




GARDEN GROVE

**STANDARD PLANS
AND
SPECIFICATIONS
2015 EDITION**

**CITY OF GARDEN GROVE
PUBLIC WORKS DEPARTMENT**



**WILLIAM E. MURRAY JR.
PUBLIC WORKS DIRECTOR**



City of Garden Grove
Public Works Department
ENGINEERING DIVISION
P.O. Box 3070
Garden Grove, CA 92842-3070
Telephone Number: 714.741.5887
FAX Number: 714.741.5578

STREET PERMIT REQUIREMENTS
48 HOUR NOTICE IS REQUIRED PRIOR TO THE START
OF ANY WORK TO BE PERFORMED
714.741.5887

General Conditions

1. All work shall conform to the City of Garden Grove Standard Plans and Specifications, as well as the Standard Specifications of the State of California Department of Transportation, latest edition.
2. Compaction testing of native material, aggregate base, and asphalt shall be provided by the permittee to the City Engineer for longitudinal and transverse trenches located within the public right-of-way. Written results of said testing shall be furnished to the City Engineer. The use of one-sack of cement per cubic yard of sand slurry backfill may be substituted for native backfill.
3. The contractor shall be responsible for protecting all existing utility lines, infrastructure, or landscaping in place and shall bear any expense for repair to said facilities.
4. The contractor shall be responsible for protecting or replacing existing landscaping in public rights-of-way. Notify the Department of Public Works at (714) 741-5887, 48 hours prior to excavation in medians or landscaped areas.
5. Contractor shall submit a certificate of insurance for worker's compensation, general liability and automobile liability. General liability and automobile liability shall each be in the amount of one million dollars and the general liability must include an endorsement designating the City of Garden Grove as additional insured.
6. Permittee must notify Underground Service Alert (USA) by calling 811 at least 48 hours prior to start of work. USA ticket must be available at job site. Permittee shall remove all USA markings upon completion of work.
7. All new utility cable, conduit, or pipe shall provide a minimum clearance of 5 feet horizontal and 1 foot vertical spacing of any proposed or existing water or sewer main and their appurtenances. Any type of above-ground utility structure shall not be allowed within 5 horizontal feet of any water or sewer related facility. Variance to these minimum clearances require approval of Water Services on a case-by-case basis.
8. All utilities shall be installed with a minimum cover of 30 inches below flow line of adjacent curb and gutter.
9. The contractor shall be responsible for shut down of fire hydrants. Notify the Department of Public Works Water Operations Superintendent at (714) 741-5348, 24 hours prior to excavating within ten feet of a fire hydrant.
10. All permitted work shall be initiated and completed within 6 months from the date of issuance; otherwise the permit shall become null and void. All class "A" and "B" permits shall expire and be cancelled sixty (60) calendar days after the date on which actual construction of the work was commenced, unless a longer construction period is specified in the permit, in which case permit shall expire at the end of the

longer period specified therein. No street lane closures will be allowed during the Christmas season, starting at the beginning of Christmas week through January 1.

11. For any vertical obstruction (including utility cabinets, power poles, street light poles, sign posts, etc.) the minimum clearance from the curb face shall be 18 inches.

Concrete Replacement

12. Permittee shall replace in-kind any broken pavement, curb, gutter, sidewalk or other concrete improvements adjacent to the work, which are undermined, damaged, or displaced due to the contractor's performance of the work. A permit to do work in the right-of-way is not authorization to cut a street unless the approval to cut the street is specified on the permit.
13. Tunneling of curbs, gutters, sidewalk, or other structures where air voids may be created will not be permitted. Jacking, pushing, and boring are acceptable.
14. For damage done to any sidewalk, the contractor shall replace full-width sidewalk to the nearest score mark for excavations in sidewalk areas.
15. A licensed Land Surveyor shall restore any survey reference points or monuments after the work is complete in accordance with section 8771 of the Business and Professions Code.
16. New concrete, which is vandalized or marked prior to acceptance by the City, shall be replaced to the satisfaction of the City Engineer. Grinding, patching, or other remedies will not be permitted.
17. Sawcut slurry shall be vacuumed immediately and shall not be allowed to leave the jobsite by any other means.

Street Resurfacing and Backfill

18. All trenches shall be neatly saw cut to a minimum depth of 2 inches. Existing asphalt pavement shall be cut by a device capable of making a neat, straight and smooth cut. For cuts greater than 600 feet in length, the entire area of work may be subject to additional resurfacing requirements as determined by the City Engineer.
19. Minimum pavement replacement sections shall be 6 inches asphalt concrete over 12 inches of class II 3/4 inch aggregate base for arterial streets. Pavement replacement sections for residential streets shall match existing pavement using a minimum criteria of 4 inches AC over 6 inches AB. The final course of asphalt shall be machine laid to achieve minimum 95% relative compaction and meet a smoothness standard of no more than one eighth of an inch plus or minus deviation in ten feet. Narrow longitudinal trenches located outside travel lanes, which exceed 6 inches wide shall be milled one inch to adequate width to allow use of a paving machine. A "T" cap will be utilized on all streets where the excavation affects a travel lane pursuant to City of Garden Grove "Standard Street Resurfacing and Trench Backfill Detail No. B-134, Case A.
20. Base course asphalt shall be Type B PG 70-10, surface course asphalt shall be Type C2 PG 70-10, and leveling course shall be Type D2 PG 70-10 per Section 203-6.4 of the Standard Specifications for Public Works Construction ("Greenbook"), latest edition. Thickness for base course shall be greater than 3", surface course shall be greater than 1" and less than equal to 3", and leveling course shall be less than 1". Tests for compaction, gradation, and oil content shall be supplied by permittee as required by the City Engineer.

21. For longitudinal trenches, no strip of asphalt pavement, which is three feet wide or less, shall remain between the trench line and lip of gutter. The asphalt in this area shall be removed and replaced with the adjacent trench paving.
22. There is a four (4) year moratorium on any trenching / street work once a street has been resurfaced. Street rehabilitation projects are often federally funded and mandate such a restriction.
23. All excavations must be backfilled by the end of each workday. Temporary paving shall be installed and compacted at the end of each day. Steel plates are acceptable provided the plates are sized to support traffic loading, anchored, and are skid resistant per Garden Grove Standard Plan No. B-138. **These steel plates shall remain in place a maximum of five (5) days; after which time the plates shall be removed and the trench backfilled.** For trenches exceeding 600 feet, a permanent hot-mix asphalt patch shall be placed beginning within two (2) working days of completion of backfill. Final paving requirements shall be performed within thirty (30) calendar days of completion of backfill.
24. No excavation within five (5) feet of the traveled way shall remain open longer than is necessary to perform the work.

At the end of each working day, if a difference in excess of 4 inches exists between the elevation of the existing pavement and the elevation of the material within the excavation and the trench lies within five feet of the traveled way, material shall be placed and compacted against the vertical cuts adjacent to the traveled way to the satisfaction of the Engineer.

The material shall be placed to the surface of the existing pavement and tapered at a slope of 4:1 or flatter to the bottom of the excavation. During excavation operations, native material may be used for this purpose; however, once the placing of the structural section commences, structural material shall be used.

25. The City of Garden Grove may take samples from the construction materials delivered to the site. Materials not conforming to the specifications shall be removed and replaced at the contractor's expense.
26. A street permit is not required prior to emergency street cuts by utility companies to restore service or eliminate hazardous conditions. In case of emergency work, notify Public Works Permits at (714) 741-5887. However, utility companies are required to secure a permit to restore the street after the fact.
27. All temporary paving shall have a minimum 2 inches of AC on residential streets and 3 inches on non-residential.

