accordance with the abandonment method and procedures in Section 15000.

B. If it is necessary to remove abandoned ACP line(s) and/or appurtenances, the appurtenances shall be removed in accordance with this Section.

3.6 REMOVAL

A. ACP shall be removed and disposed of in accordance with all applicable laws.

B. All persons entering a regulated area where employees are required to wear respirators pursuant to Title 8, CCR, Section 1529 (h)(1) shall wear a respirator conforming to the requirements therein. Respirators shall be used without exception when the removal of ACP cannot be performed intact.

C. In accordance with Title 8, CCR, Section 1529, the following work practices and controls are prohibited during removal or cleanup of ACP or debris:

1. Cutting or grinding with high-speed abrasive saws or grinding discs that are not equipped with point of cut ventilator or enclosures with HEPA filtered exhaust air.

2. The use of compressed air to remove asbestos, or materials containing asbestos, unless the compressed air is used in conjunction with an enclosed ventilation system designed to capture the dust cloud created by the compressed air.

3. Dry sweeping, shoveling or other dry clean-up of dust and debris.

4. Employee rotation as a means of reducing employee exposure to asbestos.

5. Eating, drinking, smoking, chewing tobacco or gum or application of lotions, sunscreen or any other cosmetics.

D. Proper methods shall be used to prevent the generation of friable asbestos during removal or handling of ACP. The following methods shall be used:

1. The material shall be thoroughly wetted with amended water (containing a wetting agent to increase the ability of the liquid to penetrate ACP) prior to and

during its removal. Use chain pipe cutters (snap cutters) whenever possible instead of abrasive cutters or grinders.

2. The material shall be removed in an intact state unless intact removal is demonstrated as not possible.

3. Unnecessary cutting, abrading or breaking the material shall be prohibited unless demonstrated that methods less likely to result in asbestos fiber release are not feasible.

4. Asbestos-containing material removed shall be immediately bagged or wrapped in two layers of 6-mil polyethylene prior to disposal or kept wetted until transferred to an approved closed receptacle no later than the end of the work shift.

5. ACP debris remaining in trenches should be removed by hand and placed into sealed, impermeable, waste bags for appropriate disposal.

6. If removal by hand is infeasible, use vacuum cleaners equipped with HEPA filters to collect fine debris containing ACM or PACM. The equipment shall be used and emptied in a manner that minimizes the reentry of asbestos into the work area.

3.7 SAMPLES FOR LABORATORY TESTING

A. The Contractor shall take samples of ACP for laboratory testing in accordance with Section 02262 as follows:

1. When the Work is related to the repair or replacement of ACP at valve replacement or pipeline repair sites, the Contractor shall mark the top of pipe prior to removal and retain the shortest ACP segment removed from each work site.

2. Where the project involves removal of ACP for pipeline replacement projects greater than 500 lineal feet, the Contractor shall identify the shortest segment of ACP to be retained as a sample and provide one sample for every 500 lineal feet of pipeline removed. Mark the top of pipe prior to removal.

B. Individually package and label each sample. Carefully bag and seal the sample air-tight with approved bagging and packaging materials. Keep packaged samples dry, sealed, and away from direct sunlight and high temperature during transportation.

C. Clearly label the outside of the bagging with the station/location, unique pipe ID designated by the Owner, and date of removal.

Deliver or ship the bagged and sealed sample to the laboratory for testing in accordance with Section 02262.

3.8 DISPOSAL

A. The Contractor shall determine current waste handling, transportation, and disposal regulations for the work area and for the waste disposal landfill to receive ACP. The Contractor must comply fully with these regulations and all DOT and US EPA requirements.

B. Non-friable materials may be disposed as non-hazardous construction waste at a disposal site permitted to receive the waste. The Contractor shall notify the receiving non-hazardous waste landfill of the type and nature of the asbestos debris to be disposed.

C. County of San Diego landfills do not accept friable asbestos-containing materials for disposal. Friable asbestos-containing materials are regulated as hazardous waste (22 CCR 66261.24). A friable material is defined as material that can be crumbled, pulverized, or reduced to powder in the hand.

D. All removed ACP shall be properly manifested and prepared for transport following the criteria of the County of San Diego Department of Public Works, Solid Waste Division.

E. County of San Diego landfills accept non-friable ACP under the following conditions:

1. ACP less than three feet long must have all broken edges encapsulated (sealed) with an approved product and double wrapped in 6-mil plastic which is properly sealed to prevent expulsion of dust particles.

2. Intact ACP over three feet long does not require double wrap in 6-mil plastic. Any broken edges, however, must be encapsulated with an approved product.

3. Contractor shall confirm with the landfill the quantity of ACP to be accepted per day per generator and shall obtain prior approval from the Solid Waste Division prior to transport.

4. Transport ACP to the landfill for disposal via dump truck or waste bins. CMWD will not transport or dispose of ACP generated by the Contractor's activities.

5. Each load must be accompanied by a Department of Public Works Non-Hazardous, Non-Infectious Special Waste Manifest.

6. All loads may be subject to inspection by County personnel prior to admittance to the landfill.

F. Sealed waste containers may be stored within the work area until a sufficient volume of waste has accumulated for disposal, but not to exceed five days. This storage area will be prominently designated and waste containers will be covered with polyethylene sheeting. Waste should be stored out of sight of the public in a secure area.

G. The Contractor shall fill out manifest forms for the Owner's (Generator's) signature. Original disposal receipts, manifests, and bill of lading forms must be submitted to the Engineer within ten days following legal disposal.

3.9 INSTALLATION

A. Connections shall be made at existing pipe joints and snapping of existing ACP, either ratchet or hydraulic, is permitted only when necessary and with prior wetting of the pipe and throughout the entire process.

B. The Contractor shall use PVC pipe, or other pipe type as approved by the Engineer, to replace removed ACP or where new connections are necessary. All new pipe shall comply with the CMWD Approved Materials List.

C. The Contractor shall dewater the trench to prevent the pipe from floating and shall assume full responsibility for any damage caused and shall, at their own expense, remove and reinstall or replace the pipe to the original line and grade or to the specified line and grade.

D. New pipe or materials shall not be dropped, dragged, or handled in a manner that will cause damage. All pipe, fittings, valves and other materials shall be lowered into the trench using nylon straps or by other approved methods. All materials damaged during installation shall be identified and removed from the job site.

E. The bedding material beneath pipe bells shall be excavated at each joint to permit proper assembly and inspection of the entire joint.

F. Pipe sections shall be laid in the trench to true alignment and grade in accordance with the drawings. The pipe grade shall be approved by the Engineer.

G. New pipe segments shall be at least five feet long. Shorter lengths shall be permitted only when necessary due to connection length constraints and with the approval of the Engineer.

H. Fittings shall be supported until concrete thrust blocks are placed so that the pipe is not subjected to the weight of the fitting.

I. Concrete thrust blocks of the size shown on the Plans shall be constructed at all fittings and valves unless otherwise approved by the Engineer and at no additional cost.

END OF SECTION

SECTION 02223 – TRENCHING, EXCAVATING AND BACKFILLING

PART 1 GENERAL

1.1 DESCRIPTION

This section includes materials, testing, and installation for trench excavation, backfill, and compaction of soil and soil-aggregate mixtures for backfilling of excavations for piping, conduit, manholes, and vaults.

1.2 REFERENCE STANDARDS

The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

ASTM C131	Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C150	Portland Cement
ASTM D75	Practice for Sampling Aggregates
ASTM D1556	Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone method
ASTM D1557	Test Method for Moisture-Density Relations of Soils Using a Modified Effort
ASTM D2419	Test Method for Sand Equivalent Values of Soil and Fine Aggregate
ASTM D3776	Test Method for Mass Per Unit Area (Weight) of Woven Fabric
ASTM D4253	Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Plate
ASTM D4254	Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density
ASTM D4632	Test Method for Grab Breaking Load and Elongation of Geotextiles
ASTM D4751	Test Method for Determining the Apparent Opening Size of a Geotextile
ASTM D6938	Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
CAL-OSHA	Title 8 General Industry Safety Orders
California Test 417	Method of Testing Soils, Concrete Patching Materials and Waters for Sulfate Content
California Test 422	Method of Testing Soils, Concrete Patching Materials and Waters for Chloride Content

California Test 643 Method of Test for Laboratory Resistivity and pH for Soil and Water

1.3 RELATED WORK SPECIFIED ELSEWHERE

Standard Specifications 15000, 15043, 15044, 15056, 15061, 15063, 15064, 15065, 15068, 15121 and 15125

1.4 GEOTECHNICAL TESTING

The Developer or Contractor shall engage the services of a geotechnical engineering firm or individual licensed in the State of California to monitor soil conditions during earthwork, trenching, bedding, backfill, and compaction operations (i.e., the geotechnical engineer of record). All testing and inspection services shall be performed by a qualified representative of the geotechnical engineer of record (i.e., Soils Technician) and at intervals and durations to allow certification of compliance with the specifications by the geotechnical engineer of record.

Sampling and testing procedures shall be performed in accordance with the Reference Standards and as follows:

A. The Soils Technician shall be present at the site during all backfill and compaction operations. Failure to have the Soils Technician present will subject such operations to rejection.

B. Density and optimum moisture content of soil shall be determined using the sand cone method, ASTM D1556, or nuclear density gauge method, ASTM D6938. Since the composition of the pipe and the walls of the trench influence the nuclear density test results, a minimum of 25% of the field density and moisture tests shall be made using the sand cone method.

C. Determine laboratory moisture-density relations of existing soil by ASTM D1557, Method C and/or D.

D. Determine the relative density of cohesion less soils by ASTM D1557, Method C and/or D.

E. Sample backfill material by ASTM D75.

F. Express “relative compaction” as a percentage of the ratio of the in-place dry density to the laboratory maximum dry density.

A report of all tests performed shall be stamped and signed by the geotechnical engineer of record and shall be submitted by the Contractor prior to the filling of the Notice of Completion by the City. The report shall document the sampling and testing of materials, the location and results of all tests performed, and shall certify that materials and work comply with this specification.

1.5 PIPE ZONE

The pipe zone includes the full-width of the trench from 6-inches below the bottom of the pipe to 12-inches above the top of the pipe and extends into manhole or vault excavations to the point of connection to or penetration of such structure.

1.6 TRENCH ZONE

The trench zone includes the portion of the trench from the top of the pipe zone to the bottom of the pavement zone in paved areas, or to the existing or finished surface, whichever is higher, in unpaved areas, and extends into manhole or vault excavations above the pipe zone.

1.7 PAVEMENT ZONE

The pavement zone includes the concrete or asphalt concrete pavement and aggregate base section placed over the trench zone and extends into manhole or vault excavations above the trench zone.

1.8 PROTECTION OF EXISTING UTILITIES AND FACILITIES

The Contractor shall be responsible for the protection of all existing utilities, facilities, and structures that may be encountered in or near the area of the work.

1.9 PROTECTION OF EXISTING LANDSCAPING

The Contractor shall be responsible for the protection of all trees, shrubs, fences, and other existing improvements adjacent to or within the work area unless specifically noted for demolition, removal or abandonment.

1.10 ACCESS

The Contractor shall provide continuous, unobstructed access to all driveways, water valves, hydrants, or other property or facilities within or adjacent to the work areas.

1.11 SAFETY

A. Protection of workers within trenches shall be as required by the California Labor Code.

B. All excavations shall be performed in a safe manner and shall be protected and supported in accordance with CAL-OSHA regulations.

C. Barriers and traffic delineators shall be placed in accordance with the requirements of the agency having jurisdiction.

1.12 BLASTING

Blasting for excavation shall not be performed without the written permission of the City. Procedures and methods of blasting shall conform with City policies for blasting and all Federal, State, and local laws and ordinances.

1.13 PIPE JACKING

Pipe jacking may be permitted in accordance with Section 15125. City approval is required in advance of such operations.

1.14 EXCESS EXCAVATED MATERIAL

A. The Contractor shall remove and legally dispose of all excess excavated material and demolition debris.

B. It is the intent of these specifications that all surplus material shall be legally disposed of by the Contractor. Before acceptance of the work by City, the Contractor shall provide the City with written releases signed by all property owners with whom the Contractor has entered into agreements for the temporary storage of equipment or materials or for disposing of excess excavated material, absolving the City from any liability connected therewith.

1.15 FILTER FABRIC

Filter fabric shall be used when wet, soft, spongy, or similarly unstable material is encountered, in areas of potential high groundwater, or for separation of sandy or fine grained soil and crushed rock in accordance with the recommendations of the geotechnical engineer or record and the approval of the City.

1.16 CHANGES IN LINE AND GRADE

In the event obstructions not shown on the plans are encountered during the progress of the work, and which will require alterations to the plans, the Engineer shall have the authority to change the plans and order the necessary deviation from the line and grade. Bending of pipe will not be accepted; all deflections shall be achieved with high deflection couplings or bends. The Contractor shall not deviate from the specified line and grade without prior written approval by the City.

1.17 HYDROSTATIC TESTING

Pre-testing of the piping system may be performed for the Contractor's convenience at any time. However, the final hydrostatic pressure test, as described in Sections 15043 and 15044, shall be performed following the completion of all backfilling and trench zone compaction with a minimum of 2.5-feet of material over the pipe.

PART 2 MATERIALS

2.1 GENERAL

The Contractor shall furnish backfill material as specified below. All materials used in and above the pipe zone shall be capable of attaining the required relative density.

2.2 IMPORTED SAND – PIPE ZONE

Imported sand shall be used within the Pipe Zone for PVC pressure pipe, ductile iron pipe, cement-mortar coated steel pipe and paint-coated pipe.

A. Imported sand shall be free from clay balls, organic matter, and other deleterious substances and shall have a coefficient of permeability greater than 0.014 measured in accordance with ASTM D2434 or a sand equivalent of greater than 30 per ASTM D2419.

B. Resistivity for imported sand shall be not less than 2,000 ohm-cm (California Test Method 643). Maximum chloride concentration shall not exceed 200 mg/l (California Test Method 422) and maximum sulfate concentration shall not exceed 500mg/l (California Test Method 417).

C. Imported Sand shall conform to the following gradation:

U.S. Standard Sieve Size	Percent Passing by Weight
1/2-inch	100
No. 4	75-100
No. 16	35-75
No. 50	10-40
No. 200	0-10

2.3 CRUSHED ROCK – PIPE ZONE

Crushed Rock shall be used in the Pipe Zone on PVC or HDPE Gravity Sewer Pipe. Crushed rock shall be clean, crushed stone free of organic matter. Crushed rock shall be certified to contain less than 1% asbestos by weight or volume and shall conform to the following gradation and quality requirements:

U.S. Standard Sieve Size	Percent Passing by Weight
1-Inch	100
3/4-Inch	90-100
1/2-Inch	30-60
3/8-Inch	0-20
No. 4	0-5
No. 8	---
ASTM C131 Grade	B

Percentage Wear (ASTM C131)	Requirement
100 Revolutions	15 Maximum
500 Revolutions	52 Maximum

2.4 EARTH BACKFILL MATERIAL – TRENCH ZONE

A. Earth backfill is defined as material removed from the required excavations and subsequently screened of oversize or unsuitable materials and used as backfill material. Earth backfill that meets the requirements specified herein may be used for

backfill or fill, except where imported materials are specified on the Plans or herein. Do not use stockpiled topsoil for backfill or fill.

B. Earth backfill used in the trench zone shall be native granular materials with 90 percent or greater passing the No. 4 sieve and not more than 30 percent passing the No. 200 sieve. Earth backfill shall be free of debris and organic matter and rocks greater than 4 inches in maximum dimension.

C. Where the onsite materials are determined by the Engineer to be unsuitable, imported fill shall be provided by the Contractor.

2.5 CONTROLLED LOW STRENGTH MATERIAL

A. CLSM shall conform to the requirements of Section 03000. City approval is required for use of CLSM as a backfill material.

2.6 FILTER FABRIC

Filter fabric shall be manufactured from polyester, nylon, or polypropylene. Material shall be of non-woven construction and shall meet the following requirements:

Grab tensile strength (ASTM D4632):	100 lbs. min. for a 1-inch raveled strip
Weight (ASTM D3776):	(4.5 oz./sq. yd.)
Apparent opening size (ASTM D4751):	0.006-inch

PART 3 EXECUTION

3.1 CLEARING AND GRUBBING

A. Areas where work is to be performed shall be cleared of all trees, shrubs, rubbish, and other objectionable material of any kind, which, if left in place, would interfere with the quality, performance or completion of the completed work, would impair its subsequent use, or would form obstructions therein.

B. Organic material from clearing and grubbing operations will not be incorporated into trench backfill and shall be removed from the project site or may be retained and incorporated with the topsoil.

3.2 PAVEMENT, CURB, AND SIDEWALK REMOVAL

Bituminous or concrete pavements, curbs, and sidewalks shall be removed and replaced in accordance with the requirements of the agency having jurisdiction. Removal shall extend to the nearest construction joints or as ordered by the Engineer.

3.3 DEWATERING

A. The Contractor is responsible for complying with applicable Federal, State, and local laws and regulations regarding the treatment and disposal of water from dewatering operations at the construction site.

B. Contractor shall conduct dewatering operations in accordance with applicable Conditional Waivers for low threat discharges of the Regional Water Quality Control Board per Order No. R9-2019-0005 or the latest applicable order. If the dewatering operations do not comply with the conditions of the "low threat" waiver, the Contractor shall obtain a Discharge Permit. Note that discharges from flushing water lines with the potential to discharge to the MS4, or to affect surface water quality are not eligible for enrollment in "low threat" waiver.

C. The Contractor shall provide and maintain, at all times during construction, ample means and devices to promptly remove and dispose of all water from any source entering excavations or other parts of the work. Dewatering shall be performed by methods that will maintain a drained and stable excavation, preserving the lines and grades and protection of all utilities. Dewatering methods may include well points, sump points, a suitable rock or gravel layer placed for drainage and pumping, temporary pipelines, or other means, all subject to the approval of the City. The cost of all dewatering activities shall be borne by the Developer or Contractor.

D. If flooding of the trench should occur, the Contractor shall immediately dewater and restore the trench. Damaged or altered pipeline appurtenances or trench materials shall be repaired or replaced as directed by the City Engineer.

E. Sewer systems shall not be used as drains for dewatering trenches or excavations, nor for disposal of collected or accumulated groundwater, without the approval of the agency of jurisdiction.

F. Concrete shall not be placed in water, nor shall water be allowed to rise around concrete or mortar until it has set at least four hours.

EXCAVATION SUPPORT SYSTEMS

A. The Contractor's design and installation of excavation support systems shall be consistent with the rules, orders, and regulations of CAL-OSHA.

B. Excavations shall be sheeted and shored, shielded, braced or sloped such that the walls of the excavation will not slide or settle and all existing improvements of any kind, either on public or private property, will be fully protected from damage.

C. The sheeting, shoring, bracing or sloped systems shall be arranged so as not to place any stress on portions of the completed work until the general construction has proceeded far enough to provide ample strength.

D. Care shall be exercised in the moving or removal of trench shields, sheeting, and shoring to prevent the caving or collapse of the excavation faces being supported or damage to completed work.

3.4 CORRECTION OF OVER-EXCAVATION

Over-excavations shall be backfilled with approved earth backfill or imported granular material compacted to 90% relative compaction, or crushed rock wrapped in filter fabric with prior approval of the City.

3.5 FOUNDATION STABILIZATION

A. When unsuitable soil materials are encountered at the design subgrade, the unsuitable material shall be removed to a depth of 12 inches below the design subgrade or to the depth recommended by the Soils Technician and approved by the City. The subgrade shall be restored with compacted, imported granular material or crushed rock wrapped in filter fabric. Place the specified pipe zone material on this restored foundation.

B. When rock is encountered at the design subgrade, the rock shall be removed to a depth of 6 inches below the design subgrade for 24-inch and smaller diameter pipe, or to a depth of 10 inches for pipe greater than 24 inches in diameter. The subgrade shall be restored with compacted, imported granular material or earth backfill. Place the specified pipe zone material on this restored foundation.

C. When wet, soft or similarly unstable material is encountered at the design subgrade, the unstable material shall be removed to a depth of 18 inches or as recommended by the Soils Technician and approved by the City. Restore the trench with crushed rock or well-graded gravel up to 2-inches in maximum dimension and wrapped in filter fabric. Place the specified pipe zone material on this restored foundation.

3.6 TRENCH EXCAVATION AND PLACEMENT OF BEDDING

A. Excavate the trench to the lines and grades shown on the drawings with allowance for the thickness of pipe bedding material. The trench section and width shall be as shown on the Standard Drawings.

B. The maximum length of open trench shall not exceed 500-feet or the length which can be backfilled in one work day, whichever is less, except by permission of the City. The distance is the collective length at any location, including open excavation and pipe laying, which has not been backfilled to the elevation of the surrounding grade.

C. Trench walls shall be sloped or shored per the requirements of CAL-OSHA.

D. The trench bottom shall be graded to provide a smooth, firm, and stable foundation that is free of rocks and other obstructions.

E. Place the specified thickness of bedding material over the full width of the trench. Grade the top of the pipe base ahead of the pipe laying to provide firm, uniform support along the full length of pipe.

F. Excavate bell holes at each joint to permit proper assembly and inspection of the entire joint and to provide uniform pipe support.

G. All trenches, including main pipelines and all appurtenances, shall be backfilled with the materials and methods as specified for the Pipe Zone, Trench Zone, and Pavement Zone.

H. Trench depth shall be as required to install pipelines in accordance with the Plans and these Standard Specifications. Unless shown otherwise in the Plans, the minimum cover for pipelines shall be as follows:

Pipeline Application	Minimum Cover
Potable Water	42-inches
Recycled Water	54-inches
Sewer	60-inches

3.7 MANHOLE AND VAULTS

A. The Contractor shall prepare an excavation large enough to accommodate the structure and permit grouting of openings and backfilling operations. The walls of the excavation shall be sloped or shored per the requirements of CAL-OSHA.

B. Manholes and vaults shall be placed at the location and elevation shown on the plans, on 6-inches of compacted crushed rock base over firm, undisturbed native soil or compacted backfill or fill. Excavations shall be observed by the Soils Technician prior to placing crushed rock.

C. Manhole and vault excavations shall be backfilled with the materials and methods as specified for the Pipe Zone, Trench Zone, and Pavement Zone.

3.8 COMPACTION REQUIREMENTS

A. Compaction shall be accomplished by mechanical means. Consolidation by water settling methods such as jetting or flooding is prohibited.

B. All materials to be placed in the trench as bedding or backfill shall be moisture conditioned outside of the trench to +/- 2% of optimum moisture content as measured by ASTM D1557. Materials that cannot attain the specified degree of compaction because of high moisture content shall be dried back or removed and replaced with drier material.

C. If the backfill does not meet the specified relative compaction, the backfill shall be reworked until the requirements are met. All necessary excavations for density tests shall be made as directed by the Soils Technician and as acceptable to the Engineer. The requirements of the Agency having jurisdiction shall prevail on all public roads.

D. Compaction tests shall be performed in accordance with ASTM D1556 and ASTM D6938 and at random depths and at random intervals not to exceed 150 lineal feet for each lift of backfill or as directed by the City.

E. Relative compaction shall be determined in accordance with ASTM D1557 Procedure C.

F. Unless otherwise shown on the plans, standard drawings or otherwise described in the specifications for the type of pipe installed, relative compaction in trenches shall be as follows:

1. Pipe zone – 90% relative compaction.

2. Trench zone – 90% relative compaction.

3. Structural section in paved areas – per agency requirements, 95% minimum, including the upper 12 inches of the trench zone.

4. Imported granular material for over excavation or foundation stabilization – 90% relative density.

G. All excavations are subject to compaction tests.

3.9 PIPE ZONE BACKFILL

A. Place the imported granular backfill material simultaneously around the pipe so that the pipe barrel is completely supported and that no voids or uncompacted areas remain beneath the pipe or on the sides of the pipe. Place material simultaneously on both sides of the pipe to prevent lateral movement. This area shall be mechanically compacted to attain 90% relative density. Care shall be taken when compacting appurtenance laterals 2-inches and smaller to prevent the crushing or denting of the copper lateral.

B. Soil lifts shall not exceed 8 inches in loose thickness, or the thickness necessary to achieve the specified relative compaction with the specific equipment used. Additional lifts of less thickness may be required to attain complete support of the haunch area which shall be subject to compaction testing.

C. After the spring line backfill has been approved, backfill of the remainder of the Pipe Zone may proceed. Do not drop sharp or heavy materials directly onto the pipe or the tamped material around the pipe.

D. Place and compact the imported granular material at a maximum of 8-inch loose lifts. Compact all material placed in the Pipe Zone by mechanical methods. Sand cone tests shall be taken on this layer of backfill.

E. The use of a backhoe mounted compaction wheel is prohibited within the Pipe Zone.

F. Under no circumstances shall consolidation by water-setting methods (i.e., jetting, diking and flooding, etc.) be permitted.

3.10 CLSM OR CONCRETE USED IN PIPE ZONE OR TRENCH ZONE BACKFILL

A. When site conditions do not allow for the proper compaction of granular bedding or backfill materials, CLSM may be used with the prior approval of the City Engineer.

B. CLSM or concrete shall not be placed in contact with PVC pipe. Wrap the PVC pipe in three layers of non-woven filter fabric followed by polyethylene sheet or tube encasement per Section 15000 prior to placement of CLSM or concrete. Bolts and nuts for fittings shall not be encased in CLSM or concrete.

C. Place sand bags or other materials to contain CLSM or concrete to the minimum extent required for support or encasement.

3.11 TRENCH ZONE BACKFILL

A. Backfill in the Trench Zone may proceed after the Pipe Zone material has been placed, compacted, approved by the Soil Technician and accepted by the City.

B. Compaction using vibratory equipment, tamping rollers, pneumatic tire rollers, or other mechanical tampers shall be performed with the type and size of equipment necessary to accomplish the work without damaging the pipe or structures. The backfill shall be placed in horizontal layers and maximum 8-inch loose lifts. Thinner lifts shall be used if necessary to achieve the required degree of compaction. Each layer shall be uniformly moistened, evenly spread and compacted to the specified relative density. The Contractor shall repair or replace any pipe, fitting or structure damaged by the compaction or installation operations as directed by the City.

3.12 PAVEMENT ZONE BACKFILL AND RESTORATION

A. Refer to GS series Standard Drawings for additional trench backfill and pavement resurfacing details.

B. After the Trench Zone material has been placed, compacted, approved by the Soil Technician, and accepted by the City, backfill in the Pavement Zone may proceed as necessary in accordance with the requirements of the agency having jurisdiction.

C. Replace bituminous and concrete pavement, curbs, and sidewalks removed or damaged during construction in accordance with the requirements of the agency having jurisdiction.

END OF SECTION

SECTION 02262 – ASBESTOS CEMENT PIPE TESTING

PART 1 GENERAL

1.1 DESCRIPTION

A. The work of this Section includes sampling and laboratory testing of asbestos cement pipe (ACP) using laboratory energy dispersive x-ray spectroscopy (EDS).

1.2 COORDINATION

A. Sampling of ACP shall be conducted after the pipeline has been isolated by the Owner and authorization to proceed is provided by the Owner. Cutting and removal of ACP without previous authorization from the Owner is prohibited.

B. Contractor shall coordinate with the testing laboratory to determine the requirements for the delivery of ACP and costs for handling and cutting (in the laboratory) of pipe segments that are longer than 16 inches in length.

1.3 REFERENCED SPECIFICATIONS AND STANDARDS

A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section.

1. Code of California Regulations, Title 8, Section 1529. Asbestos

2. Code of California Regulations, Title 8, Section 341.17. Approval of Asbestos Cement Pipe Training and Asbestos Cement Pipe Course Providers for the Purpose of Employer Exemption from Registration Requirements.

3. 29 CFR 1926.1101 – Asbestos

1.4 RELATED WORK SPECIFIED ELSEWHERE

A. Section 02060 – Asbestos Cement Pipe Removal and Disposal

1.5 QUALIFICATIONS

A. Personnel responsible for cutting and handling the ACP:

4. Trained and experienced in the means and methods of cutting ACP per the requirements of California OSHA Title 8, section 341.17.

5. Have completed the Initial 4-hour training course; as required and described in CCR Title 8, Section 341.17.

6. After completing the Initial 4-hour training course; once every 12 months (minimum) complete the refresher 2-hour training course described in CCR Title 8, Section 341.17.

B. Laboratory responsible for EDS testing:

1. Experienced and qualified in performing EDS testing on ACP for a minimum of three (3) projects in the last three (3) years.

C. Personnel responsible EDS testing

1. Trained and experienced in operating scanning electron microscopy and energy dispersive spectroscopy equipment for a minimum of three (3) years, having worked with the equipment used for this project for a minimum of one (1) year.

1.6 SUBMITTALS

Submit the following within 20 calendar days of the Notice to Proceed:

A. Work experience and ACP training certificates of personnel responsible for cutting and handling of the ACP including:

1. Date and Location of work performed.

2. Name and phone number of contacts with Owner or Owner's representative for whom the work was performed.

3. Name of the individual and training and experience of the "Competent Person" for the duration of work in this Section.

4. When requested; provide the air sampling study/studies which were used to demonstrate that the methods used to maintain, and or remove the ACP will maintain air borne asbestos limits below the OSHA Permissible Exposure Limit (PEL). Exposure studies must be relevant to the specific work/task that will be completed.

B. Safety equipment and measures, including personnel safety gear, temporary enclosures, warning signs, fences, etc. to be used at the site.

C. Packaging materials to be used for safe storage and transportation of ACP samples.

D. Work experience of the laboratory in responsible charge of performing EDS testing:

1. Description of work performed and date.

2. Name and phone number of contacts with Agency, Owner, or Owner's representative for whom the work was performed.

E. Documentation verifying calibration of EDS testing equipment and devices to be used for this project.

F. Work experience of personnel responsible for administering EDS testing on ACP:

1. Date, Laboratory name, and location of work performed.

2. Name and phone number of contacts with Agency, Owner, or Owner's representative for whom the work was performed.

G. EDS scanning electron microscope to be used by laboratory for EDS testing.

H. Laboratory ACP testing work plan.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 SAFTEY MEASURES

A. Perform all work in accordance with the local building codes, Federal Industrial Safety Orders, Asbestos NESHAP requirements, and requirements of Cal/OSHA. Personnel working on or in direct vicinity of cutting and handling ACP must wear protective outerwear, eyewear, and respirators per Cal/OSHA Title 8, Section 5144.

B. Provide safeguards to public and personnel safety including warning signs, fences, lights, and/or other similar items that are necessary for the protection of all personnel during the cutting and handling activities of ACP.

C. Assemble and use temporary enclosures to contain asbestos fibers that may be released and prevent them from release to the atmosphere during cutting. Wet the ACP during cutting to prevent generation of asbestos fibers that may become airborne.

D. The Contractor shall assume full responsibility for personnel and site safety.

3.2 PIPE REMOVAL

A. ACP to be removed shall be removed to the nearest pipe joint. Unnecessary cutting or snapping of pipe shall not be allowed, and the shortest ACP segments removed shall be retained for delivery to the laboratory for cutting and testing. Perform ACP cutting in accordance with Section 02060.

B. No "high speed" cutting tools can be used to cut ACP. Any tools used to cut ACP must not produce amounts of airborne asbestos fibers that exceed the OSHA PEL.

C. "Wet methods" with amended water must be used during any work including cutting or snapping that may produce airborne asbestos fibers that exceed the OSHA PEL.

D. Prior to sampling, clearly and accurately mark the following information on the segment of pipe to be extracted for testing:

1. Crown of the pipe.

2. Owner-approved unique pipe ID (GIS asset ID number) and date.

E. Pipe samples must be 12 inches in length (minimum) and 16 inches (maximum).

F. The Owner’s representative shall be the sole judge of the quality and acceptability of each sample. If a sample is deemed unsuitable for testing, provide an additional sample of ACP at no cost to the Owner.

3.3 PIPE HANDLING

A. Avoid contamination of ACP samples (grease or other foreign matter) during extraction.

B. Carefully handle ACP sample to not damage the pipe. Mishandling of the ACP sample, including damage from transportation and delivery, that results in chipping, scraping, cracking, deforming, or other damage that may void the results of testing will not be acceptable. The Owner's representative shall be the sole judge of mishandling of the ACP sample. If a sample is mishandled, deliver an additional sample of ACP to the laboratory for testing at no additional cost to the Owner.

C. Carefully bag and seal the sample air-tight with approved packaging materials. Clearly label the outside of the packaging with the OSHA required label and with the unique pipe ID and date.

   Individually package and label each sample. Keep packaged samples dry, sealed, and away from direct sunlight and high temperature during transportation. All temporary ACP storage containers will be properly labeled and secured. Temporary ACP storage containers will have a bottom, sides and a top that can be locked.

D. Deliver the bagged and sealed sample to the Owner-approved laboratory for EDS testing. Transport ACP material in accordance with Department of Transportation (DOT) and any local requirements.

3.4 LABORATORY TESTING

A. Contract with an Owner-approved laboratory to perform EDS testing on each ACP sample. Laboratory test results shall be delivered to the Owner within six (6) calendar weeks of pipe cutting.

   1. Wood PLC 9210 Sky Park Ct. San Diego, CA 92123

   2. Applied Materials & Engineering, Inc. 980 41st Street, Oakland, CA 94608

   3. Other owner-approved laboratory

B. Arrange for safe delivery of ACP samples to the Owner-approved laboratory. Coordinate with the laboratory to determine the laboratory's requirements for the maximum pipe length and all costs associated with handling and cutting of ACP samples. All laboratory personnel who may come into contact with ACP will wear personal protective equipment and use processes so that they will not be exposed to airborne asbestos fibers at a level that will be a hazard to their health.

C. Equipment:

   1. EDS equipment shall be equipped with a scanning electron microscope (SEM) capable of producing high resolution SEM images of the cross-section (where analyses are being performed) and shall be able to generate EDS elemental area maps or phase maps.

D. Laboratory Testing and Reporting:

1. Phenolphthalein Stain Testing:

a. Prior to conducting testing, coordinate with the Owner to verify testing requirements, measurement and establish a testing protocol. Confirm that ACP samples are labeled for pipe crown, pipe ID (GIS asset ID number) and date.

b. Neatly cut the ACP sample in the laboratory and apply phenolphthalein to one surface of the pipe cross section.

c. Identify the location on the pipe cross section that exhibits the least amount of phenolphthalein staining. Record this location relative to the pipe crown (i.e., 12 o'clock) as the location where 10 equally spaced EDS measurements will be made on each pipe sample.

d. Measure and record the pipe wall thickness and the dimensions of the most phenolphthalein stain loss at the outer and inner pipe surfaces.

2. EDS Testing:

a. Calibrate EDS equipment by using test peaks of known energy, covering the full analytical span prior to testing.

b. Label 10 equally spaced measurement locations on the pipe cross section in a line perpendicular to the inner and outer wall tangents (i.e., along the line used to measure wall thickness), with Point 1 being closest to the outer pipe surface and Point 10 being closest to the inner pipe surface.

c. Measure and record the percent by weight of each of the following elements at the 10 equally spaced locations: Carbon (C), Oxygen (O), Magnesium (Mg), Aluminum (Al), Silicon (Si), Calcium (Ca), and Iron (Fe).

d. Allow sufficient process time for analysis and ensure a statistically significant number of counts in order to decide if a peak is present or absent. Present a table of maximum number of counts and atomic percentage.

e. Provide the measurements and test data to the Owner in a summary report and in Microsoft Excel file format (.xlsx). See Figure 1 for a sample of the laboratory test data reporting format.

3. Re-bag ACP sample in 6-mil clear plastic. Seal and store ACP samples until confirmation from the Owner that the summary report and test data are received and complete.

4. Submit the summary report and Excel data file to the City Engineer in accordance with the submittal requirements of the General Provisions. Title the

transmittal, report and data file with the City Project Number, Project Name, and Pipe ID Number.

5. After confirmation, the laboratory shall legally dispose of each ACP sample at no additional cost to the Owner.

Figure 1 – Laboratory Test Data Reporting Format

City Pipe ID: _____

Sample ID: _____

Phenolphthalein Stain Test:

Date of Cut: _____

Position: _____ o'clock

Pipe Wall Thickness: _____ (in.)

Outer Surface Stain Loss: _____ (in.)

Inner Surface Stain Loss: _____ (in.)

EDS Testing:

Date of EDS Testing: _____

EDS Test Location		Percent Element (by Weight)						
		C %	O %	Mg %	Al %	Si %	Ca %	Fe %
Outer	1							
	2							
	3							
	4							
	5							
	6							
	7							
	8							
	9							
Inner	10							

END OF SECTION

SECTION 03000 – CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 DESCRIPTION

This section describes materials and methods for concrete construction for thrust and anchor blocks, valve support blocks, appurtenance pads and manhole bases including formwork, reinforcement, mixing, placement, curing, and repair and the use of cementitious materials and related products for mortar and grout.

1.2 REFERENCE STANDARDS

The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

ASTM A185	Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
ASTM A615/A615M	Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM C150	Specification for Portland Cement
ASTM C494	Specification for Chemical Admixtures for Concrete
ASTM C881	Specification for Epoxy-Resin-Base Bonding Systems for Concrete
AWWA M11	Steel Pipe – A Guide for Design and Installation
AWWA M11	Steel Pipe – A Guide for Design and Installation
AWWA M23	PVC Pipe –Design and Installation
AWWA M41	Ductile-Iron Pipe and Fittings
AWWA M55	PE Pipe – Design and Installation
CRSI	Recommended Practice for Placing Reinforcing Bars
SSPWC	Standard Specifications for Public Works Construction "Greenbook"

1.3 RELATED WORK SPECIFIED ELSEWHERE

Standard Specifications 02223, 15000, 15041, 15044, 15056, 15061, 15064, 15074, 15102, 15108, 15112, and 16640.

1.4 APPLICATIONS

The following materials shall be provided and installed in accordance with this specification, related sections and applicable Standard Drawings for the applications noted below:

A. Concrete for thrust and anchor blocks for bends, tees, reducers, fire hydrant bury ells and support blocks for valves 4 inches and larger.

B. Concrete for collars, cradles, curbs, encasements, gutters, manhole bases, protection posts, sidewalks, appurtenance or splash pads, and other miscellaneous cast-in-place items.

C. Mortar for filling and finishing the joints between manhole and vault sections and setting manhole grade rings and cover frames. Mortar for the repair of minor surface defects of no more than ¼-inch in depth or ½-inch in width on non-structural, cast-in-place items such as flatwork, splash pads or manhole rings.

D. Epoxy bonding agent for bonding repair mortar to concrete for repairs to damaged surfaces of precast or cast-in-place concrete manholes and vaults.

E. Repair mortar for repairs to damaged surfaces of precast or cast-in-place concrete manholes and vaults.

F. Non-shrink grout for general purpose repair of voids in concrete, pipe penetrations into vaults and grouting of base plates for equipment or structural members.

G. Epoxy adhesives for grouting of anchor bolts.

H. Protective epoxy coating for reinforcing steel exposed during construction in existing concrete structures.

I. Damp-proofing the exterior surfaces of concrete manholes and vaults located at or below the water table or where evidence of moisture or seepage exists, and as directed by the Engineer.

1.5 DELIVERY, STORAGE, AND HANDLING

Deliver reinforcing steel to the site bundled and tagged with identification. Store on skids to keep bars clean and free of mud and debris. If contaminated, all bars shall be cleaned by wire brushing, sand blasting, or other means prior to being set in forms.

PART 2 MATERIALS

2.1 CONCRETE

A. Portland cement concrete shall conform to the Standard Specifications for Public Works Construction (Greenbook).

B. The concrete class or alternate class and slump shall conform with Greenbook Section 201-1.1.2 unless otherwise noted on the Plans or approved by the City. The minimum compressive strength for reinforced concrete shall be 3,250 psi.

C. The maximum water/cement ratio shall be 0.53 by weight and the maximum slump shall be 4-inches.

D. In certain circumstances, rapid-setting concrete may be required. Accelerating admixtures shall conform to ASTM C494 and may be used in the concrete mix as permitted by the City. Calcium chloride shall not be used in concrete.

2.2 MORTAR

Cement mortar shall consist of a mixture of Portland cement, sand, and water. One part cement and two parts sand shall first be combined, and then thoroughly mixed with the required amount of water.

2.3 CONTROLLED LOW STRENGTH MATERIAL (CLSM)

Controlled low strength material shall conform with Greenbook Section 201-6.

A. When used for the encasement of PVC pipe, the pipe shall be insulated from heat of hydration with a silicon or flexible rubber foam wrap, or the compressive strength shall not exceed 60 psi (lightweight cellular concrete).

B. When used in structure backfill or in foundation bearing areas, CLSM shall contain not less than two sacks (188 pounds) of cement per cubic yard of CLSM.

2.4 REINFORCING STEEL

A. Reinforcing steel shall conform to ASTM A615, Grade 60.

B. Fabricate reinforcing steel in accordance with the current edition of the Manual of Standard Practice, published by the Concrete Reinforcing Steel Institute.

C. Minimum reinforcement for appurtenance pads (air valve assemblies, hydrants, backflow prevention devices, etc.) shall consist of No. 3 bars at 18-inch maximum spacing, on center, each way or welded wire fabric as specified herein.

2.5 WELDED FIRE FABRIC

A. Welded wire fabric shall conform to ASTM A185.

B. Minimum reinforcement for appurtenance pads (air valve assemblies, hydrants, backflow prevention devices, etc.) shall consist of 4” x 4” - W4.0/W4.0 welded wire fabric.

2.6 TIE WIRE

Tie wire shall be 16-gage minimum, black, soft annealed.

2.7 BAR SUPPORTS

Bar supports in beams and slabs exposed to view after removal of forms shall be galvanized or plastic coated. Use concrete supports for reinforcing in concrete placed on grade.

2.8 FORMS

A. Forms shall be accurately constructed of clean lumber. The surface of forms against which concrete is placed shall be smooth and free from irregularities, dents, sags or holes.

B. Metal form systems may be used upon City approval. Include manufacturer's data for materials and installation with the request to use a metal form system.

2.9 EPOXY BONDING AGENT

The epoxy bonding agent shall be an epoxy-resin-based product intended for bonding new mortar to hardened concrete and shall conform to ASTM C881. The bonding agent shall be selected from the Approved Materials List.

2.10 REPAIR MORTAR

Repair mortar shall be a two-component, cement-based product specifically designed for structurally repairing damaged concrete surfaces. The repair mortar shall exhibit the properties of high compressive and bond strengths and low shrinkage. A medium-slump repair mortar shall be used on horizontal surfaces, and a non-sag, low-slump repair mortar shall be used on vertical or overhead surfaces. Repair mortar shall be selected from the Approved Materials List.

2.11 NON-SHRINK GROUT

Non-shrink grout shall be a non-metallic cement-based product intended for filling general construction voids or grouting base plates for equipment or structural members. The non-shrink grout shall have high compressive and bond strengths and zero shrinkage and shall be capable of mixing to a variable viscosity ranging from a dry pack to a fluid consistency as required for the application. The non-shrink grout shall be selected from the Approved Materials List.

2.12 EPOXY ADHESIVE

Epoxy adhesive shall be a high-modulus epoxy-resin-based product intended for structural grouting of anchor bolts and dowels to concrete. The epoxy adhesives shall conform to ASTM C881. A pourable, medium-viscosity epoxy shall be used on horizontal surfaces, and a heavy-bodied, non-sag epoxy gel shall be used on vertical surfaces. The epoxy adhesives shall be selected from the Approved Materials List.

2.13 PROTECTIVE EPOXY COATING

The protective epoxy coating shall be an epoxy-resin-based product exhibiting high bond strength to steel and concrete surfaces and shall conform to ASTM C881. The protective epoxy coating shall be selected from the Approved Materials List.

2.14 DAMP-PROOFING FOR CONCRETE STRUCTURES

Damp-proofing material shall consist of two coats of a single-component, self-priming, cold-applied coal tar or polymer enhanced asphaltic emulsion selected from the Approved Materials List.

PART 3 EXECUTION

3.1 FORMWORK

A. The Contractor shall notify the City a minimum of two working days in advance of intended placement of concrete to enable the City to check the form lines, grades, and other required items before placement of concrete.

B. The form surfaces shall be cleaned and coated with form oil prior to installation. The form surfaces shall leave uniform form marks conforming to the general lines of the structure.

C. The forms shall be braced to provide sufficient strength and rigidity to hold the concrete and to withstand the necessary fluid pressure and consolidation pressures without deflection from the prescribed lines.

D. Unless otherwise indicated on the plans, all exposed concrete edges shall be 3/4-inch chamfered.

3.2 REINFORCEMENT

A. Place reinforcing steel in accordance with the current edition of Recommended Practice for Placing Reinforcing Bars, published by the Concrete Reinforcing Steel Institute.

B. All reinforcing steel shall be of the required sizes and shapes and placed where shown on the drawings or as directed by the City.

C. Do not straighten or re-bend reinforcing steel in a manner that will damage the material. Do not use bars with bends not shown on the drawings. All steel shall be cold bent – do not use heat.

D. All bars shall be free from rust, scale, oil, or any other coating that would reduce or destroy the bond between concrete and steel.

E. Position reinforcing steel in accordance with the Plans and secure by using annealed wire ties or clips at intersections and support by concrete or metal supports, spacers, or metal hangers. Do not place metal clips or supports in contact with the forms. Bend tie wires away from the forms in order to provide the concrete coverage equal to that required of the bars. If required by the Engineer, the Contractor shall install bars additional to those shown on the drawings for the purpose of securing reinforcement in position.

F. Place reinforcement a minimum of 2-inches clear of any metal pipe, fittings, or exposed surfaces.

G. The reinforcement shall be so secured in position that it will not be displaced during the placement of concrete.

H. All reinforcing steel, wire mesh, and tie wire shall be completely encased in concrete.

I. Reinforcing steel shall not be welded unless specifically required by the Plans or otherwise directed by the Engineer.

I. Secure reinforcing dowels in place prior to placing concrete. Do not press dowels into the concrete after the concrete has been placed.

J. Minimum lap for all reinforcement shall be 40 bar diameters unless otherwise specified on the Plans.

K. Place additional reinforcement around pipe penetrations or openings 6-inches diameter or larger. Replace cut bars with a minimum of 1/2 of the number of cut bars at each side of the opening, each face, each way, same size. Lap with the uncut bars a minimum of 40 bar diameters past the opening dimension. Place one same size diagonal bar at the four diagonals of the opening at 45° to the cut bars, each face. Extend each diagonal bar a minimum of 40 bar diameters past the opening dimension.