Traffic Control

28. Temporary traffic control during construction shall conform to the latest edition of the CaMUTCD and the requirements of the City Traffic Engineer.
29. A traffic control plan shall be submitted for approval prior to construction for work affecting arterial streets. The plan shall detail lane lines, islands and medians, street intersections and driveways. A licensed civil or traffic engineer may be required to sign the plans as directed by the City Traffic Engineer.
30. The contractor shall be responsible for protection of traffic signal detector loops. Notify the City Traffic Engineering Division at (714) 741-5192, 48 hours in advance prior to excavating within 600 feet of a signalized intersection.

31. All traffic control devices shall remain in effect during construction.
32. A Caltrans Type I flashing arrow board is required for each lane closure on an arterial street.
33. All damaged raised pavement markers; traffic striping, legends, or traffic loops shall be replaced to the satisfaction of the City Traffic Engineer.
34. Working hours where a lane closure involves an arterial type street will be limited to the hours between 9:00a.m. and 3:30p.m or as modified by the City Traffic Engineer.
35. Maximum spacing of delineators in a taper area shall be 25 feet. Maximum spacing of delineators in a tangent area shall be 35 feet.
36. All businesses and property owners affected by work shall be notified at least 24 hours prior to start of construction. **Access to businesses and residences shall be maintained at all times.**
37. Failure to adhere to working hours or traffic control requirements shall result in suspension of work until adequate arrangements can be made to ensure public safety and convenience meeting the approval of the City Traffic Engineer.

revised 5/28/15



CITY OF GARDEN GROVE PUBLIC WORKS STANDARD PLANS

B- 99 TITLE SHEET FORMAT

SERIES B-100 STREET AND HIGHWAY

- B-101 MAJOR HIGHWAY – TYPICAL SECTION
- B-102 PRIMARY HIGHWAY – TYPICAL SECTION
- B-103 SECONDARY HIGHWAY – TYPICAL SECTION
- B-104 LOCAL STREET – TYPICAL SECTION
- B-105 RESIDENTIAL SIDEWALK
- B-106 COMMERCIAL AND ARTERIAL SIDEWALK
- B-107 SIDEWALK LANDINGS
- B-108 CURB RETURN ADA ACCESS RAMP
- B-109 STANDARD KNUCKLE
- B-110 CONCENTRIC CUL-DE-SAC
- B-111 OFFSET CUL-DE-SAC
- B-112 CONCRETE CURB ONLY TYPE "A" AND "B"
- B-113 CONCRETE CURB & GUTTER TYPE "C"
- B-114 CONCRETE CURB & GUTTER TYPE "D"
- B-115 CONCRETE CURB & GUTTER TYPE "F"
- B-116 ROLLED CURB & GUTTER
- B-117 A.C. BERM
- B-118 ALLEY AND ALLEY APRON
- B-119 CROSS GUTTER
- B-120 ARTERIAL STREET DRIVEWAY
- B-121 NON-ARTERIAL, MULTI-RESIDENTIAL & COMMERCIAL DRIVEWAY
- B-122 LOCAL STREET DRIVEWAY
- B-123 TYPICAL PARKWAY TREE WELL INSTALLATION
- B-124 SURVEY MONUMENT TYPE "A"
- B-125 CHAIN LINK FENCE DETAIL
- B-126 CONCRETE BUS PAD
- B-127 STREET TREE PLANTING DETAIL
- B-128 TYPICAL ARTERIAL/ARTERIAL INTERSECTION LAYOUT



CITY OF GARDEN GROVE PUBLIC WORKS STANDARD PLANS

SERIES B-100 STREET AND HIGHWAY (continued)

- B-129 RIGHT TURN POCKET
- B-130 MID-BLOCK BUS TURNOUT
- B-131 CORNER BUS TURNOUT
- B-132 PARABOLIC CURB TRANSITION
- B-134 TRENCH BACKFILL DETAIL & STANDARD STREET RESURFACING
- B-135 CONSTRUCTION INFORMATION SIGN
- B-136 CIVIC CENTER STREET IMPROVEMENT CRITERIA
- B-137 HARBOR BOULEVARD DECORATIVE SIDEWALK IMPROVEMENTS
- B-138 UTILITY TRENCH STEEL PLATE REQUIREMENTS

SERIES B-200 STORM DRAIN

- B-201 CATCH BASIN – TYPE OS (CURB OPENING – SMALL)
- B-202 CATCH BASIN – TYPE OL (CURB OPENING – LARGE)
- B-203 MISCELLANEOUS CATCH BASIN DETAILS
- B-204 MISCELLANEOUS CATCH BASIN DETAILS
- B-205A LOCAL DEPRESSION (SUMP CONDITION)
- B-205B LOCAL DEPRESSION (FLOW-BY CONDITION)
- B-206 STORM DRAIN MANHOLE
- B-207 STORM DRAIN MANHOLE (SHALLOW DEPTH)
- B-208 CONCRETE COLLAR FOR PIPES 18”–66” DIAMETER
- B-209 PARKWAY DRAIN

SERIES B-300 TRAFFIC AND LIGHTING

- B-301 STREET SIGN FOR PUBLIC STREETS
- B-302 STREET SIGN FOR PRIVATE STREETS
- B-303 ROADWAY STRIPING DETAILS
- B-305 TYPICAL TRAFFIC MARKER & SIGN INSTALLATION
- B-306 STANDARD BARRICADE
- B-307 STEEL DAVIT STANDARD
- B-308 PRIVATE PROPERTY TOW AWAY SIGN
- B-309 STREET NAME SIGN MOUNTING BRACKET (FLAT OR EXTRUDED)
- B-310 STREET NAME SIGN POLE DETAIL



CITY OF GARDEN GROVE PUBLIC WORKS STANDARD PLANS

SERIES B-300 TRAFFIC AND LIGHTING (continued)

- B-311 PARKING LOT LAYOUT
- B-312 PARKING & QUEUING FOR DRIVE THROUGH RESTAURANTS
- B-313 STREET LIGHTING

SERIES B-500 BUILDING

- B-502 REFUSE STORAGE ENCLOSURE
- B-504 BLOCK WALL RETAINING 2' OF SOIL
- B-505 MINIMUM REQUIREMENTS FOR 6" OR 8" BLOCK WALL
- B-506 ALTERNATIVE FOOTING FOR WALL STANDARD No. 505
- B-507 EQUIPMENT VIEW OBSCURING SCREEN DETAIL
- B-508 GARDEN WALL
- B-509 COMMERCIAL BMP DEVICES FOR BUILDING SITES LESS THAN 1.0 ACRE
- B-510 RESIDENTIAL WATER QUALITY SYSTEMS

SERIES B-700 WATER

- B-701 WET BARREL FIRE HYDRANT – COMMERCIAL/INDUSTRIAL
- B-702 WET BARREL FIRE HYDRANT – RESIDENTIAL
- ~~B-703 GUARD POST DETAIL FOR FIRE HYDRANTS~~
- B-704 CONCRETE COLLAR DETAIL
- B-705 FIRE HYDRANT SETBACK DETAIL
- B-710 ANCHOR BLOCK DETAILS FOR 4" THRU 12" D.I. FITTINGS
- B-711 ANCHOR BLOCK DETAIL FOR 45° VERTICAL BEND
- B-712 ANCHOR BLOCK DETAIL FOR PVC WATER MAIN VALVES
- B-713 ANCHOR BLOCK DETAILS FOR 6" THRU 16" PIPE
- B-714 REVERSE TIE ANCHOR BLOCK ASSEMBLY FOR 6" THRU 16" PIPE
- B-718 METER BOX INSTALLATION WITH NEW CONCRETE REPLACEMENT
- B-719 1" COPPER WATER SERVICE FOR RESIDENTIAL FIRE SPRINKLER
- B-720 1" COPPER WATER SERVICE SAMPLE CONNECTION
- B-721 1" COPPER WATER SERVICE INSTALLATION FOR 5/8" & 1" METERS
- B-722 1-1/2" & 2" OMNI R2-C2 METERS AND 2" COPPER WATER SERVICE INSTALLATION



CITY OF GARDEN GROVE PUBLIC WORKS STANDARD PLANS

SERIES B-700 WATER (continued)

~~B-723 1-1/2" & 2" TURBO METER AND 2" COPPER WATER SERVICE INSTALLATION~~

B-724 3", 4", & 6" COMPOUND WATER METER AND SERVICE INSTALLATION

~~B-725 3", 4", & 6" TURBO METER AND SERVICE INSTALLATION~~

B-729 SERVICE LATERAL INSTALLATION FOR PRIVATE FIRE HYDRANTS

B-730 2-1/2" TEMPORARY WATER SERVICE

B-739 2" TAP TO 1" AIR AND VACUUM RELIEF VALVE ASSEMBLY

B-740 1" AIR AND VACUUM RELIEF VALVE ASSEMBLY

B-741 2" AIR AND VACUUM RELIEF VALVE ASSEMBLY

B-742 AIR & VACUUM RELIEF ENCLOSURE ASSEMBLY

B-743 AIR RELEASE & VACUUM RELIEF ENCLOSURE SETBACK DETAIL

B-744 2" BLOWOFF INSTALLATION AT END OF 4" WATER MAIN PIPE

B-745 4" BLOWOFF INSTALLATION FOR 6" OR LARGER MAINS

B-746 SAMPLE POINT FOR NEW WATER MAIN

B-749 CUT-IN VALVE

B-750 TAPPING SLEEVE AND GATE VALVE

B-751 WELDED TAPPING NOZZLE AND GATE VALVE FOR STEEL CYLINDER PIPE

B-752 GATE VALVE CAN ASSEMBLY

B-753 GATE VALVE CAN ASSEMBLY FOR CONCRETE AREAS

B-754 OLD GATE VALVE CAN ASSEMBLY REPLACEMENT

B-760 SEPARATION REQUIREMENTS FOR NEW WATER MAIN & EXISTING SEWER MAIN

B-761 SEPARATION REQUIREMENTS FOR NEW SEWER MAIN & EXISTING WATER MAIN

B-762 SEWER MAIN CROSSING UNDER WATER MAIN

B-763 WATER MAIN CROSSING UNDER SEWER MAIN

B-764 INSTALLATION OF WATER PIPE THROUGH STEEL CASING

B-765 DUCTILE IRON VERTICAL OFFSET

B-766 DUCTILE IRON HORIZONTAL OFFSET

B-767 WELDED STEEL OFFSET

B-769 ABOVE GROUND FIRE LINE AND BACKFLOW DEVICE SCREENING AND SETBACK REQUIREMENTS

B-770 TYPICAL 2" OR SMALLER REDUCED PRESSURE PRINCIPAL DEVICE (RPPD)

B-771 TYPICAL 2-1/2" OR LARGER REDUCED PRESSURE PRINCIPAL DEVICE (RPPD)



CITY OF GARDEN GROVE PUBLIC WORKS STANDARD PLANS

SERIES B-700 WATER (continued)

- B-773 TYPICAL 2-1/2" OR LARGER DOUBLE CHECK DETECTOR CHECK FIRE LINE ONLY
- B-774 BACKFLOW CAGE FOR TYPICAL 2" OR SMALLER REDUCED PRESSURE PRINCIPAL DEVICE (RPPD)
- B-781 WARNING IDENTIFICATION TAPE AND TRACER WIRE INSTALLATION

SERIES S-100 SEWER

- S-100 MANHOLE DETAILS
- S-101 CONCRETE BASE AND JOINT DETAILS
- S-102 SEWER DROP MANHOLE WITH CLEANOUT
- S-103 MANHOLE FRAME AND COVER
- S-104 MANHOLE SHAFT OPENING ORIENTATION PLAN
- S-105 LATERAL CLEANOUT DETAIL
- S-106 PVC PIPE BEDDING AND MANHOLE CONNECTION DETAILS
- S-107 VCP PIPE BEDDING DETAILS
- S-108 CONCRETE ENCASEMENT TYPE A, B, & C
- S-109 CONCRETE SLOPE ANCHORS
- S-110 STEEL CASING PIPE
- S-111 VCP OR PVC TYPICAL LATERAL
- S-112 CUT IN WYE CONNECTION
- S-113 PVC MANHOLE LINER
- S-114 PVC T-LOCK LINER DETAILS
- S-115 PVC LINER WITH GAS FLAP INSTALLATION
- S-116 FLAT TOP MANHOLE
- S-117 TYPICAL GREASE INTERCEPTOR
- S-118 DESIGN CRITERIA FOR SEPARATION OF WATER AND SEWER MAINS

WATER SERVICES DIVISION STANDARD SPECIFICATIONS

GARDEN GROVE SANITARY DISTRICT DESIGN CRITERIA FOR SEWER FACILITIES

A BENCH MARK : _____ ELEV. : _____

NOTES:

1. STANDARD SHEET SIZE :
OUTSIDE - 24" x 36", INSIDE - 22" x 34".
2. SHEET 2 AND ALL SUCCEEDING SHEETS
RECEIVE BLOCK H AND BORDER ONLY.
3. AREA ABOVE TITLE BLOCK MAY BE USED
FOR CONSULTANTS NAME AND OTHER
NECESSARY INFORMATION.

B DESIGNED BY _____ DRAWN BY _____ CHECKED BY _____
PLANS PREPARED UNDER SUPERVISION OF _____
DATE _____ R.C.E. No. _____

C _____

REFERENCE PLANS FOR
THESE IMPROVEMENTS

D _____

DATE BY DESCRIPTION APP'D
REVISIONS

E WATER SERVICES MGR. _____
STREET DIVISION MGR. _____
CITY TRAFFIC ENGR. _____
REAL PROPERTY AGENT _____

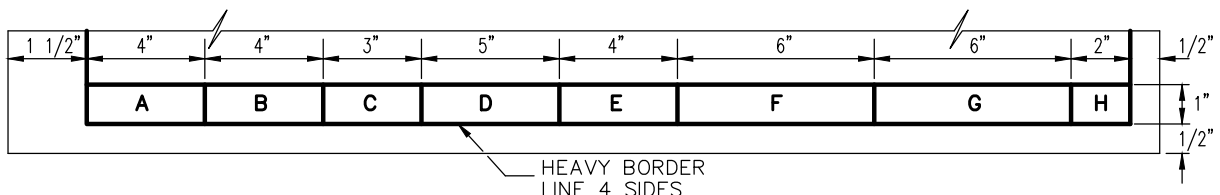
F DATE : _____
APPROVED BY : _____
CITY ENGINEER R.C.E. No. 52125 DIRECTOR OF PUBLIC WORKS
THIS PLAN IS SIGNED BY THE PUBLIC WORKS DEPARTMENT FOR CONCEPT AND
ADHERENCE TO CITY STANDARDS AND REQUIREMENTS ONLY. THE PUBLIC WORKS
DEPARTMENT IS NOT RESPONSIBLE FOR DESIGN, DESIGN ASSUMPTIONS OR ACCURACY.