L. Wire mesh reinforcement is to be rolled flat before being placed in the form. Support and tie wire mesh to prevent movement during concrete placement.

M. Extend welded wire fabric to within 2-inches of the edges of slabs. Lap splices at least 1-1/2 courses of the fabric and a minimum of 6-inches. Tie laps and splices securely at ends and at least every 24-inches with 16-gage black annealed steel wire. Pull the fabric into position as the concrete is placed by means of hooks, and work concrete under the steel to ensure that it is at the proper distance above the bottom of the slab.

3.3 EMBEDDED ITEMS

All embedded items, including bolts, dowels and anchors, shall be held correctly in place in the forms before concrete is placed.

3.4 MORTAR MIXING

The quantity of water to be used in the preparation of mortar shall be only that required to produce a mixture sufficiently workable for the purpose intended. Mortar shall be used as soon as possible after mixing and shall show no visible sign of setting prior to use. Re-mixing of mortar with the addition of water after setting shall not be permitted.

3.5 MIXING AND PLACING CONCRETE

A. All concrete shall be placed in forms before taking its initial set.

B. No concrete shall be placed in water except with permission of the City.

C. As the concrete is placed in forms, or against excavations (i.e., thrust or anchor blocks), it shall be thoroughly consolidated throughout the entire layer by internal vibration and tamping bars.

D. All existing concrete surfaces upon which or against new concrete is to be placed shall be roughened, thoroughly cleaned, wetted, and grouted before the new concrete is deposited.

3.6 CONCRETE FINISHING

A. Immediately upon the removal of forms, voids shall be neatly filled with cement mortar, non-shrink grout, or epoxy bonding agent and repair mortar as required for the application and as directed by the City

B. The surfaces of concrete exposed to view shall be smooth and free from projections or depressions.

C. Exposed surfaces of concrete not poured against forms, such as horizontal or sloping surfaces, shall be screeded to a uniform surface, steel-troweled to densify the surface, and finished to a light broom finish.

3.7 PROTECTION AND CURING OF CONCRETE

The Contractor shall protect all concrete against damage. Exposed surfaces of new concrete shall be protected from the direct sunlight by covering them with plastic film and by keeping them damp for at least 7 days after the concrete has been placed, or by using an approved curing process. Exposed surfaces shall be protected from frost by covering with tarps for at least 5 days after pouring.

3.8 REPAIRS TO DAMAGED CONCRETE SURFACES

Minor surface damage to hardened cast-in-place or precast concrete may be repaired, at the discretion of the City, using the specified materials in accordance with the manufacturer's recommendations and the following procedures:

A. Cast-in-place or precast concrete for manholes and vaults: Remove loose or deteriorated concrete to expose a fractured aggregate surface with an edge cut to a 90-degree angle to the existing surface. Clean all debris from the area, apply a 20-mil coat of epoxy bonding agent to the prepared surface, and place repair mortar while the epoxy is still wet and tacky. On horizontal surfaces, for repair depths greater than 2 inches, add aggregate to the repair mortar as recommended by the manufacturer. On vertical or overhead surfaces, for repair depths greater than 2 inches, apply the repair mortar in successive lifts, scarifying the lifts, allowing them to harden, and applying a scrub coat of the material prior to proceeding with the next lift. Cure the material as for concrete in accordance with this specification.

B. General Purpose: Remove loose and deteriorated concrete by mechanical means, sandblasting, or high-pressure water blasting. Clean all debris from the area and apply non-shrink grout in a 1/4-inch minimum thickness, at the desired consistency, ranging from a dry pack to a fluid-poured into a formed area, according to the application. Cure the material as for concrete in accordance with this specification.

3.9 EPOXY ADHESIVES FOR ANCHOR BOLT INSTALLATION

Anchor bolts set with an epoxy adhesive shall be installed in accordance with the manufacturer's recommendations and the following general procedures: Drill the hole with a rotary percussion drill to produce a rough, unpolished hole surface. Remove debris and dust with a stiff bristle brush and clean using compressed air. Utilizing a medium-viscosity epoxy for horizontal surfaces, and a gel-type non-sag epoxy for vertical surfaces, apply the material to fill the hole to approximately half its depth. Insert the bolt, forcing it down until the required embedment depth and projection length are attained and then twist the bolt to establish a bond. Secure the bolt firmly in place in the permanent position until the epoxy sets.

3.10 PROTECTIVE EPOXY COATING

Following core drilling at existing concrete structures, clean the exposed concrete surface and ends of reinforcing steel and apply two coats of protective epoxy coating for a total dry film thickness of 10-15 mils. Allow the material to cure between coats and prior to continuing the installation through the penetration.

3.11 DAMP-PROOFING FOR THE EXTERIOR OF CONCRETE STRUCTURES

After manhole and vault sections are set and repairs and piping penetrations are completed, apply the specified material to prepared concrete surfaces in accordance with the manufacturer's recommendations. The surfaces to be coated shall be fully cured and free of laitance and contamination. Apply the material to all exterior surfaces in two 15-mil coats, allowing curing between coats, prior to backfill and/or immersion in accordance with the manufacturer's recommendations.

3.12 THRUST AND ANCHOR BLOCKS

The Engineer of Work shall submit calculations for thrust and anchor block sizing and steel reinforcement in accordance with the AWWA Manual of practice pertaining to the pipe material type for approval by the City Engineer. Block dimensions shall be shown on the Plans.

The City shall observe and verify all thrust, anchor and valve support block excavations, sizes and shapes prior to concrete placement. Concrete thrust and anchor blocks shall be poured against wetted, firm, undisturbed soil or engineered fill in accordance with the Standard Drawings and design calculations. The thrust blocks shall be centered on the fitting so that the bearing area transmits the resultant thrust force to the soil uniformly and without eccentricity.

Concrete shall be placed so that fittings and valves will be accessible for repairs or replacement. Do not place concrete in a manner that eliminates maintenance access to the valve operators and valve end connection hardware.

Prior to hydrostatic pressure testing, the concrete for thrust and anchor blocks shall cure for the following number of days:

Thrust Blocks: 3 days minimum, or when 80% of compressive strength is attained.

Anchor Blocks: 7 days minimum, or when 80% of compressive strength is attained

A. The following allowable soil bearing values shall be used as a guideline for sizing thrust blocks unless otherwise approved by the City Engineer:

Soil	Allowable Bearing
Muck, peat, etc.*	0 PSF
Soft Clay	500 PSF
Fine Sand	1,000 PSF
Silty or Clayey Sand or Disintegrated Granite (D.G.)	1,500 PSF
Sandy Gravel	2,000 PSF
Cemented Sandy Gravel	2,500 PSF
Hard Shale**	3,000 PSF
Granite **	4,000 PSF

* In muck or peat soils, competent resistance shall be achieved by removal and replacement with material approved by the Engineer.

** Subject to observation by the geotechnical engineer of record and degree of weathering.

B. Thrust Block Placement:

Thrust blocks shall be used in all unrestrained pipe systems including pipe joints and joints at fittings and valves.

C. Anchor Block Placement:

For all vertical downward bends in pipelines that do not have restrained joints, the upward thrust force shall be resisted by means of an anchor block only with prior approval. The block shall be sized to withstand the thrust exerted for the particular bend angle and the required test pressure. Anchor block sizing shall not rely on the frictional resistance or weight of the soil above the anchor block.

3.13 VALVE SUPPORT BLOCKS

Valve support blocks shall be installed as described below and in accordance with the Standard Drawings and design calculations:

A. Support blocks for valves shall be cast into the sides of the trench a minimum of 12 inches or as shown on the Standard Drawings.

B. Support blocks shall extend upward to the pipe spring line and to a minimum depth of 12 inches below the valve.

C. Support blocks shall be installed so that the valve connections and operators will be accessible for repairs.

END OF SECTION

SECTION 03460 – POLYMER CONCRETE SEWER MANHOLES

PART 1 GENERAL

1.1 DESCRIPTION

A. This section describes the requirements for corrosion-resistant, polymer concrete manholes, also referred to as access holes, for new manholes to be installed in sanitary sewers.

B. The Contractor shall furnish and install all manholes shown on the Plans, complete and in place in accordance with the Contract Documents.

C. This section does not address rehabilitation of existing sewer manholes. Refer to the Greenbook for manhole rehabilitation requirements.

1.2 REFERENCE STANDARDS

The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

A. Commercial Standards:

ACI 350-20	Code Requirements for Environmental Engineering Concrete Structures & Commentary
ACI 440.1R-15	Guide for the Design and Construction of Structural Concrete Reinforced with Fiber-Reinforced Polymer (FRP) Bars
ACI 548.6R-96	Polymer Concrete-Structural Applications State-of-the-Art Report
ASTM A48	Gray Iron Castings
ASTM C443	Standard Specification for Joints for Concrete Pipe and Manholes Using Rubber Gaskets
ASTM C478	Precast Reinforced Concrete Manhole Sections
ASTM C579	Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic, Surfacing, and Polymer Concretes
ASTM C580	Standard Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes
ASTM C857	Standard Practice for Minimum Structural Design Loading for Underground Utility Structures
ASTM C923	Resilient Connectors between Reinforced Concrete Manhole Structures, Pipes, and Laterals

ASTM D648	Test Method for Deflection Temperature of Plastics Under Flexural Load in Edgewise Position
ASTM D2584	Test Method for Ignition Loss of Cured Reinforced Resins
ASTM D6783	Standard Specification for Polymer Concrete Pipe
SSPWC	Chemical Resistance (Pickle Jar) Test

1.3 RELATED WORK SPECIFIED ELSEWHERE

The Contractor shall refer to the following specification section(s) for additional requirements:

A. Trenching, Excavation, Backfilling and Compacting: 02223

B. Polyvinyl Chloride (PVC) Gravity Sewer Pipe: 15063

1.4 SUBMITTALS

A. Submit manufacturer's data and details of following items for approval in accordance with General Provisions.

1. Show dimensions, locations, lifting inserts, reinforcement, and joints

2. Shop drawings of manhole sections, base units and construction details, jointing methods, materials, and dimensions

3. Summary of criteria used in manhole design including, as minimum, material properties, loading criteria, and dimensions assumed. Include certification from manufacturer that polymer concrete manhole design meets or exceeds the load and strength requirements of ASTM C478 and ASTM C857, reinforced in accordance with ACI 440.1R-15. Include current ISO 9001:2018 certification

4. Frames, grates, rings, and covers

5. Materials to be used in fabricating pipe drop connections

6. Materials to be used for pipe connections

7. Materials to be used for stubs and stub plugs, if required

8. Proof of independent Chemical Resistance testing conducted in accordance with the Greenbook

9. Submitted sealed drawings by a California-registered Professional Engineer

1.5 QUALITY ASSURANCE

The City Inspector shall observe preparation of the subgrade and placement of gravel prior to the placement of the manhole base. The Contractor shall install manholes at the

correct elevations and orientations, level the base, ensure water tight joints, and backfill and compact in accordance with the Contract Documents.

1.6 QUALITY CONTROL

A. Facility Quality Control should adhere to ISO 9001:2018 for manufacturing. All fabricators will be ISO 9001:2018 Certified and provide documentation of current certification. Manufacturing will take place in a facility regularly engaged in polymer concrete manufacturing.

B. Manufacturer shall provide project references for approval by the City Engineer for 10 previous projects where the product has been successfully used and completed in the last 5 years.

1.7 DESIGN CRITERIA

A. Polymer concrete manhole risers, cones, flat lids, grade rings and manhole base sections shall be designed by manufacturer to meet the intent of ASTM C478 with allowable compositional and sizing differences as designed by the polymer concrete manufacturer.

B. AASHTO HS-20 or HL-93 design or as required with loading applied to manhole cover and transition and base slabs.

C. Polymer manholes will be designed based upon live and dead load criteria in ASTM C857 and ACI 350-20.

D. Unit soil weight of 120 pounds per cubic foot (pcf) located above portions of manhole, including base slab projections.

E. Internal liquid pressure based on unit weight of 63 pcf.

F. Dead load of manhole sections fully supported by polymer concrete manhole base.

1.8 DESIGN

Polymer concrete manhole risers, cones, flat lids, grade rings and manhole base sections shall be designed to meet loading requirements of ASTM C478, ASTM C857 and ACI 350-20 as modified for polymer concrete manhole design as follows:

A. Mix design shall consist of thermosetting resin, sand, and aggregate. No Portland cement shall be allowed as part of the mix design matrix. All sand and aggregate shall be inert in an acidic environment.

B. Reinforcement – Use acid resistant reinforcement (FRP Bar) in accordance with ACI 440.1R-06 as applicable for polymer concrete design.

C. The wall thickness of polymer concrete structures shall not be less than 95% of the manufacturer’s calculated design thickness.

D. Each polymer concrete manhole component shall be free of all defects, including indentations, cracks, and foreign inclusions that, due to their nature and degree or

extent, detrimentally affect the strength and serviceability of the component part. Cosmetic defect shall not be cause for rejection. The nominal internal diameter of manhole components shall not vary more than 2%.

E. Each manhole shall be marked with the following information: manufacturer's name or trademark, manufacturer's plant location and production date.

F. Manhole joints shall be assembled with a bell/spigot or shiplap butyl mastic and/or gasketed joint so that on assembly, manhole base, riser and top section make a continuous and uniform manhole. Joint sealing surfaces shall be free of dents, gouges and other surface irregularities that would affect joint integrity.

G. Minimum clearance between wall penetrations and joints shall be per manufacturer's design.

H. When flow junctions of different size pipes occur in manholes, set the invert of the smaller main at 3/4 of the depth of the larger main.

I. Construct invert channels to provide smooth flow transition with minimal disruption of flow at pipe-manhole connections. The invert slope through the manhole shall be uniform and indicated on the Plans. Cast the precast base sections monolithically. Construct the bench and channel with all polymer concrete material, monolithically. Construct an extended ballast slab to resist buoyancy with Portland cement concrete as approved by the City Engineer.

J. Provide resilient connectors conforming to requirements of ASTM C923 or other options as available. All connectors are to be water tight. Install approved resilient connectors at each pipe entering and exiting manholes in accordance with manufacturer's instructions.

PART 2 MATERIALS

2.1 MANHOLES

A. Provide polymer concrete manhole sections, monolithic base sections and related components referencing to ASTM C478. ASTM C478 material and manufacturing is allowed compositional and dimensional differences required by a polymer concrete product.

B. Provide the base riser section with a monolithic floor, unless shown otherwise.

C. Provide riser sections joined with bell and spigot or ship-lap design seamed with butyl mastic and/or rubber gaskets (ASTM C990) and wrap the exterior of the joint with a butyl rubber joint wrap so that on assembly, the manhole base, riser and top section comprise a continuous, uniform and leak-free manhole structure.

D. Construct the polymer concrete manhole using polymer concrete riser sections of the diameter indicated on the Plans. Use various lengths of polymer concrete risers to provide the correct height with the fewest joints.

E. Design the wall thickness for the depth, soil, groundwater and live load conditions as approved by the City Engineer.

F. Provide tops to support AASHTO HS-20 or HL-93 or vehicle loading or loads as required and receiving hatches or cast iron frame covers, as indicated on the Plans.

G. Manhole sections shall be cast without ladder rungs.

H. Manufacturers, or equal:

1. Armorock Polymer Concrete, (702) 824-9702, www.armorock.com

2. Olson Precast Company, (619) 843-3847, olsonprecastcompany.com

2.2 GROUT

Material for grouting and patching will be a high build, 100% solids epoxy mortar for specific use in wastewater applications and approved by the manhole manufacturer. Compressive strength shall not be less than 12,000 psi (ASTM D695) and bond strength not less than 1,500 psi (ASTM C882).

2.3 MANHOLE FRAMES AND COVERS

A. Manhole frames shall be 36” in diameter with two concentric covers, made of cast-iron in accordance with ASTM A48 Class 30 and the Standard Drawings. Covers shall incorporate a “pick-hole” for lifting purposes.

1. Locking frames and covers may be required in areas located outside the public right of way, in remote areas or when determined by the City Engineer.

B. Frames and covers shall be designed for H-20 highway wheel loading.

C. Covers shall be cast with the words “CITY OF CARLSBAD” and “SEWER”. No other lettering will be permitted on the top portion of the cover.

D. Casting shall be smooth, clean, and free from blisters, blowholes, and shrinkage. Imported covers and frames shall have country of origin marking in compliance with federal regulations.

E. Covers and frames shall be provided from the same manufacturer to ensure accurate fit.

F. City shall reject and require removal and replacement of all frames and covers not meeting machining tolerances and do not properly seat.

G. All castings shall be dipped twice in a preparation of asphalt or coal tar and oil applied at a temperature of not less than 290 degrees F nor more than 310 degrees F and in such a manner as to form a firm and tenacious coating.

H. Castings Manufacturers, or equal

1. Alhambra Foundry

2. South Bay Foundry

PART 3 EXECUTION

3.1 GENERAL

A. Pre-cast polymer concrete sections shall be transported and handled with care in accordance with the manufacturer's written recommendations. Where lifting devices are provided in pre-cast sections, such lifting devices shall be used as intended. Where no lifting devices are provided, the Contractor shall follow the manufacturer's recommendations for lifting procedures to provide proper support during lifting.

B. The manhole base shall be in place against a minimum of 6-inches of 3/4" crushed rock base situated on undisturbed soil. The inlets and outlets to the manhole shall be located as indicated on the Plans. Invert elevations of connecting sewers may vary depending upon sizes.

C. Each manhole section shall be sealed with butyl rubber sealant rope to make a watertight joint, shall be neatly banded on the inside and outside and shall be set plumb. Rubber gaskets and an EPDM or butyl rubber external joint wrap shall be provided at joints. All manholes shall be vacuum tested in accordance with the procedures specified in this specification section.

D. Grade rings shall be used to bring the top of the manhole frame and cover to the elevation on the Plans but limited to a maximum of 18 inches of grade ring. The precast concrete manhole rings shall be jointed with a minimum thickness of ½ inch of approved mortar along with butyl rubber sealant rope. Mortar shall be as approved by the polymer concrete manufacturer.

E. The finished elevations at which the manhole frames and covers are to be set shall conform to the requirements set forth in the Plans. Where the frame and cover are in existing pavement or in the traveled way of the existing road shoulder, it is to be set flush with the existing surface. When the structure is outside the limits of the traveled shoulder but not in a roadside ditch, set the frame and cover 0.10-foot above the existing ground surface.

F. Where the manhole cover falls in a roadside ditch or easement right-of-way "offsite", it is to be placed approximately 6-inches above the existing ground surface. Manhole frames shall be set at the required grade and shall be securely attached to the top precast manhole shaft unit with a polyester mortar bed and fillet. After the frames are securely set in place, covers shall be installed and all necessary cleaning and scraping of foreign materials from the frames and covers shall be accomplished to ensure a satisfactory fit.

G. Selected clean backfill material shall be used around all manholes and compacted by pneumatic tampers unless otherwise approved by the Engineer.

H. A concrete ring shall be cast around manhole frames to within 3" of finished grade and capped with asphalt concrete, as shown on the Plans. The ring shall be placed after the final grading or paving together with the final cleanup.

3.2 WATER-TIGHTNESS OF MANHOLES

A. All manholes and appurtenances shall be water tight and free from infiltration. All manhole joints shall use butyl rubber sealant material with rubber gaskets and exterior joint wrap to provide a water tight seal and shall comply with the vacuum test requirements specified in this Section. Manholes shall be free of any seeping or surface moisture.

3.3 VACUUM TESTING OF MANHOLES

A. All sewer manholes shall be vacuum tested in accordance with the requirements specified herein.

B. Manholes shall be tested after assembly and prior to mortaring the joints or backfilling.

C. All lift holes shall be plugged with an approved grout prior to testing. All pipes entering the manhole shall be plugged and bracing installed to prevent the plug from being drawn into the manhole. The test head shall be placed inside the top of the cone section and the seal inflated in accordance with the manufacture's recommendations. A vacuum of 10 inches of mercury shall be drawn. The time shall be measured for the vacuum to drop 9 inches. The manhole shall pass the test if the time taken for the drop is greater than 60 seconds. If the manhole fails the test, make necessary repairs and retest until acceptable results are obtained. The leak(s) shall be located and repaired, according to the type of leak, with material-in-kind.

3.4 MANHOLE ABANDONMENT

Sewer manholes shall have the cover and frame, concrete grade rings and cone section removed. Inlet and outlet piping shall be plugged with concrete and the manhole void filled with sand, and a 6" thick, reinforced concrete slab (No. 4 bars at 8" on-center, each way) shall be cast over the top of the remaining manhole. The Contractor shall backfill the hole to ground surface with compacted, select fill.

END OF SECTION

SECTION 09870 – TAPE COATING SYSTEM WITH MORTAR SHIELD FOR THE EXTERIOR OF STEEL WATER PIPELINES

PART 1 GENERAL

1.1 DESCRIPTION

A. Steel pipe shall be coated with polyethylene tape in accordance with AWWA C214. Fittings and specials shall be coated with cold-applied polyethylene tape in accordance with AWWA C209. A reinforced cement mortar shield shall be applied in accordance with AWWA C205. Any modifications to these standards are as stated herein.

1.2 RELATED WORK ELSEWHERE

The Contractor shall refer to the following specification section(s) for additional requirements:

A. Painting and Coating: 09900

B. Petrolatum Wax Tape Coating: 09902

C. Cement Mortar Lined Steel Pipe: 15061

1.3 QUALIFICATIONS OF MANUFACTURERS

A. Manufacturer to demonstrate a minimum of five years' successful application of tape coating system on similar diameter steel water pipelines as specified herein.

1.4 SUBMITTALS

A. List of tape coating materials indicating manufacturer, product numbers, and thickness of materials related to tape system for joints and repairs.

B. Certification of test results for each batch of liquid adhesive and each tape material specified shall conform with AWWA C214.

C. Tape application procedure approved by tape manufacturer.

1.5 COORDINATION WITH TAPE MANUFACTURER

A. The pipe manufacturer shall require the tape material manufacturer to furnish qualified factory technical representative to visit the site for technical support at the beginning of the pipe installation as may be necessary to instruct Contractor on appropriate tape application methods in the field or to resolve problems. This visit shall be coordinated to allow City Inspection and Maintenance Staff to participate in the instruction. The Contractor shall allow time for representative to give field taping instructions to his workforce.

PART 2 MATERIALS

2.1 POLYETHYLENE TAPE COATING

A. Provide polyethylene tape coating in accordance with AWWA C214 with a reinforced cement mortar shield in accordance with AWWA C205 and as specified herein. Plant

and field applied liquid adhesive, polyethylene tape, and plant and field applied repair tape shall be furnished by a single manufacturer. The physical properties of tape materials shall meet or exceed the requirements of AWWA C214 when tested in accordance with the methods described in Section 5.3, “Coating System Tests”.

B. The tape coating systems consist of an exterior polyethylene tape over the bare metal surface of steel pipe with a reinforced cement mortar coating applied over the tape system. Tape coating systems are specified for:

1. Normal plant cold-applied tape

2. Plant cold-applied tape for special sections, connections and fittings, and plant repairs of cold-applied tape

3. Field joint, field coated fittings and repair of field cold-applied tape.

2.2 LIQUID ADHESIVE

A. Liquid adhesive shall consist of a mixture of suitable rubber and synthetic compounds and a solvent in accordance with AWWA C214. The liquid adhesive shall be Polyken #1039 primer or equivalent.

2.3 STORAGE PRIMER

A. Storage primer on the exposed steel at the tape cutbacks shall be Polyken #924 or equivalent.

2.4 PLANT APPLIED TAPE SYSTEM

A. Plant applied tape coating system for pipe shall be polyethylene with a total thickness of not less than 80 mils, Polyken or approved equal:

1. Liquid adhesive: Polyken #1039 primer

2. Anti-corrosion inner layer tape: Polyken #989 (20 mil), black

3. First mechanical outer layer tape: Polyken #955 (30 mil), gray

4. Second mechanical outer layer tape: Polyken #956 (30 mil), white

5. Weld stripping tape: Polyken #933 (25 mil), if required

B. Reinforced cement mortar shield: 3/4” thick

2.5 PLANT APPLIED TAPE SYSTEM FOR SPECIALS AND REPAIRS

A. Plant applied tape coating system for specials and repairs shall be polyethylene with a total thickness of not less than 110 mils, Polyken or approved equal:

1. Liquid adhesive: Polyken #1039 primer.

2. Anti-corrosion inner layer tape: Polyken #932-50 (50 mil), black.

3. Mechanical layer outer tape: Polyken #955 (30 mil), white.

4. Weld stripping tape: Polyken #933 (25 mil), if required.

B. Reinforced cement mortar shield: 3/4" thick.

2.6 FIELD APPLIED TAPE SYSTEM

A. Field applied tape coating system for specials, pipe joints and repairs shall be polyethylene with a total thickness of not less than 100 mils, Polyken or approved equal:

1. Primer: Polyken #1029.

2. Joint filler tape: Polyken #939 (125 mil), black.

3. Mechanical inner layer tape: Polyken #932 (50 mil).

4. Mechanical outer layer tape: Polyken #932-50 (50 mil), continue inner layer with 50% overlap.

B. Reinforced cement mortar shield: 3/4" thick.

PART 3 EXECUTION

3.1 POLYETHYLENE TAPE COATING

A. Apply polyethylene tape coating to pipe in accordance with AWWA C214. Apply polyethylene tape coating to fittings and specials in accordance with AWWA C209. Apply the reinforced cement mortar shield in accordance with AWWA C205. Any modifications to these standards are as stated herein.

B. Certificate of Compliance: Prior to shipment of pipe, furnish a certificate of compliance stating that tape materials and work furnished hereunder will comply or have complied with the requirements of these specifications and AWWA C214 and C209.

3.2 STRAIGHT RUN PIPE APPLICATION

A. For straight run pipe, plant applied conditions, the tape coating shall be a four layer system consisting of: (1) liquid adhesive; (2) corrosion prevention tape (inner layer); (3) mechanical protective tape (first outer layer); (4) mechanical protective tape (second outer layer).

B. Perform the entire coating operation by experienced workers skilled in the application of polyethylene tape systems and cement mortar coating under qualified supervisors. After completion of the tape system, all handling shall be by padded equipment to prevent any damage of the tape system. Testing of tape system shall be performed per 3.5 of this section.

C. All equipment for blasting and application of the tape coating system shall be of such design and condition to comply with all the requirements of AWWA C214 and these

specifications. Immediately repair or replace equipment that, in the opinion of the Engineer, does not produce the required results. Include equipment and a repair procedure for correcting defective tape application for use under this specification in the steel pipe fabrication plan. Make available for review a copy of this portion of the fabrication plan, and any updates, at the location of the coating operation, and a repair procedure for correcting defective tape application.

D. Remove the exterior weld bead along the entire exterior surface of the pipe. The exterior weld bead shall be flush with the exterior surface of the pipe with a tolerance of plus 1/32-inch.

E. Surface preparation shall conform to AWWA C214 and the following.

1. Bare pipe shall be clean of all foreign matter such as mud, mill lacquer, wax, coal tar, asphalt, oil, grease, or any contaminants. Remove welding slag or scale from all welds by wire-brushing, hammering, or other satisfactory means. Remove welding splash globules prior to priming.

2. Prior to blast cleaning, inspect surfaces and, if required, preclean in accordance with the requirements of SSPC SP-1, Solvent Cleaning, to remove oil, grease, and all foreign deposits. Remove visible oil and grease spots by solvent wiping. Use only approved solvents that do not leave any residue. Include in the manufacturer's fabrication plan the cleaning solvent applications procedure and safety precautions.

F. Blast cleaning shall conform to AWWA C214 and the following.

1. Blast the pipe surface using a commercially available shot grit mixture to achieve a prepared surface equal to that which is specified in SSPC SP-6, Commercial Blast Cleaning.

2. For plant mortar lined pipe, perform blast cleaning of said exterior surfaces after the initial curing of the spun mortar lining. Perform the exterior blast cleaning in such a manner as not to endanger the mortar lining in the pipe. Completely remove corrosion and foreign substances from the exterior of the pipe in the cleaning operation and apply liquid adhesive after completion of blast cleaning.

3. Achieve from abrasive blasting an anchor pattern profile a minimum of 1.0 mil, but not exceeding 3.0 mils. Measure the anchor pattern or profile of the blasted surface using comparator tape as specified herein.

4. Inspect the blast cleaned exterior pipe surface for adequate surface preparation prior to application of the liquid adhesive. Surface comparator tapes are to be used by the manufacturer in at least eight random areas along any given 40-foot length of pipe. The results of the surface comparator tapes are to be documented on the quality control sheet for each pipe section.

5. Coat each pipe section with liquid adhesive and tape within the same day of being blast cleaned. Do not allow blasted and/or blasted and primed pipe to sit

overnight. All blasted and primed pipe must be coated by the end of the day. No coating will be permitted on pipe sections showing evidence of rust.

G. Liquid adhesive application shall conform to AWWA C214 and the following.

1. Prior to liquid adhesive application, clean the pipe surface free of foreign matter such as sand, grease, oil, grit, rust particles, and dirt.

2. Apply the liquid adhesive in a uniform thin film at the coverage rate recommended by the manufacturer. Meet the recommendations of the manufacturer for the state of dryness of the liquid adhesive prior to the application of the inner layer of tape.

3. Limit the application of liquid adhesive to that length of pipe which can be taped within the same workday. Pipe coated with liquid adhesive that was not taped within the same workday shall be rejected at the discretion of the Engineer. The liquid adhesive shall be removed and the surface shall be re-primed.

4. Protect liquid adhesive coated pipe sections from moisture, dirt, sand, and other potentially contaminating materials

5. Apply storage primer to the exposed steel pipe at tape cutbacks to prevent oxidation of the cleaned metal surface. Apply minimum of 1.5 mils and maximum of 2.5 mils of storage primer to exposed steel per the manufacturer's recommendations.

H. Inner layer tape application:

1. Apply the inner layer tape directly onto the primed surface using approved mechanical dispensing equipment to assure adequate, consistent tension on the tape as recommended by the tape manufacturer. Use rollers to apply pressure on the tape as it comes in contact with the pipe. Make necessary adjustments to mechanical application equipment to assure a uniform, tight coating. Maintain a tight, smooth, mechanically induced, wrinkle-free coating throughout the application process.

2. The application of tension shall be such that the width of tape will be reduced between 1½ to 2 percent of tape width prior to the pull. Provide a pressure readout gauge and chart recorder, suitable to the Engineer, with the tape let-off machine to document the tape tension during application.

3. Apply inner layer tape at a minimum roll temperature of 70° F. Continuously monitor the temperature of the tape within 12 inches of the point of contact with the pipe surface. Use a chart recorder, suitable to the Engineer, to document the temperature of the tape during application. Sections where the tape application tension and temperature are not maintained within manufacturer's recommendations shall be rejected and the tape removed from the entire pipe section and reapplied.

4. Continuously electronically test the inner tape layer at 6,000 volts immediately following application of the tape by a holiday tester permanently mounted to

the tape application station and equipped with an indicator light and audio buzzer, suitable to the Engineer to alert the workmen of the presence of holidays in the coating system.

5. Spirally wrap the inner layer tape over longitudinally or spirally welded pipe. Provide a 1-inch minimum tape overlap.

6. Splice each new roll by overlapping the new tape over the end of the preceding roll by at least 6 inches. Perform this end lap splice by hand or by a mechanical applicator so that the splice is wrinkle free and maintains the continuity of the inner wrap coating. Maintain the wrapping angle of the new roll parallel to that of the previous roll.

7. Provide tape cutbacks based on the joint type required, cutting the tape edge parallel to the end of the pipe. Perform cutbacks using a cutting device that is guided from the end of the pipe to insure a uniform, straight cutback.

I. Mechanical outer layer tape application.

1. Apply the first mechanical outer layer of tape over the inner layer tape using the same type of mechanical equipment used in the application of the inner layer tape. No overlap splice of the other layer coinciding with the overlap splice of the inner layer will be permitted. Provide a minimum 6-inch separation between overlap of splices. Apply two mechanical outer layers of tape as specified herein. The inner layer tape shall be electrically tested, inspected, and approved prior to the application of the first mechanical outer layer tape and the first mechanical outer layer tape shall also be visually inspected and approved prior to the application of the second mechanical outer layer tape. Ensure that both mechanical outer layer tapes are smooth, tight and wrinkle-free.

2. Apply mechanical outer layer tapes in accordance with the requirements for the inner layer tape, except that the minimum tape roll application temperature shall be 90° F. Monitoring for tension and temperature will be required for the mechanical outer layer tapes. The use of rollers to apply pressure on the tape is not required during application of the mechanical outer layer tapes. Holiday testing of the mechanical outer layer tapes is not required during tape application. Test the complete tape system prior to coating as specified herein.

J. Apply a reinforced cement mortar shield over the outer layer of tape in accordance with AWWA C205. Cement mortar shall be per Section 15061.

K. Storage primer application shall conform to AWWA C214 as modified herein:

1. Prior to storage primer application, clean the pipe surface free from foreign matter such as sand, grease, oil, grit, rust particles and dirt.

2. Apply primer only to a dry pipe surface. Whenever the ambient air temperatures are cold enough to cause gelling of the primer, the use of heaters will not be permitted to return the primer back to a fully liquid state. Use new primer at a minimum of 40° F.

3. Apply storage primer to the exposed steel pipe at tape cutbacks to prevent oxidation of the cleaned metal surface. Apply minimum of 1.5 mils and maximum of 2.5 mils of storage primer to exposed steel per the manufacturer's recommendations. Do not place storage primer on the edge of the steel plate.

3.3 FITTINGS COATED AT THE PLANT

A. Coat fittings that cannot be machine coated in accordance with AWWA C209 using materials as specified herein. Weld bead preparation, surface preparation, blast cleaning and liquid adhesive shall be as specified for straight run pipe. Apply an inner layer tape of Polyken #932-50 with a 1-inch minimum tape overlap on all plant coated fittings. Apply an outer layer of cold-applied polyethylene tape as specified herein with a 55 percent overlap on all plant-coated fittings. Provide a minimum thickness of 110 mils for the total tape coat system for plant-coated fittings.

B. Test all completed tape coated fittings in the presence of the Engineer with an electrical flaw detector prior to the application of the cement mortar coating. Applied voltage shall be in the range of 11,000 to 15,000 volts. Repair any holidays found.

C. Repair cement mortar coating defects in accordance with the approved repair procedures.

D. Apply cement mortar overcoat in accordance with AWWA C205, over the tape-coated fittings after completion of tape coating, testing and inspections.

3.4 FIELD APPLIED TAPE AT SPECIALS AND PIPE JOINTS

A. Field cold applied plastic tape coating shall conform with AWWA C209, as modified herein.

B. Prior to welding any field joints, wrap an 18-inch strip of heat resistance material over the entire coated pipe section to avoid damage to the plant applied coating by the hot weld spatter.

C. Clean the pipe surface free of mud, mill lacquer, wax, tar grease, or any foreign matter. The pipe surface shall be free of any moisture and all foreign matter prior to the application of prime.

D. Pack irregularities in joint with elastomeric joint filler.

E. Apply primer by brush or roller (4 mil wet, 1 mil dry).

F. After primer has dried, apply tape to the joint and overlap a minimum of 3 inches onto adjacent tape wrap. Maintain 55 percent overlap on all field joint tape to produce a minimum thickness of 100 mils.

G. Apply tape with sufficient tension to conform with the surface. The finish wrap shall produce a smooth, wrinkle-free surface.

H. The tape system for pipe joints is described in paragraph 2.6 of this Section.

3.5 INSPECTION OF TAPE COATING

Test the applied tape coating in the presence of the engineer with an electrical holiday detector, as a part of the tape installation process. Repair all holidays and physical damage. If mortar shield is applied at a different location than the tape coating system, a second electrical holiday spark test shall be required after all transportation and handling to the mortar coating location confirming the integrity of the tape undercoating. Upon completion of the mortar coating process, a continuity or spark test will again be performed for the tape system. Repair any holidays and physical damage and spark test, verifying repair.

3.6 MORTAR SHIELD

Apply cement mortar overcoat in accordance with Section 15061 and AWWA C205 over the tape coated pipe immediately upon completion of tape wrapping, testing, and inspections.

3.7 PROTECTING COATED PIPE

A. The Contractor shall protect all coated surfaces from damage prior to and during the pipe installation in accordance with these specifications.

B. In transporting the coated pipe, it shall rest in saddles shaped to the outside diameter of the coated pipe. The saddles shall be in contact with the bottom of the pipe along an arc of at least 60 degrees. Saddles shall be completely lined with adequate padding. No nails or any other fasteners that may damage the coating will be allowed in the installation of the padding of the saddles.

C. While laying tape coated steel pipe, the pipe shall not be rolled or skidded when it is in contact with the ground at any point. Immediately before the coated pipe is lowered into the trench the Contractor shall provide a visual and holiday inspection of the coating on the entire pipe coating system. Coated pipe shall be lowered into the trench using saddled, not choked, belt slings. The use of chains, hooks, or other equipment which might damage the pipe coating will not be permitted. All other pipe handling equipment and methods shall be approved by the Engineer. Pipe stored alongside of the trench shall be supported on padded skids, sand bags, or rock-free sand berms.

END OF SECTION

SECTION 09900 – PAINTING AND COATING

PART 1 GENERAL

1.1 DESCRIPTION

A. This section described the requirements for the preparation of surfaces and subsequent application of protective coatings. The Contractor shall furnish all labor, materials and equipment required for satisfactory completion of all items contained herein. The Contractor shall furnish all necessary safety equipment and protective clothing, as well as be responsible for proper instruction and supervision of their use.

B. This section does not apply to surface preparation or lining and coating of steel water storage reservoirs.

1.2 RELATED WORK DESCRIBED ELSEWHERE

The Contractor shall refer to the following Specification section(s) for additional requirements:

A. General Piping System & Appurtenances: 15000

B. Fusion Bonded Epoxy Lining and Coating: 09961

1.3 REFERENCE STANDARDS

The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

ACI 350-20	Code Requirements for Environmental Engineering Concrete Structures & Commentary
NSF/ANSI 61	Drinking Water System Components – Health Effects

1.4 SUBMITTALS

Contractor shall furnish submittals in accordance with the General Provisions. The following submittals are required:

A. Submit a chart of the manufacturer's available colors for color selection well in advance of painting operation.

B. Submit manufacturer's data sheets showing the following information:

1. Recommended surface preparation.

2. Minimum and maximum recommended dry-film thicknesses per coat for prime, intermediate, and finish coats.

3. Percent solids by volume.

4. Recommended thinners.

5. Statement verifying that the selected prime coat is recommended by the manufacturer for use with the selected intermediate and finish coats.

6. Recommended application and curing requirements including equipment, humidity, and temperature limitations.

7. Certificate of compliance for valve or fitting interior lining materials and holiday testing.

C. Submit certification that coating products conform to applicable local Air Quality Management rules and regulations.

PART 2 MATERIALS

2.1 GENERAL

A. All materials shall be those of current manufacture and shall meet applicable regulations for the application and intended service. All coats of any particular coating system shall be of the same manufacturer and shall be approved by the manufacturer for the intended service.

B. If a product specified herein is no longer manufactured or does not meet current regulations, the Contractor shall provide a substitute, currently manufactured product of at least equal performance which meets applicable regulations, subject to approval and at no additional cost.

C. Standard products of manufacturers other than those specified herein will be accepted when proved equal in composition, durability, usefulness and convenience for the purpose intended. Products listed in the paint systems refer to the following manufacturers and distributors:

Ameron Corrosion Control Division, Brea, CA

I.C. Devoe, Louisville, KY

Engard Coating Corporation, Long Beach, CA

DuPont de Nemours & Company, Los Angeles, CA

Tnemec Company, Inc., Kansas City, MO 64141

D. All surfaces to be coated or painted shall be prepared in accordance with the manufacturer's recommended procedures. Limit the area of surface preparation to that which can be coated or painted in a normal working day. All sharp edges, burrs, and weld spatter shall be removed. All concrete and masonry surfaces shall cure 30 days prior to coating or painting.

E. Surface preparation, prime coatings, and finish coats for the various systems are specified herein. Unless otherwise noted, all intermediate and finish coats shall be of contrasting colors.

F. The coating alternates specified herein serve as a general guide for the type of coating desired.

2.2 VALVES – ABOVE GROUND OR BURIED SERVICE

A. General: Coat the exterior of metal valves for buried service at the place of manufacture per this specification or as approved. For above ground service, apply the specified prime coat at the place of manufacture and apply intermediate and finish coats in the shop or field. Coat handwheels and floor stands the same as the valves.

B. Surface Preparation: SSPC-SP-10 (near white blast cleaning). Remove all protuberances which may produce pinholes in the lining or coating. Round all sharp edges and remove any contaminants which may prevent bonding.

C. Exterior Coating: Coat metal valves located above ground the same as the adjacent piping. If the adjacent piping is not coated, then coat the valves per this Section unless otherwise noted. Finish coat shall match the color of the adjacent piping.

1. Coating (Devoe Alternate): Prime coat shall be Bar-Rust 231 applied at 2 to 3 mils dry-film thickness. Intermediate coat shall be Devran 224V Epoxy applied at 4 to 6 mils dry-film thickness. Finish coat shall be Devthane 379 applied at 2 to 3 mils dry-film thickness. Total dry-film thickness shall be 8 mils minimum.

D. Interior Lining: Coat the interior ferrous surfaces of valves 4-inches and larger, excluding seating areas and bronze and stainless-steel pieces, using one of the following methods:

1. Apply two coats of polyamide epoxy to a dry-film thickness of 12 mils total. Follow the manufacturer's application recommendations including minimum and maximum drying time between the required coats.

2. Apply two coats of Tnemec Series 140 (for potable water) or Series 69 (for non- potable water), or equal, to a dry film thickness of 12 mils total. Follow manufacturer's application recommendations including minimum and maximum drying time between required coats.

3. Apply two coats of Devoe Bar-Rust 233H Epoxy applied to a dry-film thickness of 6 to 8 mils, each. Total dry-film thickness shall be 12 mils minimum.

4. All epoxy lining shall be shop applied by the valve manufacturer and shall meet current Volatile Organic Compound (VOC) content regulations. Epoxy lining for potable water valves shall be listed by NSF/ANSI 61 certified for contact with potable water.

5. Conduct holiday testing of interior linings at the factory in accordance with Part 3 of this Section.

2.3 VALVES, PIPE AND FITTINGS – FUSION BONDED EPOXY

A. Lining and coating of valves, pipe and fittings in vaults or hydraulic structures, or transitioning into vaults or structures, or as specified on the Plans shall be fusion bonded epoxy per Section 09961.

2.4 PIPE AND FITTINGS – WASTEWATER SERVICE

A. Pipe and fittings in wastewater service, fume environments and exposure to corrosive soils (Tnemec): Modified Polyamine Ceramic Epoxy, Perma-Shield PL Series 431.

1. Surface Preparation:

a. Steel: SSPC-SP5/NACE 1 (white metal blast cleaning) or ISO Sa 3 blast cleaning with a minimum angular anchor profile of 3.0 mils (NACE RP0287 or ASTM D4417, Method C).

b. Ductile Iron Pipe (interior): NAPF 500-03-01 solvent cleaning followed by uniform rotary-abrasive blast using angular abrasive to a NAPF 500-03-04: Internal Pipe Surface. Minimum angular anchor profile of 3.0 mils (NACE RP0287 or ASTM D4417, Method C).

c. Ductile Iron Pipe (exterior): NAPF 500-03-01 solvent cleaning followed by uniform rotary-abrasive blast using angular abrasive to a NAPF 500-03-04: External Pipe Surface. Minimum angular anchor profile of 3.0 mils (NACE RP0287 or ASTM D4417, Method C). Prime exterior surfaces with recommended epoxy primer at 3 to 5 mils dry-film thickness.

d. Ductile Iron Fittings: NAPF 500-03-01 solvent cleaning followed by uniformly abrasive blast using angular abrasive to a NAPF 500-03-05: Fitting Blast Clean #1, no staining. Minimum angular anchor profile of 3.0 mils (NACE RP0287 or ASTM D4417, Method C). Remove all protuberances which may produce pinholes in the lining or coating.

2. Lining and Coating:

a. Carbon Steel: 30.0 to 50.0 mils in one or more coats.

b. Ductile Iron: 40 mils (nominal) in one or more coats.

c. Number of coats and thickness requirements will vary with substrate, application method and exposure. Use Tnemec Series 44-721 Thixotropic Additive to increase film build.

d. If more than 7 days have elapsed between coats, the Series 431 coated surface must be mechanically abraded (scarified) before top-coating.

2.5 METAL, INTERIOR AND EXTERIOR, NORMAL EXPOSURE

A. General: Paint steelwork, non-galvanized handrails, exposed pipework, fittings, mechanical equipment, pumps, motors, doors, door frames and window sash with this coating system. This system shall not apply to piping, fittings and equipment in wastewater service, surfaces that are continually wet or severe sunlight exposure.

B. Surface Preparation: All exterior metal surfaces which are to be painted shall be prepared per SSPC SP-6 (commercial blast cleaning) except as otherwise specified,

in locations where sandblasting would damage previously coated surfaces and installed equipment, and in locations where dry sandblasting is prohibited. Where SP-6 commercial sandblasting is not possible, use SP-3 power tool cleaning. Sandblasting shall be done not more than 8 hours ahead of the painting, subject to humidity and weather conditions. If any rusting or discoloration of sandblasted surfaces occurs before painting, it shall be removed by additional sandblasting. Sandblasted surfaces shall not be left overnight before painting.

C. Coating (Tnemec Alternate): Prime coat or spot prime coat as required shall be Tnemec Series 4 Versare primer applied to a dry-film thickness of 2 to 3.5 mils. All metalwork previously given a shop prime coat shall be touched up as required in the field. Two or more finish coats of Tnemec Series 2H Tneme-Gloss enamel shall be applied to a thickness of 1.5 to 3.5 mils. Total dry-film thickness shall be 7 mils minimum.

D. Coating (Devoe Alternate): Prime coat as required with Devprime 1409 alkyd primer at 2 to 2.5 mils dry film thickness. Apply one or more finish coats of Devlac 1437 alkyd gloss enamel to a dry-film thickness of 3 to 4 mils. Total dry-film thickness shall be 6 mils minimum.

2.6 METAL, SUBMERGED OR INTERMITTENTLY SUBMERGED

A. General: All submerged metalwork, gates, equipment, exposed pipework and all other metalwork within areas which will be submerged, except as noted hereinafter, shall be painted with this coating system.