G (TYPES OF IMPROVEMENT IN THIS SPACE ...)

(JOB TITLE & SHEET DESCRIPTION IN THIS SPACE ...)

H DRAWING NUMBER

SHEET OF



TITLE SHEET FORMAT

Approved _____ City Engineer	Date 12-8-15 R.C.E. 52125	REVISIONS	BY	DATE	STD. PLAN NUMBER B-99
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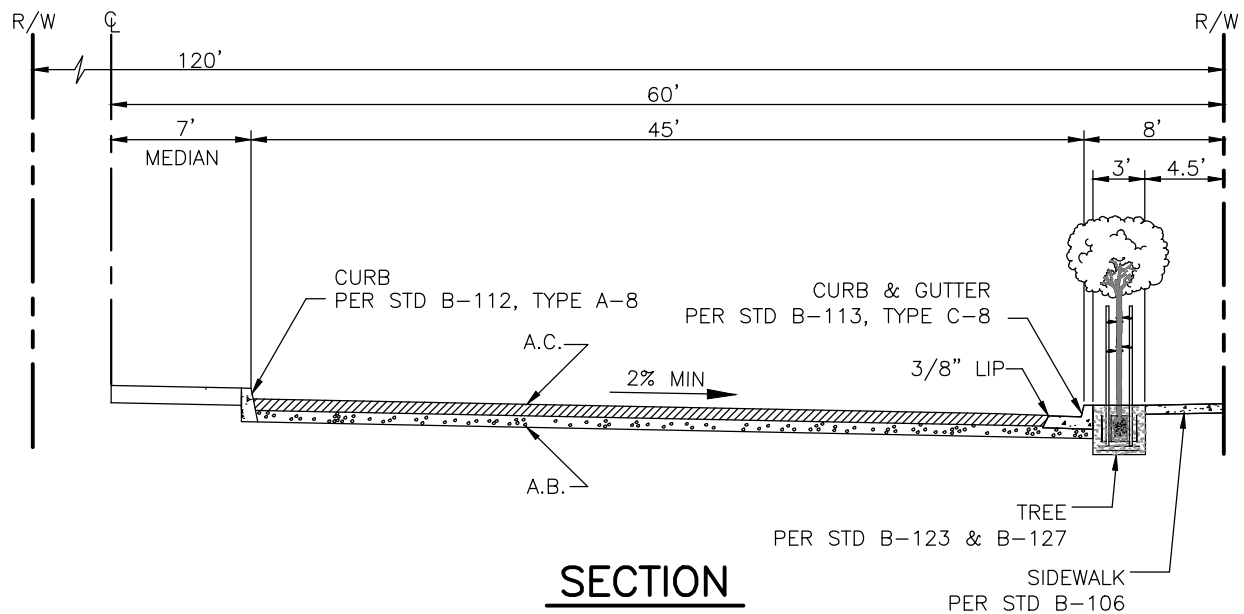


GARDEN GROVE

SERIES B-100

STREET AND HIGHWAY

SECTIONS SYMMETRICAL
ABOUT C



NOTES:

1. DETERMINE STRUCTURAL THICKNESS BY SOIL R-VALUE AND TRAFFIC INDEX. THE MINIMUM STRUCTURAL SECTION SHALL BE 6" A.C. OVER 12" A.B.
2. ASPHALT PAINT BINDER SHALL BE SS-1H AND APPLIED AS DIRECTED BY ENGINEER.
3. MINIMUM COMPACTION FOR A.C., A.B. AND UPPER 6" OF NATIVE SOIL IS 95% R.C.



City of
Garden Grove
California

MAJOR HIGHWAY TYPICAL SECTION

Approved

Date 12-8-15

REVISIONS

BY

DATE

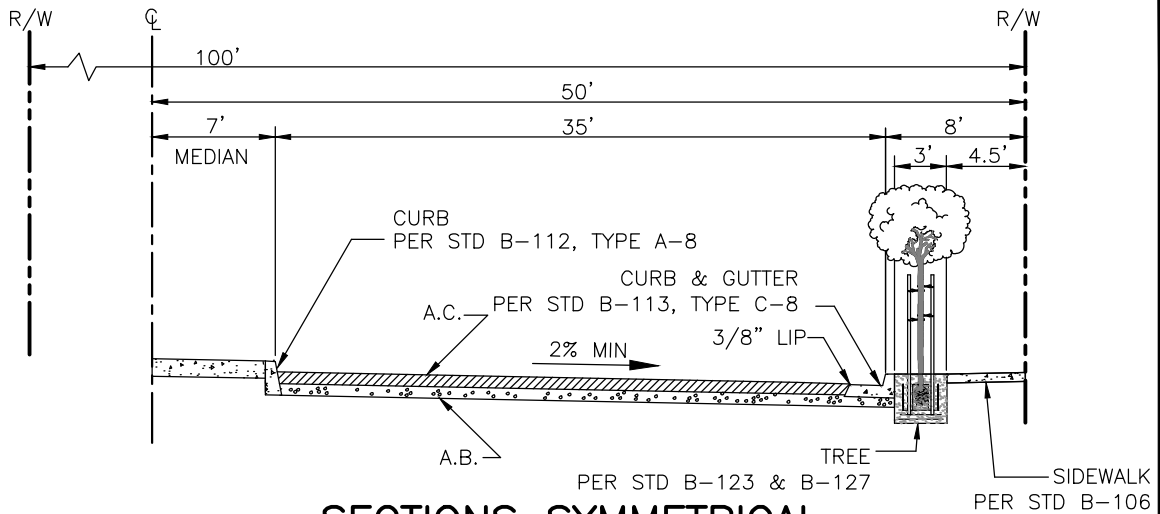
STD. PLAN NUMBER

City Engineer

R.C.E. 52125 Exp.12-31-16

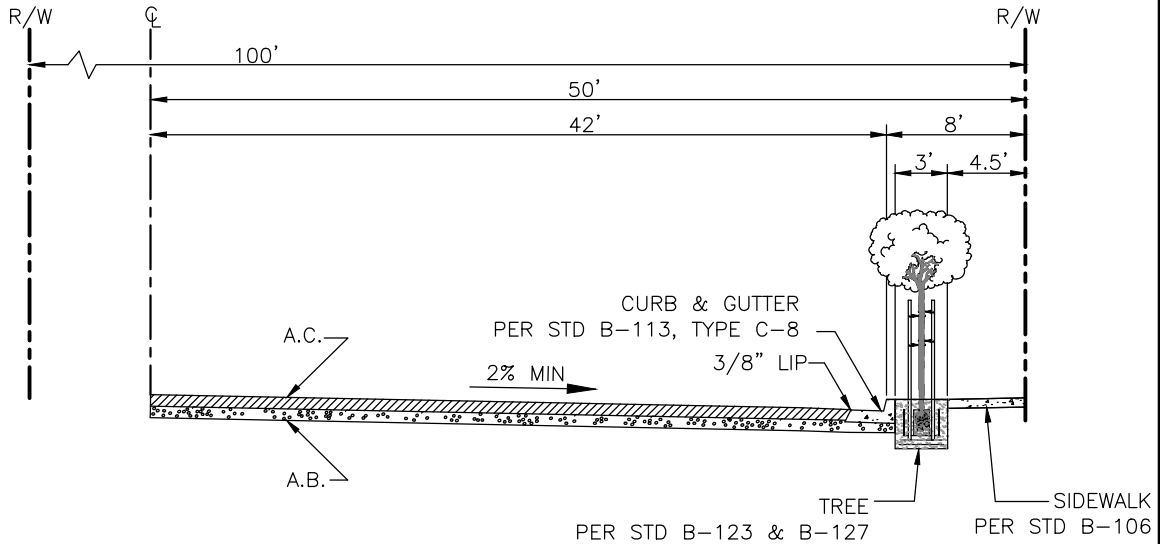
B-101

SECTIONS SYMMETRICAL
ABOUT C



SECTIONS SYMMETRICAL

SECTIONS SYMMETRICAL
ABOUT C



ALTERNATE SECTION

NOTES:

1. DETERMINE STRUCTURAL THICKNESS BY SOIL R-VALUE AND TRAFFIC INDEX. THE MINIMUM STRUCTURAL SECTION SHALL BE 6" A.C. OVER 12" A.B.
2. ASPHALT PAINT BINDER SHALL BE SS-1H AND APPLIED AS DIRECTED BY THE ENGINEER.
3. MINIMUM COMPACTION FOR A.C., A.B. AND UPPER 6" OF NATIVE SOIL IS 95% R.C.



City of
Garden Grove
California

PRIMARY HIGHWAY TYPICAL SECTION

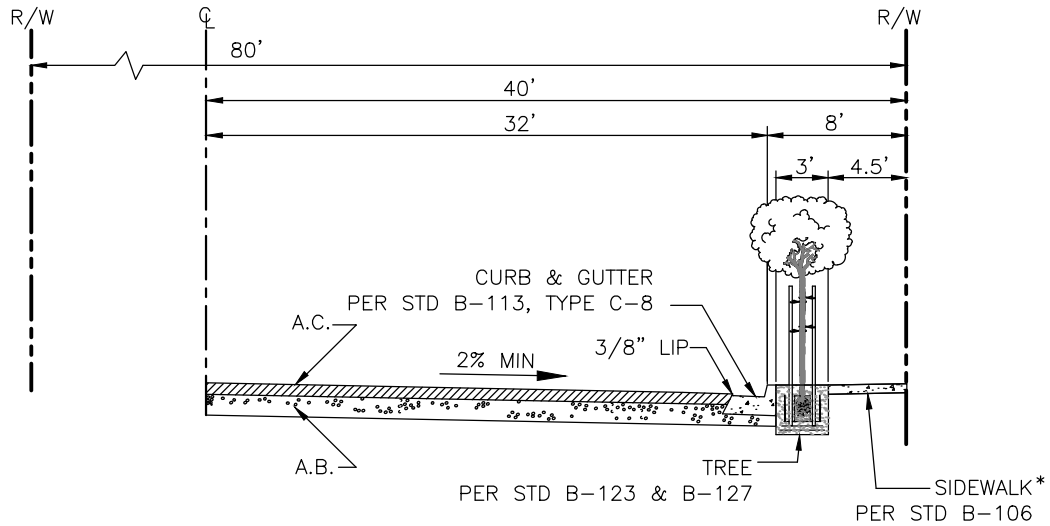
Approved  Date 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-102

SECTIONS SYMMETRICAL
ABOUT C



SECTION

NOTES:

1. DETERMINE STRUCTURAL THICKNESS BY SOIL R-VALUE AND TRAFFIC INDEX. THE MINIMUM STRUCTURAL SECTION SHALL BE 5" A.C. OVER 10" A.B.
2. ASPHALT PAINT BINDER SHALL BE SS-1H AND APPLIED AS DIRECTED BY THE ENGINEER.
3. MINIMUM COMPACTION FOR A.C., A.B. AND UPPER 6" OF NATIVE SOIL IS 95% R.C.

* SIDEWALKS MAY NOT BE REQUIRED IN M-P ZONE.
SEE STANDARD PLAN B-106 FOR SIDEWALK DETAILS.



City of
Garden Grove
California

SECONDARY HIGHWAY TYPICAL SECTION

Approved

Date 12-8-15

REVISIONS

BY

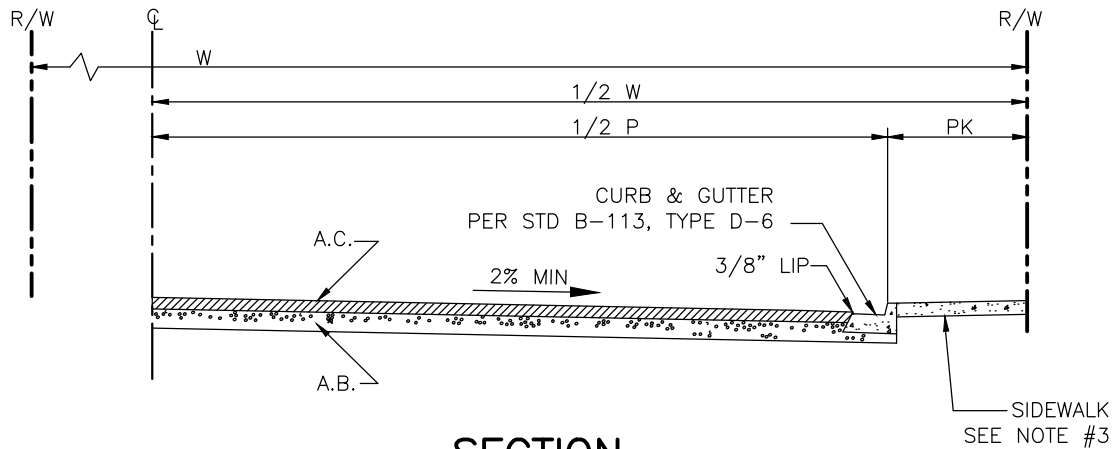
DATE

STD. PLAN NUMBER

B-103

City Engineer R.C.E. 52125 Exp. 12-31-16

SECTIONS SYMMETRICAL
ABOUT \mathcal{C}



SECTION

W	P	PK
50'	36'	7'
56'	36'	10'
60'	36'	12'

LEGEND

W= WIDTH OF R\W IN FEET

P= WIDTH OF STREET IN FEET

PK=WIDTH OF PARKWAY AND/OR
SIDEWALK

NOTES:

1. DETERMINE STRUCTURAL THICKNESS BY SOIL R-VALUE AND TRAFFIC INDEX. THE MINIMUM STRUCTURAL SECTION SHALL BE 4" A.C. OVER 6" A.B. (5" A.C. OVER 10" A.B. IN INDUSTRIAL AREAS).
2. ASPHALT PAINT BINDER SHALL BE SS-1H AND APPLIED AS DIRECTED BY THE ENGINEER.
3. SEE STANDARD PLAN B-105 FOR RESIDENTIAL SIDEWALK DETAILS AND STANDARD PLAN B-106 FOR COMMERCIAL AND ARTERIAL SIDEWALK ZONES. SIDEWALKS MAY NOT BE REQUIRED IN M-P ZONE.
4. MINIMUM COMPACTION FOR A.C., A.B. AND UPPER 6" OF NATIVE SOIL IS 95% R.C.