B. Surface Preparation: All metal surfaces shall be field sandblasted according to SSPC-SP-10 (near white blast cleaning).

C. Coating (Tnemec Alternate): Prime coat shall be Tnemec Series 69 Epoxoline II applied to a dry-film thickness of 4 to 6 mils. Two finish coats of Tnemec Series 69 Epoxoline II shall be applied to a dry-film thickness of 4 to 6 mils each coat. Total dry-film thickness shall be 12 mils minimum.

D. Coating (Devoe Alternate): Apply two coats of Bar-Rust 233H Epoxy applied to a dry-film thickness of 6 to 8 mils each coat. Total dry-film thickness of the complete system shall be a minimum of 12 mils.

2.7 METAL, SEVERE EXPOSURE TO MOISTURE OR CHEMICAL FUMES

A. Surface Preparation: All metal surfaces shall be field sandblasted according to SSPC-SP-10 (near white blast cleaning).

B. Coating (Tnemec Alternate): Prime coat shall be Tnemec Series 104 H.S. Epoxy to a dry-film thickness of 6 to 10 mils. One or more finish coats of Tnemec Series 104 H.S. Epoxy topcoat shall be applied. Total dry-film thickness shall be a minimum of 12 mils.

C. Coating (Devoe Alternate): Prime coat shall be Cathacoat 304V zinc-rich ethyl silicate at 2 to 3 mils dry-film thickness. Intermediate coat shall be Devran 224V epoxy applied at 4 to 6 mils dry film thickness. Finish coat shall be Devthane 379

urethane applied at 2 to 3 mils dry film thickness. Total dry film thickness shall be 8 mils minimum.

2.8 METAL, HIGH-TEMPERATURE EXPOSURE

A. General: Engine mufflers, exhaust systems and other metal surfaces subjected to high temperatures shall be coated with this system.

B. Surface Preparation: Surface shall be prepared in accordance with SSPC- SP-10 (near white blast cleaning).

C. Coating (Tnemec Alternate): One coat of Tnemec Series 90-96 Tneme-Zinc to a minimum total dry-film thickness of 2 to 3.5 mils.

D. Coating (Devoe Alternate): One coat of Cathacoat 304V zinc-rich ethyl silicate to a dry-film thickness of 2 to 4 mils.

2.9 METAL, GALVANIZED, ALUMINUM, COPPER, OR BRASS

A. Surface Preparation: Surfaces shall be solvent cleaned in accordance with SSPC-SP-1 (solvent cleaning) and SSPC-SP-2 (hand tool cleaning).

B. Coating: Pre-treatment prime coat shall be Tnemec Series 32-1215 Tneme-Grip or Sinclair 7113 Wash Primer applied at 3 mils dry film thickness. Next, apply recommended coating or paint for the particular surface to be coated.

C. Coating (Devoe Alternate): Prime coat shall be Devoe Bar-Rust 231 primer applied at 3 mils dry film thickness. Apply finish coating for the material and exposure as recommended by the coating manufacturer.

2.10 METAL, BURIED

A. General: The Contractor shall coat all buried metal which includes structural steel and fittings.

B. Surface Preparation: Sandblast to SSPC-SP-6 (commercial blast cleaning)

C. Coating (Tnemec Alternate): Prime none. Finish with two coats of Tnemec Series 46-465 H.B. Tnemecol or equal at 10 to 12 mils dry film thickness, each. Total dry film thickness shall be 20 mils minimum.

D. Coating (Devoe Alternate): Prime with Devtar 221 (5A) Epoxy applied at 8 mil dry film thickness. Two coats of Devtar (5A) Epoxy applied at 8 mils dry film thickness, each. Total dry film thickness shall be 24 mils, minimum.

PART 3 EXECUTION

3.1 GENERAL

A. The Contractor shall arrange with the Owner's Representative so that all surface preparation may be inspected and approved prior to the application of any coatings.

B. The Contractor is hereby notified that the Engineer will inspect the Work prior to the expiration of the warranty period and all defects in workmanship and material shall be repaired by the Contractor, at his own expense.

3.2 WORKMANSHIP

A. It is the intent of the Specifications that finishes shall be provided which meet standards for best grades of painting. Only good, clean brushes and equipment shall be used, and all brushes, buckets, and spraying equipment shall be cleaned immediately at the end of each painting period.

B. The Contractor shall take all necessary precautions to protect all adjacent Work and all surrounding property and improvements from any damage whatsoever as a result of the painting and coating operation. Drop cloths shall be placed where required to protect floors, surfaces and equipment from spatter and dropping, not to receive paint or coatings.

C. Each coat of paint shall be of the consistency as supplied by the manufacturer, or thinned, if necessary, and applied in accordance with manufacturer's instructions. Each coat shall be well brushed, rolled or sprayed to obtain a uniform and evenly applied finish. Work shall be free from "runs", "bridges", "shiners", or other defects. Each coat shall produce a uniform unbroken coating over all bolts, threads, nuts, welds, edges and corners. Paint shall not be applied in extreme heat, in dust or smoke laden air, or in damp or humid weather, unless written permission of the Engineer is obtained.

D. If paint is applied by spray, the air pressure used shall be within the ranges recommended by both the paint and spray equipment manufacturers. Spray painting shall be conducted under controlled conditions and the Contractor shall be fully responsible for any damage occurring from spray painting.

E. Care shall be exercised not to damage adjacent Work during sandblasting operations. Stainless steel need not be sandblasted. Blasted surfaces shall not be left overnight before coating. All dust shall be removed from the surface following sandblasting.

3.3 APPLICATION PROCEDURES

A. Surfaces to be Coated: All surfaces of materials furnished and constructed are to be painted or coated per the Specifications except as indicated below.

B. Surfaces Not to be Coated: The following surfaces shall not be coated unless otherwise noted on the Plans and shall be fully protected when adjacent areas are painted.

Aluminum grating	Machined surfaces
Aluminum surfaces	Metal letters
Bearings	Mortar-coated pipe and fittings
Brass and copper tubing, submerged*	Nameplates on machinery

Buried pipe	Pipe interior*
Couplings	Shafts
Grease fittings	Stainless steel
Hardware	Switch plates
Lighting fixtures	

* unless noted otherwise on the Plans or in the Specifications

C. Protection of Surfaces Not to be Coated: Surfaces not intended to be painted shall be removed, masked, or otherwise protected. Drop cloths shall be provided to prevent paint materials from falling on or marring adjacent surfaces. Working parts of mechanical and electrical equipment shall be protected from damage during surface preparation and painting process. Openings in motors shall be safely masked to prevent paint and other materials from entering the motors. All masking materials shall be completely removed and surfaces cleaned at the completion of painting operations.

D. Weather Conditions:

1. Paint shall not be applied in the rain, wind, snow, mist, and fog or when steel or metal surface temperatures are less than 5°F above the dew point.

2. Paint shall not be applied when the relative humidity is above 80%, the air temperature is above 90°F, or the temperature of metal to be painted is above 125°F.

3. Alkyd, chlorinated rubber, inorganic zinc, silicone aluminum, or silicone acrylic paints shall not be applied if air or surface temperature is below 50°F or expected to be below 50°F within 24 hours.

4. Epoxy, coal tar epoxy, acrylic latex, and polyurethane paints shall not be applied on an exterior or interior surface if air or surface temperature is below 50°F or expected to drop below 50°F within 24 hours.

3.4 SURFACE PREPARATION

A. SSPC Specifications: Wherever the words "solvent cleaning", "hand tool cleaning", "wire brushing", or "blast cleaning" or similar words are used in these Specifications or in paint manufacturer's specifications, they shall be understood to refer to the applicable SSPC (Steel Structures Paint Council) Surface Preparation Specifications, ANSI A159.1 listed below:

SP-1	Solvent Cleaning	SP-6	Commercial Blast Cleaning
SP-2	Hand Tool Cleaning	SP-7	Brush-Off Blast Cleaning
SP-3	Power Tool Cleaning	SP-8	Pickling
SP-5	White Metal Blast Cleaning	SP-10	Near White Blast Cleaning

B. General:

1. Sandblast or prepare only as much surface area as can be coated in one day. All sharp edges, burrs, and weld spatter shall be removed.

2. Oil and grease shall be removed from aluminum and copper surfaces in accordance with SSPC SP-1 using clean cloths and cleaning solvents.

3. Weld spatter and weld slag shall be removed from metal surfaces. Rough welds, beads, peaked corners, and sharp edges including erection lugs shall be ground smoothly in accordance with SSPC SP-2 and SSPC SP-3.

4. Welds shall be neutralized with a chemical solvent that is compatible with the specified coating materials using clean cloths and chemical solvent.

C. Abrasive Blast Cleaning:

1. Evaluation of blast cleaned surface preparation work will be based upon comparison of the blasted surfaces with the standard samples available from the NACE, using NACE standards TM 01 70 and TM 01 75.

2. Dry abrasive blast cleaning shall be used for metal surfaces. Do not recycle or reuse contaminated blast particles.

3. Dry clean surfaces to be coated by dusting, sweeping, and vacuuming to remove residue from blasting. Apply the specified primer or touch-up coating within the period of an 8-hour working day. Do not apply coating over damp or moist surfaces. Reclean prior to application of primer or touch-up coating any blast cleaned surface not coated within said 8-hour period.

4. Prevent damage to adjacent coatings during blast cleaning. Schedule blast cleaning and coating such that dust, dirt, blast particles, old coatings, rust, mill scale, etc., will not damage or fall upon wet or newly coated surfaces.

3.5 PROCEDURES FOR THE APPLICATION OF COATINGS

A. The recommendations of the coating manufacturer shall be followed, including the selection of spray equipment, brushes, rollers, cleaners, thinners, mixing, drying time, temperature and humidity of application, and safety precautions.

B. Coating materials shall be kept at a uniform consistency during application. Each coating shall be applied evenly, free of brush marks, sags, runs, and other evidence of poor workmanship. A different shade or tint shall be used on succeeding coating applications to indicate coverage where possible. Finished surfaces shall be free from defects or blemishes.

C. Only thinners recommended by the coating manufacturer shall be used. If thinning is allowed, do not exceed the maximum allowable amount of thinner per gallon of coating material.

D. Apply a brush coat of primer on welds, sharp edges, nuts, bolts, and irregular surfaces prior to the application of the primer and finish coat. The brush coat shall be done prior to and in conjunction with the spray coat application. Apply the spray coat over the brush coat.

E. Apply primer immediately after blast cleaning and before any surface rusting occurs, or any dust, dirt, or any foreign matter has accumulated. Reclean surfaces by blast cleaning that have surface colored or become moist prior to coating application.

F. Paint Mixing: Multiple-component coatings shall be prepared using all the contents of each component container as packaged by the paint manufacturer. Partial batches shall not be used. Multiple-component coatings that have been mixed beyond their pot life shall not be used. Small quantity kits for touch-up painting and for painting other small areas shall be provided. Only the components specified and furnished by the paint manufacturer shall be mixed. For reasons of color or otherwise, additional components shall not be intermixed, even within the same generic type of coating.

G. Field Touch Up of Shop-Applied Prime Coats: Organic Zinc Primer: Surfaces that are shop primed with inorganic zinc primers shall receive a field touch up of organic zinc primer to cover all scratches or abraded areas. Organic zinc coating system shall have a minimum solids volume of 54% and a minimum zinc content of 14 pounds per gallon. Coating shall be of the converted epoxy, epoxy phenolic, or urethane type and shall be manufactured by the prime coat and finish coat manufacturer.

H. Other Primers: Surfaces that are shop primed with other than organic zinc primer shall receive a field touch up of the same primer used in the original prime coat.

3.6 TESTING AND REPAIR

A. Special Instructions to the Contractor: The Contractor shall furnish the necessary dry-film thickness gauges and holiday (pinhole) detection equipment. The Contractor shall perform the holiday inspection in the presence of the City Engineer. The Contractor shall monitor wet film measurements throughout the application of each coat of coating.

B. Film Thickness Testing - Ferrous Metals. Dry film coating thickness shall be measured in accordance with the SSPC "Paint Application Specification No. 2" using a magnetic-type dry film thickness gauge such as Mikrotest model FM, Elcometer model 111/1EZ, or equal. Each coat shall be tested for the correct thickness. No measurements shall be made until at least 8 hours after application of the coating.

C. Film Thickness Testing - Non-magnetic Surfaces. Check for coating thickness by micrometer measurement of cut and removed coupons. Contractor shall repair coating at all locations where coupons are removed.

D. Holiday Testing: Holiday test all coated ferrous surfaces, other surfaces which will be submerged in water or other liquids, or surfaces which are enclosed in a vapor space in such structures and surfaces coated with any of the submerged and severe service coating systems. Areas which contain holidays shall be marked and repaired

or recoated in accordance with the coating manufacturer's printed instructions and then retested. Electrical inspection for linings and coatings shall be in accordance with applicable NACE standards RPO 188 and/or RPS 274.

1. Coatings with Thickness Exceeding 20 Mils: Use a pulse-type holiday detector such as Tinker & Rasor Model AP-W, D.E. Stearns Co. Model 14/20, or equal. The unit shall be adjusted to operate at the voltage required to cause a spark jump across an air gap equal to twice the specified coating thickness, the voltage approved by the coating system manufacturer, or 100 volts/mil, whichever is less.

2. Coatings with Thickness of 20 Mils or Less: Use a Tinker & Rasor Model M1 nondestructive type holiday detector, K-D Bird Dog, or equal. The unit shall operate between 67.5 and 75 V. For thicknesses between 10 and 20 mils, a nonsudsing type wetting agent, such as Kodak Photo-Flo, or equal, shall be added to the water before wetting the detector sponge.

E. Repair: If the item has an improper finish, color, insufficient film thickness, or holidays, the surface shall be cleaned and top-coated with the specified paint material to obtain the specified color and coverage. Visible areas of chipped, peeled, or abraded paint shall be hand or power-sanded, feathering the edges. The areas shall then be primed and finish coated in accordance with the Specifications. Work shall be free of runs, bridges, shiners, laps, or other imperfections.

3.7 CLEANUP

Upon completion of all painting and coating Work, the Contractor shall remove all surplus materials and rubbish. The Contractor shall repair all damage and shall leave the premises in a clean and orderly condition.

END OF SECTION

SECTION 09902 – PETROLATUM WAX TAPE COATING

PART 1 GENERAL

1.1 SCOPE

This section covers the work necessary to furnish and install petrolatum wax tape coating on buried ferrous materials including pipe flanges, bolted fittings and couplings, valves and other buried pipeline appurtenances, complete, as shown or specified.

1.2 SUBMITTALS

Submit manufacturer's technical product data, details, installation instructions and general product recommendations.

1.3 PRODUCT IDENTIFICATION

The use of a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired only. Products of other manufacturers will be considered in accordance with the Contract Documents.

PART 2 MATERIALS

2.1 GENERAL

Wrap all exposed surfaces of buried ferrous pipe, flanges, couplings and other pipeline appurtenances (including bolts, nuts, etc.) with petrolatum wax tape, unless another corrosion protection system (other than a factory-installed paint coating) is otherwise specified or indicated by the Contract Drawings. Exposed piping shall be wrapped only where specifically called out on the Drawings. Ductile iron pipe encased with polyethylene sheathing shall not be wrapped with this product.

2.2 PRIMER

Exposed surfaces shall be prime coated with a blend of petrolatum, plasticizer, and corrosion inhibitor having a paste-like consistency. The material shall have the following properties:

Application Temperature:	40 - 100° F
Flash Point:	350° F minimum
Dielectric Strength:	>100 volts/mil
Approximate Coverage:	1 gal/100 square feet
Color:	Brown

The primer shall be Trenton Wax-Tape Primer or equivalent.

2.3 WAX TAPE

Two types of petrolatum wax tape shall be available from the manufacturer: one type for buried installations and another type for above-ground installations.

Buried Installations: The covering material shall be a plastic-fiber felt tape, saturated with a blend of petrolatum, plasticizers, and corrosion inhibitors that is easily formable over irregular surfaces. The tape shall have the following properties:

Color:	Brown
Saturant Pour Point	115° - 125°F
Thickness	70-90 mils
Dielectric Strength	170 volts/mil
Tape Width	6 inches

Wax tape shall be Wax-Tape #1 as manufactured by The Trenton Corporation (Ann Arbor, Michigan), or approved equal.

2.4 OUTER COVERING

The primed and wax-tape wrapped surface shall be wrapped with a plastic tape covering consisting of three (3) layers of 50 gauge, clear, polyvinylidene chloride, high cling membranes wound together as a single sheet. The material shall have the following properties:

Width	6 inches
Thickness	1.5 mils
Dielectric Strength	2000 volts/mil
Water Absorption	Negligible
Color	Clear

The outer covering shall be Trenton Poly-Ply or approved equal.

2.5 OTHER PETROLATUM WAX TAPE SYSTEM COMPONENTS

Any components not listed above but required for a complete petrolatum wax tape coating system as recommended for this application by the manufacturer shall be provided at no additional cost to Owner.

PART 3 EXECUTION

3.1 GENERAL

The petrolatum wax tape system shall be installed in conformance with the manufacturer’s recommendations.

END OF SECTION

SECTION 09961 – FUSION BONDED EPOXY LINING AND COATING

PART 1 GENERAL

1.1 DESCRIPTION

A. This section includes materials, application and testing of one part, fusion bonded, heat cured, thermosetting, 100% solids epoxy for linings and coatings on steel and ductile-iron pipe and fittings, equipment, valves, couplings, slide gates and structural steel.

B. This section applies to piping and appurtenances located in vaults, structures or where specified on the Plans or elsewhere in these Specifications.

1.2 RELATED WORK DESCRIBED ELSEWHERE

The Contractor shall refer to the following Specification section(s) for additional requirements:

A. General Piping System & Appurtenances: 15000

B. Ductile-iron Pipe and Fittings: 15056

1.3 REFERENCE STANDARDS

The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

AWWA C213	Fusion-bonded Epoxy Coatings for the Interior and Exterior of Steel Water Pipe
ASTM D1002	Standard Test Method for Apparent Shear Strength of Single-Lap-Joint Adhesively Bonded Metal Specimens by Tension Loading (Metal-to-Metal)
ASTM D1044	Standard Test Method for Resistance of Transparent Plastics to Surface Abrasion by the Taber Abraser
ASTM D2370	Standard Test Method for Tensile Properties of Organic Coatings
ASTM D2583	Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor
ASTM G17	Standard Test Method for Penetration Resistance of Pipeline Coatings (Blunt Rod)
NSF/ANSI 61	Drinking Water System Components – Health Effects
SSPC SP-5	White Metal Blast Cleaning
SSPC SP-10	Near White Blast Cleaning

1.4 SUBMITTALS:

Contractor shall furnish submittals in accordance with the General Provisions. The following submittals are required:

A. Manufacturer's catalog literature and product data sheets describing the physical and chemical properties of the epoxy coating.

B. Application and curing procedures.

C. Manufacturer's available colors for color selection in advance of coating operations.

D. Certificate of compliance with the materials, application and testing requirements of this Section.

PART 2 MATERIALS

2.6 PIPING AND EQUIPMENT SURFACES

The Contractor shall require the equipment suppliers to provide equipment that is free of salts, oil, and grease to the coating applicator.

2.7 SHOP-APPLIED EPOXY LINING AND COATING

A. Lining and coating shall be 100% solids, thermosetting, fusion-bonded, dry powder epoxy resin.

B. Epoxy lining and coating shall meet or exceed the following requirements:

Property	Test Value
Hardness (minimum):	Barcol 17 (ASTM D2583) Rockwell 50 ("M" scale)
Abrasion resistance (maximum value):	1,000 cycles: 0.05 gram removed 5,000 cycles: 0.115 gram removed ASTM D1044, Tabor CS 17 wheel, 1,000-gram weight
Adhesion (minimum):	3,000 psi (Elcometer)
Tensile strength:	7,300 psi (ASTM D2370)
Penetration:	0 mil (ASTM G17)
Adhesion overlap shear, 1/8-inch steel panel, 0.010 glue line:	4,300 psi, ASTM D1002
Impact (minimum value):	100 inch-pounds (Gardner 5/8-inch diameter tup)

C. Approved manufacturers and products: Scotchkote 134 or 206N, Lilly Powder Coatings "Pipeclad 1500 Red," H. B. Fuller 1F-3003, or equal.

2.8 FIELD-APPLIED EPOXY COATING FOR REPAIRS

Use a two-component, 80% solids liquid resin, such as Scotchkote 306.

2.9 COATINGS FOR GROOVED-END AND FLEXIBLE PIPE COUPLINGS

Line and coat couplings the same as the pipe. Color shall match the color of the pipe coating.

PART 3 EXECUTION

3.1 SHOP-APPLIED LINING AND COATING

A. Grind surface irregularities, welds, and weld spatter smooth before applying the epoxy. The allowable grind area shall not exceed 0.25 square foot per location, and the maximum total grind area shall not exceed 1 square foot per item or piece of equipment. Do not use any item, pipe, or piece of equipment in which these requirements cannot be met.

B. Remove surface imperfections, such as slivers, scales, burrs, weld spatter, and gouges. Grind outside sharp corners, such as the outside edges of flanges, to a minimum radius of 1/4-inch.

C. Uniformly preheat the pipe, item, or piece of equipment prior to blast cleaning to remove moisture from the surface. The preheat shall be sufficient to ensure that the surface temperature is at least 5°F above the dew point temperature during blast cleaning and inspection.

D. Sandblast surfaces per SSPC SP-5. Protect beveled pipe ends from the abrasive blast cleaning.

E. Apply a phosphoric acid wash to the pipe, item, or piece of equipment after sandblasting. The average temperature, measured in three different locations, shall be 80°F to 130°F during the acid wash procedure. The acid wash shall be a 5% by weight phosphoric acid solution. The duration in which the acid is in contact with the surface shall be determined by using the average temperature as tabulated below:

Pipe Temperature (°F)	Contact Time (seconds)
80	52
85	45
90	36
95	33
100	28
105	24
110	21
130	10

F. After the acid wash has been completed, remove the acid with demineralized water having a maximum conductivity of 5 micromhos/cm at a minimum nozzle pressure of 2,500 psi.

G. Apply lining and coating by the electrostatic spray or fluidized bed process. Minimum thickness of lining or coating shall be 15 mils. Heat and cure per the epoxy manufacturer's recommendations. The heat source shall not leave a residue or contaminant on the metal surface. Do not allow oxidation of surfaces to occur prior to coating. Do not permit surfaces to flash rust before coating.

3.2 ADDITIONAL REQUIREMENTS FOR PIPE

A. Apply lining and coating per AWWA C213 except as modified in this Section.

B. Grind 0.020 inch (minimum) off the weld caps on the pipe weld seams before beginning the surface preparation and heating of the pipe.

3.3 QUALITY OF LINING AND COATING

A. The cured lining or coating shall be smooth and glossy with no graininess or roughness. The lining or coating shall have no blisters, cracks, bubbles, under-film voids, mechanical damage, discontinuities or holidays.

3.4 FACTORY TESTING OF COATING

A. Test linings and coatings with a low-voltage wet sponge holiday detector. Test pipe linings and coatings per AWWA C213, Section 5.3.3. If the number of holidays or pinholes is fewer than one per 20 square feet of coating surface, repair the holidays and pinholes by applying the coating manufacturer's recommended patching compound to each holiday or pinhole and retest. If the number of pinholes and holidays exceeds one per 20 square feet of coating surface, remove the entire lining or coating and recoat the item or pipe.

B. Measure the coating thickness at three locations on each item or piece of equipment or pipe section using a coating thickness gauge calibrated at least once per eight-hour shift. Record each measured thickness value. Where individual measured thickness values are less than the specified minimum thickness, measure the coating thickness at three additional points around the defective area. The average of these measurements shall exceed the specified minimum thickness value, and no individual thickness value shall be more than 2 mils below or 3 mils above the specified minimum value. If a section of the pipe, item, or piece of equipment does not meet these criteria, remove the entire lining or coating and recoat the entire item or piece of equipment.

C. For pipe lining and coating, check for coating defects on the weld seam centerlines. There shall be no porous blisters, craters, or pimples lying along the peak of the weld crown.

3.5 FIELD REPAIRS

A. For damaged areas smaller than 20 square inches, patch fusion bonded epoxy coated items with a two-component, 80% solids (minimum), liquid epoxy resin. Wire brush or sandblast the damaged areas per SSPC SP-10. Lightly abrade or sandblast the coating or lining on the sides of the damaged area before applying the liquid epoxy coating. Overlap the parent or base coating a minimum of 1/2-inch. Apply the liquid epoxy coating to a minimum dry-film thickness of 15 mils.

B. If a defective area exceeds 20 square inches, remove the entire lining and coating and recoat the entire item or piece of equipment.

END OF SECTION

SECTION 15000 – GENERAL PIPING SYSTEM AND APPURTENANCES

PART 1 GENERAL

1.1 DESCRIPTION

A. This Section describes the requirements and installation procedures for piping systems and appurtenances that apply to complimentary Specification Sections. The items are listed in this Section to avoid repetition in Sections elsewhere.

B. This Section includes, but is not limited to: temporary above ground piping (high line), wet taps, pipe couplings, joint restraint systems, bolts, nuts, gaskets, polyethylene wrap, warning/identification tape, tracer wire, valve boxes, valve extension stems, meter boxes and abandonment and removal of existing facilities.

1.2 REFERENCE STANDARDS

The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

A. American National Standards Institute (ANSI)

B. American Society for Testing and Materials (ASTM)

C. NSF/ANSI 61 – Drinking Water System Components – Health Effects

1.3 RELATED WORK SPECIFIED ELSEWHERE

CMWD Standard Drawings

Standard Specifications: 09900, 09961, 09902, 15043, 15044, 15056, 15064, 15065, 15068

Approved Material List (AML).

1.4 SUBMITTALS

Submit the following in accordance with the requirements of the General Provisions:

A. Shop Drawings including a listing of materials of construction, with ASTM reference and grade, for interior lining and coating systems.

B. Utility Shutdown/Connection Request form providing notification and a Work Plan for all wet taps or connections to existing pipelines.

C. Work Plans for high line installations and for abandonment of existing pipelines including access locations for plugging and/or filling.

1.5 INTERIOR LININGS

A. Products and materials in contact with potable water shall have NSF/ANSI 61 certification.

B. Volatile organic compounds present in the linings of items in contact with potable water shall not exceed concentrations allowed by the latest requirements of the State Division of Drinking Water.

C. Pipe, valves, fittings and appurtenances constructed of steel or cast or ductile iron shall be lined and coated in accordance with Section 09900 or Section 09961 as specified on the Plans or in these Specifications.

1.6 TEMPORARY ABOVEGROUND PIPE (HIGH LINE)

High line piping, where shown on the Plans or required by the City Engineer, shall be furnished, installed, disinfected, connected, maintained, and removed by the Contractor. Bacteriological sampling and testing shall be performed by a State of California Certified testing laboratory. The Contractor shall submit drawings of the layout, materials, sizing, flow calculations, schedule and duration of use, and disinfection procedures for all high line piping. The submittal shall be reviewed and approved prior to ordering or delivery of any materials.

1.7 PIPE TAPPING (WET TAP)

All pipe tap (wet tap) connections to existing pipelines, whether for mainline extensions or service laterals, shall be performed by the Contractor under the inspection of the City. The Contractor shall provide materials and labor to excavate, place thrust blocks, backfill, compact, and repair surface improvements as indicated in this Section.

1.8 JOINT RESTRAINT SYSTEM

Joint restraint systems may be used for PVC or ductile-iron pipe only and with prior approval of the Engineer. Joint restraint systems shall be used in the place of, or in conjunction with, concrete thrust blocks as directed. Restrained joint fittings shall be wax tape coated and polyethylene encased. Contractor shall submit shop drawings and catalog data for joint restraint systems.

Splined gaskets, also known as joint restraint gaskets, may be used for PVC carrier pipe within casings; however, other types of joint restraint shall be used outside of the casing. Restraint gaskets may be used for PVC casing pipe.

1.9 POLYETHYLENE ENCASEMENT

Polyethylene encasement shall be used for all buried service metallic piping, tubing and fittings that are not protected with anodes.

A. Polyethylene wrap in conjunction with a wax tape coating shall be used for the protection of buried valves or fittings which cannot be encased using sleeves.

B. Polyethylene sleeves shall be used for the protection of buried ductile iron pipe and fittings or copper tubing. Where the use of a sleeve is not practical for fittings, the fittings shall be wrapped. Additionally, all bolted connections shall be coated with wax tape in accordance with Section 09902.

C. Polyethylene sleeves may be installed on buried PVC pipe for recycled water identification.

1.10 WARNING/IDENTIFICATION TAPE

Warning/identification tape shall be used to identify the locations of underground utilities and to provide warning against accidental excavation of buried utilities. Warning/identification tape shall be used on all underground water and recycled water mains, potable and recycled water irrigation systems, sewer mains, and all related appurtenances. Warning/identification tape shall also be used on cathodic protection wiring systems and tracer wire brought into and out of access ports.

1.11 TRACER WIRE

Tracer wire shall be used in all buried, non-metallic pipeline installations including transmission and distribution mains and appurtenance piping.

1.12 VALVE BOX ASSEMBLIES

Valve box assemblies shall consist of a PVC valve well and cast or ductile iron frame and lid assembly and shall be used for buried valves 4" and larger, unless otherwise indicated on the Standard Drawings.

1.13 VALVE STEM EXTENSION

Valve Stem Extensions shall be installed when the valve operating nut is more than 5' below grade. Extensions shall be of sufficient length to position the top operating nut between 12" and 18" below the valve box lid.

1.14 METER BOXES

A. Meter boxes shall be used for all water meters and appurtenances.

B. Meter boxes shall be sized for the specific meter or appurtenance size as indicated on the Standard Drawings.

1.15 RECYCLED WATER IDENTIFICATION

Facilities installed for the use of recycled water shall be identified with purple color coating, identification labels, or signs.

1.16 CURB IDENTIFICATION MARK FOR SERVICES

The Contractor shall mark the location of all potable water, recycled water and sewer laterals at the curb crossing by stamping the face of the curb in 2" high letters as described below:

A. Potable water laterals shall be stamped with a letter "W".

B. Recycled water laterals shall be stamped with a letter "RW".

C. Sewer laterals be stamped with a letter "S".

PART 2 MATERIALS

2.1 TEMPORARY ABOVEGROUND PIPE (HIGH LINE)

High line piping layout, materials and appurtenances shall be as indicated on the approved submittal.

2.2 FLEXIBLE PIPE COUPLINGS

Flexible pipe couplings shall conform with the Approved Materials List and as described below:

A. Steel Couplings shall have middle rings made of steel conforming to ASTM A36/A36M, A53 (Type E or S), or A512 having a minimum yield strength of 207 MPa (30,000 psi). Follower rings shall be ductile iron per ASTM A536, or steel per ASTM A108, Grade 1018 or ASTM A510, Grade 1018. Minimum middle ring length shall be 7" for pipe sized 6" through 24".

B. Sleeve bolts shall be made of stainless steel per ASTM A193 and shall have a minimum yield strength of 276 MPa (40,000 psi), an ultimate yield strength of 414 MPa (60,000 psi) and shall conform to AWWA C111.

2.3 GROOVED END OR SHOULDERED COUPLINGS FOR DUCTILE IRON OR STEEL PIPE

Groove end or shouldered couplings shall conform with the Approved Materials List and as described below:

A. Use square-cut shouldered or grooved ends per AWWA C606. Grooved-end couplings shall be malleable iron per ASTM A47, or ductile iron per ASTM A536. Gaskets shall be per ASTM D2000.

B. Bolts in exposed service shall conform to stainless steel, ASTM F593 or ASTM F594, Group 2.

2.4 JOINT RESTRAINT SYSTEM

Joint restraint systems shall be ductile-iron and shall consist of a split-ring restraint with machined (not cast) serrations on the inside diameter, a back-up ring, and connecting bolts, and shall be selected from the Approved Materials List.

Splined gaskets, also known as joint restraint gaskets, may be used for casing pipe shall be a rubber-ring type with stainless steel locking segments vulcanized into the gasket.

2.5 BOLTS AND NUTS

A. Flange assembly bolts shall be ANSI B18.2.1 heavy hexagon head bolts with ANSI B18.2.2 heavy hexagon nuts. Threads shall be ANSI Bl.1, standard coarse thread series; bolts shall be Class 2A and nuts shall be Class 2B.

B. Bolt length shall conform to ANSI B16.5. Bolt threads shall project through the nut between 1/8-inch and 1/2-inch when drawn tight.

C. Provide a washer under each nut and under each bolt head. Use washers of the same materials as the nuts.

D. All bolts shall be coated with no-oxide grease during installation. Lubricant shall be Husky Lube-O-Seal by Husk-ITT Corporation or equal.

E. Whenever stainless steel bolts and nuts are specified on the Plans or elsewhere in the Specifications, provide Type 316 stainless steel bolts conforming to ASTM A193 Grade B8M and ASTM A194 Grade 8M heavy hex nuts.

F. Buried Service, Above Ground or Vaults:

1. Bolts and nuts shall be cadmium or zinc plated, low-carbon steel and shall conform to ASTM A307, Grade B.

2. All buried flanges, couplings and adapters, including bolts, nuts and washers, shall be wax tape coated and polyethylene encased per Section 09902.

G. Submerged and Wastewater Service:

1. Bolts for submerged or wastewater service shall be Type 316 stainless steel.

2. Nuts for above-ground installations shall be Type 316 stainless steel.

3. Nuts for submerged service shall be made of copper-silicon alloy bronze conforming to ASTM B98, alloy C65100, designation H04 or alloy C65500, designation H04.

2.6 GASKETS

A. Gaskets for flat-faced flanges shall be 1/8" thick acrylic or aramid fibers bound with nitrile. Gaskets shall be full-face type with pre-punched holes.

B. Gaskets for equipment with raised face flanges shall be compressed fiber ring gaskets that match the raised face and shall be 1/8-inch thick.

C. Furnish gaskets with torque specifications from the gasket manufacturer.

D. If organic solvents or petroleum products are encountered during the course of the work, provide fuel resistant gasket materials and exterior joint treatment as required by the City Engineer.

2.7 TRACER WIRE FOR NON-METALLIC PIPE

A. Tracer wire for direct burial installations shall conform to the following:

1. Conductor: Minimum 10 AWG, copper clad steel or solid copper

2. Break load: Minimum 600-lb

3. Insulation: High Molecular Weight Polyethylene (HMWPE), minimum 30-mil. Color per the APWA uniform color code and type of service.

4. Splices and connectors: For repairs only, moisture displacement and corrosion proof, direct bury splice kits, UL rated for 600 volts. Splices are not allowed for new installations.

B. Tracer wire for high tensile load installations such as directional drilling or sliplining shall conform to the following additional requirements:

1. Conductor: Minimum 8 AWG, copper clad steel

2. Break load: Minimum 2,500-lb

3. Insulation: High Molecular Weight Polyethylene (HMWPE), minimum 45-mil.

2.8 POLYETHYLENE ENCASEMENT

Polyethylene encasement shall conform with AWWA C105 and shall be selected from the Approved Materials List. Polyethylene materials shall be kept out of direct sunlight exposure.

A. Polyethylene sleeves shall be a minimum 0.012" thick.

B. Polyethylene wrap shall be a minimum 0.008" thick.

C. Polyethylene wrap and sleeves shall be clear for use with potable water and purple for use with recycled water.

D. Polyethylene or vinyl adhesive tape a minimum of 2" wide or plastic tie straps shall be used to secure polyethylene encasement.

2.9 WARNING/IDENTIFICATION TAPE

Warning/identification tape shall be as indicated below and in accordance with the Approved Materials List.

A. Tape shall be an inert plastic film or metallic formulated for prolonged underground use that will not degrade when exposed to alkalies, acids and other destructive substances commonly found in soil.

B. Tape shall be puncture-resistant and shall have an elongation of two times its original length before parting. Tape shall be colored to identify the type of utility intended for identification. Printed message (or similar) and tape color shall be as follows:

Printed Message	Tape Color
Caution: Waterline Buried Below	Blue
Caution: Recycled Waterline Buried Below	Purple
Caution: Cathodic Protection Cable Buried Below	Red or Orange
Caution: Electric Line Buried Below	Red
Caution: Sewer Line Buried Below	Green

Ink used to print messages shall be permanently fixed to tape and shall be black in color with message printed continuously throughout.

C. Tape shall be minimum 0.004" thick x 6" wide with a printed message on one side. Tape used with the installation of onsite potable and recycled water irrigation systems shall be a minimum of 3" wide.

2.10 INSULATING UNIONS & COUPLINGS

A. Insulating unions and couplings shall prevent electrolytic deterioration and provide insulation against galvanic corrosion where piping of dissimilar metals is joined.

B. Provide insulating unions in standard metals or combination of metals as required for the installation: Type 304 or 316 Stainless, A105 Carbon Steel or Brass. Carbon steel components shall have a heat cured epoxy polymer coating with greater than 600 volts/mil dielectric resistance.

C. Insulating unions shall have an O-ring seal located in the thread piece face and Class 3000 pressure rating. Ends shall be male NPT.

D. Threaded outlets on steel mains shall use a 3,000-lb. threaded half coupling welded to the pipe and an insulating union. Outlet threads shall be female NPT.

2.11 VALVE BOX

Valve boxes shall be as indicated below in accordance with the Approved Materials List.

A. Valve box casing diameter for 4” and larger valves shall be 8" diameter PVC.

1. Use purple PVC pipe for recycled water system applications.

2. Use white or blue PVC pipe for potable water system applications.

3. Outside diameter of PVC casing shall be sized to fit inside the frame and lid assembly.

B. Valve box frame and lid assembly shall be as indicated below and in accordance with the Approved Materials List or approved equal.

1. Valve box lids shall be cast or ductile-iron and shall include a skirt for a close fit inside the upper portion of the valve box. Lids shall be cast with the “CMWD” and “WATER” or “RECYCLED WATER” as applicable.

2. Assemblies for 4” and larger valves where the speed limit is 35 mph or greater shall have machined bearing surfaces where the lid meets the frame. Lids shall be 8” nominal diameter with a 6" long skirt.

2.12 VALVE STEM EXTENSIONS

Stem extensions shall be complete with operating nut, centering ring and lower socket to fit the valve operating nut. The extension stem operating nut shall match that of the valve it operates.

A. Stem extensions for 14” and smaller valves shall be continuous, one-piece, square fiberglass tubing to a maximum length 9 feet.

B. Steel stem extensions shall be used for 16” and larger valves or where the depth to the operating nut exceeds 8 feet. Steel stem extensions may be round or square, hot-dipped galvanized, Schedule 40 steel tubing with centering guides. Construction shall be welded steel.

C. Stem extensions longer than 10 feet may consist of two-piece, steel construction and the design shall be such that the operating torque is transmitted by a standard 2” operating nut or other approved means and not by pins, couplings or bolts.

2.13 PIPE SUPPORTS

A. Pipe supports shall be welded steel construction using Schedule 40 steel pipe for the stanchion and an adjustable, threaded riser. Select the pipe supports from the Approved Materials List.

B. Base plates for pipe supports shall have hole spacing equal to or greater than 12 times the diameter of the anchor bolt.

C. Saddles shall conform to the diameter of the pipe or flange that it supports as indicated on the Plans.

D. Carbon steel materials shall be hot dip galvanized per ASTM A123 after fabrication. Furnish Type 316 stainless steel pipe supports for use in wastewater vaults or structures or where exposed to marine environments.

2.14 METER BOXES

Meter boxes shall be polymer concrete boxes and lids selected from the Approved Materials List.

A. Meter box sizes and application shall be as follows:

Meter Box Size	Application
12" x 20"	1" water services
17" x 30"	2" water services

B. Meter box lids for use in potable water system applications shall be gray.

C. Meter box lids for use in recycled water system applications shall be purple.

2.15 RECYCLED WATER IDENTIFICATION

Materials used to identify recycled water pipe and appurtenances not manufactured in purple color shall be as described in Volume 2 of the Carlsbad Engineering Standards.

PART 3 EXECUTION

3.1 INSTALLATION OF TEMPORARY END CAPS TO MAINTAIN SERVICE

Before excavating for new water mains that are to replace existing mains or services, it may be necessary to install temporary end caps on existing pipes that are later to be abandoned or connected to in order to maintain domestic or fire service during construction. When indicated on the Plans or when directed by the City Engineer, the Contractor shall install and maintain such temporary end caps as indicated below and in accordance with the Standard Drawings.

A. For existing water mains 14” or less in diameter, the existing pipe shall be removed near the planned connection location and fitted with a rubber-gasketed ductile-iron solid end cap specifically designed for the size and type of pipe being temporarily capped.

B. Temporary end caps shall be fitted with a 2” tapped outlet for a temporary 2” blow-off or connection to temporary water source as approved by the City Engineer.

C. The temporary end cap shall be wrapped in polyethylene encasement as a bond breaker and braced with a concrete thrust block or as otherwise approved prior to re-pressurization of the water main. The temporary end cap and thrust block shall be removed during the final connection work for the new water main.

D. Do not install temporary end caps on existing 16” or larger water mains.

3.2 TEMPORARY ABOVEGROUND PIPE (HIGH LINE)

A. All high line piping, fittings, and service connections shall be furnished, installed, disinfected and maintained by the Contractor, and the Contractor shall make connections to a metered water source designated by the City Engineer. Water meter deposit and charges for water use shall be paid for by the Contractor.

B. All pipe, valves, fittings, hose and connections furnished by the Contractor shall be of good quality, clean, non-leaking and suitable for conveying potable water in accordance with these specifications.

C. The high line pipe shall be installed in such a manner that it will not present a hazard to pedestrians or be damaged by vehicle traffic and will not interfere with access to homes and driveways along its route.

D. Isolation valves shall be installed at a maximum interval of 200’. The use of pressure reducing valves (PRV) may be required as directed by the City Engineer.

E. The Contractor shall be responsible for disinfecting all high lines, connections, and flushing in accordance with Section 15041 prior to placing the highline in service.

F. Following disinfection and acceptance of the high line as a potable water system, the Contractor shall maintain continuous service through the high line piping to all customers normally served both directly and indirectly by the pipeline.

G. Upon completion of the work, the Contractor shall remove the high line piping and appurtenances and restore the site and improvements.

H. If progress in making repairs to the high line is inadequate, the City reserves the right to make repairs using its own forces or another contractor. All costs for corrective measures shall be borne by the Contractor.

3.3 CONNECTION TO EXISTING FACILITIES (WET TAPS & CUT-IN INSTALLATIONS)

The Contractor shall furnish the tapping sleeve, service saddles, fittings and valves and all other materials as called for in the Specifications or the Plans and in accordance with the Approved Materials List. The Contractor shall provide all materials, equipment and labor required to excavate and expose the pipe, install tapping sleeves or service saddles, make the connects and backfill and restore pavements. In certain circumstances when a drip-tight water main shut down is not possible or to avoid the potential for a discharge violation, the Contractor may be required to provide a water truck, dewatering pumps and high line piping during the connection work. The Contractor shall provide emergency standby equipment or materials to alleviate any hardship incurred during a shutdown.

Wet taps or cut-in tee and valve installations shall be performed as follows:

A. Prior to construction, Contractor shall pothole the existing pipe at the location of the proposed connection. The City shall inspect the pothole prior to backfilling the pothole. Refer to the General Provisions for the protection of existing facilities. Contractor shall record the following information on the as-built drawings:

   1. Pipe size, outside diameter.

   2. Pipe type such as ACP, PVC, ductile-iron or steel.

   3. Pipe class and/or pressure rating.

   4. Elevation, grade, and alignment.

   5. Location of collars, pipe bells, fittings or couplings, if found. The outer edge of the tapping saddle shall not be placed within 3’ of collars, bells, fittings, or couplings.

   6. Clearances from existing utilities. If potential conflicts with utilities or structures exist, measure to determine the required offset to clear the conflict.

B. To facilitate the proposed connection and allow for slight adjustments in alignment, the Contractor shall leave a minimum 10' gap between the new pipe installation and the proposed connection point at the existing water main. The Contractor may leave a gap longer than 10' but not more than 18’ if conditions warrant or if directed by the City Engineer.

C. The new pipeline shall have successfully passed pressure testing in accordance with Section 15044 and disinfection and bacteriological testing in accordance with Section 15041 prior to proceeding with the connection to the existing pipeline.

D. Upon approval to proceed with the connection, the Contractor shall schedule the wet tap or cut-in installation with the City Inspector.

1. Provide notice prior to any proposed excavation or shutdowns of existing water mains or services in accordance with the requirements of the Utility Shutdown/Connection Request (Form E-28). The schedule shall be subject to City Engineer approval and may be scheduled for nights or weekends if required.

2. The City may postpone or reschedule any shutdown operation if, for any reason, the City Engineer believes that the Contractor is lacking competent personnel, equipment, or materials to proceed with the connection.

3. If progress in completing the connection within the time specified is inadequate, the City reserves the right to make corrective measures using its own forces or another contractor. All costs for corrective measures shall be borne by the Contractor.

E. Contractor may proceed with excavation only after potholing has been completed and the results reviewed and approved by the City Engineer, materials have been approved and delivered, and wet tap or cut-in installation has been scheduled with the City Inspector.

1. The Contractor shall provide lights, barricades and traffic control in accordance with the requirements of the agency of jurisdiction, the City Engineer and applicable regulations.

2. The Contractor shall saw-cut pavement, excavate and provide and install shoring and steel plating, when necessary, one day prior to the wet tap or cut-in installation.

3. Where cut-in installations are required, the Contractor shall dewater existing mains in accordance with NPDES regulations. The work shall be conducted in the presence of the City Inspector and in accordance with Section 15041.

4. Only City personnel shall operate existing valves. The Contractor shall be responsible for all damage resulting from unauthorized operation of existing facilities.

5. The Contractor, under the inspection of the City, shall perform the following work for wet taps and cut-in installations:

a. Place crushed rock at the base of the excavation and dewater the pipeline and excavation as required.

b. Wet taps: Disinfect and install the tapping sleeve and tapping valve or service saddle. Support the tapping sleeve, tapping valve and the weight of the tapping equipment using concrete thrust blocks or other approved methods prior to the tapping operation.

c. Cut-ins: Cut and remove portions of existing mains, and disinfect and install tees, valves, couplings, and appurtenances required to complete the closure. The Contractor shall discard pipe and appurtenances removed from service in accordance with this Section.

6. After the Contractor has performed tapping or cut-in operations, the Contractor shall complete the installation, including, but not limited to:

a. Disinfecting and installing the pipe section(s) necessary to make the closure to the new system.

b. Installing and setting the valve boxes in accordance with the Standard Drawings.

c. Installing thrust and anchor blocks in accordance with Section 03000 and the Standard Drawings or detail drawings.

d. Completing all backfill and compaction of the trench in accordance with Section 02223.

e. Repairing or replacing pavement as necessary.

3.4 FLEXIBLE PIPE COUPLINGS

Flexible pipe couplings shall be installed in accordance with the manufacturers recommendations and as described below:

A. Flexible couplings may be used only where indicated on the Plans or approved by the Engineer.

B. Use flexible couplings with plain-end pipe conforming to AWWA C200. Provide joint harnesses per AWWA M11 for above-ground applications or where indicated on the Plans.

C. Clean oil, scale, rust, and dirt from the pipe ends. Repair paint coatings or exposed metal surfaces with an epoxy coating and allow time for curing before installing the coupling. Clean all mating surfaces and gaskets before installing.

D. Follow the manufacturer's recommendation for installation and bolt torque using a properly calibrated torque wrench.

E. Lubricate the bolt threads with graphite prior to installation.

3.5 GROOVED-END OR SHOULDERED COUPLINGS FOR DUCTILE IRON OR STEEL PIPE

Grooved-end or shouldered couplings shall be installed in accordance with the manufacturer's recommendations and as described below:

A. Grooved-end or shouldered joint couplings shall be installed per AWWA C606 and the manufacturer's recommendations.

B. Clean loose scale, rust, oil, grease, and dirt from the pipe or fitting groove. Repair paint coatings or exposed metal surfaces with an epoxy coating and allow time for curing before installing the coupling.

C. Clean the pipe surface and gasket before installation. Apply a lubricant selected from the Approved Materials List to the gasket exterior including lips, pipe ends, and housing interiors.

D. Fasten the coupling alternately and evenly until the coupling halves are seated. Follow the manufacturer's recommendation for bolt torque using a properly calibrated torque wrench.

3.6 JOINT RESTRAINT SYSTEM

Joint restraint systems shall be installed in accordance with the manufacturer's recommendations and as described below:

A. Length of pipe to be restrained on each side of bends, tees, reducers and other fittings shall be determined by the Engineer of Work in accordance with AWWA Manual of Practice for the type of pipe and the requirements of the restraint device manufacturer.

B. Split ring restraint shall be installed on the spigot end of pipe, connected to a back-up ring which seats behind the bell of the adjoining pipe or fitting.

C. Restraint devices can be installed prior to lowering pipe into the trench.

D. Splined gaskets, also known as joint restraint gaskets, may be installed on pipe casings in accordance with the manufacturer's recommendations and only with the prior approval of the Engineer. Do not use restraining gaskets on pressure pipelines.

3.7 BOLTS AND NUTS

A. All bolts and nuts shall be new and unused.

B. Bolts and nuts shall be cleaned, if needed, by wire brushing and lubricated prior to assembly.

C. Tighten nuts uniformly and progressively.

D. Buried bolts and nuts shall be coated with wax tape in accordance with Section 09902 prior to encasement with polyethylene.

E. All stainless steel bolts shall be coated with an anti-seize compound selected from the Approved Materials List.

F. Bolts and nuts shall not be reused once tightened. Used bolts and nuts shall be discarded and removed from the job site.

3.8 POLYETHYLENE ENCASEMENT

A. Use polyethylene wrap or sheet tube encasement on all buried service, wax tape coated piping connections, fittings or valves.

Pipe & Fittings: All ductile-iron pipe and fittings shall be encased with polyethylene sleeves in accordance with Method A described in AWWA C105, except that tees may be encased with polyethylene wrap in accordance with Method C described in AWWA C105.

Valves: Wrap buried valves leaving only the stem and operating nut exposed. Attach the wrap to the valve body so that valve operation will not disturb the seal provided by the polyethylene wrap. Refer to the applicable valve specification to determine other coating requirements.

B. Polyethylene sleeves shall be secured with polyethylene or vinyl adhesive tape or plastic tie straps at the ends and quarter points along the sleeve in a manner that will hold the sleeve securely in place during backfill. Polyethylene wrap shall be secured with polyethylene or vinyl adhesive tape in a manner that will hold the wrap securely in place during backfill.

3.9 WARNING/IDENTIFICATION TAPE

Warning/Identification Tape shall be installed as described below in accordance with the Standard Drawings.

A. Tape shall be placed at the top of the pipe zone 12" above and centered over the utility intended for identification. Tape used with onsite potable and recycled water irrigation systems shall be installed at 6" above the pipe.

B. Tape shall be installed with the printed side up and run continuously along the entire length of the utility intended for identification. Tape shall be installed on the main piping and all appurtenant laterals, including blow-offs, air valve assemblies, fire hydrants, and services. Tape splices shall overlap a minimum of 24" for continuous coverage.

C. Tape shall be installed prior to placement of the Trench Zone Backfill.

3.10 VALVE BOX AND VALVE STEM EXTENSION

Valve box assemblies shall be installed as shown on the Standard Drawings and as described below:

A. The valve box frame and lid shall be coated in accordance with Section 09900.

B. Valve stem extensions shall be installed when the valve operating nut is more than 5' below grade. Stem extensions shall be of sufficient length to position the operating nut between 12" and 18" below the lid.

3.11 METER BOX INSTALLATION

Meter boxes shall be installed at the elevations and locations shown on the Plans and in accordance with the Standard Drawings. Near the completion of the project, a final meter box adjustment to finish grade may be required. Water meters shall not be installed until final adjustments are made to the meter box and approved by the City.

3.12 ABANDONMENT OR REMOVAL FROM SERVICE OF EXISTING FACILITIES

Before excavating for new mains that are to replace existing mains or services, the Contractor shall make provisions for the continuation and maintenance of service to customers as directed by the City Engineer.

Abandonment or removal from service of existing mains, appurtenances or water services shown on the Plans, or as required by the City Engineer, shall be as indicated below and in accordance with the Standard Drawings. Abandonment in-place shall require the prior approval of the City Engineer.

A. Removal by Excavation:

1. Unless otherwise approved or noted on the Plans, existing mains, water services or appurtenances to be replaced, discontinued from use, or are no longer in service shall be removed from the ground by excavation.

2. When the water service or appurtenance piping is being removed:

   a. Existing fittings, valves, service saddles and corporation stops on asbestos-cement pipe (ACP) mains shall be removed and a PVC pipe spool installed on the main between existing ACP joints. Removal of ACP shall conform with Section 02060.

   b. Threaded outlets on steel pipe mains shall be permanently sealed with threaded plugs. Flanged outlets on steel pipe mains shall be sealed with a blind flange. Install corrosion protection in accordance with Section 09902.

   c. Outlets on ductile iron pipe mains shall be sealed with restrained caps, plugs or flanges. Install corrosion protection in accordance with Section 09902.

3. Sewer laterals shall be removed to the wye fitting connected to the sewer main, and the branch on the fitting shall be sealed with a plug and restrained with a concrete block cast against the plug.

4. Sewer mains and appurtenances shall be removed and transported off site in a manner that produces no leakage of raw sewage.

5. Backfill, compaction, and surface restoration of excavations made for the removal of pipe and appurtenances shall conform with the Plans, Section 02223 and the Standard Drawings.

B. Abandonment In-Place:

1. Existing pipe 4" and smaller shall have a short section of pipe removed and the pipe ends encased in concrete.

2. Existing pipe 6” through 12” shall be cut and plugged at 200’ spacing or, at the discretion of the City Engineer, shall be pressure-grouted.

3. Existing pipe 12” and larger or pipe located beneath improved areas shall be entirely filled by pressure-grouting.

4. Filling of pipe 12” and larger with blown sand may be allowed in unimproved locations and with prior approval if venting of the abandoned pipe and placement methods will enable complete filling.

5. The procedures and access locations for filling of abandoned mains by pressure grouting or blown sand shall be approved by the City Engineer.

6. For abandonment of water services or appurtenant piping not otherwise removed, valves and corporation stops shall be closed and the water service piping shall be disconnected from the main and abandoned in place.

7. Meter boxes, curb stops and the service piping shall be removed to a minimum depth of 24” below finish grade and the surface restored to the satisfaction of the City Engineer.

8. Valve boxes shall be removed to a depth of 24” below grade and the remaining portion filled to the bottom of the structural pavement section with a CLSM per Section 03000 or backfilled and compacted with imported granular material per Section 02223.

3.13 SALVAGE

When the Contractor is required to remove existing pipe and appurtenances, or portions thereof, from the ground, such material may be salvaged to the City at its discretion.

A. The Contractor shall remove all materials to be salvaged and shall deliver them to the District’s Operations Yard as directed.

B. The Contractor shall legally dispose of all other materials in accordance with applicable regulations for handling, transport and disposal.

3.14 RECONNECTIONS

A. Existing service laterals or appurtenances to be connected to new pipelines shall be installed as shown on the Plans or in accordance with the Standard Drawings and as directed by the City Engineer.

3.15 REPAIR OF DAMAGED COATINGS

Damaged coatings shall be repaired or replaced as directed by the Engineer and in accordance with these Specifications and the manufacturer's recommendations. Refer to applicable sections of Division 9.

END OF SECTION

SECTION 15041 – DISINFECTION OF PIPING

PART 1 GENERAL

1.1 DESCRIPTION

This section describes requirements for disinfection by chlorination of potable water mains, services, pipe appurtenances and connections.

1.2 REFERENCED STANDARDS

The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

A. American Water Works Association (AWWA):

B300 Standard for Hypochlorites

B301 Standard for Liquid Chlorine

C651 Disinfecting Water Mains

C655 Field Dechlorination

1.3 RELATED WORK SPECIFIED ELSEWHERE

CMWD Standard Specifications 15000, 15044, 15056, 15057, 15061, 15064, 15065, and 15068

1.4 SERVICE APPLICATION

A. All potable water mains and appurtenances taken out of service for inspection, repairs, or other activity that might lead to contamination shall be disinfected before they are returned to service.

B. All new potable water mains and temporary high lines shall be disinfected prior to connection to the existing potable water system.

C. All components incorporated into a connection to the existing potable water system shall be disinfected prior to installation.

1.5 SUBMITTALS

A. The Contractor shall submit a written Disinfection Plan signed by a certified chlorinator to the City Engineer for review and approval prior to starting disinfection or dechlorination operations. The Plan shall include:

1. Personnel qualifications. Personnel performing the disinfection shall demonstrate a minimum of five years of experience in the chlorination and dechlorination of potable water distribution systems.

2. Equipment and procedures used to inject the chlorine solution

3. Gauges or scales to measure the rate of injection

4. Testing location and schedule

5. Potable water source

6. Dechlorination method and water disposal locations

B. Qualification of certified testing laboratory.

C. Four copies of bacteriological test results to the City Engineer upon completion of each test.

D. Emergency Response Plan.

1. 6 DELIVERY, STORAGE AND HANDLING

Chlorination and dechlorination shall be performed by competent individuals knowledgeable and experienced in the operation of the necessary application and safety equipment in accordance with applicable Federal, State and Local laws and regulations. The transport, storage and handling of these materials shall be performed in accordance with Code of Federal Regulations (CFR) 1910.120 Hazardous Waste Operations and Emergency Response, CFR 49.172 Hazardous Materials Regulations, and the General Industry Safety Orders of the California Code of Regulations, Title 8, Section 5194.

1.7 CONCURRENT DISINFECTION AND HYDROSTATIC TESTING

The specified disinfection of the pipelines may be performed concurrently with the hydrostatic testing in accordance with Section 15044. In the event repairs are necessary, as indicated by the hydrostatic test, additional disinfection may be required in accordance with this specification.

1.8 CONNECTION TO EXISTING MAINS

Prior to connection to existing mains, disinfection and bacteriological testing shall be performed in accordance with this specification, and hydrostatic testing shall be performed per Section 15044. City authorization to connect to an existing system shall be based on acceptable hydrostatic, disinfection and bacteriological test results. Connection to existing mains shall be performed in accordance with Section 15000.

1.9 FINAL CONNECTIONS

Final connections must be made within 72 hours after passing bacteriological test results.

PART 2 MATERIALS

2.1 CHLORINE (GAS)

A. Liquid chlorine contains 100-percent available chlorine and is packaged in steel containers in net weights of 68.1kg (150 lb.) or 907.2kg (1 ton).

B. Liquid chlorine shall be used with appropriate gas flow chlorinators, heaters, and injectors to provide a controlled, high-concentration solution feed to the water. The chlorinators and injectors shall be the vacuum-operated type.

2.2 SODIUM HYPOCHLORITE (LIQUID)

Sodium hypochlorite is available in liquid form in glass or plastic containers, ranging in size from 0.95 L (1 Qt.) to 18.93 L (5 Gal.). The solution contains approximately 10% to 15% available chlorine.

2.3 TABLET OR GRANULAR HYPOCHLORITE

Tablet or granular hypochlorite may be used if a solution container is utilized to provide a continuous feed method.

PART 3 EXECUTION

3.2 GENERAL

A. Disinfection of pipelines shall not proceed until all appurtenances and any necessary sample ports have been installed and the Engineer provides authorization.

B. Every effort shall be made to keep the water main and its appurtenances clean and dry during the installation process.

C. All piping, valves, fittings, and appurtenances which become contaminated during installation shall be cleaned, rinsed with potable water, and then sprayed or swabbed with a 5 percent sodium hypochlorite disinfecting solution prior to installation.

D. Water mains under construction that become flooded by storm water runoff or groundwater shall be cleaned by draining and flushing with metered potable water until clear water is evident. Upon completion, the entire main shall be disinfected using a method approved by the Engineer.

3.3 METHODS

A. Chlorine (Gas)

1. Only vacuum-operated equipment shall be used. Direct-feed chlorinators, which operate solely from gas pressure in the chlorine cylinder, shall not be permitted. The equipment shall incorporate a backflow prevention device at the point of connection to the potable water source used to fill the line being tested.

2. The chlorinating agent shall be applied at the beginning of the system to be chlorinated and shall be injected through a corporation stop, a hydrant, or other approved connection to ensure treatment of the entire system being disinfected.

3. Only a certified, licensed chlorination and testing contractor shall perform gas chlorination work. The chlorination contractor must also possess a Grade II Treatment Plant Operator Certification from the State of California if required by the Engineer.

B. Sodium Hypochlorite Solution (Liquid)

1. Sodium hypochlorite solution shall be used for cleaning and swabbing piping, appurtenances and all components of connections immediately prior to connection to the existing potable water system.

2. Sodium hypochlorite solution may be used for the initial disinfection of newly installed water mains. The solution shall be applied at a terminus of the system to be chlorinated using an injector which can adjust the amount of solution being injected into the piping system. The solution shall be injected in the appropriate concentration to achieve the specified concentration range of chlorine throughout the entire piping system. Where pumping equipment is used in conjunction with an injector, an integral backflow prevention device shall be used and connected to the potable water supply.

3. Water trucks, pumping equipment, piping, appurtenances and all other equipment in contact with potable water shall be disinfected prior to use.

4. Sodium hypochlorite solution may also be used to increase the total chlorine residual if the concentration from the initial chlorination of the system is found to be low. The solution shall be added to the system in sufficient amounts at appropriate locations to ensure that the disinfecting solution is present at a concentration within the specified range throughout the piping system.

3.4 DISINFECTING TIE-INS AND CONNECTIONS

Pipe spools, fittings, valves and all other components incorporated into connections to the existing potable water system shall be spray disinfected or swabbed with a minimum 1% liquid chlorine solution in accordance with AWWA C651 and as specified herein. Upon completion of the connection, the water main and connected appurtenances shall be flushed as directed by the City Engineer. Disinfection by this method is generally limited to assemblies of 20 feet or less in length. Alternate methods such as "pre-disinfection" prior to installation in accordance with AWWA C651 may be required at the discretion of the City Engineer.

3.5 PROCEDURE FOR DISINFECTING WATER MAINS AND APPURTENANCES

A. The pipeline shall be filled at a rate not to exceed 300 GPM (1,135 liters per minute) or a velocity of 1 foot per second (0.3 meters per second), whichever is less.

B. Disinfection shall result in a total chlorine concentration of not less than 25 mg/l. This concentration shall be evenly distributed throughout the system to be disinfected, using a continuous feed method of chlorination.

C. All valves shall be operated with the disinfection solution present in the pipeline. All appurtenances such as air-vacuum relief valves, blow-offs, hydrants, backflow

prevention devices, and water service laterals shall be flushed with the treated water a sufficient length of time to ensure a chlorine concentration within the specified range in all components of each appurtenance. (Note the limitations for discharge of chlorinated water outlined below.)

D. The City Engineer will verify the presence of the disinfection solution throughout the system by sampling and testing for acceptable chlorine concentrations at the various appurtenances and/or at the test ports provided by the Contractor. Areas of the system found to be below the specified chlorine concentration level shall receive additional flushing as noted above and/or additional disinfection solution as necessary. (Note the limitations for discharge of chlorinated water outlined below.) Addition of disinfection solution after the initial charging of the line shall be made by either the liquid chlorine (gas) method, or the sodium hypochlorite method as directed by the City Engineer.

E. The chlorinated water shall be retained in the system for a minimum of 24 hours. The City Engineer will test the total chlorine residual. The system shall contain a total chlorine residual of not less than 80% of the initial total chlorine residual before the 24-hour soaking period began. If the total chlorine residual has decreased more than 20%, the system shall be soaked for an additional 24-hour period. If the total chlorine residual has not deceased after this additional 24-hour period, the system shall be flushed in accordance with the procedure detailed herein. If the total chlorine residual has decreased, the system shall be flushed in accordance with the procedure detailed herein and shall be re-disinfected.

F. Following a successful retention period as determined by the City Engineer, the chlorinated water shall be flushed from the system at its extremities and at each appurtenance, using potable water from a source designated by the City Engineer. The minimum water velocity during flushing shall be 3 feet per second (0.9 meters per second) or as directed by the City Engineer. Flushing shall continue until the replacement water in the new system is equal in chlorine residual to the potable water source of supply as verified by the City. (Note the limitations for discharge of chlorinated water outlined below.)

G. The Contractor shall contract with a State certified laboratory to perform sampling, transport samples and perform bacteriological testing as specified herein.

H. Upon receipt of passing bacteriological test results and City Engineer approval, the Contractor shall proceed with the connection of the new main to the existing water main. If the connection is not made within three days of receipt of passing test results, the Contractor shall repeat the disinfection procedures or perform additional bacteriological testing as described herein.

3.6 BACTERIOLOGICAL TESTING

The Contractor shall employ a State certified laboratory to perform bacteriological sampling and testing of all new system installations. The testing methodology employed by the City shall be as set forth in "Standard Methods for the Examination of Water and Waste Water" (current edition). Testing requirements are as set forth in the California Domestic Water Quality and Monitoring Regulations and commensurate with current requirements for surface water testing. The testing laboratory will analyze the samples for

the presence of coliform bacteria and heterotrophic-type bacteria (heterotrophic plate count). The evaluation criteria for a passing test are as follows:

A. Coliform bacteria: no positive sample, and

B. Heterotrophic plate count (HPC): 500 colony forming units/ml or less.

3.7 REDISINFECTION

If the initial disinfection fails to produce satisfactory bacteriological test results, the pipeline system shall be re-flushed and re-sampled. If the second set of samples does not produce satisfactory results, the pipeline system shall be re-chlorinated, flushed, and re-stamped. The chlorination, flushing, and sampling procedure shall continue until satisfactory results are obtained. Re-disinfection and retesting shall be at the Contractor's expense.

3.8 DISCHARGE OF DECHLORINATED WATER

A. Indiscriminate onsite disposal or discharge to sewer systems, storm drains, drainage courses or surface waters of chlorinated water is prohibited.

B. Procedures for field dechlorination shall confirm with AWWA C655 and this specification. In case of conflict, the more stringent requirement shall apply.

C. Discharge of dechlorinated water shall comply with applicable regulatory requirements or permits.

D. In locations where chlorine neutralization is required, the reducing agent shall be applied to the water as it exits the piping system. The Contractor shall monitor the chlorine residual during the discharge operations. Total residual chlorine limits in these locations, and for the discharge of chlorinated water from the testing of pipelines to surface waters of the San Diego Region are as follows:

Total Residual Chlorine Effluent Limitations	
30-Day Average	- 0.002 mg/l
Average Daily Maximum	- 0.008 mg/l
Instantaneous Maximum	- 0.020 mg/l

The various methods of dechlorination can remove residual chlorine to concentrations below standard analytical methods of detection, 0.02 mg/l, which will assure compliance with the effluent limit. The Contractor will perform all necessary tests, keeping and providing records to the Engineer to ensure that the total residual chlorine effluent limitations listed above are met.

E. In locations where no hazard to the environment is evident based on the joint examination described above, the chlorinated water may be broadcast for dust control on the surface of the immediate site. Broadcasting of water shall be conducted in a manner that prevents runoff.

END OF SECTION

SECTION 15043 – TESTING OF GRAVITY SEWER PIPELINES

PART 1 GENERAL

1.1 DESCRIPTION

A. The Contractor shall furnish all tools, equipment, materials, and supplies and shall perform all labor required to complete the work as indicated on the Drawings and specified herein.

B. This Section covers the performance of all pipeline flushing and testing, complete, for sanitary sewer system piping as specified herein and in accordance with the requirements of the Contract Documents.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Polyvinyl Chloride (PVC) Gravity Sewer Pipe: 15063

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Comply with the applicable reference specifications as specified in the General Provisions.

1.4 SUBMITTALS

A. Submittals shall be made in accordance with the General Provisions.

B. The Contractor shall submit the proposed testing plan including the materials and equipment for water conveyance, control and disposal. The Contractor shall also submit written notice 48 hours in advance of the proposed testing schedule for review and concurrence of the City Engineer.

PART 2 PRODUCTS

2.1 GENERAL

A. The Contractor shall provide temporary valves, plugs, bulkheads and other air pressure testing and water control equipment and materials. No materials shall be used which will be injurious to the pipeline structure or its function. Air test gages shall be laboratory-calibrated annually. At the discretion of the City Engineer, gages shall be recalibrated by a certified laboratory at the Contractor's expense prior to the leakage test.

PART 3 EXECUTION

3.1 GENERAL

A. Unless otherwise specified, water for testing shall be procured by the Contractor through a metered water source and the Contractor shall make all necessary provisions for conveying the water from the approved source to the points of use.

B. After testing has been completed, discharge of water from pipelines shall comply with all applicable stormwater pollution prevention regulations.

C. All testing operations shall be performed in the presence of the City Inspector.

3.2 SEWER PIPE CLEANING

A. All sewer pipes shall be thoroughly flushed with clean water, from access-hole to access-hole with an appropriately sized inflatable ball.

B. All construction debris and water shall be removed from each access-hole prior to removal of expandable plugs.

C. Water used in flushing the new sewer mains and laterals shall not be discharged into the existing sewer system.

3.3 TESTING OF PIPELINE

A. General: All gravity sewer pipes and service laterals shall be tested for exfiltration and/or infiltration and deflection, as specified. Sewer pipelines shall be backfilled prior to testing. All leakage tests of sanitary sewer systems shall be in conformance with SSPWC.

B. Water Exfiltration Test shall be in conformance with SSPWC.

C. Water Infiltration Test shall be in conformance with SSPWC. Unless otherwise specified, infiltration will be measured by the Contractor using measuring devices approved by the Engineer.

D. Air Pressure Test shall be in conformance with SSPWC.

E. At the Contractor's option, joints may be air tested individually, joint by joint, with the use of specialized equipment. The Contractor shall submit its joint testing procedure for the Engineer's review and approval prior to testing. Prior to each test, the pipe at the joint shall be wetted with water. The maximum test pressure shall be 3.0 psi. The minimum allowable pressure drop shall be 1.0 psi over a 30-second test period.

F. Water Pressure Test shall be in conformance with SSPWC.

G. Deflection Test: All flexible and semi-rigid main line pipe shall be tested in accordance with SSPWC for deflection, joint displacement, or any other obstruction by passing a rigid mandrel through the pipe by hand, not less than 30 days after completion of the trench backfill, but prior to permanent resurfacing. The mandrel shall be a full circle, solid cylinder, or a rigid, non-adjustable, odd-numbered leg (9 leg minimum) steel cylinder, accepted by the Engineer as to design and manufacture. The circular cross section of the mandrel shall have a diameter of at least 95 percent of the specified average inside diameter of the pipe and the minimum length of the circular portion of the mandrel shall be equal to the nominal diameter of the pipe. Obstructions encountered by the mandrel shall be corrected by the Contractor.

3.4 CLOSED-CIRCUIT TELEVISION INSPECTION

A. A closed-circuit television inspection shall be conducted of new sewer lines after sewer pipe cleaning and mandrel testing.

B. Closed circuit television inspections shall be performed in accordance with the SSPWC. Video documentation shall be provided in digital format (DVD).

C. All defects and evidence of reverse slope by ponding of water or dips in pipe alignment revealed by the closed-circuit television inspection shall be repaired to the satisfaction of the City Engineer at the Contractor's expense.

END OF SECTION

SECTION 15044 – HYDROSTATIC TESTING OF PRESSURE PIPELINES

PART 1 GENERAL

1.1 DESCRIPTION

This section describes the requirements and procedures for pressure and leakage testing of all pressure mains.

1.2 RELATED WORK SPECIFIED ELSEWHERE

CMWD Standard Drawings

CMWD Standard Specifications 15000, 15041, 15056, 15061, 15064, 15065 and 15068

1.3 REQUIREMENTS PRIOR TO TESTING

A. Provide testing procedure submittal including testing pressure, testing schedule, test bulkhead locations, and water supply details.

B. All piping, valves, fire hydrants, services, and related appurtenances shall be installed prior to testing.

C. The pipe trench shall have trench zone backfill placed and compacted with a minimum of 2.5' of material over the pipe.

D. All concrete anchor blocks shall be allowed to cure a sufficient time to develop a minimum strength of 2,000 psi (13.79 MPa) before testing.

E. Pressure tests on exposed and aboveground piping shall be conducted only after the entire piping system has been installed and attached to pipe supports, hangers or anchors as shown on the Plans.

F. Steel pipelines shall not be tested before the mortar lining and coating of all pipes has been in place for a minimum of fourteen (14) days. Cement-mortar lined pipe shall not be filled with water until a minimum of eight hours has elapsed after the last joint has been mortared.

1.4 CONCURRENT HYDROSTATIC TESTING AND DISINFECTION OF PIPELINES

Hydrostatic testing of pipelines shall be performed prior to or concurrently with the disinfection operations in accordance with Section 15041. In the event repairs are necessary, as indicated by the hydrostatic test, the City may require additional disinfection in accordance with Section 15041.

1.5 CONNECTION TO EXISTING MAINS

Hydrostatic testing shall be performed prior to connections to existing mains. City authorization to connect to the existing system shall be based on acceptable hydrostatic, disinfection and bacteriological test results. Connection to existing mains shall be performed in accordance with Section 15000.

PART 2 MATERIALS

2.1 WATER

A. Potable water shall be used for hydrostatic testing of potable and recycled water mains.

B. Potable water shall be supplied by a City-approved source. Make-up water for testing shall also be potable water.

C. A chlorinated water solution, in accordance with Section 15041, shall be used to charge the line and for make-up water when hydrostatic testing and disinfection operations are combined.

D. Meet all applicable state and local requirements for disposal of testing water.

2.2 CONNECTIONS

A. Testing water shall be supplied through a metered connection equipped with a backflow prevention device in accordance with Section 15112 at the point of connection to the potable water source used.

B. The Contractor shall provide any temporary piping needed to deliver potable water to the piping that is to be tested. Temporary piping shall conform with Section 15000.

PART 3 EXECUTION

3.1 GENERAL

A. All water systems shall be pre-tested to ensure passage of test prior to scheduling the official test with the City Inspector.

B. The Contractor shall notify the City at least 48 hours prior to the requested date and time for hydrostatic tests.

C. The Contractor shall furnish all labor, materials, tools, and equipment for testing.

D. Temporary blocking during the tests will be permitted only at temporary plugs, caps or where otherwise directed by the City.

E. All valves and appurtenances shall be operated during the test period. The test shall be conducted with valves in the open position. The Contractor is not permitted to operate any valves on the existing water distribution system.

F. At the onset of testing, all valves, air vacuum assemblies, blow-offs, and services shall be monitored for possible leakage and repairs made, if necessary, before the test proceeds. The appurtenances shall be monitored through the duration of the testing.

G. For pipe with cement mortar lining, the pipe shall be filled with water and pressurized to 25 psi for a minimum of forty-eight (48) hours prior to the actual hydrostatic test.

H. For high density polyethylene pipe (HDPE), the pipe shall be filled with water and pressurized to 25 psi for a minimum of twenty-four (24) hours prior to the actual hydrostatic test.

I. Testing shall be made before connecting the new line to the existing water mains.

J. The pipeline should be filled at a rate such that the velocity of flow is less than 1 fps.

K. Maximum length of pipe to be included in any one test shall not exceed 2,500 linear feet or vertical elevation difference of 115 feet.

3.2 TEST PRESSURE

A. The hydrostatic test pressure shall be 150 percent above the operating pressure of the pipeline at the lowest point in the test section or 250 psi, whichever is less.

B. The test pressure shall not be less than 125 percent above the operating pressure at the highest point of the test section.

3.3 FIELD TEST PROCEDURE

A. The test pump gauge and meter shall be connected to the water main at a location other than the highest point in the line in order to allow release of air from the high point.

B. Before applying the specified test pressure, release all air within the pipe and appurtenances to be tested. Air shall be released through services, fire hydrants, air release valves, bulkheads, or other approved locations.

C. Apply and maintain the test pressure by means of a hydraulic force pump. Maintain the test pressure for the following duration by restoring it whenever it falls by 5 psi:

Pipe Diameter	Test Duration
18” and less	4 hours
20” to 36”	8 hours
Greater than 36”	24 hours

D. After the test pressure is reached, use a meter to measure the amount of water added to maintain the test pressure. The leakage shall be considered as the total amount of water pumped into the pipeline during the test period.

E. This amount of water added is the loss due to leakage in the piping system. The allowable leakage for rubber-gasketed PVC pipe (AWWA C900) and ductile iron pipe (AWWA C151) for various test pressures is as follows (ref. AWWA C600 and C605):

Allowable Leakage (Gallons/Hr./1000' of Pipe)

Pipe Diameter	Test Press. = 150 psi	Test Press. = 200 psi	Test Press. = 250 psi
4	0.33	0.38	0.43
6	0.50	0.57	0.64
8	0.66	0.76	0.85
10	0.83	0.96	1.07
12	0.99	1.15	1.28
14	1.16	1.34	1.50
16	1.32	1.53	1.71
18	1.49	1.72	1.92
20	1.66	1.91	2.14
24	1.99	2.29	2.56

F. The allowable leakage for welded steel pipe shall be zero gallons.

G. The allowable leakage for piping having threaded, brazed, welded, solvent welded, or butt fusion joints shall be zero gallons.

H. Repair and retest any pipes showing leakage rates greater than allowed by the above criteria.

I. Means shall be provided for accurately measuring the quantity of water pumped through a meter and pumped into the pipe immediately, during and after the test period to maintain or restore the initial test pressure.

J. All pipe, fittings, valves, services and appurtenances shall be subjected to the hydrostatic test and, irrespective of the measured quantity of leakage, all detectable leaks shall be repaired by the Contractor at no additional cost to the Owner.

K. If a tested system is damaged or a leak occurs after the official test, the portion of system affected, or the entire system at the Engineer's discretion, will be retested in accordance with this section.

3.4 FIELD TEST PROCEDURE – HDPE PIPE

A. Follow the procedure outlined in paragraph 3.3 with the following modifications:

1. Maintain the test pressure for 4 hours for all pipe diameters.

2. Add makeup water as needed to keep the pressure constant. The volume of water added is not monitored.

3. Reduce the pressure by 10 psi and monitor the pressure for one additional hour.

4. The test shall be deemed to pass if, after one hour, the pressure remains within 5% of the reduced pressure.

END OF SECTION

SECTION 15056 – DUCTILE-IRON PIPE AND FITTINGS

PART 1 GENERAL

1.1 DESCRIPTION

This section includes materials and installation of ductile-iron pipe and fittings for potable water systems.

1.2 REFERENCE STANDARDS

The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

ANSI B16.42	Ductile Iron Pipe Flanges and Flanged Fittings, Classes 150 and 300.
ASTM A536	Specification for Ductile Iron Castings.
AWWA C104	Cement Mortar Lining for Ductile Iron Pipe and Fittings for Water
AWWA C105	Polyethylene Encasement for Ductile Iron Pipe Systems
AWWA C110	Ductile-Iron and Gray-Iron Fittings
AWWA C111	Rubber-Gasket Joints for Ductile Iron Pipe
AWWA C115	Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
AWWA C150	Thickness Design of Ductile-Iron Pipe
AWWA C151	Ductile-Iron Pipe, Centrifugally Cast
AWWA C153	Ductile-Iron Compact Fittings
AWWA C600	Installation of Ductile Iron Water Mains and Appurtenances
AWWA C606	Grooved and Shouldered Joints
AWWA M41	Ductile-Iron Pipe and Fittings
NSF/ANSI 61	Drinking Water System Components – Health Effects

1.3 RELATED WORK SPECIFIED ELSEWHERE

CMWD Standard Drawings

CMWD Standard Specifications 09900, 15000, 15044, 15061, 15064, 15108, 15112, and 16640

1.4 SERVICE APPLICATION

A. Ductile-iron pipe shall be used only in specific applications approved by the Engineer.

B. Ductile iron pipe lining systems used in potable water applications shall be NSF/ANSI 61 certified.

1.5 DESIGN REQUIREMENTS

A. General:

1. Ductile-iron pipe and fittings shall be manufactured per AWWA C110, C115, C150, C151, and C153. Gray-iron or cast-iron fittings or flanges shall not be used. Ductile-iron pipe and fittings shall be selected from the Approved Materials List.

2. Compact ductile-iron fittings conforming with AWWA C153 shall be used with 12" and smaller diameter pipe in vaults or structures unless otherwise approved by the Engineer.

3. Rubber gasket joints for ductile-iron pipe and fittings shall be mechanical, flanged or push-on in accordance with AWWA C111 or grooved and shouldered joints per AWWA C606.

4. Joints in buried piping may be of the push-on, flanged or mechanical-joint type per AWWA C111 except where particularly specified on the Plans.

5. Joints that are above-ground or within structures shall be flanged or grooved or shouldered unless otherwise shown on the Plans. Joints for submerged piping shall be flanged.

B. Where threaded flanges are used, certification of compliance shall be provided by the pipe fabricator, and the pipe or spool piece to which they are connected will be hydrostatically tested in the presence of the Engineer prior to installation. The pipe section or spool piece shall be hydrostatically tested for 15 minutes at the pressure rating of the flanges. No leaks shall be permitted.

C. Plain ends shall conform to the requirement of AWWA C151 and to the dimensions included within AWWA C110 to accept a mechanical joint, push-on joint, flanged coupling adaptor, flexible coupling, or grooved coupling. Refer to Section 15000 for coupling descriptions.

D. Buried pipe and fittings shall be cement-mortar lined, double thickness in accordance with AWWA C104. Cement shall be Type II or Type V Portland cement per ASTM C150.

E. Ductile-iron pipe systems shall have bonded joints for electrical continuity in accordance with Section 16640.

1.6 QUALITY ASSURANCE

A. The manufacturer of each shipment of pipe shall certify that each lot or load of pipe or fittings has successfully passed the tests specified for ductile-iron pipe and fittings per AWWA C110, C111, C115, C150, C151, and C153, as applicable.

B. All pipes shall have a home mark on the spigot end to indicate proper penetration when the joint is made.

C. Ductile-iron pipe shall bear indelible identification markings as required by AWWA C151.

1.7 SUBMITTALS

The following items shall be submitted and reviewed by the City prior to shipping of ductile-iron pipe and fittings:

A. An affidavit of compliance with AWWA C104, C110, C111, C115, C150, C151, C153, and the requirements of this specification.

B. Typical joint details.

C. Details and description of lining and coating systems.

D. Calculations for selected wall thickness of special thickness class pipe.

E. Calculations demonstrating that each proposed restrained joint arrangement can resist the applied forces.

1.8 DELIVERY, STORAGE, AND HANDLING

Delivery, storage, and handling of ductile-iron pipe and fittings shall follow the recommendations of AWWA C600 and as specified herein:

A. Handling of pipe shall be performed with lifts, cranes, or other suitable equipment and devices. Slings, hooks, or pipe tongs shall be padded and used in such a manner as to prevent damage to the pipe, linings, and coatings. The pipes shall not be dropped or dragged.

B. During transport, the pipe shall be supported and secured against movement using padded devices in such a manner to prevent damage.

C. Stored pipe shall be protected from damage and kept free from dirt and foreign materials by closing the ends of the pipe. Other pipeline materials shall be protected by appropriate packaging or wrapping. Gaskets shall be stored in a cool location out of direct sunlight. Bolts, nuts, and washers shall be stored in a dry location.

D. Pipe laid out for installation shall be placed on earth berms or timber cradles adjacent to the trench in the numerical order of installation.

E. Maintain plastic end caps on all pipe and fittings in good condition until the pipe is ready to be installed in the trench. Periodically open the plastic end caps and spray clean potable water inside the pipe for moisture control.

F. Under no circumstances shall ropes or other devices be attached through the fitting's interior for handling.

1.9 RECYCLED WATER IDENTIFICATION

Ductile-iron pipe and fittings for recycled water shall be identified with purple-colored coatings per Section 09900, purple polyethylene sleeves for buried pipe, identification labels or signs in accordance with Section 15000.

1.10 CORROSION PROTECTION

A. Unless otherwise specified, the exterior surfaces of all buried pipe and fittings shall be factory coated with a minimum one (1) mil thick petroleum asphaltic material per AWWA C110 and C151.

B. In addition to shop-applied coatings, buried service ductile iron pipe shall be polyethylene encased, and fittings and appurtenances (flanges, mechanical joints, couplings, etc.) shall be wax tape coated in accordance with Section 09902 and polyethylene encased or wrapped in accordance with 15000.

C. Ductile-iron pipe in vaults or structures or where specified on the Plans shall be fusion-bonded epoxy lined and coated in accordance with Section 09961.

D. Ductile iron pipe and fittings for wastewater service shall be ceramic epoxy lined unless specified otherwise on the Plans.

E. Refer to Section 09900 for other lining and coating requirements.

F. Refer to Section 16640 for cathodic protection requirements.

1.11 WARNING/IDENTIFICATION TAPE

Warning/Identification tape shall be installed for ductile-iron pipe and fittings in accordance with Section 15000.

PART 2 MATERIALS

2.1 DUCTILE-IRON PIPE

A. The nominal thickness of ductile iron pipe shall conform to AWWA C150, Pressure Class 350 for 12” and smaller diameter pipe, or Pressure Class 250 for 14” and larger diameter pipe.

B. The minimum wall thickness for pipe used with grooved and shouldered joints shall conform with the requirements of AWWA C606, minimum special thickness class 54.

2.2 FLANGES

A. Flanges for ductile iron fittings shall comply with AWWA C110.

B. Threaded flanges for ductile iron pipe shall be shop threaded and comply with AWWA C115. Threading of flanges in the field is not permitted.

C. The maximum working pressure of flanges shall be as specified in AWWA C110 or C115.

D. Flanges shall be flat-faced and smooth or with shallow serrations. Raised-face flanges shall not be used.

E. Flanges shall be solid. Hollow-back flanges are not permitted.

2.3 GASKETS

A. Mechanical joint rubber gasket configuration and materials shall comply with AWWA C111, and according to the applicable joint type and pressure rating of the piping system.

B. Push-on joint rubber gaskets shall be per AWWA C111.

C. Flange gaskets shall conform with Section 15000 and shall be selected from the Approved Materials List.

2.4 BOLTS AND NUTS FOR FLANGES

Bolts and nuts shall conform with Section 15000 and shall be selected from the Approved Materials List.

2.5 WAX TAPE COATING

Wax tape coating system shall be provided in accordance with Section 09902 and the Approved Materials List.

2.6 POLYETHYLENE ENCASEMENT

Polyethylene encasement shall be provided in accordance with Section 15000 and selected from the Approved Materials List.

2.7 WARNING/IDENTIFICATION TAPE

Warning/Identification tape materials shall conform with Section 15000 and selected from the Approved Materials List.

PART 3 EXECUTION

3.1 GENERAL

At all times when the work of installing pipe is not in progress, including worker break times, ends of the pipe shall be closed with a rigid cap or plug to prevent unauthorized

entry of persons or vermin. Do not permit trench water to enter the pipe. Do not place tools, clothing, or other materials in the pipe. The Contractor shall maintain the interior of the pipe in a sanitary condition free from foreign materials.

3.2 TRENCHING, BACKFILLING AND COMPACTING

Trenching, backfilling and compacting shall be performed in accordance with Section 02223.

3.3 DEWATERING

The Contractor shall provide and maintain at all times during construction ample means and devices to promptly remove and dispose all water from any source entering trench excavations or other parts of the work in accordance with Section 02223.

3.4 PIPE INSTALLATION

When the work requires and the size of the pipe allows entry of personnel into the pipe, the Contractor shall comply with all Federal and State regulations for confined space entry. Work inside pipelines shall not be undertaken until all the tests and safety provisions of the Code of Federal Regulations 1910.146, and the General Industry Safety Orders of the California Code of Regulations, Title 8, Section 5159 for confined space entry have been performed and the area is verified as safe to enter.

The Contractor shall furnish and install all pipe, specials, fittings, closure pieces, valves, supports, bolts, nuts, gaskets, jointing materials, and all other appurtenances as shown on the Plans and as required to provide a complete and workable installation. Install pipe in the trench as follows:

A. Inspect each pipe and fitting before lowering the pipe or fitting into the trench. Inspect the interior and exterior protective coatings. Patch damaged areas in the field with material recommended by the protective coating manufacturer. Thoroughly clean the ends of the pipe. Remove foreign matter and dirt from inside of the pipe and keep pipe clean during and after installation.

B. Install pipe according to the manufacturer's approved order of installation. Install pipes uphill if the grade exceeds 10%. Lower the pipe onto the bedding at the proper lines and grades.

C. The manufacturer's printed installation guide outlining the radius of curvature that can be negotiated with pipe sections of various lengths shall be followed, except they shall not exceed the deflections allowed in AWWA C600 according to joint type. Combined deflections at rubber gasket or flexible coupling joints shall not exceed that recommended by the manufacturer.

D. The pipe shall have firm bearing along its full length, and bell holes shall be provided at each joint to permit visual inspection of the joint and prevent the pipe from being supported by the bell end or coupling.

E. Pipe Assembly:

1. Push-On Type: Assemble the pipe joint using a lubricant selected from the Approved Materials List. Insert the spigot end into the bell or coupling to the proper insertion mark. Check that the elastomeric ring has not left the groove during assembly by passing a feeler gauge around the completed joint. Drive spigot ends of the pipe into bell ends in accordance with the manufacturer's recommendations. Stabbing shall not be permitted.

2. Mechanical Joint Type: Assembly of mechanical joint fittings shall conform with the manufacturer's recommendations regarding installation.

F. During installation operations, do not place tools, clothing, or other materials in the pipe.

G. When pipe installation is not in progress, including worker break times, ends of the pipe shall be closed with a vermin-proof and child-proof cap or plug. Do not permit trench water, animals, or foreign material to enter the pipe.

3.5 CORROSION PROTECTION

A. Polyethylene encasement shall be installed on all buried ductile-iron pipe and fittings in accordance with Section 15000. Additionally, all buried ductile iron fittings with bolted connections (flanges, mechanical joints, etc.) shall be coated with wax tape in accordance with Section 09902.

B. Joints in ductile iron pipe systems with cathodic protection shall be bonded in accordance with Section 16640.

3.6 FLANGED PIPE AND FITTINGS

Flanged connections shall be installed where indicated on the Plans.

A. Bolt holes shall straddle the horizontal and vertical centerlines.

B. The bolts, nuts and flange faces shall be thoroughly cleaned by wire brush prior to assembly.

C. Bolts and nuts shall be lubricated with an approved anti-seize compound.

D. Nuts shall be tightened in an alternating "star" pattern to the manufacturer's recommended torque.

E. Coat the exterior of exposed flanges, bolts and nuts located aboveground or within vaults in accordance with Section 09910.

3.7 MECHANICAL JOINT CONNECTIONS

A. Install mechanical joint connections per AWWA C600 and the manufacturer's recommendations.

B. Prior to installation of the mechanical joint, clean the socket and plain end of the pipe. Lubricate both the gasket and plain end of the pipe with an approved lubricant

per AWWA C111 immediately prior to slipping the gasket onto the plain end of the pipe.

C. Tighten the bolts to the normal range of bolt torque per the manufacturer's recommendations and AWWA C600, Table 3, as follows:

Pipe Diameter	Bolt Size	Range of Torque
3"	5/8"	45-60 ft.-lb. (61-81 N-M)
4”-24"	3/4"	75-90 ft.-lb. (102-122 N-M)
30”-36"	21"	100-120 ft.-lb. (136-163 N-M)

3.8 CROSSES

A. Each flanged ductile-iron cross shall be installed with flanged ductile-iron pipe spools between the cross and the valves. The spools are included to position the valves a sufficient distance from the cross to allow installation of the thrust blocks without conflicting with the valve actuators.

B. The spools shall be 18" long for pipe sizes 8" through 12", and 24" long for pipe sizes 16" and larger.

C. The spools shall have the same pressure class as the adjacent pipe.

3.9 JOINT BONDING AND CATHODIC PROTECTION

Bonding of joints to provide continuity, flange insulation kits, internal epoxy linings, and other cathodic protection items and materials shall be installed where shown on the Plans in accordance with the Standard Drawings and Section 16640.

3.10 COUPLINGS FOR DUCTILE-IRON PIPE

Mechanical type flexible joints shall be installed where shown on the Plans. Grooved couplings shall be used in vaults and above ground. Flexible couplings may be used where indicated on the drawings. Flanged coupling adapters shall be restrained. Thrust blocks shall be used with non-restrained flange coupling adapters for buried piping.