City of
Garden Grove
California

LOCAL STREET TYPICAL SECTION

Approved

Date 12-8-15

REVISIONS

BY

DATE

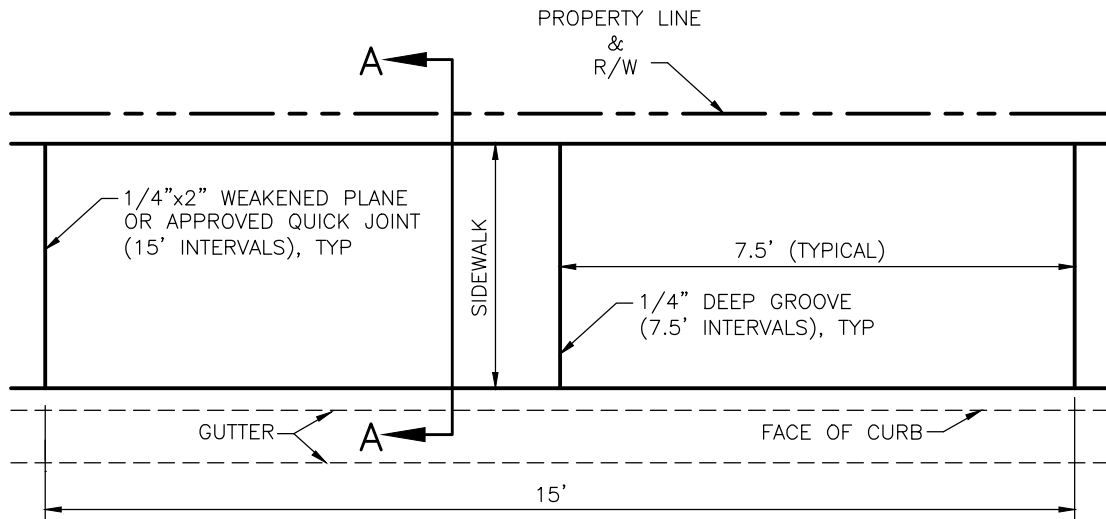
STD. PLAN NUMBER

City Engineer

R.C.E. 52125

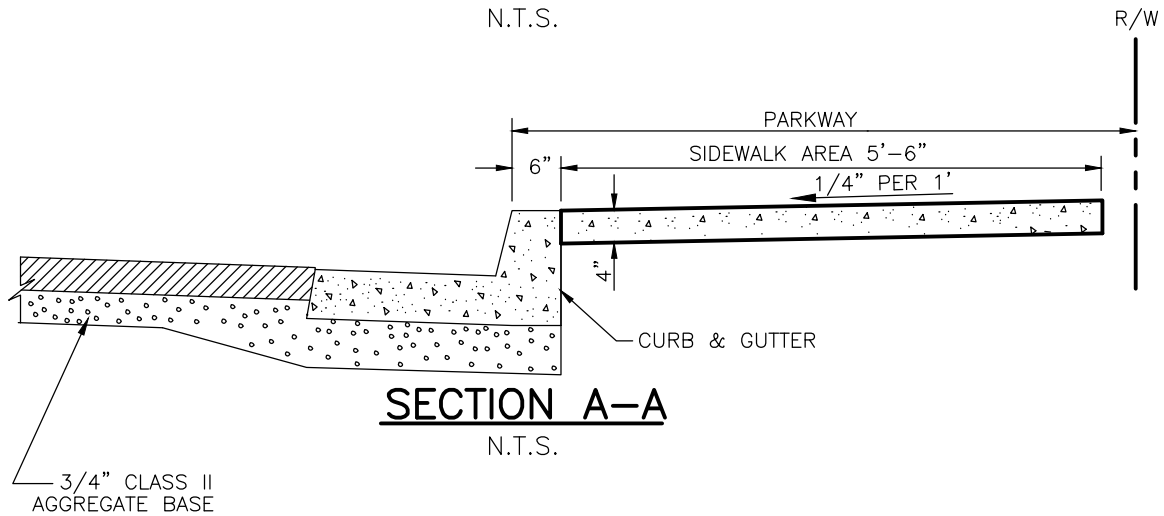
Exp.12-31-16

B-104



PLAN VIEW OF SIDEWALK

N.T.S.



SECTION A-A

N.T.S.

NOTES:

1. SIDEWALK SHALL BE CONSTRUCTED NEXT TO CURB.
2. 3/4"x4" FELT EXPANSION JOINTS SHALL BE PLACED AT THE ENDS OF ALL CURB RETURNS AND AT TOP OF DRIVEWAYS. 1/4"x2" WEAKENED PLANE JOINTS SHALL BE PLACED AT 15' INTERVALS. SCORING LINES SHALL BE PLACED AT 7-1/2' INTERVALS. EXPANSION JOINTS TO BE INSTALLED AT 45' MAXIMUM SPACING.
3. 1/4"x2" APPROVED QUICK JOINTS FOR SIDEWALK SHALL BE PLACED TO COINCIDE WITH JOINTS OF THE CURB.
4. ALL CONCRETE SHALL BE CLASS 520-C-2500 AND 4" THICK.
5. 90% RELATIVE COMPACTION REQUIRED UNDER SIDEWALK.
6. COLORED ADDITIVES OR PATTERNED CONCRETE SHALL NOT BE USED IN PUBLIC R/W.