A. Grooved joint couplings shall be installed per AWWA C606 and as indicated in Section 15000.

B. Flanged coupling adapters shall be installed per the manufacturer's recommendations.

C. Flexible couplings shall be installed per Section 15000 and the manufacturer's recommendations.

D. All couplings for ductile-iron pipe shall be shop-coated in accordance with Section 15000.

3.11 CONCRETE

Concrete thrust and anchor blocks shall be installed in accordance with Section 03000 and the Standards Drawings and project design calculations.

3.12 WARNING/IDENTIFICATION TAPE

Warning/Identification tape shall be installed in accordance with Section 15000 and the Standard Drawings.

3.13 DISINFECTION AND BACTERIOLOGICAL TESTING

Disinfection, bacteriological testing, and flushing shall be performed in accordance with Section 15041.

3.14 HYDROSTATIC TESTING

Field hydrostatic testing shall be performed in accordance with Section 15044.

END OF SECTION

SECTION 15057 – COPPER TUBING, BRASS AND BRONZE PIPE FITTINGS

PART 1 GENERAL

1.1 DESCRIPTION

This section includes materials and installation of copper tubing, brass and bronze pipe fittings and appurtenances.

1.2 REFERENCE STANDARDS

The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

ANSI B1.20.1 Pipe treads, general purpose

ANSI B16.18 Case copper alloy solder joint pressure fittings

1.3 RELATED WORK SPECIFIED ELSEWHERE

CMWD Standard Drawings

CMWD Standard Specifications 09900, 15000, 15041, 15044, 15056, 15061 and 15064

1.4 SERVICE LATERAL WET TAP CONNECTIONS

Contractor shall perform all wet tap connections to existing pipelines in accordance with Section 15000.

1.5 RECYCLED WATER IDENTIFICATION

Copper Tubing, Brass, and Bronze Pipe Fittings for recycled water shall be identified with purple color coating, purple polyethylene sleeve, identification labels or signs in accordance with Section 15000.

1.6 WARNING/IDENTIFICATION TAPE

Warning/Identification Tape shall be used for all copper tubing in accordance with Section 15000, except that which is bored or jacked.

PART 2 MATERIALS

2.1 COPPER TUBING AND FITTINGS

A. Copper tubing shall conform to the requirements of ASTM B88 Type K or ASTM B88 M (Metric) Type A seamless copper water tube. Copper tubing of 1” diameter shall be soft, and 2” may be soft or rigid except that soft tube shall be used with compression fittings.

B. Compression fittings shall be copper tube size (CTS) compression per the Standard Drawings and be selected from the Approved Materials List, Mueller Grip Compression, or equal.

2.2 BRASS PIPE, NIPPLES, AND FITTINGS

A. Threaded nipples, brass pipe and fittings shall conform to ASTM B43, regular wall thickness. Threads shall conform to ANSI B1.20.1.

2.3 BRONZE APPURTENANCES

A. All items specified herein shall be manufactured of bronze conforming to ASTM B62.

B. Fittings shall be flanged or threaded.

C. Corporation stops, curb stops, meter and angle meter stops, meter flange adapters, and bronze-bodied service saddles shall be as shown on the Standard Drawings and be selected from the Approved Materials List.

D. Service saddles for 2” and smaller service and appurtenance connections on PVC, ductile iron and asbestos cement pipe shall be the double strap type. The saddle body shall be manufactured from cast bronze in accordance with ASTM B62 or B584 and AWWA C800. The gasket shall be Buna N.

2.4 BOLTS AND NUTS FOR FLANGES

Bolts and nuts shall conform with Section 15000 and the Approved Materials List.

2.5 WARNING/IDENTIFICATION TAPE

Warning/Identification Tape materials shall conform with Section 15000 and shall be selected from the Approved Materials List.

PART 3 EXECUTION

3.1 COPPER TUBING AND FITTINGS

A. Trenching, bedding, backfilling and compacting shall be performed in accordance with the Standard Drawings. Provide a minimum cover of 30” below finished street grade.

B. Cut tubing true and square and remove burrs.

C. Bends in soft copper tubing shall be long sweep. Shape bends with shaping tools. Form bends without flattening, buckling, or thinning the tubing wall at any point.

D. Assemble copper tubing and fittings per the manufacturer’s recommendation in accordance with the Standard Drawings.

E. All fittings shall be threaded or compression as shown on the Plans and Standard Drawings.

F. No joints shall be allowed in 1” copper water service piping between the water main and the meter or other appurtenant equipment.

G. For 2” copper tube, use straight tube in minimum 20’ lengths to reduce the number of joints between the water main and the meter or other appurtenant equipment.

H. Install warning/identification tape in accordance with Section 15000 and the Standard Drawings.

3.2 SERVICE SADDLES

A. Service and appurtenance connections shall be made at the locations shown on the Plans.

B. Service saddles for connections shall be located a minimum of 24” from adjacent saddles, pipe joints, valves or fittings. Additionally, service saddles for multiple service connections that are installed on the same side of a PVC pipe segment shall be radially staggered with the outlet position 10 degrees more or 10 degrees less than the true 45-degree positioning of the outlet (i.e, outlet positions at 55 or 35 degrees from the horizontal).

C. Remove loose soil or material from the surface of the pipe to provide a hard, clean surface.

D. The service saddle shall be tightened in accordance with the manufacturer’s recommendations to ensure a tight seal, using care to prevent damage or distortion of the service saddle or corporation stop due to over-tightening.

E. The tap into the pipe shall be made in accordance with the pipe manufacturer’s recommendation. Use tapping tools and shell cutters with internal teeth or double slots that will retain the coupon.

3.3 DISINFECTION AND BACTERIOLOGICAL TESTING

Disinfection, bacteriological testing, and flushing shall be performed in accordance with Section 15041.

3.4 HYDROSTATIC TESTING

Field hydrostatic testing shall be performed in accordance with Section 15044.

END OF SECTION

SECTION 15061 – CEMENT-MORTAR LINED AND TAPE COATED STEEL PIPE AND SPECIALS

PART 1 GENERAL

1.1 DESCRIPTION

A. This section includes materials, design, fabrication, and installation of cement-mortar lined and tape coated steel pipe and specials with cement mortar shield.

B. Cement-mortar lined and tape coated steel pipe with cement mortar shield shall be used for transmission mains 18” in diameter or larger and may be used for smaller diameter transmission or distribution mains with City Engineer approval.

C. Refer to Section 09870 for exterior tape coating system with cement mortar shield.

D. For modification or repair of existing steel pipe that does not have a tape coating, the applicable requirements of this specification section and AWWA C200 and AWWA C205 shall apply.

1.2 REFERENCE STANDARDS

The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

AWWA C200	Steel Water Pipe 6-inches and Larger
AWWA C205	Cement-Mortar Protective Lining and Coating
AWWA C206	Field Welding of Steel Water Pipe
AWWA C207	Steel Pipe Flanges
AWWA C208	Dimensions for Fabricated Fittings
AWWA C209	Cold Applied Tape Coating for the Exterior of Special Sections, Connection and Fittings for Steel Water Pipelines
AWWA C210	Coal-tar Epoxy Coating System for Interior and Exterior of Steel Water Pipelines
AWWA C213	Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines
AWWA C214	Machine-Applied Polyolefin Tape Coatings for Steel Water Pipe
AWWA C602	Cement Mortar Lining of Water Pipelines In Place – 4 In. (100 mm) and Larger
AWS	Standard Qualification Procedure for Manual Welding Operators
ASME	Boiler and Pressure Vessel Code

1.3 RELATED WORK SPECIFIED ELSEWHERE

CMWD Standard Drawings

CMWD Standard Specifications 09870, 09900, 09961, 15000, 15041, 15044, 15074, 15100, 15102, 15108, and 15112.

1.4 SPECIALS

A special is defined as any piece of pipe other than a normal full length of straight pipe. This includes, but is not limited to, elbows, short pieces, reducers, tees, crosses, spools, sections with outlets, beveled sections and access holes.

1.5 SUBMITTALS

Submit shop drawings and supporting information in accordance with the General Provisions for the following:

A. Manufacturer's quality control manual including welding qualification per AWWA C200, Section 4.6

B. Fabrication drawings and details of standard pipe and specials and a listing of materials by grade and reference standards

C. Lay drawings that indicate the order of installation, the length and location of each pipe section and special, the station and elevation of the pipe invert at all changes in grade, and data for alignment deflections at bends for both horizontal and vertical alignments.

D. Results of all hydrostatic tests of steel cylinders, dye penetrant tests of welds and other tests conducted in the fabrication process.

E. Mill test reports for steel.

F. Product data for tape coating systems and cement to be used for mortar lining and mortar coating.

G. Product data and test reports for the physical properties of rubber gaskets.

H. Welder certifications for all field welders.

I. Certification of compliance with these specifications and referenced standards.

1.6 QUALITY ASSURANCE

A. Pipe and specials shall be subject to inspection at the manufacturing plant by the City Engineer. If the manufacturing plant is more than 100 miles from the City, the Developer or Contractor may be responsible for travel expenses, including overnight accommodations and air travel, at the discretion of the City Engineer.

B. In addition to the shop hydrostatic testing performed on pipe cylinders required per AWWA C200, all welds of specials and attachments (i.e., joint rings and nozzles) shall be tested by a dye-penetrant process.

C. Field welders shall be certified under Section IX, Part A of the ASME Boiler and Pressure Vessel Code or in accordance with AWWA C206, Section 3. Submit welder certification in accordance with the General Provisions prior to performing any field welding. Welder certifications shall be effective prior to the start of field welding and maintained in valid standing throughout the duration of the project. Certified welders shall have a minimum of three (3) years of experience in the welding procedure(s) to be used in the Work.

D. Plainly mark each length of straight pipe and each special at the bell end to identify the proper location of the pipe item by reference to the layout schedule.

E. The top of all pipe and specials shall be clearly identified by marking the top with "TOP." for easy identification in the field.

PART 2 MATERIALS

2.1 PIPE DESIGN REQUIREMENTS

Pipe manufacturing shall be the product of one company in the business of designing and manufacturing cement-mortar lined, tape wrapped and mortar coated steel pipe conforming with the reference standards and specifications of this section. The pipe shall consist of the following components:

A. A welded steel cylinder with joints formed integrally with the steel cylinder or with steel joint rings welded to the ends.

B. A centrifugally cast cement-mortar lining.

C. A self-centering bell and spigot joint with a circular preformed elastomeric gasket designed to be watertight under all conditions of service. The use of rubber gasketed, unrestrained joints shall require the prior approval of the City Engineer.

D. Restrained pipe joints shall be butt-welded, welded butt-strap or bell-and-spigot lap welded joints.

E. A dielectric tape wrap coating system of the cylinder.

F. A dense, concentric, steel-reinforced, exterior cement-mortar coating that is pneumatically applied.

The Plans indicate the elevations and alignment of the pipeline, the nominal inside diameter of the lined pipe, and the minimum steel cylinder thickness or design pressure (adjusted to satisfy transient conditions). Design soil cover shall be as stated on the Plans or Specifications.

Minimum thickness of the steel cylinder shall be as shown on the Plans or, if not shown on the Plans, as determined by the following formula, except that steel thickness shall not

be less than 10 gauge (0.1345-inch) and the minimum design pressure shall be 300 psi, whichever is greater.

$t = \frac{Pd}{2S}$ Where

P = Design pressure, in psi plus 50 psi minimum
S = Steel stress at design pressure, i.e., 16,500 psi
t = Steel cylinder thickness, in inches
d = OD of steel cylinder, in inches

2.2 STEEL CYLINDERS

Materials used in fabricating steel cylinders shall be hot rolled carbon steel sheets conforming to the requirements of ASTM A53, Grade B, ASTM A570 Grade 36 or Grade 33, or steel plates conforming to the requirements of ASTM A36. The method of testing shall conform to the requirements of ASTM A570.

Pipe fabrication and preparation of ends shall conform with AWWA C200. Welds may be longitudinal or spiral seam. Full penetration welds will be required. The circumferential stress in the steel shall not exceed 16,500 psi at the design pressure.

2.3 CEMENT

Cement for mortar lining and coating shall be Portland Cement Type II and conform to ASTM C150, unless otherwise specified. Admixtures containing chlorides shall not be used.

2.4 STEEL BAR OR WIRE REINFORCEMENT

Circumferential steel bar or wire reinforcement shall conform to ASTM A615, Grade 40, "Specifications for Billet-Steel Bars for Concrete Reinforcement". Wire fabric reinforcing for cement-mortar coatings and linings of fittings shall conform to ASTM A185, "Specifications for Welded Steel Wire Fabric," or ASTM A497, "Specifications for Welded Deformed Steel Wire Fabric." Spiral-wire reinforcement for cement-mortar coatings shall conform to ASTM A82.

2.5 STEEL FOR JOINT RINGS

Steel for bell rings shall conform to ASTM A575, "Specification for Merchant Quality Hot Rolled Carbon Steel Bars." Steel for spigot rings shall conform to ASTM A576, "Specification for Special Quality Hot-Rolled Carbon Steel Bars."

2.6 DIMENSIONS

The steel pipe sizes shown on the Plans or otherwise referred to shall be the nominal inside diameter. Unless otherwise specified, the nominal diameter shown on the Plans shall be the inside diameter after lining.

2.7 MANUFACTURER'S TESTS

Each steel cylinder with joint rings attached and cylinders for specials shall be hydrostatically tested to a circumferential stress of at least 22,000 psi, but not more than

25,000 psi. If leaks develop during testing, the cylinder shall be repaired by welding and retested until all leaks are eliminated.

The seams in short radius bends and special fittings shall be tested by the air-soap method using air at a pressure of 5 psi or by the dye-check method. However, if the fitting is fabricated from cylinders which have been previously hydrostatically tested, no further test will be required on seams so tested.

Hydrostatic testing of fittings to 150% of the design pressure may replace the tests described above. Any defects revealed by any of the alternate test methods shall be repaired by welding and the fitting retested until all defects have been eliminated.

2.8 FABRICATION DETAILS

Dimensions and material grade for all pipe and specials shall be detailed on the shop drawings. Include details for pipe joints, flanges, thread-O-lets, welded outlets, reinforcement, etc.

Dimensions of hold-back for linings and coatings shall be provided for pipe to be field welded or for mechanical connections.

Each special and each length of straight pipe shall be plainly marked at the bell end to identify the design pressure, the top of pipe and the proper location of the pipe or special by reference to layout schedule.

2.9 LINING AND COATING

A. All steel pipe and fittings for buried service shall be cement mortar lined and taped coated with a cement mortar shield in accordance with AWWA C205, C214 and C602 and Section 09870 unless otherwise specified on the Plans. Cement mortar lining and coating thicknesses shall be as follows:

Pipe Dia.	Lining Thickness	Tolerance	Coating Thickness	Tolerance
4” – 10”	1/4”	-1/32” +1/32”	1/2”	+1/8”
12” – 18”	3/8”	-1/16” +1/8”	5/8”	+1/8”
20” – 44”	1/2”	-1/16” +1/8”	3/4”	+1/8”
45” – 58”	3/4”	-1/16” +1/8”	1”	+1/8”
60” and over	3/4”	-1/16” +1/8”	1-1/4”	+1/8”

B. Lining and coating for steel pipe and fittings in vaults shall conform with Section 09961.

C. Paint coatings for above ground installations shall conform with Section 09900.

D. Epoxy mortar and liquid epoxy used for interior repairs in potable water installations shall be NSF/ANSI 61 certified.

2.10 STEEL PIPE AND SPECIALS

Steel pipe and specials shall conform to the requirements of the AWWA C200 and C205, and AWWA M11, except as modified herein.

A. Steel for fabricated cylinders shall conform to ASTM A36/A36M, ASTM A283/A283M, Grade D, or ASTM A570/A570M, Grade 36. Other steel grades may be used with the approval of the City Engineer.

B. Cement-mortar coating shall be reinforced in accordance with AWWA C205.

C. Cement mortar grout for field joints shall consist of a mixture of 1-1/2 to 2 parts sand to 1 part Type II or Type V Portland Cement with enough clean, potable water to permit packing and troweling without crumbling. The sand shall be washed, well-graded sand such that all will pass a No. 8 sieve. The quantity of water to be used in the preparation of grout shall be the minimum required to produce a mixture sufficiently workable for the purpose intended. Grout shall attain a minimum compressive strength of 12.4 MPa (1,800 psi) in 28 days.

D. In certain circumstances, rapid-setting mortar may be required. Acceleration admixtures may be used in the mix as permitted by the City Engineer. Calcium chloride shall not be used in the mix.

2.11 FLANGES

Flanges shall conform with AWWA C207, Class E or Class F; or ANSI B16.5, Class 150 or Class 300.

2.12 BOLTS AND NUTS FOR FLANGES

Bolts and nuts shall conform with Section 15000 and the Approved Materials List.

2.13 GASKETS

A. Flange gaskets shall conform with Section 15000 and shall be selected from the Approved Materials List.

B. Rubber gaskets used in bell and spigot joints shall comply with AWWA C200.

2.14 CEMENT-MORTAR CURING

The pipe shall be cured by water or steam. Water curing and steam curing may be used interchangeably on a time ratio basis of four hours water curing to one hour of steam curing. Where steam curing is used, the pipe shall be kept in steam maintained at a temperature of 100 F to 150 F for the specified period. Where water curing is used, the pipe shall be kept continually moist by spraying or other means for seven days at a temperature of not less than 40 F before being moved to the site.

Cement-mortar lining and coating of special pipe and fittings may be cured in accordance with the above provisions or by prompt application of a white-pigmented sealing compound conforming to ASTM C309. Sealing compound shall not be applied at joint ends where compound will interfere with the bond of joint mortar.

2.15 SPECIALS AND FITTINGS

The manufacturer shall furnish all fittings and special pieces required for closures, curves, bends, branches, manways, outlets and connections for valves and other appurtenances required by the Plans.

Fittings and special pieces shall be fabricated of welded steel sheet or plate, lined and coated with cement-mortar of the same type as the adjoining pipe and applied as specified for lining and coating of specials in AWWA C208 and as modified herein. Butt welding shall be used, unless otherwise indicated on the Plans.

The centerline radius of an elbow or bend shall be 2.5 times the outside diameter of the steel cylinder. Submit stress calculations per AWWA M11 and AWWA C208 for radii less than this value. The maximum deflection at a mitered girth seam shall be 22-1/2 degrees.

The circumferential stress in the sheet or plate shall not exceed 13,500 psi at the design pressure. The minimum thickness of sheet or plate shall be as follows:

Fitting Diameter	Min. Steel Plate Thickness
14” and less	10 gauge
16” – 24”	3/16" or 7 gauge
30” – 36”	1/4"
42” – 48”	5/16"
54” – 60”	3/8"
66” – 72”	7/16"

Outlets at special fittings shall be reinforced with collars or crotch plates. If collar reinforcement is used, the outlet diameter shall not exceed 69% of the ID of the fitting. The diameter of outlets reinforced with crotch plates may equal the fitting diameter.

The effective shoulder width "W" of collars from the inside surface of the steel outlet to the outside edge of the collar measured on the surface of the cylinder shall be not less than one-third or more than one-half the ID of steel outlet. The thickness of the collar shall be not less than "T" as determined by:

$$T = \frac{Pw \times ID\ cyl. \times ID\ outlet}{36{,}000 \times W}$$

Where Pw is the design pressure in pounds per square inch, and all other dimensions are in inches. Collars may be oval in shape or rectangular with rounded corners. Three-inch diameter and smaller outlets may be installed without collars.

The design of crotch plates shall be based upon the paper by Swanson, Chapton, Wilkinson, King, and Nelson, originally published in June 1955 issue of the Journal of the American Water Works Association and in conformance with AWWA Manual M11.

2.16 TAPE WRAP AND MORTAR SHIELD

Tape wrap and mortar shield for cement mortar lined steel pipe shall conform with Section 09870.

2.17 GROUT BANDS FOR EXTERIOR MORTAR JOINTS

Grout bands shall consist of a polyethylene-foam-lined fabric. The fabric shall be spun-bonded polypropylene with a minimum of three ounces per square yard weight. The fabric shall be of sufficient strength and stability to retain the fresh Portland cement grout without leakage. The fabric shall be hemmed on each edge with steel strap or wire contained within each hem. The steel strappings or wire and their seals shall hold the weight of the grout without failure.

The foam liner material shall be Ethafoam 221 PGB manufactured by Dow Chemical Company or approved equal. The foam shall be a multicellular, closed-cell polyethylene plastic foam with a density of 1.8 to 2.2 lbs./cubic foot. The cell size shall be 3.0 to 3.7 mm.

The cells of the foam liner shall be open and hollow on the surface facing inward towards the pipe. The smooth polyethylene skin surface shall be attached to the fabric of the grout band. The foam liner and fabric shall completely cover the circumference of the pipe and joint width with overlap after closure.

PART 3 EXECUTION

3.1 GENERAL

At all times when the work of installing pipe is not in progress, the ends of the pipe shall be closed to prevent entry of vermin, groundwater or storm water, or unauthorized persons. The Contractor shall maintain the interior of the pipe in a sanitary condition free from foreign materials.

3.2 DELIVERY, STORAGE AND HANDLING

Delivery, storage, and handling of the pipe and specials shall be as follows:

A. Pipe and fittings shall be carefully handled and protected against damage to linings and coatings. Pipe shall not be placed directly on rough ground but shall be supported in a manner which will protect the pipe against injury whenever stored. Pipe shall be handled and stored per these requirements and in accordance with the Manufacturer's recommendations.

B. Stulls shall be installed in all pipe and specials 24" in diameter and larger prior to shipment to the job site. The bracing shall be located 12" from each end of the pipe and additionally at interior points. Maintain internal bracing as specified under Pipe Installation.

C. Transport pipe to the job site on padded bunks with nylon tie-down straps or padded bonding to protect the pipe.

D. Pipe and specials shall only be handled with appropriate spreader bars and wide nylon slings. Chains or wire rope slings shall not be used. Under no circumstances shall pipe or specials be pushed or dragged along the ground. All pipe sections over 20' in length shall be lifted at the quarter points from each end.

E. Store pipe on earth berms or timber cradles adjacent to the trench in the numerical order of installation. Place the supports at about one-quarter point from the pipe ends.

F. Maintain plastic end caps on all pipe and specials in good condition until the pipe is ready to be installed in the trench. Maintain a moist environment during storage for curing of mortar linings in accordance with the manufacturer's recommendations.

3.3 DEWATERING

The Contractor shall provide, and maintain at all times during construction, ample means and devices to promptly remove and dispose of all water from any source entering trench excavations or other parts of the work in accordance with Section 02223.

3.4 PIPE INSTALLATION

When the work requires and the size of the pipe allows entry of personnel into the pipe, the Contractor shall comply with all Federal and State regulations for confined space entry. Work inside pipelines shall not be undertaken until all the tests and safety provisions of the Code of Federal Regulations 1926 Subpart AA and the General Industry Safety Orders of the California Code of Regulations, Title 8, Section 5157 for confined space entry have been performed and the area is verified as safe to enter. Generally, the aforementioned safety provisions apply to pipe larger than 24". For pipe less than 24" diameter, more stringent safety procedures apply.

Pipe installations shall be as shown on the Plans and Shop Drawings in accordance with the following:

A. No pipe shall be installed where the linings or coatings show cracks that are deemed harmful as determined by the City Engineer. Such damaged linings and coatings shall be repaired, or new, undamaged pipe sections shall be furnished and installed by the Contractor.

B. Pipe damaged prior to Substantial Completion shall be repaired or replaced by the Contractor.

C. The Contractor shall inspect each pipe and fitting to ensure that there are no damaged portions of the pipe. The Contractor shall remove or smooth out any burrs, gouges, weld splatter, or other small defects prior to laying the pipe.

D. Before placement of pipe in the trench, each pipe or fitting shall be thoroughly cleaned of any foreign substance which may have collected thereon and shall be kept clean at all times thereafter. For this purpose, the openings of all pipes and fittings in the trench shall be closed during any interruption to the work as noted above.

E. Pipe shall be laid directly on the bedding material. No blocking will be permitted, and the bedding shall be such that it forms a continuous, solid bearing for the full length of the pipe. Excavations shall be made as needed to facilitate removal of handling devices after the pipe is laid. Bell holes shall be formed at the ends of the pipe to prevent point loading at the bells or couplings and to permit visual inspection of the joint. Excavation shall be made as needed outside the normal trench section at field joints to permit adequate access to the joints for field connection operations and for application of coatings on field joints.

F. Installation Tolerances: Each section of pipe shall be laid in the order and position shown on the approved layout schedule to the proper lines and grades in accordance with the following:

1. Each section of pipe having a nominal diameter less than 48" shall be laid not to vary more than 0.2-ft horizontally or 0.1-ft vertically from the alignment and elevations shown on the Plans.

2. Each section of pipe having nominal diameter 48" and larger shall be laid not to vary more than 5% of the pipe diameter horizontally or 2.5% of the pipe diameter vertically.

3. In addition to the horizontal and vertical tolerances above, lay the pipe so that no high or low points occur along the pipeline other than those shown on the approved layout schedule.

G. Where necessary to raise or lower the pipe due to unforeseen obstructions or other causes, the City Engineer may order a change in the alignment. Such change shall be accomplished by the deflection of joints, by the use of bevel adapters, or by the use of additional fittings. However, in no case shall the deflection in the joint exceed seventy five percent (75%) of the maximum deflection recommended by the pipe manufacturer. No joint shall be deflected any amount that will be detrimental to the strength and water tightness of the finished joint. In all cases, the joint opening, before finishing with the protective mortar inside the pipe, shall be the controlling factor.

H. Pipes shall be laid uphill on grades exceeding 10 percent. Pipe that is laid on a downhill grade shall be blocked and held in place until the following pipe section has been installed to provide sufficient support to prevent movement.

I. Stulls shall be left in place until pipe zone compaction has been completed. The Contractor shall employ a laboratory to monitor pipe deflection by measuring pipe inside diameter before bracing is removed and 24 hours after removal. Pipe deflection shall not exceed 3 percent in 24 hours after the bracing has been removed.

J. Cold Weather Protection: No pipe shall be installed upon a foundation onto which frost has penetrated or at any time that there is a danger of the formation of ice or penetration of frost at the bottom of the excavation. No pipe shall be laid unless it can be established that the trench will be backfilled prior to formation of ice and frost.

K. Pipe and Special Protection: The openings of all pipe and specials where the pipe and specials have been mortar-lined in the shop shall be protected with suitable bulkheads to maintain a moist atmosphere and to prevent unauthorized access by persons, animals, water, or any undesirable substance. The bulkheads shall be designed to prevent drying out of the interior of the pipe. The Contractor shall introduce water into the pipe to keep the mortar moist where moisture has been lost due to damaged bulkheads.

3.5 PREVENTING FOREIGN MATTER FROM ENTERING THE PIPE

At all times when pipe laying is not in progress, the open end of the pipe shall be closed with a tight-fitting cap or plug to prevent the entrance of foreign matter into the pipe. In no event shall the pipeline be used as a drain for removing water which has infiltrated into the trench. The Contractor shall maintain the inside of the pipe free from foreign materials and in a clean and sanitary condition.

3.6 BUTT STRAP JOINTS

A. Butt strap closure joints shall be completed in the trench after the pipe has been laid to the alignment and grade shown on the Plans. They should be field welded by full-circumferential fillet welds on the two adjoining pipes. Welding shall be done in the same manner as specified for field welded joints.

B. Butt straps shall conform with AWWA C206 and consist of two half-sections or a complete cylinder with 5” diameter steel, threaded half-couplings for interior joint finishing. The number of hand holes and spacing shall be such that the entire interior pipe joint is accessible for mortar finishing.

C. Prior to butt-strap welding, the pipe and pipe joint shall be properly positioned in the trench using line-up clamps so that, in the finished joint, the abutting pipe sections shall not be misaligned by more than 1/16".

D. Butt straps shall be field welded to the outside plain end of the pipe along both edges with circumferential welds, and longitudinal welds for two-piece butt straps. A minimum of two weld passes shall be used.

E. The interior of the joints shall be filled with a rapid-set mortar and finished off smoothly to match the pipe interior mortar lining surface.

F. After interior mortar lining of the joint is completed and approved, seal weld a steel threaded plug onto the 5” diameter steel half-coupling.

G. Clean the exterior of the butt strap with a wire brush and apply a cement and water wash coat prior. Place 2" x 4" x No. 13 gauge galvanized wire mesh on the exterior of the butt strap, then coat with mortar to a minimum thickness of 1-1/4" to cover all steel.

3.7 FIELD WELDED JOINTS

A. Joints shall be field welded after the pipe is in final position but prior to placing backfill at the joint. The standard joint for fully restrained steel pipelines shall be a lap-welded

joint as shown on the Plans. The minimum overlap of the assembled lap joint shall be shown on the Plans. Any recess between the bell and spigot shall receive a steel filler rod. Pipe having 30-inch diameter or larger may be welded from the inside. Joints shall be welded on the inside and outside where indicated on the Plans as "Double Welded Joints."

B. Field Welding shall conform with AWWA C206 and AWS D1.1, except as modified herein. Welders assigned to the Work shall be qualified under the AWS standard qualification procedure.

C. Joints to be welded shall be cleaned of all loose scale, heavy rust, paint, cement, and grease. Provide at least 1/2-inch of clear space from adjacent mortar-covered surfaces to place the weld.

D. Welding electrodes shall be as recommended by the pipe manufacturer. Typically, electrodes shall be E6010 for root passes and for additional passes.

E. Preheat the joints to be welded where required in accordance with Table 1 of AWWA C206. In all hand welding, the metal shall be deposited in successive layers. Do not deposit more than 1/8" of throat thickness per pass. Complete and clean each pass around the entire circumference of the pipe before commencing the next pass.

F. The minimum number of passes in the completed weld shall be as follows:

Steel Cylinder Thickness	Min. No. Passes
Less than 1/4"	2
Greater than 1/4"	3

G. Welded joints shall be visually inspected and shall undergo dye penetrant testing and hydrostatic testing in accordance with AWWA C206 and ASTM E165.

H. To minimize longitudinal stresses due to temperature variations, it is necessary to leave one joint unwelded per each 400' of pipeline. This joint shall be left unwelded until all the joints on both sides of it are welded, and it shall be welded at the coolest time of the working day.

I. Inspection of Field Welded Joints:

1. The City shall arrange for the welds to be inspected. Inspection of welds shall take place as soon as possible following the completion of the welds.

2. The Contractor shall furnish and install ventilation, lighting, and other equipment deemed necessary for inspection. The Contractor shall be responsible for providing traffic control, safe entry into and out of the trench, confined space entry programs, and other precautions to ensure the safety of workers and inspection personnel.

J. After welding, the interior joint surface shall be cement mortar lined in accordance with this Section.

3.8 INTERIOR JOINT FINISH – PIPE LESS THAN 24"

Complete mortar lining of interior joints through hand holes at butt straps or on the ends of the pipe.

3.9 INTERIOR JOINT FINISH – PIPE 24" AND LARGER

A. Complete interior mortar joints for pipe sizes 24" and larger by the trowel method. Prior to applying interior mortar at the joints all backfill in the area shall be completed. After cleaning the interior joint, pack cement mortar into each joint. Finish the surface with a steel trowel to a smooth finish and equal thickness to match the adjoining interior mortar lining.

B. Where more than a 4" wide strip of mortar is required, place 2" x 4" x No. 13 gauge galvanized welded wire mesh reinforcement over the exposed steel. Install the mesh so that the wires on the 2" spacing direction run circumferentially around the pipe. Crimp the wires on the 4" spacing to support the mesh 3/8" from the metal surface. Steel-trowel finish the interior mortar to match the adjoining mortar-lined surfaces.

3.10 EXTERIOR JOINT FINISH

A. Grouting of the outside joint spaces shall be kept as close behind the laying of the pipe as possible without damaging the exterior grout joint.

B. The exterior joint recess shall be completely filled with grout using fabric grout bands. The grout space shall be flushed with water prior to filling so that the surfaces of the joint to be in contact with the grout will be thoroughly moistened when the grout is poured. Center the grout band over the joint space with approximately equal widths extending over each pipe end and securely attach to the pipe with the steel straps.

C. The joint shall consist of two parts sand to one part Portland cement, mixed with sufficient clean water to maintain a freely pouring consistency. The grout consistency should be that of a very thick cream. The joint shall be filled with grout by pouring from one side only. Grout shall be rodded or vibrated so that the grout completely fills the joint recess. After filling the exterior joint space with grout, the flaps shall be closed and overlapped in a manner that fully encloses the grout.

3.11 FLANGED CONNECTIONS

Flanged connections shall be used to connect to valves, equipment, adapters and dismantling joints or where indicated on the Plans.

A. Slip-on flanges shall be field welded on the pipe interior and exterior in accordance with AWWA C207.

B. Apply three coats of liquid epoxy to the pipe at the interior field weld. Alternatively, remove the mortar lining at least ¾-inch from the flange face and apply epoxy mortar lining flush with the existing mortar lining and the flange face.

C. Restore the tape wrap and cement mortar coating removed for the installation of the flange.

D. Bolt holes shall straddle the horizontal and vertical centerlines.

E. Bolts, nuts and flange faces shall be thoroughly cleaned by wire brush prior to assembly. Bolts and nuts shall be lubricated with an approved anti-seize compound.

F. Nuts shall be tightened in an alternating "star" pattern to the gasket manufacturer's recommended torque.

3.12 JOINT BONDING AND CATHODIC PROTECTION

A. Pipe joints at valves or mechanical fittings shall be bonded for electrical continuity in accordance with the Standard Drawings and Section 16640.

B. Install flange insulation kits where contact between dissimilar metals occurs or where shown on the Plans.

3.13 LINING AND COATING

A. Apply linings and coatings to the surfaces of steel pipe and fittings not otherwise mortar-coated in accordance with Section 09900 or Section 09961.

B. Apply linings to interior surfaces in contact with potable water such as plain ends or grooved and shouldered ends of pipe and exposed inside surfaces of threaded outlets and blind flanges.

3.14 WAX TAPE

Coat the exterior of flanges, bolts and nuts with a wax tape coating system in accordance with Section 09902 and encase in polyethylene.

3.15 CONCRETE

Where required, concrete thrust and anchor blocks shall be installed in accordance with Section 03000 and as shown on the Plans. Refer to Section 03000 for the minimum concrete curing time prior to filling the pipeline with water.

3.16 WARNING/IDENTIFICATION TAPE

Warning/Identification Tape shall be installed in accordance with Section 15000 and the Standard Drawings.

3.17 DISINFECTION AND BACTERIOLOGICAL TESTING

Disinfection, bacteriological testing, and flushing shall be performed in accordance with Section 15041.

3.18 HYDROSTATIC TESTING

Field hydrostatic testing shall be performed in accordance with Section 15044.

END OF SECTION

SECTION 15063 – POLYVINYL CHLORIDE (PVC) GRAVITY SEWER PIPE

PART 1 GENERAL

1.1 DESCRIPTION

This section describes the requirements for the manufacture and installation of polyvinyl chloride (PVC) gravity sewer pipe to be furnished and installed by the Contractor in accordance with the Plans and as herein specified.

1.2 REFERENCE STANDARDS

ASTM D2321	Underground Installation of Flexible Thermoplastic Sewer Pipe
ASTM D2412	Pipe Stiffness Test
ASTM D3034	PVC Sewer Pipe and Fittings (4" to 15")
ASTM D3212	Joints for Drain and Sewer Plastic Pipe Using Elastomeric Seals
ASTM F477	Elastomeric Gaskets for Joining Plastic Pipe
ASTM F679	PVC Large Diameter Gravity Sewer Pipe and Fittings (18" to 27")
UNI-B-5	Uni Bell Recommended Practice for the Installation of PVC Sewer Pipe

1.3 RELATED WORK DESCRIBED ELSEWHERE

The Contractor shall refer to the following Specification section(s) for additional requirements:

A. Trenching, Excavation, Backfilling and Compaction: 02223

B. Cast-In-Place Concrete: 03000

C. Testing of Gravity Sewer Pipelines: 15043

1.4 SUBMITTALS

The Contractor shall furnish submittals in accordance with the General Provisions. Submittals are required for the following:

A. Submit Shop Drawings, material lists, manufacturer’s literature and catalog cuts and other information.

B. An affidavit from the pipe manufacturer including compliance with requirements of the Plans and Specifications shall be delivered with the pipe.

1.5 QUALITY ASSURANCE

A. The manufacturer of each shipment of pipe shall be required to supply a statement certifying that each lot or load of pipe has been subjected to the tests specified for

PVC gravity sewer pipe. Tests shall show that the pipe has been found to meet all the requirements of ASTM D3034, F679, and/or F794 as applicable.

B. Sewer pipe shall be furnished in standard 14’ or 20’ lengths, unless otherwise detailed or required on the Plans. Random lengths may be furnished but shall not exceed 15% of the total footage.

C. PVC pipe and couplings shall bear indelible identification markings as required by ASTM D3034, F679 and/or F794 and as follows:

1. All pipe, fittings, and couplings shall be clearly marked at an interval not to exceed 5’ as follows:

a. Nominal pipe diameter.

b. PVC cell classification.

c. Company, plant, date of manufacture, ASTM and SDR designation. Fittings and couplings do not require the SDR designation.

d. Service designation or legend.

2. All pipes shall have home marks on the spigot ends to indicate proper penetration when joints are made.

1.6 DELIVERY, STORAGE, AND HANDLING

A. PVC pipe shall be stored in suppliers’ yards and on the job site in accordance with AWWA M23 and the manufacturer’s recommendations. PVC pipe that has been subjected to ultraviolet radiation from sunlight for a period greater than 3 months shall not be used. The determination as to the acceptability of PVC pipe faded by the sun’s radiation shall rest solely with the City Engineer.

B. Store PVC pipe in the field by supporting the pipe uniformly per AWWA M23. Do not stack pipe higher than 4’ or stack the pipe with weight on the bell ends. Cover stored PVC pipe to protect it from the sun’s ultraviolet radiation. Any pipe that has been contaminated with any petroleum products (inside or outside) shall not be installed.

C. Pipe and fittings shall be handled according to manufacturer’s recommendations. Proper care shall be used to prevent damage in handling, moving, and placing the pipe. All pipe, fittings, and other pipeline materials shall be lowered into the trench in a manner that prevents damage. Pipe shall not be dropped, dragged or handled in a manner that will cause bruises, cracks, or other damage. PVC pipe or fittings that have been gouged or scratched shall be subject to rejection as determined by the City Engineer.

PART 2 MATERIALS

2.1 GENERAL

PVC gravity sewer pipe shall be made of PVC plastic having a cell classification of 12454-B, 13364-A, or 13364-B as defined in ASTM D1784. The fittings shall be made of PVC plastic having a cell classification of 12454-B, 12454-C or 13343-C as defined in ASTM D1784.

2.2 PIPE

A. PVC gravity sewer pipe, fittings, coupling and joints, 4-inch through 15-inch, shall be manufactured in conformance with the requirements of ASTM D3034, SDR 35 and shall have gasketed joints. All pipes shall be of solid wall construction with smooth interior and exterior surfaces.

B. PVC gravity sewer pipe, fittings, coupling and joints, 18-inch through 21-inch, shall be manufactured in conformance with the requirements of ASTM F679 with T-1 wall thickness and shall have gasketed joints. All pipes shall be of solid wall construction with smooth interior and exterior surfaces.

C. The minimum pipe stiffness for both small diameter and large diameter PVC gravity sewer pipe shall be 46 psi according to ASTM D2412.

D. Pipe shall be selected from the Approved Materials List.

2.3 JOINTS

A. The pipe shall be jointed with an integral bell gasketed joint that meets the requirements of ASTM D3212. The gasket shall be manufactured from a synthetic elastomer and factory installed in the belled end of the pipe. Gasket shall conform to ASTM F477.

B. All pipes shall have a home mark on the spigot end to indicate proper penetration when the joint is made. The socket and spigot configurations for fittings and couplings shall be compatible to those used for the pipe.

PART 3 EXECUTION

3.1 GENERAL

A. At all times when the work of installing pipe is not in progress, including worker break times, close the ends of the pipe with a tight-fitting, vermin-proof and child-proof, cap or plug. Do not permit trench water to enter the pipe. Do not place tools, clothing, or other materials in the pipe. The Contractor shall maintain the interior of the pipe in a sanitary condition free from foreign materials.

B. Where pipe sections less than standard pipe lengths are required, the pipe sections shall be installed in accordance with the manufacturer’s installation guide and shall only be used with the approval of the City Engineer. The minimum pipe length

permitted is 5’ when used to connect to manholes and cleanouts. The minimum pipe length permitted for stub outs shall be 36”.

3.2 TRENCHING, BACKFILLING AND COMPACTION

Trenching, bedding, backfilling and compaction operations shall be performed in accordance with Section 02223.

3.3 DEWATERING

The Contractor shall provide and maintain at all times during construction ample means and devices to promptly remove and dispose all water from any source entering trench excavations or other parts of the work in accordance with Section 02223.

3.4 PIPELINE INSTALLATION

When the work requires and the size of the pipe allows entry of personnel into the pipe, the Contractor shall comply with all Federal and State regulations for confined space entry. Work inside pipelines shall not be undertaken until all the tests and safety provisions of the Code of Federal Regulations 1910.146, and the General Industry Safety Orders of the California Code of Regulations, Title 8, Section 5159 for confined space entry have been performed and the area is verified as safe to enter.

The Contractor shall furnish and install all pipe, specials, fittings, closure pieces, supports, gaskets, jointing materials, and all other appurtenances as shown and as required to provide a complete and workable installation. Pipe installation shall be as recommended in UNI-B-5 except as modified below and as shown on the Approval Plans.

A. Inspect each section of pipe prior to lowering the pipe into the trench. Thoroughly clean the ends of the pipe. Remove foreign matter and dirt from inside of the pipe and keep pipe clean during and after installation.

B. Install pipe according to the manufacturer’s approved order of installation to the proper lines and grades as shown on the Plans.

   1. Pipe shall be installed with pipe bells up-grade. Lay pipes uphill if the grade exceeds 10 percent (10%).

   2. Installation tolerances for the pipe shall not vary more than 2” horizontally or 1” vertically from the alignment and elevation shown on the Plans.

   3. Install the pipe such that the identification markings on each pipe section are continuously aligned for the total length of the pipeline alignment. Orient the strip marking upwards to the 12 o’clock position (top) of the trench opening.

   4. Avoidance of reverse slope: Any pipeline installed with reversed slope, as evidence by ponding of water or sag, is not allowed. Any such pipeline shall be removed and replaced (at proper line and grade) to the nearest upstream and downstream sewer structure as directed by the City Engineer.

C. The pipe shall have firm bearing along its full length, and bell holes shall be provided at each joint to permit visual inspection of the joint and prevent the pipe from being supported by the bell and or coupling.

D. Field cutting and milling shall be accomplished to equal the quality of shop-fabricated ends in accordance with the manufacturer's written instructions.

E. Pipe Assembly: Assemble the pipe joint using the lubricant supplied by the pipe manufacturer. Insert the spigot end into the bell or coupling to proper insertion mark. Check that the elastomeric ring has not left the groove during assembly by passing a feeler gauge around the completed joint. Drive the spigot end into the bell in accordance with the manufacturer's recommendations. Stabbing shall not be permitted.

F. Pipe curvature shall comply with design requirements specified in Chapter 6 of Volume 1 of the Carlsbad Engineering Standards. Mechanical means shall not be used to accomplish bending. Bending should be done manually by workers in the trench. Curvature will be accomplished by bending the pipe rather than deflecting joints.

G. PVC wyes shall be located where shown on the Plans in accordance with the Standard Drawings. Wyes shall not be placed closer than 5' from the exterior of any structure such as manholes.

3.5 SEWER LATERALS

A. The Contractor shall install sewer laterals using wye-branch fittings sized and located as shown on the Plans.

B. All sewer laterals that are to be left unconnected to a building lateral extension shall be capped and identified as shown on the Standard Drawings.

C. All sewer laterals shall run perpendicular from the sewer main to the property line. They shall be bedded, backfilled and compacted the same as the sewer main into which they connect in accordance with Section 02223.

D. All Sewer laterals shall be plugged or capped at the end of the last joint, to withstand the internal pressure during leakage and infiltration testing.

3.6 SADDLE CONNECTIONS TO EXISTING SEWER MAINS

The Contractor shall furnish the saddle fitting, appurtenances and all other materials necessary to complete the connection. The Contractor shall provide all equipment and labor required for the excavation and installation of the connection including, but not limited to backfill and pavement replacement. In certain circumstances the Contractor may be required to provide a water truck, bypass pump, and fittings as part of the equipment for making the connections. Emergency standby equipment or materials may be required of the Contractor by the City Engineer.

Saddle connections to existing sewer mains for the tie-in of new sewer laterals shall be as follows:

A. Prior to construction, Contractor shall pothole the existing pipe at the location of the proposed connection. The City shall inspect the pothole prior to Contractor's repair of trench. Contractor shall record the following information on Record Drawings:

   1. Pipe size, outside diameter.

   2. Pipe type such as PVC or VCP.

   3. Elevation, grade, and alignment.

   4. Can the tie-in be made at the indicated location, assure no collars, pipe bells, fittings or couplings exist in the area of the connection.

   5. Potential conflicts with existing utilities.

B. To facilitate the proposed connection and allow for slight adjustment in alignment, the Contractor shall leave a minimum 10' gap between the new pipe installation and the proposed connection point at the existing main. The Contractor shall leave a gap longer than 10' if conditions warrant, or if directed by the Engineer.

C. After the City Engineer has given approval to proceed with the connection, the Contractor shall schedule the connection with the City Engineer.

   1. Tie-ins will be scheduled at the convenience of the City. Work may be scheduled for nights and weekends if required.

   2. The Contractor shall notify the City Engineer a minimum of five (5) working days in advance of any proposed excavation. Scheduling shall be subject to approval of the City Engineer.

   3. The City Engineer may postpone or reschedule the connection operation if, for any reason, the City Engineer believes that the Contractor is improperly prepared with competent personnel, equipment, or materials to proceed with the connection.

   4. If progress in completing the connection within the time specified is inadequate, the City Engineer may order necessary corrective measures. Corrective measures may consist of directing City personnel or another contractor to complete the work. All costs for corrective measures shall be borne by the Contractor.

D. Contractor may proceed with the excavation and connection, only when approved materials are onsite, connection operations have been scheduled and a copy of the approved traffic control plan has been supplied to the City Engineer.

   1. The Contractor shall saw-cut pavement, excavate and provide and install shoring and steel plating, when necessary, one day prior to the wet tap or cut-in installation.

2. The Contractor shall provide lights, barricades and traffic control in accordance with the Agency of jurisdiction as deemed necessary for the excavation by the City Engineer.

3. After the City Engineer has given approval to proceed, the Contractor shall complete the installation as shown on the Approved Plan in accordance with Standard Specifications including:

   a. Installing the pipe section(s) necessary to make the closure to the new system.

   b. Complete all backfill and compaction of the trench in accordance with Section 02223.

   c. Make all pavement repairs and/or replacement as necessary in accordance with agency of jurisdiction requirements.

   d. Discard pipe and appurtenances removed from service as specified in this Section.

   e. In lieu of a saddle connection, a wye connection may be made by cutting the sewer and installing a wye. All applicable provisions of this Specification will be adhered to in making a cut-in wye connection.

3.7 CONNECTION TO EXISTING SEWER SYSTEMS

A. Connection to the existing sewer system at an existing manhole or dead end shall be made as shown on the Plans in accordance with Section 03460. All work shall be performed in the presence of the City Engineer.

B. In order to prevent accidental use of the new sewer before completion and acceptance, the new inlet to the existing tie-in manhole and outlet of the new upstream manhole shall be sealed with expandable plugs. Installation of plugs shall conform with the manufacturer's recommendations and as approved by the City Engineer. Plugs shall be removed at the time of final inspection or as directed by the City Engineer.

3.8 PIPELINE ABANDONMENT

A. Sewer pipelines specifically identified to be abandoned in-place shall be filled with CLSM. All other inactive sewer lines shall be removed, unless directed otherwise by the City Engineer.

B. Sewer laterals shall be cut and capped at the main or property line, as directed by the City Engineer.

END OF SECTION

SECTION 15064 – POLYVINYL CHLORIDE (PVC) C900 PRESSURE PIPE

PART 1 GENERAL

1.1 DESCRIPTION

This section designates the requirements for the manufacture and installation of polyvinyl chloride (PVC) pressure pipe to be furnished and installed by the Contractor as shown on the Plans and as specified herein.

Specifications for related Work are as follows:

AWWA C900	PVC Pressure Pipe
ANSI A21.10	Ductile Iron and Gray-Iron Fittings
AWWA C110	Ductile Iron and Gray-Iron Fittings
AWWA C153	Ductile Iron Compact Fittings
AWWA Manual M23	Pipe Design and Installation
NSF/ANSI 61	Drinking Water System Components – Health Effects

1.2 RELATED WORK DESCRIBED ELSEWHERE

The Contractor shall refer to the following Specification section(s) for additional requirements:

A. Disinfection of Piping: 15041

B. Hydrostatic Testing of Pressure Pipeline: 15044

1.3 SUBMITTALS

The Contractor shall furnish submittals in accordance with the General Provisions. Submittals are required for the following:

A. Submit Shop Drawings, material lists, manufacturer's literature and catalog cuts and other information. Materials shall be selected from the Approved Materials list.

B. Submit an affidavit from the pipe manufacturer that all delivered materials comply with the requirements of AWWA C900, the Plans and Specifications.

1.4 PAYMENT

A. Payment for the Work in this section shall be included as part of the lump-sum or unit-price bid item for which such Work is appurtenant thereto.

B. When paid by unit price, payment shall be made by the linear foot for each diameter and for each pressure class measured horizontally over the pipe centerline and shall include fittings, thrust blocks and appurtenances unless such items are paid for under a separate bid item.

PART 2 MATERIALS

2.1 GENERAL

Material used to produce the pipe shall be made from Class 12454-A or B rigid polyvinyl chloride compounds in accordance with AWWA C900 Section 2.1 (Basic Materials), with an established hydrostatic design basis (HDB) equal to or greater than 4,000 psi for water at 73.4 degrees F (23 degrees C). Elastomeric gaskets shall comply with the requirements of AWWA C900 Sections 2.1.5 and 2.1.5.1 (Gaskets and Lubricants).

2.2 PIPE

PVC pipe in shall be manufactured in accordance with AWWA C900 and shall be of the size and dimension ratio (DR) shown on the Plans. The pipe shall have integral bell and spigot joints with elastomeric gaskets and outside diameter equivalent to ductile iron or cast iron (CIOD) sizing system unless otherwise shown or specified.

If a pressure class is called for on the Plans, it shall mean the pressure rating (PR) as defined in AWWA C900.

Pipe with nominal diameters of 4 inches through 16 inches shall have a minimum wall thickness of DR 18. When used in pipelines with an operating pressure greater than 150 psi or when specified on the Plans, the wall thickness shall be DR 14.

PVC pressure pipe with nominal diameters of 18 inches or larger shall require the prior approval of the City Engineer.

2.3 MARKINGS

Each pipe length shall be marked showing the nominal pipe size, outside diameter sizing system, pressure rating, and AWWA specification designation in accordance with the marking requirements of AWWA C900.

Pipe color shall conform with the APWA uniform color code for the service application. For potable water use, the pipe color may be white or blue and the pipe shall bear the NSF/ANSI 61 certification.

2.4 FITTINGS

All fittings used in PVC pressure pipe systems shall be ductile iron manufactured in accordance with ANSI A21.10, AWWA C110 or C153. The letters "DI" or "DUCTILE" shall be cast on the fittings unless otherwise approved.

2.5 DEFLECTION COUPLINGS

A. Deflection couplings shall be selected from the Approved Materials List and deflections shall not exceed 80% of the manufacturer’s written recommendations. Depending on the manufacturer, this will result in a maximum allowable deflection of 2° at each bell for a maximum of 4° total deflection with each deflection coupling.

B. PVC deflection couplings for pipe sizes 4” through 12” shall meet the requirements of AWWA C900 and be certified by NSF for use with potable water. Couplings shall have a pressure rating equal to or greater than that of the pipe. Deflection couplings for use with PVC pipe shall be submitted to and approved by the Engineer prior to installation.

C. Deflection in PVC pipe joints for pipe sizes 14” and greater shall be accomplished with the use of ductile iron mechanical joint sleeves or ductile iron fittings conforming to Section 15056 and specifically designed to achieve joint deflection.

2.6 SERVICES SADDLES

Service saddles for PVC pressure pipe shall conform with Section 15057 and be selected from the Approved Materials list.

Service connections to 16 inch and larger water transmission pipe shall not be allowed unless specifically called for on the Plans and approved by the Engineer.

2.7 JOINT RESTRAINT SYSTEMS

Joint restraint systems may be used for PVC pipe when shown on the Plans or with prior approval of the Engineer. The Contractor shall submit shop drawings and catalog data for joint restraint systems in accordance with the General Provisions.

Joint restraint systems shall be ductile-iron and shall consist of a split-ring restraint with machined (not cast) serrations on the inside diameter and connecting bolts and shall be selected from the Approved Materials List.

PART 3 EXECUTION

3.1 PIPE LENGTHS

Laying lengths shall be 20-feet with the manufacturer's option to supply up to 15% random (minimum length 10-feet) sections. Pipe spools shorter than 5 feet shall not be used.

3.2 EARTHWORK

Excavation and backfill, including the pipe bedding, shall conform to the provisions of Section 02223.

3.3 GENERAL INSTALLATION PROCEDURES AND WORKMANSHIP

PVC pressure pipe and fittings shall be installed per AWWA Manual M23 "PVC Pipe-Design and Installation", and as herein specified.

Proper care shall be used to prevent damage in handling, moving, and placing the pipe. Hoist pipe with fork lift or other handling equipment to prevent major damage or shorten its service life. A cloth belt sling or a continuous fiber rope shall be used to prevent scratching the pipe. The pipe shall be lowered and not dropped from the truck. Dropped pipe will be rejected.

Prior to laying the pipe, the bottom of the trench shall be graded and prepared to provide uniform bearing throughout the entire length of each joint of pipe. Bell holes of ample dimension shall be dug in the bottom of the trench at the locations of each joint to facilitate the joining. The trench shall have a flat or semi-circular bottom conforming to the grade to which the pipe is to be laid.

The pipe shall be accurately placed in the trench to the lines and grades on the Plans. Fittings shall be supported independently of the pipe.

3.4 LONGITUDINAL BENDING

Neither longitudinal bending or deflection of integral bell and spigot joints is allowed on PVC pipe. Deflections shall be accomplished with the use of PVC high deflection couplings or ductile iron mechanical joint sleeves. Specialty fittings capable of accommodating deflection at a joint shall be approved by the City Engineer.

3.5 PIPE JOINT ASSEMBLY

Clean the pipe or fitting joint to remove all soil or debris. Lubricate the rubber gaskets for push on or mechanical joints in accordance with the manufacturer's instructions prior to joint assembly. Insert the rubber ring into the groove making sure the ring is completely seated. The spigot and bell shall slide together without displacement or rolling of the rubber gasket.

Pipe laying shall be in the uphill direction and with the pipe bells facing in the direction of laying. The spigot shall be inserted slowly into the bell and into position to the homing mark by use of a large bar lever and a wood block across the pipe end. For large pipe, a cable ratchet (with padding that will not scratch the pipe) may be used. Do not use motorized equipment for joint assembly as over-insertion and pipe damage may occur.

3.6 CONCRETE THRUST BLOCKS

Concrete thrust blocks shall be placed as shown on the Plans and shall conform to the requirement of Section 03000. Concrete blocks shall bear against undisturbed and competent native soil or backfill. The bearing area of the thrust block shall be as shown on the Plans, unless otherwise determined by the City Engineer. The concrete shall be placed, unless specifically shown otherwise on the Plans, so that the pipe joints and fittings will be accessible to repairs. Do not encase PVC pipe in concrete placed for thrust blocks.

3.7 JOINT RESTRAINT SYSTEMS

Joint restraint systems shall be installed at the locations shown on the Plans and in accordance with the manufacturer's recommendations. Joint restraint systems may be used in lieu of concrete thrust blocks with permission of the City Engineer.

3.8 PREVENTING FOREIGN MATTER FROM ENTERING THE PIPE

At all times when pipe laying is not in progress, the open end of the pipe shall be closed with a tight-fitting cap or plug to prevent the entrance of foreign matter into the pipe. In no event shall the pipeline be used as a drain for removing water which has infiltrated into

the trench. The Contractor shall maintain the inside of the pipe free from foreign materials and in a clean and sanitary condition until its acceptance by the City Engineer.

3.9 LEAKAGE TEST

Pipelines and their appurtenances shall be pressure tested in accordance with Section 15044.

3.10 DISINFECTION

Disinfection shall be conducted in accordance with Section 15041.

END OF SECTION

SECTION 15065 – FUSIBLE POLYVINYL CHLORIDE (PVC) PIPE

PART 1 GENERAL

1.1 DESCRIPTION

A. This section specifies fusible polyvinyl chloride (PVC) pipe, including standards for dimensionality, testing, quality, acceptable fusion practice, safe handling, storage and installation of the pipe by sliplining, horizontal directional drilling or conventional trenching and backfilling.

B. Fusible PVC pipe shall be used when a “jointless” pipe system is required for compliance with the pipe separation requirements of the California Water Works Standards, Title 22 CCR. Fusible PVC pipe may also be used for the rehabilitation of existing water mains by the sliplining method, in other trenchless installations or for pipe casings.

1.2 REFERENCE STANDARDS

A. This section contains references to published standards, manuals of practice or guidelines and are incorporated herein by reference as specified and modified. In the event of a conflict between the requirements of this section and those of the listed documents, the requirements of this section shall govern.

B. Unless otherwise specified, references to documents shall mean the documents in effect at the time of contract award.

AWWA C110	Standard for Ductile-Iron and Gray-Iron Fittings
AWWA C111	Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C153	Standard for Ductile-Iron Compact Fittings
AWWA C605	Standard for Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings
AWWA C651	Standard for Disinfecting Water Mains
AWWA C900	Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 in. through 60 in. (100mm Through 1500mm)
AWWA C907	Standard for Injection-Molded Polyvinyl Chloride (PVC) Pressure Fittings, 4 In. Through 12 In. (100 Mm Through 300 Mm), For Water, Wastewater, And Reclaimed Water Service
AWWA M23	AWWA Manual of Supply Practices for PVC Pipe—Design and Installation, Third Edition

ASTM C923	Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals
ASTM D1784	Standard Specification for Rigid Poly Vinyl Chloride (PVC) Compounds and Chlorinated Poly Vinyl Chloride (CPVC) Compounds
ASTM D1785	Standard Specification for Poly Vinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120
ASTM D2152	Test Method for Degree of Fusion of Extruded PolyVinyl Chloride (PVC) Pipe and Molded Fittings by Acetone Immersion
ASTM D2241	Standard Specification for Poly Vinyl Chloride (PVC) Plastic Pipe (SDR-PR)
ASTM D2665	Poly Vinyl Chloride (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings
ASTM D3034	Standard Specification for Type PSM Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings
ASTM F477	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F679	Standard Specification for PolyVinyl Chloride (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings
ASTM F1057	Standard Practice for Estimating the Quality of Extruded Poly Vinyl Chloride (PVC) Pipe by the Heat Reversion Technique
ASTM F1336	Standard Specification for Poly Vinyl Chloride (PVC) Gasketed Sewer Fittings
ASTM F1417	Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air
UNI-B-6	Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe
UNI-PUB-08	Tapping Guide for PVC Pressure Pipe
NSF-14	Plastics Piping System Components and Related Materials
NSF/ANSI 61	Drinking Water System Components – Health Effects
PPI TR-2	PVC Range Composition Listing of Qualified Ingredients

1.3 QUALITY ASSURANCE

A. Manufacturer Requirements

QA/QC testing shall conform with the test methods referenced in the pipe standard stated in Part 2.

B. Fusion Technician Requirements:

Fusion technician(s) shall be qualified by the pipe supplier to install fusible polyvinylchloride (PVC) pipe of the type(s) and size(s) specified. Qualification shall be current as of the actual date of fusion performance on the project.

C. Specified Fusion Process and Pipe Suppliers:

1. The pipe fusion joining process shall be that of Underground Solutions, Inc., Poway, CA, Patent No. 6,982,051.

2. The pipe manufacturer shall be fully experienced, reputable, and qualified in the manufacture of fusible polyvinyl chloride (PVC) products for Underground Solutions, Inc., Poway, CA, (858) 679-9551. Fusible polyvinyl chloride (PVC) pipe marking shall include either Fusible PVC®, Fusible C-900®, or FPVC®.

1.4 SUBMITTALS

A. The following product data shall be required from the pipe supplier and fusion provider:

1. Pipe Size

2. Dimensions

3. Pressure Class or Pressure Rating per applicable standard

4. Color and markings

5. Recommended Minimum Bending Radius

6. Recommended Maximum Safe Pull Force

7. Fusion technician qualification indicating conformance with this specification.

B. The following work plan and information is required from the Contractor. This work plan and information shall also be supplied to the pipe supplier, upon request:

1. The work plan shall include all excavation locations, excavation dimensions, the locations of interfering utilities, and flow bypass and traffic control schematics as applicable.

2. If grout is to be used for filling the annular space in sliplining installations, submit the grout design mix, installation plan and contingency plan for all grouting.

C. Post-Construction Submittals

The Contractor's fusion services provider shall present the following information to the Engineer or pipe supplier upon request:

1. The joint fusion datalogger reports.

2. Fusion joint documentation containing the following information:

   a. Pipe size (Diameter) and Thickness

   b. Fusion Machine Make, Model and Serial Number

   c. Fusion Technician Identification and Qualification Level

   d. Job Identification (Name, Location and/or Project Number)

   e. Fusion Joint Number

   f. Fusion, Heating, and Drag Pressure Settings

   g. Heat Plate Temperature

   h. Time Stamp

   i. Fusion Heating Time and Cool Down Time

   j. Ambient Temperature and Weather Conditions

3. If grout is used in the annular space, present the as-recorded grout testing reports to the Engineer or pipe supplier upon request.

PART 2 PRODUCTS

2.1 FUSIBLE POLYVINYL CHLORIDE (PVC) PIPE

A. Fusible polyvinyl chloride (PVC) pipe used in pressure pipe applications shall conform with AWWA C900 and ASTM D2241. All piping shall be made from PVC compound conforming to cell classification 12454 per ASTM D1784.

B. Schedule series pipe shall conform to ASTM D1785.

C. For non-pressure applications, conform with ASTM D3034 or ASTM D679, as specified in the Contract Documents.

D. Fusible polyvinylchloride (PVC) pipe shall be extruded with plain ends. The ends shall be square to the pipe and free of any bevel or chamfer. There shall be no bell or gasket incorporated into the pipe.

E. Fusible polyvinyl chloride (PVC) pipe shall be manufactured in a standard 40' or 45' nominal length or specified custom lengths.

F. Marking on the pipe exterior shall include:

1. Pipe size (nominal diameter)
2. PVC
3. Dimension Ratio (DR) or Standard Dimension Ratio (SDR) or Schedule (SCH)
4. Pressure Class (PC) or Pressure Rating (PR) for pressure pipe applications
5. Pipe stiffness (PS) may be required for non-pressure pipe applications
6. AWWA or ASTM standard designation
7. NSF/ANSI 61 mark verifying suitability for potable water applications
8. Extrusion production-record code
9. Trademark or trade name
10. Cell Classification 12454 or PVC material designation code 1120
11. Pipe color shall conform with the APWA uniform color code for the service application. The pipe exterior shall be the required color or include exterior stripes of the required color.

2.2 FUSION JOINT ASSEMBLY

A. Unless otherwise specified, fusible PVC pipe shall be assembled via thermal butt-fusion in the field. The Contractor shall follow the pipe supplier's written guidelines and comply with the requirements of Part 1 of this specification.

B. In sliplining applications where the annular space is less than 1.5 inches, the exterior fusion joint bead shall be removed by approved means to provide a smooth, pipe outside diameter with no reduction in diameter at the fusion joint.

2.3 DUCTILE IRON FITTINGS

A. Fittings for use with fusible PVC pipe shall conform with ductile iron flanged, push-on or mechanical joint fittings per AWWA C110, C151or C153.

B. Connections to fusible PVC pipe may be made using a restrained or non-restrained fittings specifically designed for use with PVC pipe including push-on, mechanical joint or flanged fittings.

C. Ductile iron fittings and glands must be installed per the manufacturer's guidelines.

2.4 PVC GASKETED, PUSH-ON FITTINGS

A. PVC pressure fittings for use with fusible polyvinyl chloride pipe require the prior approval of the Engineer and shall conform to AWWA C900 or C907. PVC non-

pressure fittings for use with fusible PVC pipe shall conform to ASTM D3034, F679 or F1336.

B. PVC fittings for joining fusible PVC pipe to other sections of fused or gasket-joint PVC pipe shall include gasketed, push-on type couplings and fittings, including bends, tees, and couplings as shown in the Plans.

C. Bends, tees and other PVC fittings shall be restrained with the use of thrust blocking or other restraint products as indicated in the Contract Documents.

D. PVC gasketed, push-on fittings and mechanical restraints, if used, must be installed per the manufacturer's guidelines.

2.5 FUSIBLE POLYVINYL CHLORIDE PIPE SWEEPS OR BENDS

A. Fusible polyvinyl chloride (PVC) pipe sweeps or bends shall conform to the same sizing convention, diameter, dimensional tolerances, and pressure class of the pipe being joined using the sweep or bend.

B. Fusible polyvinyl chloride (PVC) pipe sweeps or bends shall be manufactured from the same fusible polyvinyl chloride pipe being used for the installation and shall have at least 2 feet of straight section on either end of the sweep or bend to allow for fusion of the sweep to the pipe installation.

C. Standard fusible polyvinyl chloride pipe sweep or bend angles shall not be greater than 22.5 degrees and shall only be allowed for nominal diameters ranging from 4-inch through 16-inch.

2.6 SLEEVE-TYPE COUPLINGS

A. Sleeve-type, mechanical couplings shall be manufactured for use with PVC pipe and may be restrained or unrestrained as indicated in the Contract Documents.

B. Sleeve-type couplings shall be rated at the same, or greater, pressure as the pipe.

2.7 EXPANSION AND FLEXIBLE COUPLINGS

A. Only expansion-type mechanical couplings manufactured for use with PVC pipe shall be permitted and may be restrained or unrestrained as indicated in the Plans.

B. Expansion-type mechanical couplings shall be rated at the same, or greater, pressure as the pipe.

2.8 CONNECTION HARDWARE

A. Unless otherwise specified, bolts and nuts for buried service shall be made of non-corrosive, high-strength, low-alloy steel having the characteristics specified in ANSI/AWWA C111/A21.11, regardless of any other protective coating.

2.9 CONNECTION TO SANITARY SEWER MANHOLES AND STRUCTURES

A. Fusible polyvinyl chloride (PVC) pipe shall be connected to manholes and other structures to provide a leak-free, properly graded flow into or out of the manhole or structure.

B. Unless otherwise indicated in the Contract Documents, connections to existing manholes and structures shall be the following:

1. For cored or drilled openings, install a flexible, watertight connection that meets and/or exceeds ASTM C923.

2. For knock-out openings, install a watertight connection (waterstop or mechanical link seal) meeting the material requirements of ASTM C923 that is securely attached to the pipe with stainless steel bands or other means provided in the Contract Documents.

3. Fill the openings in manhole walls with a non-shrink, epoxy grout. Concrete collars shall be poured around pipe and outside manhole openings. Install flexible pipe joints or flexible connectors within 2 feet of the collar.

C. Unless otherwise indicated in the Contract Documents, connections to a new manhole or structure shall be the following.

1. A flexible, watertight gasket per ASTM C923 shall be cast integrally with riser section(s) for all precast manholes and structures.

2. Drop connections shall be installed where shown on the Plans.

3. Joint gaps and openings around the connection shall be grouted with non-shrink grout.

2.10 GROUT

A. When specified or shown on the Plans, grout used to fill the annular space between the fusible PVC carrier pipe and the host pipe shall be a non-pervious closed cell, low-density, highly flowable cellular concrete. Grout shall meet the following requirements:

1. Portland cement shall comply with ASTM C150 (Type I, II or III).

2. Fly ash: Class C or Class F and compatible with foaming agent.

3. Water shall be free from deleterious substances.

4. Foaming agent shall conform to ASTM C796.

5. Admixtures for water reducing, retarding, accelerating, and other specific properties may be used when recommended by the manufacturer of the foaming agent.

6. Cast Density: 40 – 60 lbs./cubic foot.

7. Compressive Strength (28 Days): 50 – 80 psi

8. Flow Consistency, ASTM D6103: Greater than 7 inches

B. Testing shall conform with the requirements of the Contract Documents. Grout additives to improve its flow properties shall be permitted, provided that the grout strength property requirements are met.

2.11 PIPE PULL HEADS

A. Pipe pull heads and their connection to the pipe shall employ a positive through-bolt design that provides a smooth pull head exterior against the host pipe interior throughout the pipe insertion. The connection shall be designed to withstand the calculated pulling forces.

B. Pipe pull heads shall be specifically designed for use with fusible PVC pipe and shall be as recommended by the pipe supplier.

2.12 PIPE ROLLERS

A. Pipe rollers shall be sized to fully support the weight of the pipe during handling and pullback operations.

B. To assure adequate support and resist excessive sagging of the pipe, the quantity and spacing of pipe rollers shall be per the pipe supplier's guidelines.

PART 3 EXECUTION

3.1 DELIVERY AND OFF-LOADING

A. All pipes shall be bundled or packaged in such a manner as to provide adequate protection of the ends during transportation to the site. Any pipe damaged in shipment shall be replaced as directed by the Engineer.

B. Each pipe shipment shall be inspected prior to unloading to see if the load has shifted or otherwise been damaged. The Engineer shall be notified immediately if more than immaterial damage is found. Each pipe shipment shall also be checked for quantity and proper pipe size and type.

C. Pipe shall be loaded, off-loaded, and otherwise handled in accordance with AWWA M23, and all the pipe supplier's guidelines shall be followed.

D. Off-loading devices such as chains, wire rope, chokers, or other pipe handling implements that may scratch, nick, cut, or gouge the pipe are strictly prohibited.

E. During off-loading and handling, care shall be taken to avoid the pipe striking hard objects. Substantial impact could cause damage, particularly during freezing weather.

F. If appropriate unloading equipment is not available, pipe may be unloaded by removing pieces individually. Care should be taken to ensure that pipe is not dropped or damaged. Pipe shall be carefully lowered, not dropped, from trucks.

3.2 HANDLING AND STORAGE

A. Visibly damaged pipe sections and sections with suspected damage, shall be segregated and set aside for thorough evaluation.

B. Any damage, scratch or gouge that is deeper than 10% of the wall thickness shall be significant and is basis for rejection unless determined acceptable by the Engineer. Significantly damaged pipe sections shall be rejected or cut out. Cutting shall be performed according to the pipe supplier's recommendations.

C. Pipe lengths should be stored and placed on level ground. Pipe should be stored at the job site in the unit packaging provided by the manufacturer. Caution shall be exercised to avoid compression, damage, or deformation to the ends of the pipe. The interior of the pipe, as well as all end surfaces, should be kept free from dirt and foreign matter.

D. Pipe shall be handled and supported with the use of woven fiber pipe slings or approved equal. Care shall be exercised when handling the pipe to not cut into, gouge, scratch or otherwise abrade the pipe.

E. If pipe is to be stored for more than 6 months, cover or otherwise shield the pipe from direct sunlight. If the pipe is shielded with a cover, adequate air circulation above and around the pipe shall be provided to prevent excess heat from accumulating.

F. Pipe shall be stored and stacked per the pipe supplier's guidelines.

3.3 FUSION PROCESS

A. General Requirements

1. Fusible polyvinylchloride (PVC) pipe shall be handled in a safe and non-destructive manner before, during, and after the fusion process and in accordance with this specification and pipe supplier's guidelines.

2. Fusible polyvinylchloride pipe shall be fused by qualified fusion technicians, as documented by the pipe supplier.

3. Each fusion joint shall be recorded and logged by an electronic monitoring device (data logger) properly connected to the fusion machine.

4. Only appropriately sized and outfitted fusion machines that have been approved by the pipe supplier shall be used for the fusion process. Fusion machines must incorporate the following elements:

a. Heat Plate - Heat plates shall be in good condition with no deep gouges or scratches. Plates shall be clean and free of any debris or contamination. Heater controls shall function properly. The cord and plug shall be in good condition. The appropriately sized heat plate shall be capable of maintaining a uniform and consistent heat profile and

temperature for the size of pipe being fused, per the pipe supplier's guidelines.

b. Carriage – The carriage shall travel smoothly with no binding at less than 50 psi. Jaws shall be in good condition with proper inserts for the pipe size being fused. Insert pins shall be installed with no interference to carriage travel.

c. Fusion Machine Overview - The entire fusion machine shall be examined for defects, missing parts, or potential safety issues. All issues shall be rectified prior to use.

d. Data Logging Device – An approved electronic datalogging device with the current version of the pipe supplier's recommended and compatible software shall be used. The operation and maintenance manual shall always be kept with the datalogging device. If fusing for extended periods of time, an independent 110V power source shall be available to extend battery life.

5. Other equipment specifically required for the fusion process shall include the following:

a. Pipe rollers shall be used to adequately support the pipe on both sides of the machine

b. A weather protection canopy or like protection that allows full machine motion of the heat plate, fusion assembly and carriage shall be provided for fusion in inclement, extreme temperatures, and/or windy weather conditions, per the pipe supplier's recommendations. When the pipe temperature is below 40°F, the pipe supplier's cold weather operating procedures shall be followed.

c. An infrared (IR) pyrometer with an accuracy of ±1% or better, shall be used to check pipe and heat plate temperatures.

d. The fusion machine operations and maintenance manual shall always be kept with the fusion machine.

e. Facing blades specifically designed for use on fusible PVC pipe shall be used.

B. Fusion Joint Report Requirements

1. Each fusion joint shall be recorded and logged by an electronic monitoring device (data logger) connected to the fusion machine. The fusion data logging report shall be generated by software developed specifically for the butt-fusion of fusible polyvinyl chloride (PVC) pipe. The software shall register and/or record the parameters required by the pipe supplier and these specifications.

2. Pertinent data not logged by the data logger shall be logged manually and be included in the Fusion Technician's report.

3.4 HOST PIPE PREPARATION

A. In sliplining applications, the host pipe shall be cleaned in accordance with all applicable standards and guidelines. Unless otherwise specified, all interior pipe surfaces shall be cleaned per AWWA M28. The number of cleaning passes will depend on the method used and what is needed to create a uniform interior host pipe surface that is free of all loose material and sharp edges. Any potentially deleterious areas of the host pipe should be removed or secured in place, prior to the insertion of fusible polyvinyl chloride (PVC) pipe.

B. Hazardous materials shall be removed and disposed of per all applicable requirements and regulations.

3.5 VIDEO INSPECTION

A. The host pipe shall be inspected by video camera after or during the cleaning process in accordance with these specifications.

B. Video camera inspection after host pipe cleaning shall indicate condition of host pipe and the suitability of host pipe for fusible PVC pipe insertion.

C. Obstructions such as corporation taps, valves and valve bodies, and collapsed piping shall be remedied prior to pipe insertion. Spot repairs shall be made in accordance with the Plans and these specifications.

3.6 FUSIBLE POLYVINYL CHLORIDE (PVC) PIPE INSTALLATION

A. Access pit excavations shall be performed at all points where the fusible PVC pipe will be inserted into the existing pipeline. When possible, access pit excavations shall coincide with host pipe lateral connection points or other appurtenance locations.

B. Access pit length shall be such that the minimum bending radius, per the pipe supplier, for the fusible PVC pipe is maintained. Sheeting, shoring and bracing shall conform with applicable worker safety requirements and regulations.

C. Pipe shall be handled with care to minimize the possibility of it being cut, kinked, gouged, or otherwise damaged. Metal cables or hooks shall not be permitted.

D. The pulling mechanism shall be properly connected to the end of the fusible PVC pipe via a pulling head or arrangement approved by the pipe supplier.

E. The maximum pulling tension on the pipe shall not exceed the pipe supplier’s recommended safe pulling force.

F. If possible and immediately following the completion of an installation by sliplining, the pipe should be pushed back into the host pipe, at the pulling head, until a small amount of pipe movement is observed at the insertion pit, i.e., on the other end of the installation from the pulling equipment.

G. Damaged, cut, or gouged fusible PVC pipe shall be removed by cutting out the damaged section(s) of pipe. Cutting and beveling shall be performed according to the pipe supplier's recommendations.

H. Field bending involves excavating the trench to the desired bend radius which shall not exceed the pipe manufacturer's minimum allowable bending radius, then sweeping or pulling the pipe string into the required bend and placing it in the trench. Temporary restraints may be required to bend the pipe, and to maintain the bend while placing the pipe in the trench and placing initial backfill. Temporary blocks or restraints must be removed before installing final backfill, and any voids must be filled with compacted initial backfill material. Considerable force may be required to field bend the pipe, and the pipe may spring back forcibly if the restraints slip or are inadvertently released while bending. Observe appropriate safety precautions during field bending.

3.7 ANNULAR SPACE GROUTING

A. If required in the Contract Documents, the annular space between the outside of the fusible polyvinylchloride (PVC) pipe and the inside of the existing host pipe can be filled with a flowable grout in accordance with the Contract Documents.

B. Samples of grout shall be obtained in accordance with ASTM C495. One set of four standard cylinders shall be cast for each grout batch. Special handling and sampling procedures shall be followed if indicated by the grout manufacturer. The samples must meet the design compressive strength of the grout as outlined in the Contract Documents and per the grout manufacturer. Samples shall be tested in accordance with ASTM C495.

C. The fusible PVC pipe shall be filled with water prior to grouting. This shall aid in keeping the pipe from excessive floating or collapsing during grouting and aid in dissipating the grout's heat of hydration as the grout cures. The water filling can be done in conjunction with the post-installation pipe pressure testing.

D. Grouting of the annular space shall be done in such a manner as to prevent damage or collapse of the fusible polyvinyl chloride (PVC) pipe. Grouting operations shall be properly vented and grouting pressures monitored. Grouting pressure shall be limited to no higher than 5 psi.

E. If the grouting pressure exceeds the allowable pressure, additional grouting points shall be installed by the Contractor.

3.8 CONNECTIONS TO ADJOINING PIPE SYSTEMS

A. The fused pipe string shall be completely assembled and successfully tested and disinfected prior to making connections to existing pipe systems.

B. The sizes, type and locations of adjoining piping systems shall be verified in the field prior to making connections.

C. All required fittings, which may include saddles, sleeve type couplings, flanges, tees, or others as shown in the construction documents shall be delivered to their respective connection location(s) as shown on the Plans.

D. All temporary pumps and/or pipes shall be in place and operational in accordance with the Contract Documents prior to making connections.

E. Pipe connections shall be installed per applicable standards and regulations and the fitting or structure manufacturer's guidelines and as indicated in the Contract Documents. Pipe connections shall be installed in accordance with the connection details shown on the Plans.

3.9 HYDROSTATIC TESTING OF PRESSURE PIPELINES

A. Hydrostatic pressure and leakage testing shall be conducted according to and comply with AWWA C605 and Section 15044. Leakage testing shall comply with all applicable codes and standards.

B. Fused pipe strings may be tested separately in accordance with standard testing procedures and safety practices, when approved by the Engineer. The limits of the specific test sections shall be submitted to the Engineer for review.

C. Prior to pressure testing the following preparations shall be completed:

1. All air must be vented from the pipeline prior to pressurization. This may be accomplished with the use of the air relief valves or corporation stop valves, vent piping in the testing hardware or end caps, or any other method which adequately allows air to escape the pipeline at all high points. Venting may also be accomplished by 'flushing' the pipeline in accordance with the parameters and procedures as described in AWWA C605.

2. The pipeline must be fully restrained prior to pressurization. This includes complete installation of approved mechanical restraints per the restraint manufacturer's guidelines, whether permanent or temporary to the final installation. This also includes the installation and curing of all required thrust blocking. All appurtenances included in the pressure test, including valves, blow-offs, and air-relief valves shall be checked for proper installation and restraint prior to beginning the test.

3. Temporary pipeline alignments that are being tested, such as those that are partially installed in their permanent location shall be configured to minimize the amount of potentially trapped air in the pipeline.

3.10 LEAKAGE TESTING FOR NON-PRESSURE PIPING

A. Gravity sanitary sewer leakage testing may include appropriate water or low-pressure air testing. The leakage outward or inward (exfiltration or infiltration) shall not exceed 25 gallons per inch of pipe diameter per mile per day for any section of the system. Water exfiltration or infiltration test shall be performed with a minimum positive head of two feet. The air test, when used, shall be conducted in accordance with either ASTM F1417 or UNI-B-6.

B. Gravity sanitary sewers that contain mechanical jointing in addition to fused PVC joints shall be tested for leakage in accordance with Section 15043.

3.11 DISINFECTION OF POTABLE WATER PIPING

A. After installation and successfully passing all required hydrostatic testing, the fusible polyvinyl chloride (PVC) pipeline shall be disinfected prior to being put into service. Unless otherwise directed by the Engineer, the pipeline will be disinfected per AWWA C651 and Section 15041.

B. Chlorine granules shall not be used or be present near the pipe ends while the pipe sections are being joined.

END OF SECTION

SECTION 15068 – HIGH DENSITY POLYETHYLENE PIPE

PART 1 GENERAL

1.1 DESCRIPTION

This section designates the requirements for the manufacture and installation of high density polyethylene pipe (HDPE) to be furnished and installed by the Contractor at the location and to the lines and grades shown on the Plans and as herein specified.

1.2 REFERENCE STANDARDS

The latest editions of the following standards are herein incorporated by reference.

ASTM D2321 Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications

ASTM 2837 Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products

ASTM D3035 Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter

ASTM D3261 Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing

ASTM D3350 Standard Specification for Polyethylene Plastics Pipe and Fittings Materials

ASTM F714 Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter

ASTM F1055 Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing

ASTM F1290 Standard Practice for Electrofusion Joining Polyolefin Pipe and Fittings

ASTM F2164 Standard Practice for Field Leak Testing of Polyethylene Pressure Pipe Systems Using Hydrostatic Pressure

AWWA C906 Polyethylene (PE) Pressure Pipe and Fittings, 4 In. through 65 In. (100 Mm through 1,650 Mm), for Waterworks

AWWA M55 PE Pipe – Design and Installation

PPI TR-3 Policies and Procedures for Developing Hydrostatic Design Basis (HDB), Hydrostatic Design Stresses (HDS), Pressure Design Basis (PDB), Strength Design Basis (SDB), Minimum Required Strength (MRS) Ratings, and Categorized Required Strength (CRS) for Thermoplastic Piping Materials or Pipe

1.3 RELATED WORK DESCRIBED ELSEWHERE

Refer to the following Specification section(s) for additional requirements:

A. Trenching, Excavation, Backfilling & Compacting: 02223

B. Open Trench Pipe Casing: 15121

1.4 SUBMITTALS

A. Submit the following product data:

1. Pipe diameter and wall thicknesses and shop drawings showing dimensions of all fabricated fittings

2. Pressure Class or Pressure Rating per applicable standard

3. Color and markings

4. Quality control program for the manufacturing of HDPE pipe and fittings

5. Recommended minimum pipe bending radius and maximum safe pull force

B. Submit a Work Plan showing or describing the following information:

1. Fusion technician qualification indicating conformance with the quality assurance requirements of this specification.

2. Staging areas for excavation locations and dimensions, the locations of adjacent utilities and monitoring or protection methods, flow bypass, and/or traffic control plans, as applicable.

C. If grout is to be used for filling the annular space in sliplining installations, submit the grout design mix, installation plan and contingency plan for all grouting.

D. Submit the following post-construction information to the Engineer:

1. The joint fusion datalogger reports.

2. Fusion joint documentation containing the following information:

a. Pipe size (Diameter) and Thickness

b. Fusion Machine Make, Model and Serial Number

c. Fusion Technician Identification and Qualification Level

d. Job Identification (Name, Location and/or Project Number)

e. Fusion Joint Number

f. Fusion, Heating, and Drag Pressure Settings

g. Heat Plate Temperature

h. Time Stamp

i. Fusion Heating Time and Cool Down Time

j. Ambient Temperature and Weather Conditions

1.5 QUALITY ASSURANCE

A. The Contractor shall ensure that heat fusion technicians have received training in the manufacturer's recommended procedures. The Contractor shall maintain records of trained personnel and shall certify that training was received not more than 12 months before commencing construction. Submit certifications to the Engineer in accordance with the General Provisions.

B. The pipe and/or fitting manufacturer's production facility shall be available for inspection by the Engineer or designated representative with reasonable advance notice. During inspection, the manufacturer shall demonstrate that the facility is capable of manufacturing and testing the pipe and/or fittings to the standards required by this specification.

PART 2 MATERIALS

2.1 GENERAL

A. HDPE pipe and fittings shall conform with material designation PE 4710 and shall be manufactured in accordance with ASTM D3350 with outside diameter pipe size (IPS or DIPS) and pressure class or dimension ratio (DR) as specified on the Plans.

B. HDPE pipe color or color identification markings shall conform to the APWA uniform color code for the service application and be approved by the Engineer. This requirement may be waived for pipe used as a casing with the written approval of the Engineer.

C. HDPE pipe and fittings shall be supplied by the same manufacturer. Pipe and fittings from different manufacturers shall not be interchanged without each manufacturer's written certification that the materials are compatible for the intended use.

D. Products intended for contact with potable water shall be certified to the requirements of NSF/ANSI 61 by a certification organization accredited by the American National Standards Institute.

2.2 PIPE MATERIAL

A. Materials used for the manufacture of polyethylene pipe and fittings shall be high density polyethylene conforming to cell classification 445474C or E per ASTM D3350; and shall be as listed in the name of the pipe and fitting manufacturer in the Plastic Pipe Institute's Recommended Hydrostatic and Design Stresses for Thermoplastic Pipe and Fittings Compounds, with a standard grade HDB rating of 1,600 psi at 73 F per ASTM D2837 and PPI TR-3. The manufacturer shall provide

a certification that the materials used in the fabrication of pipe and fittings meets these requirements.

B. Polyethylene pipe shall be manufactured in accordance with ASTM F714 and shall be so marked. Each production lot of pipe shall be tested for (from material or pipe) melt index, density, percent carbon, (from pipe) dimensions and ring tensile strength. The results of these tests shall be submitted to the Owner for review.

2.3 FITTINGS

A. Butt Fusion Fittings

1. Butt fusion fittings shall conform with ASTM D3261 and shall be manufactured by injection molding, a combination of extrusion and machining, or fabricated from HDPE pipe conforming to this specification.

2. All fittings shall be pressure rated to provide a working pressure rating no less than that of the pipe.

3. Fabricated fittings shall be manufactured using a McElroy Datalogger to record fusion joints made in the fabrication and shall be maintained as part of the quality control program. The fitting shall be homogenous throughout and free of visible cracks, holes, foreign inclusions, voids, or other defects.

B. Electrofusion Fittings:

1. Electrofusion fittings shall be the same base resin as the pipe.

2. Fittings shall have a minimum pressure rating equal to or greater than the pipe to which they are joined unless otherwise specified by the engineer.

3. Electrofusion fittings shall not be permitted when subjected to pipe bending forces associated with the installation process.

C. Flanged and Mechanical Joint Adapters:

1. Flanged and mechanical joint adapters shall be the same base resin as the pipe. Flanged and mechanical joint adapters shall have a manufacturing standard of ASTM D3261.

2. All adapters shall be pressure rated to provide a working pressure rating no less than that of the pipe.

3. Flange adapters shall be made with sufficient through-bore length to be clamped in a butt fusion joining machine without the use of a stub-end holder.

D. Mechanical Joint Restraint:

1. Mechanical joint restraint for HDPE may be provided by mechanical means separate from the mechanical joint gasket sealing gland. The restrainer shall provide wide, supportive contact around the full circumference of the pipe and be equal to the listed widths. Means of restraint shall be machined serrations

on the inside surface of the restrainer equal to or greater than the listed serrations per inch and width. Loading of the restrainer shall be by a ductile iron follower that provides even circumferential loading over the entire restrainer. Design shall be such that restraint shall increase with an increase in line pressure.

2. Serrated restrainer shall be ductile iron ASTM A536, Grade 65-45-12 with a ductile iron follower; bolts and nuts shall be corrosive resistant, high strength quality alloy steel.

3. The restrainer shall have a pressure rating of, or equal to that of the pipe on which it is used or 150 PSI whichever is greater. Restrainer shall be ASC Engineering Solutions, Gruvlok Figure 7305 HDPE coupling or approved equal.

4. Mechanical joint restraint gasket properties shall conform to the requirements of ANSI/AWWA C111.

5. Pipe stiffeners shall be used in conjunction with restrainers. The pipe stiffeners shall be designed to support the interior wall of the HDPE. The stiffeners shall support the pipe's end and control the "necking down" reaction to the pressure applied during normal installation. The pipe stiffeners shall be formed of 316 stainless steel to the HDPE manufacturers published average inside diameter of the specific size pipe. Stiffeners shall be by JCM Industries or pre-approved equal.

2.4 COMPLIANCE TESTS

A. The manufacturer's inspection and testing program shall comply with applicable ASTM standards. A list of the inspection and test certifications shall be submitted prior to the shop drawing submittal for HDPE pipe and fittings.

B. In case of conflict with the manufacturer's certifications, the Contractor, the Engineer, or the Owner may request retesting by the manufacturer or have retests performed by an outside testing service. All retesting of failed tests shall be paid for by the manufacturer.

PART 3 – EXECUTION

3.1 GENERAL

A. Polyethylene pipe and fittings shall be handled, assembled and installed in accordance with the applicable sections of AWWA C906, ASTM D2774 or ASTM D2321, as applicable, and the manufacturer's recommendations and as specified herein.

3.2 EXCAVATION, BEDDING AND BACKFILL

A. Excavation and backfill, including the pipe bedding and pipe zone backfill, shall conform with Section 02223.

3.3 PIPE HANDLING

A. Unloading, inspection and handling of HDPE pipe shall follow the manufacturer's written procedures and AWWA Manual M55.

B. Use wide fabric choker slings capable of safely carrying the load to handle pipe and fittings. Slings shall be of sufficient capacity for the load and shall be inspected before use. Wire rope or chain or worn or damaged equipment shall not be used.

3.4 FUSION AND JOINING

A. Polyethylene pipe and fittings may be joined together or to other materials by means of flanged connections, mechanical couplings designed for joining polyethylene pipe or for joining polyethylene pipe to another material, or electrofusion as shown on the Plans or as approved by the Engineer. The installation instructions of the joining device manufacturer shall be strictly followed when joining by other means is performed.

B. Butt Fusion: Sections of polyethylene pipe should be joined into continuous lengths on the jobsite above ground. The joining method shall be the butt fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations. The butt fusion equipment used in the joining procedures should be capable of meeting all conditions recommended by the pipe manufacturer, including but not limited to, temperature requirements of 400 degrees Fahrenheit, alignment, and an interfacial fusion pressure of 75 PSI. The butt fusion joining will produce a joint weld strength equal to or greater than the tensile strength of the pipe itself. All field welds shall be made with fusion equipment equipped with McElroy Data Logger. Temperature, fusion pressure and a graphic representation of the fusion cycle shall be part of the quality control records. Interior or exterior beads from butt fusion welds shall be removed when specified.

C. Electrofusion: Electrofusion joining shall be done in accordance with the manufacturers recommended procedure. Other sources of electrofusion joining information are ASTM F1290, PPI TN 34, and PPI Municipal Advisory Board (MAB) Generic Electrofusion Procedure for Field Joining of 12 Inch and Smaller Polyethylene (PE) Pipe. The electrofusion processor must be capable of reading and storing the input parameters and the fusion results for later download to a record file.

D. Sidewall Fusion: Sidewall fusion for connections to outlet piping shall be performed in accordance with HDPE pipe and fitting manufacturer's specifications. The heating irons used for sidewall fusion shall have an inside diameter equal to the outside diameter of the HDPE pipe being fused. The size of the heating iron shall be ¼ inch larger than the size of the outlet branch being fused.

E. Mechanical Joining: Bolted joining may be used in non-pressure pipe applications or where the butt fusion method cannot be used and with the approval of the Engineer. Flange joining will be accomplished by using HDPE flange adapter with a ductile iron back-up ring. Mechanical joint joining will be accomplished using either a molded mechanical joint adapter or the combination of a Sur-Grip Restrainer and Pipe Stiffener as manufactured by JCM Industries, Inc. Either mechanical joining method will have a ductile iron mechanical joint gland.