City of
Garden Grove
California

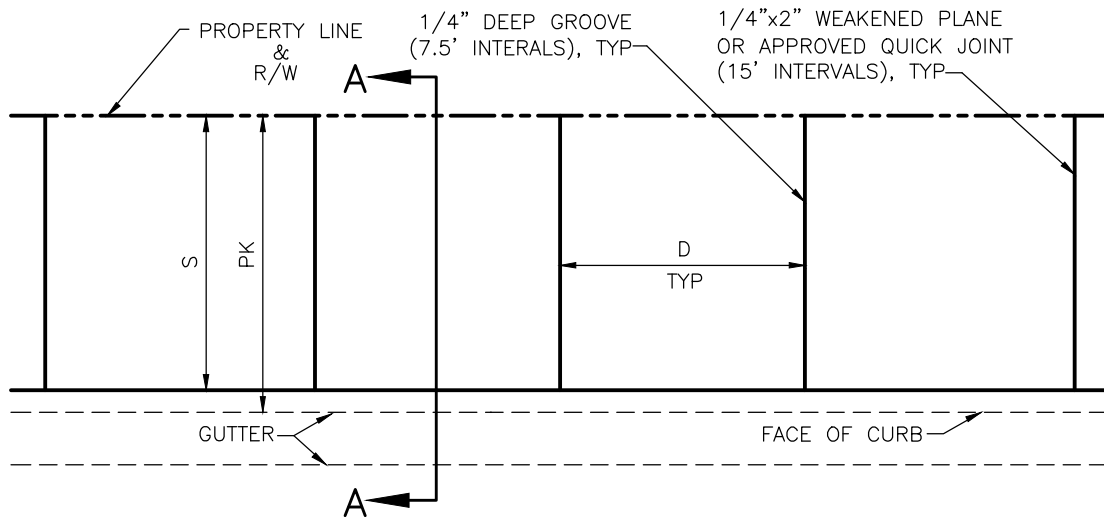
RESIDENTIAL SIDEWALK

Approved  Date 12-8-15
City Engineer R.C.E. 52125 Exp.12-31-16

REVISIONS	BY	DATE

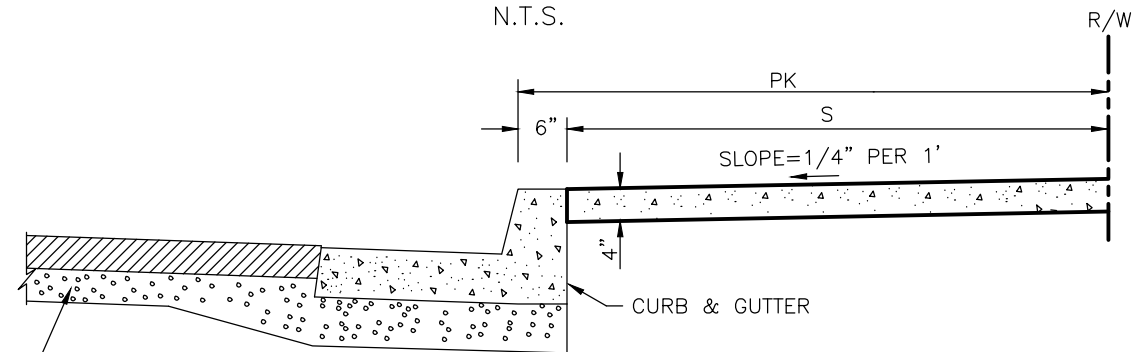
STD. PLAN NUMBER

B-105



PLAN VIEW OF PARKWAY

N.T.S.



SECTION A-A

N.T.S.

3/4" CLASS II
AGGREGATE BASE

PK	S	D
7'	6.5'	7.5'
8'	7.5'	7.5'
10'	9.5'	7.5'
12'	11.5'	7.5'
13'	12.5'	7.5'

PK = WIDTH OF PARKWAY
S = WIDTH OF SIDEWALK
D = DISTANCE BETWEEN SCORE LINES

NOTES:

1. 3/4"x4" FELT EXPANSION JOINTS SHALL BE PLACED AT THE ENDS OF ALL CURB RETURNS AND AT TOP OF "X" AT DRIVEWAYS. 1/4"x2" WEAKENED PLANE JOINTS SHALL BE PLACED AT 15' INTERVALS. SCORING LINES SHALL BE PLACED AT 7-1/2' INTERVALS. EXPANSION JOINTS TO BE INSTALLED AT 45' MAX. SPACING.
2. 1/4"x2" APPROVED QUICK JOINTS FOR SIDEWALK SHALL BE PLACED TO COINCIDE WITH JOINTS OF THE CURB.
3. REFER TO STD. PLAN B-305 FOR TRAFFIC CONTROL SIGN INSTALLATION.
4. ALL CONCRETE SHALL BE CLASS 520-C-2500 AND 4" THICK.
5. 90% RELATIVE COMPACTION REQUIRED UNDER SIDEWALK.
6. S MAY BE REDUCED TO 5' WITH ADEQUATE PROVISION FOR MAINTENANCE OF REMAINING PARKWAY.



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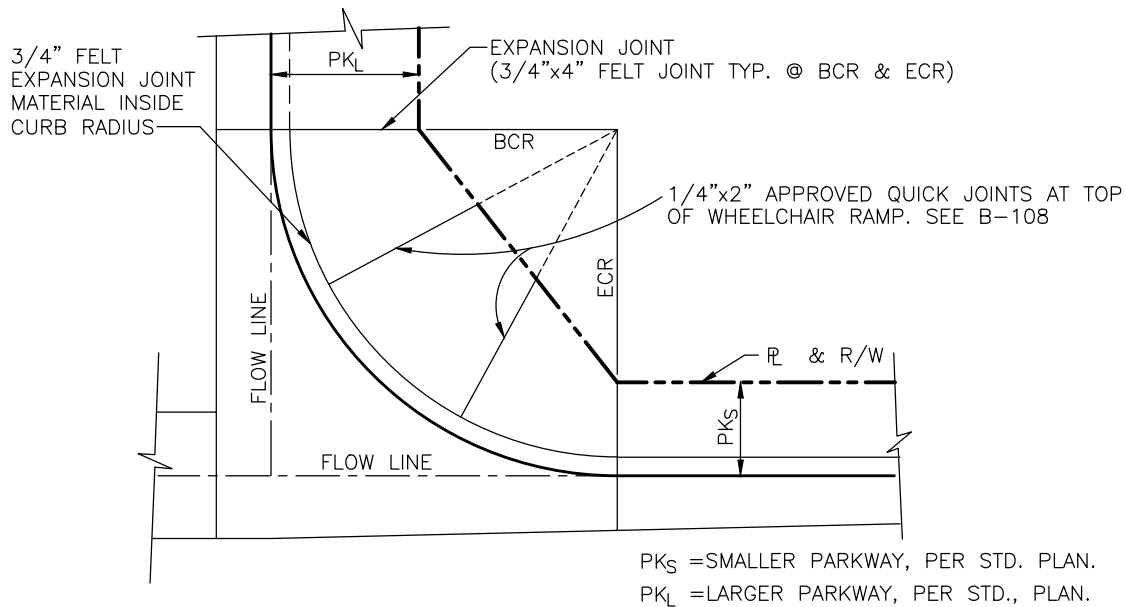
**COMMERCIAL AND
ARTERIAL SIDEWALK**

Approved  Date 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-106



COMMERCIAL LANDING

N.T.S.

CORNER DATA	
CURB RADIUS	APPLICATION—INTERSECTION OF:
25'	1. TWO LOCAL STREETS
	2. LOCAL STREET & ARTERIAL HWY.
35'	TWO ARTERIAL HIGHWAYS

NOTES:

1. ALL CONCRETE SHALL BE CLASS 520—C—2500 AND 4" THICK.
2. SEE STD. PLAN B-108 FOR WHEELCHAIR RAMPS.



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SIDEWALK LANDINGS

Approved  Date 12-8-15

City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-107

REFER TO LATEST
CALTRANS STANDARD PLAN
NO. A88A AND A88B FOR
APPROPRIATE ADA ACCESS
RAMP DESIGN

YOU MAY VISIT : www.dot.ca.gov FOR INFORMATION

SPECIAL CONDITION RAMPS
MUST BE DETAILED ON DESIGN
PLANS AND BE IN FULL
CONFORMANCE WITH LATEST
EDITION OF DEPT. OF JUSTICE
STANDARDS & TITLE 24.



City of
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CURB RETURN ADA ACCESS RAMP