F. Other: Socket fusion, hot gas fusion, threading solvents, and epoxies may not be used to join HDPE pipe.

3.5 FIELD BENDING

A. Field bending involves excavating the trench to the desired bend radius which shall not exceed the pipe manufacturer's minimum allowable bending radius, then sweeping or pulling the pipe string into the required bend and placing it in the trench. Temporary restraints may be required to bend the pipe, and to maintain the bend while placing the pipe in the trench and placing backfill. Temporary blocks or restraints must be removed before installing final backfill, and any voids must be filled with compacted backfill material.

B. Considerable force may be required to field bend the pipe, and the pipe may spring back forcibly if the restraints slip or are inadvertently released while bending. Observe appropriate safety precautions during field bending.

3.6 PREVENTING FOREIGN MATTER FROM ENTERING THE PIPE

A. At all times when pipe laying is not in progress, the open end of the pipe shall be closed with a tight-fitting cap or plug to prevent the entrance of foreign matter into the pipe. In no event shall the pipeline be used as a drain for removing water which has infiltrated into the trench. The Contractor shall maintain the inside of the pipe free of foreign materials and in a clean and sanitary condition until its acceptance.

3.7 DAMAGED PIPE OR FITTINGS

A. Sections of pipe with cuts or gouges in excess of 10% of the pipe wall thickness shall be cut out and removed. The undamaged portions of the pipe shall be rejoined using the heat fusion joining method.

3.8 BUTT FUSION WELD TESTING

A. On every day that butt fusion welds are made, the first fusion joint of the day shall be a trial fusion. The trial fusion shall be cooled completely, then fusion test straps shall be cut. The test strap shall be 12-inches minimum or 30 times the wall thickness in length with the fusion in the center, and 1-inch minimum or 1.5 times the wall thickness in width. Bend the test strap until the ends of the strap touch. If failure occurs at the fusion joint, a new trial fusion shall be made, cooled completely and tested.

B. Butt fusion of the pipe to be installed shall not commence until a trial fusion joint has passed the bent strap test.

3.9 PRESSURE TESTING

A. All pressure pipelines shall be flushed and tested in accordance with Section 15044 and the applicable provisions of AWWA M55.

B. There will be no leakage allowed for butt-fused portions of the pipeline.

3.10 DISINFECTION

Pipe used for potable water mains shall be disinfected in accordance with Section 15041.

END OF SECTION

SECTION 15074 – BLOW-OFF ASSEMBLIES

PART 1 GENERAL

1.1 DESCRIPTION

This section includes requirements for materials, testing, and installation of blow-off assemblies.

1.2 RELATED WORK SPECIFIED ELSEWHERE

CMWD Standard Drawings

CMWD Standard Specifications 09900, 15000, 15041, 15044, 15056, 15057, 15061, 15064, 15065 and 15100

1.3 SERVICE APPLICATION

A. The use of blow-off assemblies shall be limited to locations where pipeline draining using fire hydrants is deemed impractical and at the discretion of the City Engineer.

B. Blow-off assemblies shall be installed on potable water and recycled water mains.

C. Blow-off assemblies shall be sized and located as shown on the Plans. In general, blow-off assemblies will be installed at low points of pipelines as follows:

1. 2” blow-off assemblies or multiple 2” blow-off assemblies shall apply to pipelines with diameters 4” through 16”.

2. 6” blow-off assemblies shall apply to pipelines with 18” and larger diameters.

1.4 WARNING/IDENTIFICATION TAPE

Warning/Identification Tape shall be installed for blow-off assemblies in accordance with Section 15000.

PART 2 MATERIALS

2.1 GENERAL

Blow-off assemblies and appurtenant components and materials shall be selected from the Approved Materials List.

2.2 CONCRETE

Concrete thrust or anchor blocks shall be placed as shown on the Plans and in accordance with Section 03000.

2.3 WARNING/IDENTIFICATION TAPE

Warning/Identification tape materials shall conform with Section 15000 and the Approved Materials List.

2.4 FIELD PAINTING AND COATING

Field painting and coating materials shall conform with Section 09900 and the Approved Materials List.

PART 3 EXECUTION

3.11 INSTALLATION

A. Blow-off assemblies shall be installed at locations shown on the Plans or as directed by the Engineer in accordance with the Standard Drawings.

B. Blow-off assemblies utilizing a service saddle shall be connected to water mains no closer than 24” to a bell, coupling, joint or fitting. Blow-off assemblies requiring a push-on or mechanical joint ductile iron tee shall be no closer than 5 feet to the center of a bell, coupling, joint or fitting.

3.12 CONCRETE

Concrete thrust or anchor blocks shall be placed as shown on the Plans in accordance with Section 03000.

3.13 WARNING/IDENTIFICATION TAPE

Warning/Identification Tape shall be installed in accordance with Section 15000 and the Standard Drawings.

3.14 DISINFECTION OF BLOWOFF ASSEMBLIES

Blow-off assemblies shall be disinfected in accordance with Section 15041 in conjunction with disinfecting the main to which it is connected. Blow-off assembly valves shall be operated and the assembly shall be flushed to completely disinfect all internal parts.

3.15 HYDROSTATIC TESTING

Blow-off assemblies shall be hydrostatically tested in accordance with Section 15044 in conjunction with hydrostatically testing the pipeline to which it is connected.

END OF SECTION

SECTION 15099 – PROCESS VALVES, REGULATORS AND MISCELLANEOUS VALVES

PART 1 GENERAL

1.1 DESCRIPTION

This section includes materials, testing and installation of manually operated process valves such as check valves, pressure control valves, pressure reducing valves and ball valves.

1.2 REFERENCE STANDARDS

The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

ASTM B62 Standards for Ball Vales

AWWA C508 Standards for Swing Check Valve

1.3 RELATED WORK SPECIFIED ELSEWHERE

CMWD Standard Drawings

CMWD Specification Sections 09900, 15000, 15041, 15044, 15057, 15074, 15108 and 15112

1.4 SERVICE APPLICATIONS

Check valves, pressure control valves, pressure reducing valves, bronze gate valves and ball valves are primarily used in the installation of potable and recycled water main appurtenances and where called for on the Plans and indicated on the Standard Drawings.

1.5 SUBMITTALS

The following items shall be submitted to the Engineer for review and approval prior to procurement in accordance with the General Provisions:

A. The valve manufacturers catalog data showing the size to be used, valve dimensions, pressure rating and materials of construction.

B. For potable water installations, NSF 61 certification on the lining materials to be used.

C. Installation procedures including field adjustments as required.

1.6 SIZING OF VALVES

Valves shall be the same size as the appurtenance in which they are to be installed with unless otherwise called for on the Plans or indicated on the Standard Drawings.

1.7 VALVE ENDS

Valve ends shall be compatible with the piping system or appurtenance in which they are to be installed or as called for on the Plans or indicated on the Standard Drawings.

1.8 DELIVERY, STORAGE AND HANDLING

Valves shall be delivered and stored in accordance with the manufacturer's recommendations. Valves shall remain in factory packaging until ready for installation. Valves shall not be stored in contact with bare ground.

1.9 POLYETHYLENE WRAP

Polyethylene wrap shall be used for the buried installation of valves in accordance with Section 15000.

1.10 VALVE BOX ASSEMBLY AND EXTENSION STEM

Valve boxes and extension stems shall be installed on all isolation valves 4" and larger in accordance with Section 15000 and the Standard Drawings.

PART 2 MATERIALS

2.1 CHECK VALVE – RUBBER-FLAPPER

A. Rubber-flapper check valves and appurtenant components shall conform with AWWA C508 and be selected from the Approved Materials List.

B. Rubber-flapper check valves shall have a ductile-iron body and cover with flanged ends conforming with Section 15056. Check valves shall have full pipe size flow area.

C. The disc shall be steel encapsulated in nylon-reinforced Buna-N with an integral O-ring seating edge. The flapper shall be secured between the body and the body cover with a Buna-N encapsulated rod to permit the flapper to flex from closed to fully open position during flow through the valve. Flapper shall be easily removed without need to remove valve from line. The seating surface shall be inclined at 45-degrees from the pipe centerline. The flapper shall travel 35 degrees from closed to fully open position for minimum head loss and non-slam closure.

D. Buna-N flapper shall be reinforced with high-strength fabric from the disc to the rod. An external hold-open device to allow backflow for pipeline draining shall be furnished.

E. Check valves shall be tested by the manufacturer and the test results shall be approved by the City Engineer prior to shipment. Check valves must unseat at a head no greater than 24".

2.2 SMALL DIAMETER ISOLATING VALVES

A. Provide all small diameter valves and cocks for isolation of process connections, instrumentation and other miscellaneous uses in accordance with the Plans.

B. Valves shall be of the same materials and have the same or greater pressure rating as the adjacent process piping. Shutoff valves shall be compatible with instrumentation and other equipment in accordance with the manufacturer's recommendations.

2.3 CORPORATION STOPS

Corporation stops shall be in the ball type with a bronze body and T-Head operator. Valve ends shall be compatible with the piping system in which they are being installed or as called for on the Plans or indicated on the Standard Drawings. Corporation stops shall be rated for a minimum pressure of 200 psi. Corporation stops shall be selected from the Approved Materials List.

2.4 ANGLE METER STOPS

A. Angle meter stops shall be the ball type with a bronze body and 90-degree lock wing. For 1" tubing, angle meter stop ends shall be compression inlet by swivel meter nut outlet. For 2" tubing, use compression inlet by meter flange outlet.

B. Angle meter stops shall be rated for a minimum pressure of 200 psi and be selected from the Approved Materials List.

2.5 CUSTOMER METER SHUT-OFF VALVE

Customer meter shut-off valves shall be the ball type with a bronze body and lever handle operator. Valve ends shall be swivel meter nut for 1" inlets and meter flange for 2" inlets. Customer meter shut-off valves shall be rated for a minimum pressure of 200 psi. The City Engineer may require the use of a customer meter shut-off valve equipped with a 90-degree lock wing.

2.6 BALL VALVES

Ball valves 2" and smaller shall be of bronze construction conforming to ASTM B62 and equipped with a T-Head or lever handle operator as required. Valve ends shall be compatible with the piping system in which they are being installed or as indicated on the Plans or Standard Drawings. Ball valves shall be rated for a minimum pressure of 200 psi (1,379 Kpa). Ball valves shall be selected from the Approved Materials List.

2.7 BACKFLOW PREVENTERS

Backflow preventers shall conform with Section 15112 and selected from the Approved Materials List.

2.8 POLYTHYLENE WRAP

Polyethylene wrap shall conform with Section 15000 and selected from the Approved Materials List.

2.9 VALVE BOX ASSEMBLY AND EXTENSION STEM

Valve box assemblies and extension stems for buried valves shall conform with Section 15000 and the Approved Materials List.

PART 3 EXECUTION

3.1 INSTALLATION

A. Valves shall be set in true alignment straddling the centerline of pipe with the valve operator in the vertical position unless otherwise noted on the Plans or shown on the Standard Drawings.

B. Valves shall be installed in accordance with the manufacturer's recommendations and the applicable section of these specifications for the piping material and joint type being used.

C. Aboveground valves shall be rigidly held in place using supports and hangers in accordance with the Plans and Standard Drawings. The stem orientation of valves in elevated piping shall be as approved by the City Engineer for accessibility, except that no valves shall be installed with stems aligned below horizontal. Saddle type valve supports shall be provided. Supports shall be of rugged construction providing at least 120-degree support for the valve body. Valve supports shall be constructed of steel and shall be anchored to the foundations using stainless steel anchor bolts.

3.2 POLYETHYLENE WRAP

Installation of polyethylene wrap for buried valves shall be in accordance with Section 15000.

3.3 VALVE BOX ASSEMBLY AND EXTENSION STEM

Valve box assemblies and extension stems for buried valves shall be installed in accordance with Section 15000 and the Standard Drawings.

3.4 DISINFECTION OF THE VALVES

Disinfection and flushing shall conform with Section 15041 and shall be conducted during disinfection of the main pipeline. The valves shall be operated during the disinfection period to completely disinfect all internal parts.

3.5 HYDROSTATIC TESTING

Valves shall be hydrostatically tested in conjunction with the pipelines in which they are installed in accordance with Section 15044.

END OF SECTION

SECTION 15100 – RESILIENT WEDGE GATE VALVES (RWGVs)

PART 1 GENERAL

1.1 DESCRIPTION

This section includes materials, testing, and installation of manually operated resilient wedge gate valves (RWGVs).

1.2 REFERENCE STANDARDS

The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

AWWA C210	Liquid Epoxy Coatings and Linings for Steel Water Pipe and Fittings
AWWA C509	Resilient-Seated Gate Valves for Water Supply Service
AWWA C550	Protective Interior Coatings for Valves and Hydrants
NSF/ANSI 61	Drinking Water System Components – Health Effects

1.3 RELATED WORK SPECIFIED ELSEWHERE

CMWD Standard Drawings

CMWD Standard Specifications 09900, 09961, 15000, 15041, 15044, 15056, 15057, 15061, 15064, 15074, 15108 and 15112

1.4 SERVICE APPLICATION

A. Resilient wedge gate valves (RWGV's) shall be installed on potable and recycled water mains and appurtenances in accordance with the Plans and the Standard Drawings.

B. Resilient wedge gate valves shall be used for open/closed operations, throttling service and frequent operation after long periods of no actuation.

C. In general, resilient wedge gate valves shall be used when valves are required on pipelines and appurtenances 4" through 16".

D. Valves for pipelines sized 18" and larger generally require the use of butterfly valves (BFV) in accordance with Section 15102.

E. All valves shall be of at least the same pressure class as the adjoined pipe.

1.5 SUBMITTALS

Submit the following in accordance with the General Provisions:

A. The valve manufacturer's catalog data showing the size to be used, valve dimensions, pressure rating and materials of construction.

B. Actuator manufacturer's catalog data and detail construction drawings showing the dimensions, materials, number of turns, and required input torque and torque rating of the actuator.

C. Manufacturer's catalog data for lining and coating materials.

D. Certificate of compliance:

1. Actuators used were furnished and installed by the valve manufacturer.

2. Valves have successfully passed hydrostatic testing per AWWA C509.

3. NSF 61 certification for interior lining materials and holiday testing.

E. Operation and maintenance manuals.

1.6 SIZING OF VALVES

Valves shall be the same size as the line in which they are installed unless otherwise noted on the Plans.

1.7 VALVE ENDS

A. Valve ends shall be compatible with the piping system in which they are being installed in accordance with the Plans or directed by the City Engineer.

B. Ductile-iron flanges shall conform with Section 15056.

1.8 VALVE TESTING

Resilient wedge gate valves shall be hydrostatically tested, and valve coatings shall be holiday detected prior to shipment in accordance with the reference test standards. Valves delivered to the site prior to successful hydrostatic testing and holiday detection shall be subject to rejection.

1.9 DELIVERY, STORAGE AND HANDLING

Valves shall be delivered and stored in accordance with AWWA C550. The port openings shall be covered with plastic, cardboard or wood while in transit and during storage. These covers shall remain in place until valves are ready to be installed. Valves shall not be stored in contact with bare ground. Valves shall not be stacked.

1.10 CORROSION PROTECTION

Buried Valves: All bolted connections and bolted valve components (bonnets, flanges, etc.) shall be wax tape coated in accordance with Section 09902 and the entire valve encased in polyethylene in accordance with Section 15000.

PART 2 MATERIALS

2.1 RESILIENT WEDGE GATE VALVES (RWGVs)

A. Resilient wedge gate valves and appurtenant components and materials shall be selected from the Approved Materials List.

B. RWGV's shall be ductile iron in accordance with AWWA C509 and C515 except as modified herein.

C. Each valve shall have a smooth unobstructed waterway free from any sediment pockets.

D. Valves shall be leak-tight at their rated pressure.

E. Valves shall have a non-rising low-zinc bronze or stainless steel stem opened by turning left (counterclockwise).

F. Stem seals shall be the O-ring type incorporating a minimum of two rings as required by AWWA C509.

G. Low-friction torque-reduction thrust washers or bearings shall be provided on the stem collar.

H. Wedge (gate) shall be fully encapsulated with a bonded-in-place Nitrile elastomer covering. Minimum thickness of the rubber seating area shall be 1/4".

I. Valves for buried applications shall be provided with a 2" square operating nut, and valves located above ground or in structures shall be equipped with a hand wheel in accordance with AWWA C509 unless otherwise shown on the Plans.

J. All bolts and nuts used in the construction of RWGVs shall be Type 316 stainless steel.

K. Interior and exterior surfaces (except for the encapsulated disc) shall be coated as described below.

2.2 EPOXY LINING AND COATING

Epoxy lining and coating for valves shall conform with the following:

A. Linings and coatings for valves shall be fusion bonded epoxy in accordance with AWWA C550 and Section 09961.

B. When approved as an alternate, liquid epoxy lining shall be applied in accordance with Section 09900.

C. Lining and coating of valve surfaces shall be performed by the manufacturer in a facility with qualified personnel and a controlled environment.

D. Surface preparation shall be as detailed in SSPC-SP5, White-Metal Blast Cleaning.

E. Epoxy lining materials shall be NSF 61 certified for use in contact with potable water.

F. Coatings that are damaged during shipment or fail holiday testing upon delivery shall be rejected and returned to the valve manufacturer.

2.3 VALVE BOX ASSEMBLY AND EXTENSION STEM

Valve box assemblies and extension stems for buried valves shall conform with Section 15000 and the Approved Materials List.

2.4 CONCRETE

Concrete used for anchor or thrust blocks shall conform with Section 03000.

2.5 WAX TAPE COATING

Wax tape shall conform with Section 09902 and be selected from the Approved Materials List.

2.6 POLYETHYLENE ENCASEMENT

Polyethylene encasement shall conform with Section 15000 and be selected from the Approved Materials List.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install valves with the bolt holes straddling the vertical centerline of pipe and the operating nut in the vertical position unless otherwise noted on the Plans.

B. Valves shall be installed in accordance with the manufacturer's recommendations and the applicable section of these specifications for the piping material and joint type being used.

C. Joints shall be cleaned and installed in accordance with Section 15056.

3.2 CORROSION PROTECTION

Valve linings and coatings shall be shop applied in accordance with Section 09961 or Section 09900.

Buried Valves: All bolted connections and bolted valve components shall be coated with Wax Tape in accordance with Section 09902 and the entire valve encased in polyethylene in accordance with Section 15000.

3.3 CONCRETE

Concrete thrust, anchor, and support blocks shall be installed in accordance the Standard Drawings and design calculations. The concrete shall be placed so that valves and valve operators will be accessible for repairs or replacement.

3.4 VALVE BOX ASSEMBLY AND EXTENSION STEM

Valve box assemblies and extension stems for buried valves shall be installed in accordance with Section 15000 and the Standard Drawings.

3.5 DISINFECTION OF VALVES

Disinfection and flushing of valves shall conform with Section 15041 and shall be conducted during disinfection of the main pipeline. The valves shall be operated during the disinfection period to completely disinfect all internal parts.

3.6 HYDROSTATIC TESTING

Valves shall be hydrostatically tested in conjunction with the pipeline in which they are installed in accordance with Section 15044.

END OF SECTION

SECTION 15102 – BUTTERFLY VALVES (BFVs)

PART 1 GENERAL

1.2 DESCRIPTION

This section includes materials, testing, and installation of manually operated butterfly valves (BFV).

1.3 REFERENCE STANDARDS

The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. References shall be made to the latest edition of said standards unless otherwise called for.

AWWA C504	Standards for Rubber–Seated Butterfly Valves
AWWA C550	Protective Interior Coatings for Valves and Hydrants
NSF/ANSI 61	Drinking Water System Components – Health Effects

1.4 RELATED WORK SPECIFIED ELSEWHERE

CMWD Standard Drawings

CMWD Standard Specifications 09900, 15000, 15041, 15044, 15056, 15061 and 15064

1.5 SERVICE APPLICATION

A. Butterfly valves (BFV) shall be installed on potable and recycled water mains and appurtenances where shown on the Plans and in accordance with the Standard Drawings.

B. Butterfly valves shall be used for open/closed operations and throttling service and frequent operation after long periods of inactivity.

C. In general, butterfly valves shall be used when valves are required on pipelines 18” and larger and where the use of a motor-operated valve is required as shown on the Plans. Butterfly valves smaller than 18” shall only be used as indicated on the Plans or with the prior approval of the City Engineer.

D. Valves for pipelines sized 16” and smaller generally require resilient wedge gate valves (RWGV’s) in accordance with Section 15100.

E. All valves shall be of at least the same pressure class as the adjoined pipe.

1.6 SUBMITTALS

Submit the following in accordance with the General Provisions:

A. The valve manufacturer’s catalog data showing the size to be used, valve dimensions, pressure rating and materials of construction.

B. Actuator manufacturer's catalog data and detail construction drawings showing the dimensions, materials, number of turns, and required input torque and torque rating of the actuator.

C. Manufacturer's catalog data for lining and coating materials.

D. Certificate of compliance:

1. Actuators used were furnished and installed by the valve manufacturer.

2. Valves have successfully passed hydrostatic testing per AWWA C504.

3. NSF 61 certification for interior lining materials and holiday testing.

E. Operation and maintenance manuals.

1.7 SIZING OF VALVES

Valves shall be the same size as the line in which they are installed unless otherwise shown on the Plans.

1.8 VALVE ENDS

Valve ends shall be flanged ductile iron unless otherwise called for on the Plans or as directed by the City Engineer.

Ductile-iron flanges shall generally be in accordance with AWWA C115, rated at a working pressure of 250 psi (1,724 Kpa). When Class 250 butterfly valves are shown on the Plans or are otherwise required, ductile-iron flanges shall be compatible with AWWA C207, Class "F".

Maximum working pressure of the flange shall be as specified in AWWA or ASME/ANSI. Flanges shall be integrally cast per AWWA C110.

1.9 VALVE TESTING

Butterfly valves shall be hydrostatically tested, and coatings holiday detected prior to shipment to the field. Valves delivered to the site prior to successful hydrostatic testing and holiday detection will be subject to rejection.

1.10 DELIVERY, STORAGE AND HANDLING

Valves shall be delivered and stored in accord with AWWA C504 and AWWA C550. The port openings shall be covered with plastic, cardboard or wood while in transit and during storage in the field. These covers shall remain in place until the valve is ready to be installed. Valves shall not be stored in contact with bare ground. Valves shall not be stacked.

1.11 CORROSION PROTECTION

Buried Valves: All bolted connections and bolted valve components shall be coated with Wax Tape in accordance with Section 09902 and the entire valve encased in polyethylene in accordance with Section 15000.

PART 2 MATERIALS

2.1 BUTTERFLY VALVES (BFV)

A. Butterfly valves and appurtenant components and materials shall be selected from the Approved Materials List.

B. Valves shall be short body, leak-tight closing, and rubber-seated in accordance with AWWA C504 except as modified herein.

C. Except as modified below, BFVs shall be Class 150B in accordance with AWWA C504, rated for a flow velocity of 16 ft/s.

D. Where the static pressure of the pipeline in which the valve is to be installed exceeds 1.03 Pa (150psi), a Class 250B butterfly valve conforming to AWWA C504 shall be required.

E. Butterfly valves shall open by turning left (counterclockwise). Valve disc shall rotate 90 degrees from the fully open position to the tight shut position.

F. Valve interior and exterior surfaces shall be coated as described below.

2.2 MANUAL VALVE ACTUATORS

A. General:

1. All valve actuators shall be watertight, designed for buried or submerged uses. Actuators shall be fully gasketed, sealed, and factory packed with grease.

2. Actuators for valves shall be provided with a 2” square-operating nut when buried or when shown on the Plans.

3. Actuators for valves located above ground or in vaults and structures may have hand wheels or chain wheels as shown on the Plans. Minimum hand wheel diameter shall be 12”. The actuator shall be equipped with a dial indicator, which shows the position of the valve disc.

4. Actuators shall have travel stops, which can be adjusted in the field without having to remove the actuator from the valve. The position stops shall be capable of withstanding 450 ft-lbs of input torque.

5. Actuators shall be sized for opening and closing the valve at the valve’s full rated working pressure and at a flow velocity of 16 ft/s.

6. Actuators shall accept a minimum of 300 ft-lbs of input torque at the full open and full closed positions without damage to the actuator or the valve.

7. Actuators equipped with 2” operator nuts shall require a maximum input torque of 150 ft-lbs to operate the valve. A maximum input torque of 80 ft-lbs shall be required to operate valves with hand wheels.

8. Actuators shall require a maximum of 100 input turns for the complete 90-degree movement of the disc.

9. Actuators shall be of the same manufacturer as the valve. When actuators of a different manufacturer are shown or specified, the actuators shall be installed, adjusted, tested and certified by the valve manufacturer prior to shipping.

10. Actuators shall receive an epoxy coating on the exterior surface as described below.

B. Traveling Nut Actuators:

1. Actuators for 18” and 20” butterfly valve may be the manual traveling nut type. Traveling nut actuators shall not be used on valves requiring motor driven actuators or where a worm gear type actuator is specified.

2. Actuators shall be capable of producing the below listed output torque at the closed position:

C. Worm Gear Type Actuators:

1. Actuators for 24” or larger butterfly valves shall be the worm gear type. In addition, worm gear type actuators shall be used on butterfly valves requiring motor driven actuators or where a worm gear actuator is specified.

2. Worm gear actuators shall be totally enclosed and self-locking.

2.3 EPOXY LINING AND COATING

Epoxy lining and coating for valves shall conform with the following:

A. Linings and coatings for valves shall be fusion bonded epoxy in accordance with AWWA C550 and Section 09961.

B. When approved as an alternate, liquid epoxy lining shall be applied in accordance with Section 09900.

C. Lining and coating of valve surfaces shall be performed by the manufacturer in a facility with qualified personnel and a controlled environment.

D. Epoxy lining materials shall be NSF 61 certified for use in contact with potable water.

E. Coatings that are damaged during shipment or fail holiday testing upon delivery shall be rejected and returned to the valve manufacturer.

2.4 VALVE BOX ASSEMBLY AND EXTENSION STEM

Valve box assemblies and extension stems for buried valves shall conform with Section 15000 and the Approved Materials List.

2.5 CONCRETE

Concrete used for anchor or thrust blocks shall conform with Section 03000.

2.6 WAX TAPE COATING

Wax Tape shall be provided in accordance with Section 09902 and the Approved Materials List.

2.7 POLYETHYLENE ENCASEMENT

Polyethylene encasement shall be provided in accordance with Section 15000 and selected from the Approved Materials List.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install valves with the bolt holes straddling the vertical and horizontal centerlines of pipe, with the operating nut in the vertical position, unless otherwise noted on the Plans.

B. Valves shall be installed per the manufacturer's recommendation in accordance with the applicable specification for the piping material and joint type being used for the valve and the water main.

C. Joints shall be cleaned and installed in accordance with Section 15056.

3.2 FLANGE INSULATING KITS

Flange insulating kits shall be installed where shown on the Plans in accordance with Standard Drawing.

3.3 CORROSION PROTECTION

Valve linings and coatings shall be shop applied in accordance with Section 09900.

Buried Valves: All bolted connections and bolted valve components shall be coated with Wax Tape in accordance with Section 09902 and the entire valve encased in polyethylene in accordance with Section 15000.

3.4 CONCRETE

Concrete thrust, anchor, and support blocks shall be installed as called for in the Standard Drawings and design calculations. The concrete shall be placed so that valves and valve operators will be accessible for repairs or replacement.

3.5 VALVE BOX ASSEMBLY AND EXTENSION STEM

Valve box assemblies and extension stems for buried valves shall be installed in accordance with Section 15000 and the Standard Drawings.

3.6 DISINFECTION OF THE VALVES

Disinfection and flushing shall be performed in accordance with Section 15041, as part of the process of disinfecting the main pipeline. The valves shall be operated during the disinfection period to completely disinfect all internal parts.

3.7 HYDROSTATIC TESTING

Valves shall be hydrostatically tested in conjunction with the pipeline in which it is connected in accordance with Section 15044.

END OF SECTION

SECTION 15108 – AIR RELEASE, AIR AND VACUUM, AND COMBINATION AIR VALVE ASSEMBLIES

PART 1 GENERAL

1.1 DESCRIPTION

This section includes the materials and installation instructions for above ground air release valve, air and vacuum valve, and combination air valve assemblies.

The term “air valve” is used generically in this specification to refer to requirements common to all the specified air release valves, air and vacuum valves, and combination air valves. Otherwise, the various types of air valves are addressed by the individual designations commonly used in AWWA and industry standards.

1.2 REFERENCE STANDARDS

The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

American Water Works Association (AWWA)

C512 Standards for Combination Air Valve Assemblies

1.3 RELATED WORK SPECIFIED ELSEWHERE

CMWD Standard Drawings

CMWD Standard Specifications 09900, 15000, 15041, 15044, 15056, 15057, 15061, 15064, 15100, 16640

1.4 SERVICE APPLICATION

A. Combination air valves are generally installed on potable and recycled water mains at high points and where shown on the Plans and in accordance with the Standard Drawings.

B. Unless otherwise approved, combination air valves will be required as indicated below:

1. Combination air valve assemblies shall be sized for pipe flow rate during draining and filling conditions and maximum pipe slope in the pipeline segment on which the valve will be installed. Calculations and valve sizing charts conforming to the valve manufacturer’s design methodology shall be submitted to the City Engineer for approval.

2. 2” combination air valve assemblies shall be installed on pipeline sizes 14” and smaller.

3. Combination air valve assemblies for 16” through 24” pipeline diameters shall be 2” minimum, or sized using the valve manufacturer’s sizing criteria, whichever is greater.

4. Combination air valve assemblies for pipeline diameters larger than 24” shall be 4” minimum or sized using the valve manufacturer’s sizing criteria, whichever is greater.

C. Air release valves and air and vacuum valves shall be installed in accordance with the Plans as indicated below:

1. Manual air release assemblies shall be installed at local high points created by the closure of an isolation valve.

1.5 SUBMITTALS

A. Submit the following in accordance with the General Provisions:

1. Catalog data including detailed drawings showing dimensions and weights, parts list, materials of construction, performance data and manufacturer’s recommended maximum and minimum operating pressures.

2. Installation, maintenance and operating instructions.

3. NSF certification for valves having internal epoxy.

1.6 DELIVERY, STORAGE, AND HANDLING

Valves shall be delivered and stored in accordance with AWWA C550. The port openings shall be covered with plastic, cardboard, or wood while in transit and during storage in the field. These covers shall remain in place until the valve is ready to be installed. Valves shall not be stored in contact with bare ground. Valves shall not be stacked.

1.7 RECYCLED WATER IDENTIFICATION

Air valve assemblies and enclosures used for recycled water shall be identified with purple-colored coating, identification labels or signs in accordance with Section 15000.

1.8 WARNING/IDENTIFICATION TAPE

Warning/Identification tape shall be installed for air valve assemblies in accordance with Section 15000.

PART 2 MATERIALS

2.1 COMBINATION AIR VALVES

A. Combination air valves and appurtenant components and materials suitable for the system pressure shall be selected from the Approved Materials List.

B. Combination air valves shall comply with AWWA C512, as applicable, and as modified herein.

C. 2” combination air valves shall be the single-body type incorporating stainless steel internal components and National Pipe Threaded (NPT) inlet and outlet configurations.

D. Combination air valves 3” and larger shall be the single-body type unless otherwise required by the Engineer. Valves shall incorporate stainless steel internal components, protective hood and flanged inlet.

E. Internal, protective, epoxy coatings shall conform with AWWA C550.

1. Liquid epoxy lining and coating materials shall be listed in the NSF Listing for Drinking Water Additives, Standard 61, certified for use in contact with potable water.

2. The minimum dry film thickness for epoxy linings shall be 8 mils. Liquid epoxy lining shall be applied in not less than two (2) coats in accordance with AWWA C210.

2.3 ISOLATION VALVES

A. For 2” air valve assemblies, install an isolation ball valve below the inlet of each air valve in accordance with the Standard Drawings.

B. For 3” and larger assemblies, install a tee with a 6” branch, a 90-degree bend and a 6” gate valve and valve box assembly at the connection to the water main. Install a reducer after the gate valve and piping to match the size of the air valve.

2.4 ENCLOSURES

Air valve enclosures shall be polyethylene selected from the Approved Materials List with a color accent strip around the top of the enclosure corresponding to the APWA uniform color code for the service application.

2.5 CONCRETE

Concrete used for anchor or thrust blocks and equipment pads shall conform with Section 03000.

2.6 BREAK-AWAY BOLTS

Install break-away bolts for 4" and larger, flanged, combination air valves, air release valves and air and vacuum valves located above ground in accordance with the Standard Drawings and the Approved Materials List.

2.7 WARNING/IDENTIFICATION TAPE

Warning/Identification Tape shall conform with Section 15000 and the Approved Materials List.

2.8 FIELD PAINTING AND COATING

Field painting and coating materials shall conform with Section 09900 and the Approved Materials List.

PART 3 EXECUTION

3.1 INSTALLATION

A. Air valve assemblies shall be provided as shown on the Plans. Additional air valve assemblies may be required in areas of potential air entrapment and final locations will be at the discretion of the City Engineer.

B. Air valve assemblies shall be installed in accordance with the Standard Drawings.

C. Connection of the air valve assembly piping to the main line shall be made no closer than 24" to a pipe bell, coupling, joint or fitting.

3.2 CONCRETE

Placement and curing of concrete for thrust or anchor blocks and equipment pads shall conform with Section 03000.

3.3 WARNING/IDENTIFICATION TAPE

Warning/Identification Tape shall be installed in accordance with Section 15000 and the Standard Drawings.

3.4 DISINFECTION

Air valve assemblies shall be disinfected in conjunction with disinfection of the main in accordance with Section 15041. Valves shall be operated and the assembly flushed to completely disinfect all internal parts.

3.5 HYDROSTATIC TESTING

Air valve assemblies shall be hydrostatically tested in accordance with Section 15044 in conjunction with the pipeline to which they are connected.

END OF SECTION

SECTION 15112 – BACKFLOW PREVENTERS

PART 1 GENERAL

1.1 DESCRIPTION

This section includes materials, installation and testing of backflow prevention devices: double check detector assemblies (DCDA) and reduced pressure principle (RP) or reduced pressure detector assemblies (RPDA).

1.2 REFERENCE STANDARDS

The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

A. State Water Resources Control Board, Cross-Connection Control Policy Handbook (CCCPH), latest adopted version.

B. University of Southern California, Foundation for Cross-Connection Control and Hydraulic Research, List of Approved Backflow Prevention Assemblies, latest edition.

1.3 RELATED WORK SPECIFIED ELSEWHERE

CMWD Standard Drawings

CMWD Standard Specifications 09900, 15000, 15041, 15044, 15056, 15057, 15061, 15064 and 15100

1.4 SERVICE APPLICATION

A. Reduced pressure principle assemblies shall be provided on all commercial, industrial and multi-family water services.

B. Reduced pressure principle detector assemblies shall be provided on all potable and recycled water irrigation services.

C. Reduced pressure principle assemblies shall be provided on potable water services where recycled water, well water or any other water supply is or will be served to the same property.

D. Reduced pressure principle assemblies shall be provided at all points of connections to City sources at construction sites.

E. Double check detector assemblies shall be provided on all fire services unless a higher degree of protection is deemed necessary by the City Engineer or any other regulatory agency in accordance with Title 17, CCR or applicable regulations adopted by the State of California. A fire service requiring a higher degree of protection shall use a reduced pressure detector assembly.

F. The City Engineer shall approve the location, installation and type of backflow prevention device required.

G. When replacement of an existing backflow prevention assembly is proposed or required, the City Engineer may require the replacement of the fire service piping from the water main to the backflow prevention assembly when such replacement is determined necessary by the City Engineer. The determination of the City Engineer shall be final.

1.5 GENERAL DESIGN CONSIDERATIONS

A. The design and construction of the backflow prevention assembly shall meet the requirements called for in this specification except that any modifications specifically shown on the Plans and approved by the City Engineer shall take precedence over these general standards.

B. When used in conjunction with a meter, the nominal size of the backflow prevention device shall be equal to or greater than the size of the purchased meter. For example: a 1" or larger backflow device shall be used with a 1" meter.

C. The nominal size of double check detector assemblies or reduced pressure principle detector assemblies used in fire protection systems shall be as approved by the Fire Marshal and shall be shown on the Plans.

D. The assembly shall include isolation valves of the same size as the backflow device and located on each end of the backflow device. Four test cocks shall be located on the backflow assembly to allow for cross connection testing and certification.

E. Enclosures, concrete slabs and/or protection posts shall be constructed as shown on the Plans or required by the City Engineer.

1.6 DELIVERY, STORAGE AND HANDLING

Backflow prevention assemblies shall be delivered and stored in accordance with AWWA C210, AWWA C213, and AWWA C550. The port openings shall be sealed during transit and storage in the field and shall remain in place until installation of the backflow assembly. Backflow assemblies shall not be stacked or stored in contact with bare ground.

1.7 RECYCLED WATER IDENTIFICATION

Backflow prevention assemblies and enclosures for recycled water shall be identified with purple-colored coating, identification labels or signs in accordance with Section 15000.

1.8 WARNING/IDENTIFICATION TAPE

Warning/Identification tape and tracer wire shall be installed for buried piping for backflow prevention assemblies in accordance with Section 15000.

PART 2 MATERIALS

2.1 BACKFLOW PREVENTION ASSEMBLIES

Backflow prevention assemblies shall be among those listed on the latest adopted "List of Approved Backflow Prevention Assemblies" as issued by the University of Southern California.

2.2 CONCRETE

Concrete used for slabs and anchor or thrust blocks shall conform with Section 03000.

2.3 WARNING/IDENTIFICATION TAPE

Warning/Identification Tape shall conform with Section 15000 and the Approved Materials List.

PART 3 EXECUTION

3.1 INSTALLATION

A. Installation of backflow prevention assemblies shall comply with the Carlsbad Engineering Standards, the latest edition of the California Plumbing Code, right-of-way permit procurement in accordance with Carlsbad Municipal Code (CMC) Section 11.16.050 and notification for shutdown/connection request procedures. Refer to Section 15000.

B. Water service and fire service isolation valves will be secured closed during installation until an approved backflow prevention device is installed and tested in compliance with this specification.

C. When static pressure exceeds 150 psi or when recommended by the backflow device manufacturer, a pressure-reducing valve shall be installed upstream of the backflow prevention device and between the isolation valves for the backflow assembly.

D. Buried fittings, spools and hardware shall be replaced concurrently with the replacement of a backflow prevention device in accordance with these Standards.

3.2 WARNING/IDENTIFICATION TAPE

Warning/Identification Tape shall be installed in accordance with Section 15000 and the Standard Drawings.

3.3 CONCRETE

Placement and curing of concrete for thrust or anchor blocks and support slabs shall conform with Section 03000.

3.4 ENCLOSURES

Fabricated steel enclosures shall be installed at City facilities (parks, buildings and facilities) or when shown on the Plans.

3.5 DISINFECTION

Disinfection and flushing shall be performed in accordance with Section 15041 as part of the process of disinfecting the main pipeline. The backflow assemblies shall be flushed during the disinfection period to completely disinfect all internal parts.

3.6 HYDROSTATIC TESTING

Backflow assemblies shall be hydrostatically tested in conjunction with the pipeline to which they are connected in accordance with Section 15044.

3.7 TESTING

The City will initially test each backflow prevention assembly upon completion of the installation and successful inspection in accordance with these specifications.

3.8 MAINTENANCE AND REPLACEMENT

The property owner shall be responsible for maintenance and annual testing of the backflow prevention assembly.

The property owner shall be responsible for replacement of the backflow prevention device when it fails a test or when determined necessary by the City.

END OF SECTION

SECTION 15121 – OPEN TRENCH PIPE CASING

PART 1 GENERAL

1.1 DESCRIPTION

This section includes materials for and installation of open trench pipe casings. Jacked casings or specially installed pipe casings shall be installed in accordance with Section 15125.

1.2 REFERENCE STANDARD

The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. References shall be made to the latest edition of said standards unless otherwise called for.

1.3 RELATED WORK SPECIFIED ELSEWHERE

CMWD Standard Drawings

CMWD Standard Specifications 03000, 15000, 15056, 15061, 15064 and 15065

1.4 SERVICE APPLICATION

Generally, pipe casings are used for protection of utilities (carrier pipes), for separation of potable and non-potable fluid pipelines or for future utility installations. Pipe casings shall be used for the installation of potable water, reclaimed water, and sewer mains where shown on the Plans or as required by the City.

1.5 DESIGN REQUIREMENTS

A. Pipe casings shall be provided for carrier piping where shown on the Plans or as required by the City. The sizes and material type for pipe casing shall be as detailed in Part 2 of this Section.

B. The City Engineer may select a greater steel thickness and diameter as appropriate for the intended application.

1.6 SUBMITTALS

The following items shall be submitted for review and approval by the City Engineer prior to the start of the casing work:

A. Casing pipe.

B. Casing spacers and end seals.

C. Installation procedure.

D. Method of restraint to be used for the casing and carrier pipes.

E. Welding procedure.

F. Cathodic protection.

G. Annular space grout mix design.

1.7 DELIVERY, STORAGE AND HANDLING

A. PVC pipe casing shall be stored in the supplier's yard and on the job site in accordance with AWWA M23 and the manufacturer's recommendations. PVC pipe casing which has been subjected to excessive ultraviolet radiation from the sun shall not be used. The determination as to the acceptability of PVC pipe casing faded by the sun's radiation shall rest solely with the City.

B. Store PVC pipe casing in the field by the supporting the pipe uniformly per AWWA M23. Do not stack pipe higher than 4' high or stack the pipe with weight on the bell ends. Cover stored PVC pipe casing to protect it from the sun's ultraviolet radiation. Pipe which has been contaminated with any petroleum products (inside or outside) shall not be installed.

C. Proper care shall be used to prevent damage in handling, moving and placing the pipe casing. All pipe casing materials shall be lowered into the trench in a manner that prevents damage. The pipe casing shall not be dropped, dragged or handled in a manner that will cause bruises, cracks, or other damage.

1.8 CASING SPACERS AND END SEALS

Casing spacers and end seals shall be used for all carrier pipe installations within casings.

1.9 WARNING/IDENTIFICATION TAPE

Warning/Identification Tape shall be installed in accordance with Section 15000.

PART 2 MATERIALS

2.1 PIPE CASING

A. Pipe casing diameters for the various sizes of carrier pipe are as follows:

Nominal Carrier Pipe Dia.	Min. Casing I.D.
6"	14"
8"	16"
10"	18"
12"	20"
16"	24"
20"	30"
24"	36"

B. Casing diameters for carrier pipe with butt-fusion or welded joints or for carrier pipe diameters greater than 24" shall be as approved by the City Engineer. The inside diameter of the casing shall provide sufficient clearance for annular space grout pipes. Where grouting is not required, the inside diameter of the casing shall be no less than 2 inches greater than the outside diameter of carrier pipe bells, joints or couplings.

C. Non-metallic pipe casings pipe casings shall conform with the following and their use shall require the prior approval of the City Engineer:

1. Polyvinyl Chloride (PVC) pipe casings in sizes 14" through 36" shall conform with AWWA C900, pressure rated 235 (DR 18) per Section 15064 or Section 15065.

2. HDPE pipe casings shall conform with AWWA C906, pressure rated 200 (DR 11) per Section 15068.

3. PVC or HDPE casing pipe shall have a color accent strip or solid color conforming with the APWA uniform color code.

D. Steel pipe casings shall be as follows:

1. Unless otherwise approved, steel pipe casings shall be butt-welded sheets (spiral welding of pipe not allowed) conforming to ASTM A36/A36M, ASTM A283/A 283M, Grade D, or ASTM A568/A 568M, Grade 33. Other steel grades may be used with approval. Steel casings sized 20" or smaller shall have a minimum wall thickness of 3/8". Steel casings sized larger than 20" shall have a minimum wall thickness of 1/2".

2. Steel pipe casings shall not be lined or coated with any material unless otherwise specified in the Contract Documents. If required, steel pipe casing shall be lined and coated with liquid epoxy paint per AWWA C210. Liquid epoxy shall be applied in three coats to a minimum thickness of 0.012".

3. Steel pipe casings shall include the installation of an anode in accordance with Section 16640 and the Standard Drawings, unless otherwise directed by the City Engineer.

2.2 CASING SPACERS

Casing spacers shall be stainless steel, centered-position type with PVC liner and non-metallic anti-friction runners selected from the Approved Materials List.

2.3 CASING END SEALS

Casing end seals, selected from the Approved Materials List, shall wrap around the casing and carrier pipe to provide a barrier to backfill material and seepage. The casing end seal shall be a minimum 1/4" thick styrene butadiene rubber sheet attached to the carrier pipe and casing with 1" wide stainless steel bands. New installations shall utilize seamless end seals with stainless steel bands.

2.4 WARNING/IDENTIFICATION TAPE

Warning/Identification tape materials shall conform with Section 15000 and the Approved Materials List.

PART 3 EXECUTION

3.1 TRENCH EXCAVATION, BACKFILL AND COMPACTION

Trenching, bedding, backfilling and compaction operations shall be performed in accordance with Section 02223.

3.2 DEWATERING

The Contractor shall provide and maintain at all times during construction ample means and devices to promptly remove and dispose all water from any source entering trench excavations or other parts of the work in accordance with Section 02223.

3.3 PIPE CASING INSTALLATION

Installation of pipe casing and carrier pipe shall be as described below and in accordance with the Standard Drawings.

A. Pipe casing shall be installed in an open trench type excavation.

B. Pipe casings shall be lowered onto the bedding of the proper lines and grades called for on the Plans.

C. Pipe casings shall have firm bearing along their full length.

D. Pipe casing sections shall be bell and spigot joint connection for PVC. PVC casing sections shall be restrained by mechanical means or by the use of splined gaskets. Steel casing sections shall be joined by full-circumference butt welding in the field. Steel casing shall have all areas of damaged coating repaired.

E. Carrier pipe shall be pushed into the casing incorporating the use of casing spacers as described below.

F. PVC or ductile-iron carrier pipe joints shall be restrained either by mechanical means or by use of splined gaskets.

G. Steel carrier pipe sections shall be lap joint welded per Section 15061.

H. Upstream and downstream elevations of the carrier pipe shall be verified prior to installing the end seals.

I. The portion of carrier pipes installed within casings shall have pressure, leakage, and infiltration testing completed in accordance with Sections 15043 and 15044 prior to installation of the end seals.

J. The annular space between the carrier pipe and casing shall not be filled with any material unless otherwise noted on the Plans.

3.4 CASING SPACERS

Casing spacers shall be used to prevent the carrier pipe bell from touching the casing and to maintain a uniform space between the carrier pipe and casing interior. A minimum of

three casing spacers shall be installed, equally spaced, on each pipe section at intervals recommended by the manufacturer.

3.5 CASING END SEALS

Casing end seals shall be installed in accordance with the manufacturer's recommendations.

Carrier pipe shall pass hydrostatic or leakage tests in accordance with Sections 15044 or Section 15043 prior to the installation of casing end seals or backfilling operations.

3.6 WARNING/IDENTIFICATION TAPE

Warning/Identification Tape shall be installed above the casing pipe in accordance with Section 15000 and the Standard Drawings.

3.7 TRACER WIRE

Tracer wire shall be installed on the carrier pipe as required in Section 15000 and in accordance with the Standard Drawings.

END OF SECTION

SECTION 15125 – JACKED PIPE CASING

PART 1 GENERAL

1.1 DESCRIPTION

This section includes materials and installation of jacked pipe casings. Where the contractor proposes to install pipelines using directional drilling or boring, a complete submittal of the methods and materials shall be made to the City prior to the initiation of the work.

1.2 REFERENCE STANDARDS

The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. References shall be made to the latest edition of said standards unless otherwise called for.

1.3 RELATED WORK SPECIFIED ELSEWHERE

CMWD Standard Drawings

CMWD Standard Specifications 15000, 15056, 15061, 15064 and 15065

1.4 SERVICE APPLICATION

Generally, pipe casings are used for protection of utilities (carrier pipes) and may be installed for future utility installations. Pipe casings shall be used in conjunction with the installation of potable water, recycled water and sewer mains in areas shown on the Plans or as directed by the City Engineer.

1.5 PROTECTION OF EXISTING UTILITIES AND FACILITIES

The contractor shall be responsible for the care and protection of all existing utilities, facilities, and structures that may be encountered in or near the area of the work.

1.6 SAFETY AND PERMITTING REQUIREMENTS

A. Pipe jacking and boring projects 30" in diameter or larger are required to be classified by the State of California. Department of Industrial Relations, Division of Occupational Safety and Health.

B. Protection of workers in trench excavation shall be as required by the State of California Construction Safety Orders, the State of California State Health and Safety Code, the requirements of CAL-OSHA.

C. All excavations shall be performed, protected, and supported as required for safety and in the manner set forth in the operation regulations prescribed by CAL- OSHA.

D. It shall be the Contractor's responsibility to obtain excavation permits, traffic control permits, or other applicable permits from the local agency which has jurisdiction.

E. A pre-job safety conference with representatives of the Division of Occupational Safety, CAL-OSHA, the City, the Contractor and Contractor's employees shall be held before the work begins.

F. Contractors performing this work are required to hold a current C-34 or General Engineering Contracting License from the State of California.

1.7 DESIGN REQUIREMENTS

A. Pipe casing shall be provided for the carrier piping where shown on the Plans or as required by the City Engineer. The sizes and material type for pipe casing shall be as detailed in Part 2 of this Section.

B. The City Engineer may select a greater steel thickness and diameter as appropriate for the intended application.

1.8 SUBMITTALS

The contractor shall provide to the City and the agency, or agencies, of jurisdiction a drilling, boring, and jacking plan prior to commencing boring operations. The submittal shall include:

A. Configuration of the jacking pits and jacking pit bracing or shoring. Pit excavations deeper than 20' require the shoring system to be certified by a Registered Civil Engineer regularly engaged in the design of excavation support systems.

B. The pipe casing material to be used. Include pipe material type, wall thickness, and welding details.

C. Casing spacers and end seals.

D. Jacking plan and profile drawing detailing the placement of the jacked casing.

E. Installation procedure.

F. Manufacturer and type of liquid epoxy paint, including proposed steel preparation and application methods to be used.

G. The jacking machinery and jacking head proposed to be used.

H. Summary of the backfilling method to be used.

I. Worker Protection and Safety Plan.

J. Cathodic Protection.

1.9 DELIVERY AND HANDLING

Proper care shall be used to prevent damage in handling, moving and placing the pipe casing. All pipe-casing materials shall be lowered into the trench in a manner that prevents damage. The pipe casing shall not be dropped, dragged or handled in a manner that will cause dents, cracks, or other damage to the pipe casing.

1.10 CASING SPACERS AND END SEALS

Casing spacers and end seals shall be used for all pipe installations with casings.

If the carrier pipe is not installed within the casing as a continuous operation, following completion of jacking, then bulkhead the portals and backfill the approach trenches. Bulkheads will be removed at a later time to allow for the installation of the carrier pipe.

PART 2 MATERIALS

2.1 PIPE CASINGS

A. The minimum size and thickness of jacked steel pipe casings shall be as follows unless otherwise required by the agency having jurisdiction over the road or railroad.

Nominal Carrier Pipe Dia.	Min. Casing I.D.	Min. Wall Thickness
6"	14"	1/4"
8"	16"	5/16"
10"	18"	5/16"
12"	20"	3/8"
16"	24"	3/8"
20"	30"	1/2"
24"	36"	1/2"

B. Casing diameters for carrier pipe with butt-fusion or welded joints or for carrier pipe diameters greater than 24" shall be as approved by the City Engineer. The inside diameter of the casing shall provide sufficient clearance for annular space grout pipes. Where grouting is not required, the inside diameter of the casing shall be no less than 2 inches greater than the outside diameter of carrier pipe bells, joints or couplings.

C. The Contractor may submit a greater steel thickness and diameter as appropriate for the method of work and loadings involved, as suitable for the site and as limited by possible interferences. The Contractor shall submit any deviations from the approved design at least fourteen (14) working days in advance of jacking operations and may not proceed with any work until the City Engineer has approved the alternate methods proposed.

D. Unless otherwise approved by the City, steel pipe casings shall be butt-welded sheets (spiral welding of pipe now allowed) conforming to ASTM A36/A36M, ASTM A283/A 283M, Grade D, or ASTM A570/A570M, Grade 33. Other steel grades may be used upon approval of the City Engineer.

E. Steel pipe casings shall include the installation of an anode in accordance with the Standard Drawings unless otherwise approved by the City Engineer.

2.2 CASING SPACERS

Casing spacers shall be used to prevent the carrier pipe bell from touching the casing and to maintain a uniform space between the carrier pipe and casing interior. Casing spacers

shall be stainless steel, centered-position type with PVC liner and non- metallic anti-friction runners in accordance with the Approved Materials List.

2.3 CASING END SEALS

Casing end seals, in accordance with the Approved Materials List, shall wrap around the casing and carrier pipe to provide a barrier to backfill material and seepage. The casing end seal shall be a minimum 1/4" thick styrene butadiene rubber sheet attached to the carrier pipe and casing with 1" wide stainless steel bands. New installations shall utilize seamless casing end seals with stainless steel bands.

2.4 WARNING/IDENTIFICATION TAPE

Warning/Identification Tape materials shall conform with Section 15000 and the Approved Materials List.

PART 3 EXECUTION

3.1 TRENCH EXCAVATION, BACKFILL AND COMPACTION

Trenching, bedding, backfilling and compaction operations shall be performed in accordance with Section 02223.

3.2 JACKING PIT

A. The approach trench for jacking or boring operations shall be adequately shored to safeguard existing substructures and surface improvements and to ensure against ground movement in the vicinity of the casing portal.

B. Placement of equipment in the approach trench of the jacking pit shall be firmly bedded on the required line and grade using heavy timbers, structural steel, or concrete cradles of sufficient length to provide accurate control of jacking alignment. Provide space to insert the casing lengths to be jacked. Anchor the timbers and structural steel sections to ensure action of the jacks in line with the axis of the casing. Place a timber or structural steel bearing block between the jacks and the end of the casing to provide uniform bearing upon the casing end evenly distribute the jacking pressure.

C. After jacking equipment and debris from the tunnel have been removed from the approach trench of jacking pit, prepare the bottom of the jacking pit as a pipe foundation. Remove all loose and disturbed materials below pipe grade to undisturbed earth and re-compact the material in accordance with Section 02223.

3.3 PIPE CASING INSTALLATION

Installation of pipe casings shall be as described below and in accordance with the Standard Drawings. Only workers experienced in jacking operations shall be used in performing the work of jacking and boring.

A. The Contractor's attention is called to the fact that extreme care is required in placing the casing so as to permit the installation of the carrier pipe to the lines and grades shown on the Plans.

B. Gravity flow pipelines are designed at grades that do not permit variance from the lines and grade as shown on the Plans.

C. Fit a sectional shield or steel jacking head to the leading section of the casing. The shield or head shall extend around the outer surface of the upper two-thirds of the casing and project at least 18" beyond the driving end of the casing. It shall not protrude more than 1/2" beyond the outer casing surface.

D. The leading section of casing shall be equipped with a jacking head securely anchored thereto to prevent any wobble or variation in alignment during the jacking operation.

E. To avoid loss of ground outside the casing, carry out excavation entirely within the jacking head and not in advance of the head. In general, excavated materials shall be removed from the casing as jacking progresses.

F. A jacking band to reinforce the end of the pipe receiving the jacking thrust will be required.

G. Control the application of jacking pressure and excavation of material ahead of the advancing casing to prevent it from becoming friction-bound or deviating from required line and grade. Do not encroach upon the minimum annular space detailed. Restrict the excavation of material to the least clearance to prevent binding in order to avoid settlement or possible damage to overlying structures or utilities.

H. Steel casing sections shall be circumferentially butt-welded in the field and shall provide stress transfer across the joints capable of resisting the jacking forces involved.

3.4 CARRIER PIPE INSTALLATION

A. Carrier pipe shall be pushed into the casing incorporating the use of casing spacers as described below.

B. PVC or ductile-iron carrier pipe joints shall be restrained by mechanical means. Thrust blocks shall be used in conjunction with splined (restraining) gaskets.

C. Steel carrier pipe sections shall be lap joint welded in accordance with Section 15061.

D. Upstream and downstream elevations of the carrier pipe shall be verified prior to installing the end seals.

E. The portion of carrier pipe installed within a casing shall have pressure, leakage, and infiltration testing completed in accordance with Section 15043 and 15044 prior to installation of the end seals.

F. The annular space between the carrier pipe and casing shall not be filled with any material unless otherwise noted on the Plans.

3.5 CASING SPACERS

Casing spacers shall be installed on the carrier pipe at intervals per the manufacturer's recommendations with a minimum of three, equally spaced, per pipe section.

3.6 CASING END SEALS

Casing end seals shall be installed in accordance with the manufacturer's recommendations.

Carrier pipe shall pass hydrostatic or leakage tests in accordance with Sections 15044 or 15043 prior to the installation of casing end seals or backfilling operations.

3.7 TRACER WIRE

Tracer wire shall be installed on the carrier pipe as required in Section 15000 and in accordance with the Standard Drawings.

END OF SECTION

SECTION 15139 – FIRE HYDRANTS

PART 1 GENERAL

1.1 DESCRIPTION

This section includes the materials for and installation of fire hydrant assemblies.

1.2 REFERENCE STANDARDS

The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

1.3 RELATED WORK SPECIFIED ELSEWHERE

CMWD Standard Drawings

CMWD Standard Specifications 09900, 15000, 15041, 15044, 15056, 15061, 15064, and 15100

1.4 SYSTEM DESCRIPTION

A. Hydrant outlet sizes and configuration shall be as shown on the Plans or as approved by the fire department of jurisdiction or the Engineer.

B. Hydrants shall generally have the following number and size of outlets:

1. Residential: One 2-1/2" outlet and one 4" outlet

2. Commercial: Two 2-1/2" outlets and one 4" outlet

3. Industrial: One 2-1/2" outlet and two 4" outlets

1.5 SERVICE APPLICATION

A. Fire hydrants shall be installed on potable water mains as shown on the Plans.

B. Standard wet-barrel hydrants shall be used for water distribution system pressures up to 150 psi (1.03 MPa). High-pressure wet-barrel hydrants shall be used for pressures up to 200 psi (1.38 MPa) in accordance with the Approved Materials List.

1.6 DELIVERY, STORAGE AND HANDLING

Fire hydrants shall be delivered and stored in accordance with AWWA C210, AWWA C213 and AWWA C550. The port openings shall be covered with plastic, cardboard or wood while in transit and during storage in the field. These covers shall remain in place until the valve is ready to be installed. Fire hydrants shall not be stored in contact with bare ground. Fire hydrants shall not be stacked.

1.7 WARNING/IDENTIFICATION TAPE

Warning/Identification Tape and tracer wire (for non-metallic pipe) shall be installed for fire hydrant piping in accordance with Section 15000.

PART 2 MATERIALS

2.1 HYDRANT

A. Wet-barrel fire hydrants shall comply with AWWA C503 and these specifications unless otherwise indicated on the Plans.

B. All outlets shall be provided with National Standard Fire-Hose Threads. Outlets shall be equipped with plastic caps.

C. Wet-barrel fire hydrant flanges and appurtenant bury ells and spools shall incorporate a six-hole bolt pattern.

D. Fire hydrants shall be selected from the Approved Materials List.

2.1 EXTENSION SPOOL

A. Hydrant extension spools shall be cement lined, cast or ductile iron with a single break off groove for spool lengths less than 12” or two grooves for lengths 12” or longer.

B. Bolt pattern shall match the hydrant flange drilling.

C. Selected extension spools from the Approved Materials List.

2.2 BOLTS AND NUTS

A. Hydrant flange bolts and nuts shall be selected from the Approved Materials List.

B. Bolts and nuts shall be zinc plated A307 carbon steel in accordance with Section 15000.

2.3 CONCRETE

Concrete used for splash pads, thrust or anchor blocks shall conform with the Standard Drawings, design calculations and Section 03000.

2.4 WARNING/IDENTIFICATION TAPE

Warning/Identification Tape materials shall conform with Section 15000 and the Approved Materials List.

2.5 PAINTING AND COATING

A. Painting and coating shall conform with Section 09900 and the Approved Materials List. The manufacturer’s standard paint system may be used when approved by the City Engineer.

B. Paint color shall be Safety Yellow for public hydrants and Safety Red for private hydrants. Protection posts shall be painted the same color as the hydrant.

PART 3 EXECUTION

3.1 GENERAL

A. Fire hydrant assemblies shall be installed at locations shown on the Plans or as directed by the fire department of jurisdiction in accordance with the Standard Drawings.

B. Install bury ell and hydrant extension spools plumb. Break-off groove on hydrant extensions shall be located 1” above finished grade.

C. The location and port orientation of the fire hydrant shall conform with the Standard Drawings.

D. Fire hydrant flange bolts shall be set with nuts on top. Torque nuts uniformly and progressively in accordance with the manufacturer's recommendations.

E. Depending on location, fire hydrant assemblies may require protection posts or concrete retaining walls. When required by the City Engineer, or when shown on the Plans, protection posts or retaining walls shall be installed in accordance with the Standard Drawings.

3.2 CONCRETE

Concrete thrust and anchor blocks shall be installed in accordance with the Standard Drawings, design calculations and Section 03000.

3.3 WARNING/IDENTIFICATION TAPE

Warning/Identification Tape shall be installed in accordance with Section 15000 and the Standard Drawings.

3.4 DISINFECTION OF FIRE HYDRANT

The fire hydrant assembly shall be disinfected in accordance with Section 15041 as part of the process of disinfecting the main pipeline. The hydrant and isolation valve shall be operated and the assembly flushed to completely disinfect all internal parts.

3.5 HYDROSTATIC TESTING

Fire hydrant assemblies shall be hydrostatically tested in accordance with Section 15044 in conjunction with the pipeline to which it is connected.

3.6 FIELD PAINTING AND COATING

The fire hydrant exterior shall be field painted in accordance with Section 09900.

END OF SECTION

SECTION 16640 – CATHODIC PROTECTION BY SACRIFICIAL ANODES

PART 1 GENERAL

1.1 DESCRIPTION

This section includes materials, testing, and installation of corrosion protection and monitoring systems for metallic pipes including insulating flange kits, test stations, copper/copper sulfate reference electrodes, galvanic anodes, wiring, and exothermic welds.

1.2 DEFINITIONS

A. Contractor. The qualified construction firm selected by the Owner to have prime responsibility for the completion of work.

B. Owner. The Owner, as referred to in these specifications, is the City of Carlsbad.

C. Engineer. The Engineer is the Owner's representative who is assigned to be the direct contact between the Owner and the Contractor.

D. Corrosion Engineer. Retained by the Contractor, who is trained and experienced in cathodic protection installations and design and who is either a Registered Corrosion Engineer or a NACE Certified Cathodic Protection Specialist.

1.3 SPECIFICATIONS AND STANDARDS

The latest versions of the documents at the time of project biding shall apply.

A. American Society for Testing and Materials (ASTM):

B418	Standard Specification for Cast and Wrought Galvanic Zinc Anodes
B843	Standard Specification for Magnesium Alloy Anodes for Cathodic Protection
C94-86	Ready-Mixed Concrete
D-2220	Polyvinyl chloride Insulation for Wire and Cable
D-1248	Polyethylene Plastics Molding and Extrusion Materials
B3	Soft or Annealed Copper Wire
B8	Concentric-Lay Stranded Copper Conductors

B. American Water Works Association (AWWA):

C217	Petrolatum & Petroleum Wax Tape Coating for the Exterior of Connections and Fittings for Steel Water Pipelines

C. Federal Specifications (FS) Military Specification (Mil. Spec):

MIL-C-18480B Coating Compound, Bituminous, Solvent, Coal Tar Base

D. National Electrical Manufacturers Association

NEMA LE Cotton Phenolic Resin – Electrical Grade

NEMA CE Canvas Phenolic Resin – General Purpose Grade

NEMA G10 Glass Reinforced Epoxy

E. Underwriter's Laboratories, Inc. (UL) Publications:

83 Thermoplastic-Insulated Wires

486A-486B Wire Connectors and Soldering Lugs for Use with Copper Conductors

F. National Association of Corrosion Engineers (NACE):

SP0169 Recommended Practice, Control of External Corrosion on Underground or Submerged Metallic Piping Systems

SP0104 The Use of Coupons for Cathodic Protection Monitoring Applications

SP0286 Electrical Isolation of Cathodically Protected Pipelines

1.4 SUBMITTALS

The following information shall be submitted for approval of the Engineer in accordance with the General Provisions.

A. Catalog Cuts:

1. High potential magnesium anodes
2. Zinc anode
3. At-grade concrete test box with cast iron lid
4. Terminal Board
5. Shunts
6. Wire and cable
7. Exothermic weld kits
8. Pin Braze
9. Weld caps

10. Weld coating

11. Plastic warning tape

12. Insulating flange kits

13. Wax tape coating system

B. Qualifications of the Contractor's Corrosion Engineer and Corrosion Technician(s).

C. As-Built Drawings.

The Contractor shall maintain As-Built drawings showing exact locations of anodes, test stations, insulators, and wire trenching runs. Location changes from the design shall be clearly marked in red on a blue line copy of the design drawings. The As-Built drawings shall be submitted to the Engineer at the completion of construction in accordance with the General Provisions. The project is not considered complete until As-Built drawings are submitted.

D. Test Results.

1. Insulator tests

2. Continuity tests

3. Anode testing and cathodic protection performance

1.5 QUALITY ASSURANCE

A. The criteria used to indicate adequate corrosion protection of the steel pipeline shall conform with NACE SP0169. Testing of structure-to-soil potentials shall conform with NACE TM0497.

B. The installation of the corrosion protection system's electrical components shall conform to the NEC, applicable local codes, and NACE SP0169.

C. Services of Corrosion Engineer: Obtain the services of a Corrosion Engineer to inspect and test the installation of the corrosion protection system. The Corrosion Engineer shall be a registered professional engineer licensed by the State of California with certification or licensing that includes education and experience in cathodic protection (CP) of buried or submerged metal structures, or a person accredited or certified by NACE at the level of CP Specialist (i.e., NACE CP 4). Such a person shall have not less than five years of experience inspecting water transmission pipeline cathodic protection systems. Report shall be signed and certified by the Contractor's Corrosion Engineer stating that the requirements in this specification have been met.

D. Services of CP Technician: Obtain the services of a CP Technician to inspect and test the installation of the corrosion protection system. The CP Technician shall be onsite during the construction phase to perform the critical inspection tests detailed in Parts 3 and 4 herein. The CP Technician will be under the direct supervision of

the Corrosion Engineer. The CP Technician refers to a person certified by NACE at the level of CP Technician (i.e., NACE CP 2) or above. Such a person shall have not less than five years of experience inspecting water transmission pipeline cathodic protection systems. All tests performed by the CP Technician shall be under the direct supervision of the Corrosion Engineer.

PART 2 MATERIALS

2.1 GENERAL

Materials and equipment shall be new and the standard product of manufacturers regularly engaged in the manufacturing of such products. All materials and equipment shall bear evidence of safe operation approval from a nationally recognized testing laboratory.

2.2 HIGH POTENTIAL MAGNESIUM ANODES

A. Anode Alloy. Anodes shall be cast magnesium alloy ingots conforming to ASTM B843 Grade M1C.

B. Capacity. High potential magnesium anodes shall have a theoretical energy content of 1000 ampere-hours per pound and have a minimum useful output of 500 ampere-hours per pound.

C. Open Circuit Potential. The open circuit potential of all anodes, buried in the soil, shall be a minimum -1.60 volts DC versus a copper-copper sulfate reference electrode.

D. Anode Current Capacity. The anode's current capacity, as measured using the ASTM G97 standard test procedure, shall be minimum 480 amp-hours per pound. If anodes are of the cast type, the anode foundry or the anode retail supplier shall have a quality control program that includes random ASTM G97 testing. ASTM G97 current capacity tests shall be performed on randomly selected anodes at a minimum rate of one for every 2,500 anodes cast. Submit the ASTM G97 current capacity test results for the testing date that is closest to the production date of the anodes. All cast high potential magnesium anodes shall bear a stamp with its foundry heat number for traceability.

E. Chemical Composition (High Potential Magnesium).

Aluminum	0.01 percent (max)
Manganese	0.5 to 1.3 percent
Copper	0.02 percent (max)
Nickel	0.001 percent (max)
Iron	0.03 percent (max)
Silicon	0.05 percent (max)
Other	0.05 percent each (max)
Magnesium	balance

F. Ingot Size and Weight. Anodes shall be 48-pound pre-packaged, high potential ingots with a trapezoidal cross section. Ingot length shall be a minimum of 30.125 inches long. The total packaged weight shall be 105 lbs.

G. Anode Construction. Anodes shall be cast magnesium with a galvanized steel core rod recessed on one end to provide access to the rod for connection of the lead wire. Silver braze the lead wire to the rod and make the connection mechanically secure. Insulate the connection to a 600-volt rating by filling the recess with epoxy and covering any exposed bare steel core or wire with heat shrinkable tubing. The insulating tubing shall extend over the lead wire insulation by not less than 1/2 inch.

H. Anode Pre-Packaged Backfill Material. The anodes shall be completely encased and centered within a permeable cloth bag in a special low resistivity backfill mix with the following composition:

Gypsum	75%
Powdered bentonite	20%
Anhydrous sodium sulfate	5%

I. Backfill grains shall be such that 100 percent can pass through a screen of 100 mesh. Backfill shall be firmly packed around the anode such that the ingot is approximately in the center of the backfill. The resistivity of the backfill shall be no greater than 50 ohm-cm when tested wet in a soil box. Total prepackaged weight shall be approximately 105 pounds.

2.3 ZINC ANODES

A. Zinc anodes shall be 99.99 percent zinc bars, conforming to ASTM B418, Type 2, prepackaged in a cloth bag containing backfill of the following composition: 75 percent gypsum, 20 percent bentonite and 5 percent sodium sulfate.

B. Anodes shall be cast with a galvanized steel core strap. One end of the anode shall be recessed to provide access to the rod for connection of the lead wire. The lead wire shall be silver brazed to the rod, making a mechanically secure connection. The connection shall be insulated to a 600-volt rating by filling the recess with asphalt. The asphalt material shall be extended over the lead wire insulation by not less than 1/2 inch. The Contractor shall repair all damaged lead wire insulation as directed by the Engineer and at no additional cost to the Owner.

C. Unless otherwise indicated or specified on the Drawings, the anode lead wire shall be minimum No. 12 AWG stranded copper wire with red THW insulation. The anode wire shall be long enough to extend to the test box without any splices and provide for a minimum of 24 inches of slack within the test box and at the anode connection.

D. Zinc anode weight, total anode bag weight, and dimensions shall be as indicated on the Drawings.

2.4 AT-GRADE TEST STATIONS

A. Test Box. At-grade test boxes shall be round, pre-cast concrete with a cast iron lid. The traffic valve box for test station enclosures shall be G5 Utility Box as manufactured by Christy Concrete Products, Inc., No. 3RT Utility Box as manufactured by Brooks Products, or equal, with a cast iron supporting ring and lid. The lid shall be cast with the legend "Corrosion".

B. Terminal Board Enclosure. Each at-grade test station box shall include a 5-inch x 5-inch cross-laminated phenolic terminal board with a minimum thickness of 1/4-inch. The phenolic material shall be NEMA type CE or LE. The terminal board shall contain individual electrical lugs for each wire entering the test station or junction box.

C. Shunt. The shunt resistance shall be 0.01 ohm mounted on the terminal board with marine grade brass-nickel terminal lugs (Promark PM-TS3-lugs or approved equal) with brass set screw. Terminal holes shall be 1/4-inch diameter and 1 inch on center. The overall shunt dimensions shall allow easy connection to the terminal board. Use yellow COTT shunt as manufactured by Cott Manufacturing Company, yellow shunt as manufactured by Tinker & Razor, or equal.

D. Identification Tags. All test leads shall be identified with an Avery label (model 5361), self-adhesive covered with polyolefin clear heat shrink tubing (3mfp301). The label shall include name of facility – size – pipe material; type of insulation; station number

E. Concrete Pad. Test boxes mounted in unpaved areas shall be mounted in a reinforced 24-inch square by 6-inch thick concrete pad constructed of ASTM C94 ready-mix concrete. Rebar shall be No. 4 steel.

2.5 WIRE AND CABLE

All wires shall be stranded copper with HMWPE insulation suitable for direct burial in corrosive soil and water, conforming to UL 83 and ASTM standards B3 or B8. HMWPE insulation shall conform to ASTM D1248 Type 1, Class C, Grade 5. THWN insulation shall conform to ASTM D-2220.

A. Test Leads. No. 8 AWG HMWPE.

B. Anode Lead Wire. No. 12 AWG HMWPE.

C. Mechanical Joint Bond Wire. No. 4 AWG HMWPE.

D. Casing Lead Wire. No. 10 AWG HMWPE

E. All wire and copper connectors shall conform to UL 486-76.

F. Wire Splicing. NO wire splicing is permitted.

2.6 EXOTHERMIC WELD KIT

A. Exothermic welds shall be provided for connecting wires to structures in strict accordance with the manufacturer's recommendations. All exothermic welding hardware and consumable material shall be the product of a single manufacturer. Exothermic welds shall be Cadweld as manufactured by Erico Products, Inc., Thermoweld as manufactured by Continental Industries, Inc., or equal. Duxseal packing as manufactured by Johns-Manville or equal shall be used where necessary to prevent leakage of molten weld metal. It is the Contractor's responsibility to determine the manufacturer's recommended weld charge size for metallic surfaces.

B. The shape and charge of the exothermic weld shall be chosen based on the following parameters:

1. Pipe material

2. Pipe size

3. Pipe wall thickness

4. Wire material

5. Number of strands to be welded

6. Orientation of weld (vertical or horizontal)

C. Weld Caps. Royston Roybond Primer 747 and Royston Handy Cap IP or equal.

D. Weld Coating. Cold-applied fast-drying mastic consisting of bituminous resin and solvents per Mil. Spec. Mil-C-18480B such as Koppers bitumastic 50 or 505, Tnemec 40-h-413, tape-coat TC mastic or 3M Scotch Clad 244. The minimum coating thickness shall be 25 mils (0.025 inch).

2.7 PIN BRAZING

A. Pin brazing technique is based primarily upon Electric-arc silver soldering using a specially designed portable pin brazing unit, a hollow brazing pin containing silver solder and flux. Pin brazing process "BAC", “Safetrack”, or approved equal.

B. Brazing pins are available in direct connection or threaded formats of various sizes. Pin brazed connectors have low transition resistance which does not change with time, and they can handle amperage above the capacity of the cable.

2.8 INSULATING FLANGE KITS

A. General: Insulating flange kits shall consist of Type E, full face sealing element retainers, insulating sleeves and double washers (steel and dielectric) on each end. All insulating material shall be of the type designated by the manufacturer as suitable for the operating temperature and pressure of the service. All components shall be the product of a single manufacturer.

1. Insulating Retainer and Sealing Element: NEMA grade G-10 epoxy glass containing a precision groove to accommodate a rectangular nitrile (Buna-N) O-ring sealing element. Minimum total thickness shall not be less than 1/8-inch. Dielectric strength shall be not less than 550 volts per mil, and compressive strength of not less than 50,000 psi.

2. Insulating Sleeves: 1/32-inch thick tube, full length, G10 glass material per NEMA LI-1. Dielectric strength shall be not less than 400 volts per mil. The length of the sleeve is a critical requirement. The required length is equal to the distance from one flange to the other (including gasket thickness) plus twice the insulating washer thickness plus the thickness of two steel washers minus

1/16-inch. For installation on threaded bolts, i.e., at butterfly valve flange bonnets and bases, the sleeves shall be half length. Provide four extra insulating sleeves in case some are cracked during installation.

3. Insulating Washers: 1/8-inch thick, full length, G10 glass per NEMA LI-1. Dielectric strength shall not be less than 550 volts per mil, and compressive strength of not less than 50,000 psi. Provide eight extra insulating washers to avoid installation delays commonly associated with components damaged during the installation process.

4. Steel Washers: 1/8-inch cadmium plated or zinc plated steel placed between the nut and insulating washer. The inside diameter of the steel washers shall be a minimum of 1/16-inch larger than the outside diameter of the insulating sleeves to prevent binding. For flanges with bolt sizes of 1-1/4-inch and larger, two steel washers shall be ordered for each side so that the insulating washer can be "sandwiched" between the two for additional support.

5. Coating: All buried insulating flanges shall be wax taped coated per AWWA C217. See section for "External Coating for Buried Surfaces" below.

2.9 EXTERNAL COATING FOR BURIED SURFACES

A. All buried insulating flange kits and buried pipe sections and fitting surfaces that are not epoxy or polyurethane coated shall be wrapped with a three-layer petrolatum wax tape coating system per AWWA C217.

B. Primer: All surfaces shall be prime coated with a blend of petrolatum, plasticizer, inert fillers, and corrosion inhibitors having a paste-like consistency. Use Denso Paste, Trenton Wax-Tape Primer, or approved equal.

C. Wax Tape: Covering material shall be a synthetic felt tape, saturated with a blend of petrolatum, plasticizers, and corrosion inhibitors that is formable over irregular surfaces. Use Denso Densyl Tape, Trenton #1 Wax-Tape, or approved equal.

D. Plastic Outer Wrap: The primed and wax taped surface shall be covered with a plastic outer wrap consisting of three layers of 50-guage (10-mil) polyvinylidene chloride or PVC, high cling membrane wound together. Use Denso Poly-Wrap, Trenton Poly-Ply, or approved equal.

2.10 WARNING/IDENTIFICATION TAPE

A. Utility warning/identification tape shall conform with Section 15000.

PART 3 EXECUTION

3.1 GENERAL

A. Standard. Cathodic protection installation shall conform to NACE SP0169 "Recommended Practice, Control of External Corrosion on Underground or Submerged Metallic Piping Systems.

B. Contractor Qualifications. All work shall be performed by qualified, experienced personnel working under continuous, competent supervision. Qualified Contractors must demonstrate at least five years of experience with cathodic protection installations.

C. Test Results. The Contractor shall submit a Corrosion Engineer's report including all test data, conclusions, repairs, and cathodic protection system performance.

D. Notification for Testing. The Contractor shall notify the Engineer at least five days in advance of the anodes and test station installations. The Engineer or the Owner's representative shall, at their discretion, witness the installation of anodes and cathodic protection facilities. Testing shall be as described in this specification section.

3.2 GALVANIC ANODE INSTALLATION

A. Install prepackaged anodes at the locations indicated for protection of piping, fittings, and appurtenances. Remove plastic and paper wrapping from the anode prior to lowering the anode into the hole. Do not suspend anodes by the lead wire. Backfill the anodes with native soil or backfill approved by the Engineer. Under no circumstances shall cement slurry or CLSM be allowed for backfill within three feet of the anodes.

B. Upon completion of compaction of backfill to the top of the anode, and prior to filling the hole and compacting the backfill to the surface, pour a minimum of 10 gallons of water into the hole to saturate the prepackaged anode backfill and surrounding soil.

C. Backfill the anode with 6-inch lifts, compacting the soil around the anode during each lift until the backfill has reached grade. Damage to the canvas bag, anode-to-wire connection, copper wire, or wire insulation shall require replacement of the entire assembly at the Contractor's expense. Do not backfill anodes prior to inspection and acceptance by the Engineer.

D. Upon completion of installation, test the open-circuit potential of all anodes with a copper sulfate reference electrode. If any installed zinc anode has a potential more electropositive than −1.00 Volt, the anode is to be replaced at the Contractor's expense. If any installed high potential magnesium anode has a potential more electropositive than −1.60 Volts, the anode is to be replaced at the Contractor's expense. All testing procedures and results are to be verified by the Engineer before acceptance.

3.3 AT-GRADE CORROSION PROTECTION TEST STATIONS

A. Location. At-grade corrosion protection test boxes (CPTS) shall be located at the edge and directly behind the curb unless otherwise shown on the Drawings. All test box locations shall be approved by the Engineer.

B. Route wires to the terminal board as shown on the Drawings. Connect each wire to the terminal board using binding post connectors. Attach terminal board cover. Place terminal board in concrete test box upright, as shown on the Drawings.

C. Galvanic Anode Junction Boxes. Provide test box for all galvanic anode installations. Do not direct connect anodes to the pipelines. Provide a shunt to enable monitoring of the anodes.

D. Wire ID. Wire identifiers shall be placed on all wire prior to backfill and installation of test stations.

E. Test Box Bottom. Test boxes shall be set in native soil.

F. Test Lead Attachment. Test leads shall be attached to the pipe using the exothermic weld process. Coil 24 inches of slack wire at each weld at the pipe and inside each test box.

G. Concrete Pad. A 24-inch square by 6-inch thick reinforced concrete pad is required around each at-grade test station. Test boxes and concrete pad shall be flush with the top of the curb.

3.4 WIRE AND CABLE

A. Test Lead Trench. Horizontal test or anode lead runs shall be placed in a trench 36 inches deep.

B. PVC Conduit. Place all wire runs in schedule 40 PVC conduit with solvent welded joints.

C. Wire Handling. Wire leads shall not be stretched or kinked. Care shall be taken when installing wire and backfilling. If wire insulation is damaged during installation, it shall be rejected and replaced completely at the Contractor's expense. All rejected wire shall be removed from the job site at the close of each workday.

D. Plastic Warning Tape. Plastic warning tape shall be installed in all wire trenches and 12 inches below finished grade.

E. Splicing. Wire splices are not permitted.

3.5 WIRE-TO-PIPE CONNECTIONS

A. Exothermic Weld. All connections of copper wires to the pipe shall be made by the exothermic weld or pin brazing method.

B. Weld Charge Size. Use the manufacturer’s recommended weld charge size.

C. Preparation of Wire. Do not deform cable. Remove only enough insulation from the cable to allow for the exothermic or pin braze weld.

D. Preparation of Metal. Remove all coating, dirt, grime and grease from the metal structure by wire brushing. Clean the structure to a bright, shiny surface free of all serious pits and flaws by using a file. The surface area of the structure must be absolutely dry.

E. Wire Position. The wire is to be held at a 30-degree angle to the surface when welding. Only one wire shall be attached with each weld.

F. Testing of All Completed Welds. After the weld has cooled, the weld shall be tested by striking the weld with a 2-lb hammer while pulling firmly on the wire. All unsound welds shall be cleaned, re-welded, and re-tested. All weld slag shall be removed.

G. Weld Coating. The area to be coated shall be clean and completely dry. Apply a primer specifically intended for use with an elastomeric weld cap. Apply the weld cap and a bituminous mastic coating material to all exposed areas around the cap in accordance with the manufacturer's recommendations. The coating shall overlap the structure coating by a minimum of 3 inches.

H. Concrete-Encased or Mortar Coated Pipe. For concrete-encased or mortar coated pipelines, cover the exothermic weld nugget and all disturbed areas of the pipeline coating with a quick cure, non-shrink, cementitious patching compound. Apply the compound to a thickness equal to the surrounding pipe coating thickness or 3/4-inch, whichever is greater. The patching compound shall have a set time of 20 minutes, a maximum shrinkage of 0.087 percent after seven days (ASTM C596), achieve a minimum compressive strength of 3,500 psi in one day, and a minimum compressive strength of 8,000 psi in 28 days (ASTM C109).

I. Mortar Repair. Coating voids shall be filled with cement grout.

3.6 BOND WIRES

A. Mechanical Joint Bond Wires. Two (2) No. 4 HMWPE bond wires are required across each non-insulating, in-line valve; flexible couplings, and all non-welded joints to ensure electrical continuity. A third No. 6 HMWPE bond wire is required from the valve to one outside flange as shown in the drawings. The bond wires shall be attached using the exothermic weld process. Bond wires shall have some slack wire at each weld to allow for creep when backfilling.

3.7 INSULATING FLANGE KITS

A. General: Insulating flange kits shall be pre-assembled and installed as recommended by the manufacturer, and per NACE SP0286. Moisture, soil, and other foreign matter must be fully removed and prevented from contacting any portion of mating surfaces. If foreign matter contacts any portion of these surfaces, then the entire flange shall be disassembled, cleaned, and dried before reassembly.

B. Installation: Align and install insulating joints according to the manufacturer's recommendations to avoid damaging insulating materials. The manufacturer’s bolt tightening sequence and torque specifications shall be followed.

C. Conductive Grease. Conductive grease shall not be used on the flange bolts or any other flange components under any circumstances.

D. Paint Pigments: No electrically conductive pigments or paints shall be used either internally or externally on the bolts, washers, or flanges.

E. Inspection: All buried insulating flanges shall be inspected, tested, and approved by the Engineer as described in Part 4 of this specification and prior to the application of wax tape coating.

3.8 EXTERNAL COATING

A. All buried insulating flanges shall be covered with a 3-layer wax tape coating system per AWWA C217. Additionally, all in-line valves, flanges, couplings, and adapters that are not coated with a bonded dielectric coating shall be wax tape coated per AWWA C217.

B. Primer: Surfaces must be cleaned of all dirt, grime, and dust by using a wire brush and clean cloth. The surface shall be dry. Apply the primer by hand or brush. A thin coating of primer shall be applied to all surfaces and worked into all crevices. The primer shall be applied generously around bolts, nuts, and threads, and shall fully cover all exposed areas. The primer should overlap the pipe coating by a minimum of 6 inches.

C. Petrolatum Saturated Tape: The wax tape can be applied immediately after the primer. Short lengths of tape shall be cut and carefully molded around each individual bolt, nut, and stud end. For long bolts (such as in couplings), short lengths of tape shall be cut and circumferentially wrapped around each individual bolt. After the bolts are covered, the tape shall be circumferentially wrapped around the flange with sufficient tension to provide continuous adhesion without stretching the tape. The tape shall be formed, by hand, into all voids and spaces. There shall be no voids or gaps under the tape. The tape shall be applied with a 1-inch minimum overlap.

D. Outer Covering: A plastic outer cover shall be applied over the petrolatum- saturated tape. The plastic shall be a minimum of 50-guage (10-mil) and shall have two layers applied.

PART 4 TESTING AND INSPECTION

The Contractor's Corrosion Engineer shall submit his proposed test procedures to the Engineer at least five (5) days in advance of the time that the cathodic protection system testing is scheduled. The Engineer shall witness all testing at their discretion. All test data shall be submitted to the Engineer within seven (7) days of the completion of the testing. All testing shall be done under the supervision of a qualified Corrosion Engineer who is retained by the Contractor. All deficiencies found to be due to faulty materials or workmanship shall be repaired or replaced by the Contractor and at his expense. Notify the Engineer at least three (3) days in advance to witness the performance testing.

4.1 TEST LEADS

It is the Contractor's responsibility to test all test leads.

A. Test Method. All completed wire connection welds shall be tested by striking the weld with a 2-lb hammer while pulling firmly on the wire. Welds failing this test shall have the surface re-prepared, have the wire re-welded to the pipe and re- tested. Wire welds shall be spot tested by the Engineer. After backfilling the pipe, all test lead pairs shall be tested using a standard ohmmeter.

B. Wire Identification. The Engineer shall be given the opportunity (two days prior notice) to verify that buried pipe lead wires and anode lead wires are properly

identified with heat shrinkable label prior to backfilling the wires and the welded wire-to-pipe connections.

C. Pipe Test Wire Integrity Tests. After the pipe is buried, the pipe lead wire trenches are backfilled, and the cathodic test boxes are installed, the Contractor's Corrosion Engineer shall test each set of pipe lead wires for electrical continuity to the pipe. If more than twice the theoretical resistance of the pipe lead wire lengths is measured, the Contractor shall excavate the pipe and replace the pipe lead wires.

Wire Size	Resistance (Ohms/100 feet at 77 °F)
No. 4 AWG	0.027
No. 6 AWG	0.043
No. 8 AWG	0.068
No. 10 AWG	0.108
No. 12 AWG	0.172
No. 14 AWG	0.273

4.2 ANODE LEAD WIRE

The Contractor is responsible for inspecting anode lead wires. Lead wires shall be spot inspected by the Engineer.

A. Test Method. A visual inspection and by running his hand along the full length of the lead while installing.

B. Acceptance. All leads shall be free of cuts nicks or abrasions in the wire insulation. Damaged leads shall be rejected.

4.3 TEST LEAD TRENCHING

The Engineer, at his or her discretion, shall inspect wire trenches and backfill material and methods.

A. Test Method. The depth, trench bottom, padding, and backfill material shall be visually inspected prior to backfilling.

B. Acceptance. Conformance with specifications.

4.4 PIPELINE CONTINUITY THROUGH IN-LINE VALVES

The Contractor's Corrosion Engineer shall measure the linear resistance of sections of pipe in which in-line valves or other mechanical joints have been installed. All testing shall be done by the Corrosion Engineer in the presence of the Engineer.

A. Test Method. Resistance shall be measured by the linear resistance method. A direct current shall be impressed from one end of the test section to the other (typically test station to test station). A voltage drop is measured for several different current levels. The measured resistance (R) is calculated using the equation R=dV/I, where dV is the voltage drop between the test span and I is the current.

B. Acceptance. Acceptance is a comparison between the measured resistance (from the field test data) and the theoretical resistance. The theoretical resistance must consider the pipe (length and wall thickness) and the resistance of the bond wires. The measured resistance shall not exceed the theoretical resistance by more than 120%. The Contractor's Corrosion Engineer shall submit, within seven (7) days of the completion of the testing and in a report format, to the Engineer all calculations of the theoretical resistance and measured pipe resistance for each section tested.

4.5 INSULATING FLANGE KITS

A. Responsibility: Insulating flanges shall be inspected and tested by the Contractor's Corrosion Engineer and in the presence of the Engineer, prior to backfilling. Testing of the buried insulating flange kit prior to backfill, without the Engineer present, will result in non-acceptance of the insulator.

B. Test Method: The assembled flange shall be tested using a Gas Electronics Model 601 Insulation Checker specifically design for testing insulating flanges. The testing shall be done by a qualified Corrosion Engineer accepted by the Engineer and shall be done in accordance with NACE RP0286.

C. Acceptance: The installation of the insulating flange kit shall be considered complete when the testing device indicates no shorts or partial shorts are present. The Contractor shall aid in finding any and all shorts or shorted bolts. All disassembly and reassembly necessary for acceptance shall be done at the Contractor's expense.

4.6 CATHODIC PROTECTION PERFORMANCE

The Contractor's Corrosion Engineer shall inspect, activate, adjust, and evaluate the effectiveness of the cathodic protection system in the presence of the Engineer. All testing shall be performed under the direct supervision of a Corrosion Engineer as defined by this specification. The term "direct supervision" is defined in this specification as requiring the Corrosion Engineer to work onsite during the start of the cathodic protection system activation to plan, direct, and verify the testing procedures and to provide troubleshooting as required. The CP system activation report shall be reviewed and signed as being accurate and complete by the Corrosion Engineer.

A. Provide a minimum of five days advance notice to the Engineer before the cathodic protection activation will be performed to allow for coordination and observance of these tests.

B. Measure CP Native Potentials (i.e., baseline pipe-to-soil potentials) at all corrosion test stations prior to activating the cathodic protection system. Measure CP Native Potentials on both sides of all insulating flanges, dielectric unions, and at all corrosion test station wires. Measure the CP Native potentials of electrically grounded equipment inside all vaults and structures along the pipeline. Where two wires are attached to the same pipeline, measure and record the CP Native Potentials for both wires. If the potential measurements for the same pipeline differ by more than 5 millivolts, investigate the cause and correct the issue until the potential measurement differs by less than 5 millivolts.

C. Measure the CP Potentials of all galvanic anodes before they are connected to pipe wires inside the corrosion test station. Verify minimum open-circuit potentials of the anodes.

D. Activate the cathodic protection system by connecting all the anode wires to the shunts inside the corrosion test station. Measure CP “On Potentials” at the same locations where CP “Native Potentials” were previously measured.

E. Measure all anode currents at corrosion test stations by measuring the voltage drop across the calibrated shunts provided. Calculate the corresponding amount of direct current flow using the shunt rating. Explicitly state the shunt rating on each data sheet.

F. Acceptance. Shall be based on achieving the –850 mV criterion or 100 mV polarization criterion as outlined in NACE SP0169. Furnish all test results including all CP Potential readings, anode current readings, startup test data, insulating flange test data, dates in a summary report submitted to the City Engineer for approval.

G. Compliance with Specifications. Deficiencies or omissions in materials or workmanship found by these tests shall be rectified at the Contractor’s expense. Deficiencies shall include but are not limited to broken leads, improper or unclean trenches, lack of specified slack wire in test boxes; improperly mounted test boxes; improper installation and testing of insulators; and other deficiencies associated with the workmanship, installation, and non-functioning equipment.

END OF SECTION