Approved

Date 12-8-15

REVISIONS

BY

DATE

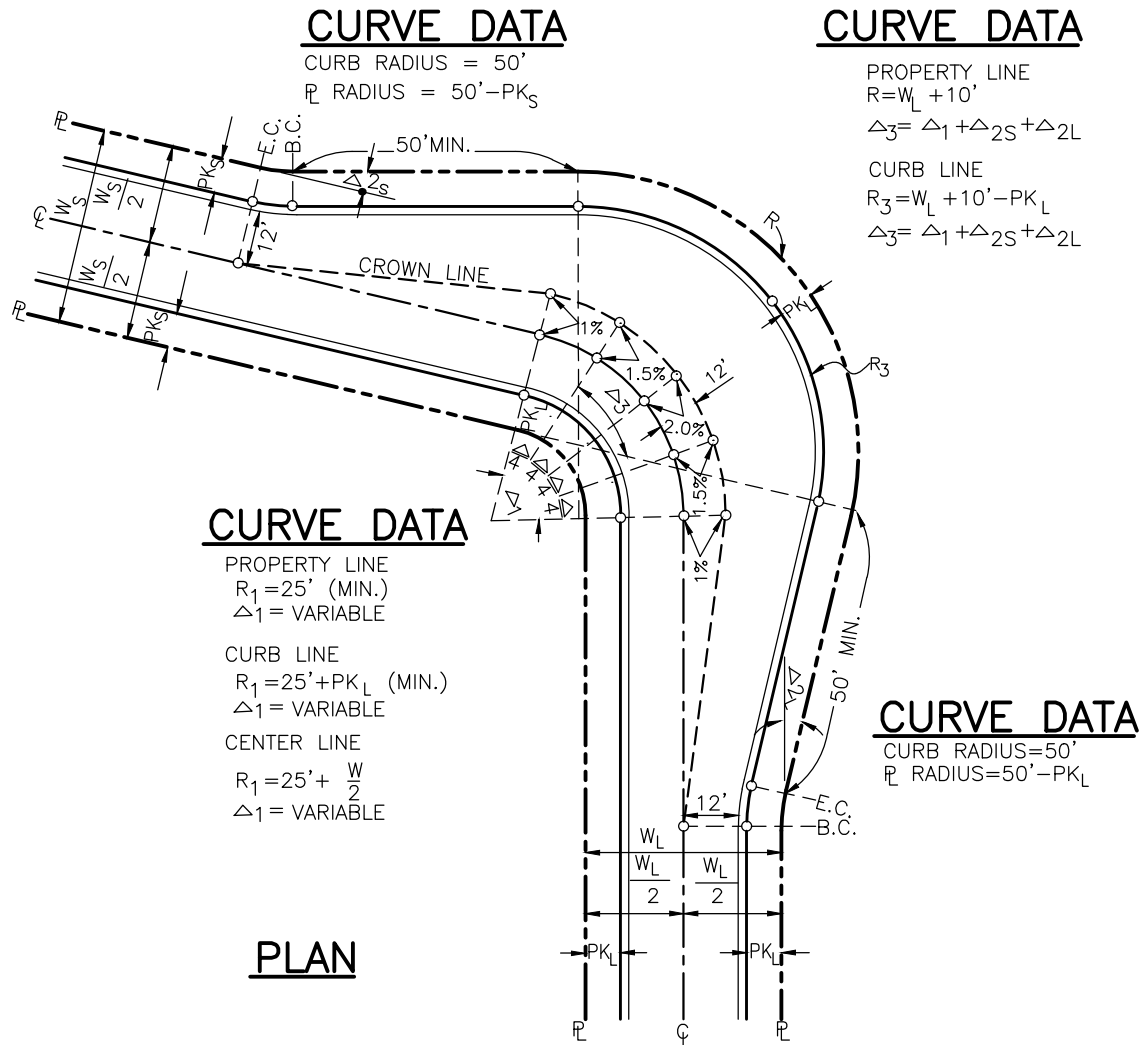
STD. PLAN NUMBER

City Engineer

R.C.E. 52125

Exp.12-31-16

B-108



NOTES:

1. USE NORMAL SECTION FROM INNER CURB TO CENTER LINE.
2. FROM CROWN LINE TO OUTER CURB THE MAXIMUM SLOPE IS 1" PER FOOT.
3. SUBSCRIPTS "S" AND "L" DENOTE SMALLER AND LARGER STREETS RESPECTIVELY
4. SUPERELEVATION PERCENTAGES SHOWN ARE STRAIGHT FROM CENTER LINE TO CROWN LINE.
5. ELEVATIONS ARE REQUIRED AT POINTS INDICATED BY "o".



City of
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STANDARD KNUCKLE

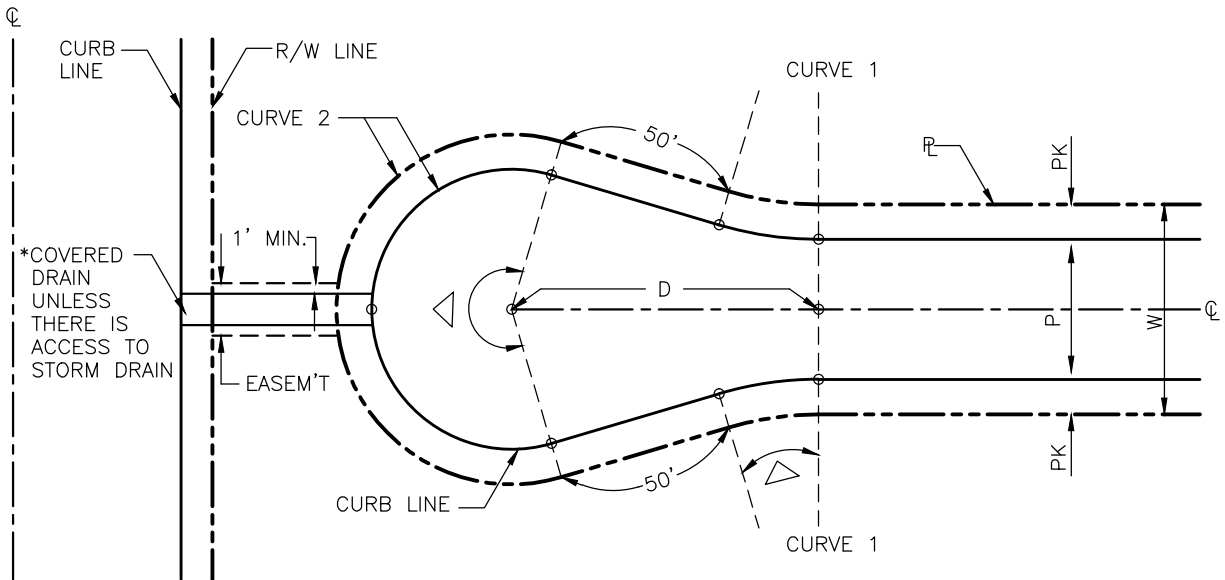
Approved:  Date: 12-8-15
 City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-109

ELEVATIONS ARE REQUIRED AT POINTS INDICATED BY "o".



PLAN

CURVE 1										
W	P	PK	D	△	CURB			PROP. LINE		
					R	L	T	R	L	T
54'	40'	7'	84.52'	15° 14' 33"	100'	26.60'	13.38'	93'	24.74'	12.44'
60'	40'	10'	87.75'	16° 31' 20"	100'	28.84'	14.52'	90'	25.95'	13.07'

CURVE 2								
W	P	PK	D	△	CURB		PROP. LINE	
					R	L	R	L
54'	40'	7'	84.52'	210° 29' 06"	38'	139.60'	45'	165.31'
60'	40'	10'	87.75'	213° 02' 40"	40'	148.73'	50'	185.92'

NOTE:

*IN THE CASE WHERE THE CUL-DE SAC BACKS INTO AN ARTERIAL HIGHWAY AND DRAINS TOWARDS IT AND NO STORM DRAIN IS AVAILABLE, A COVERED DRAIN PER CITY STD. PLAN NO. B-209 SHALL BE PROVIDED THRU A DRAINAGE EASEMENT A MINIMUM OF 2' WIDER THAN THE DRAIN AS SHOWN ABOVE. PLANS SHALL INCLUDE ALL INFORMATION PERTINENT TO THE DRAIN, EXACT LOCATION, SIZE, REINFORCEMENT, EASEMENT, FLOW LINES, CURB-FACE OPENINGS, LOCAL DEPRESSIONS, CAPACITIES, ETC. AND ADDRESS PROVISIONS FOR SECONDARY OVERFLOW. EASEMENTS MUST SPECIFY FOR DRAINAGE AND MAINTENANCE ACCESS.



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CONCENTRIC CUL-DE-SAC

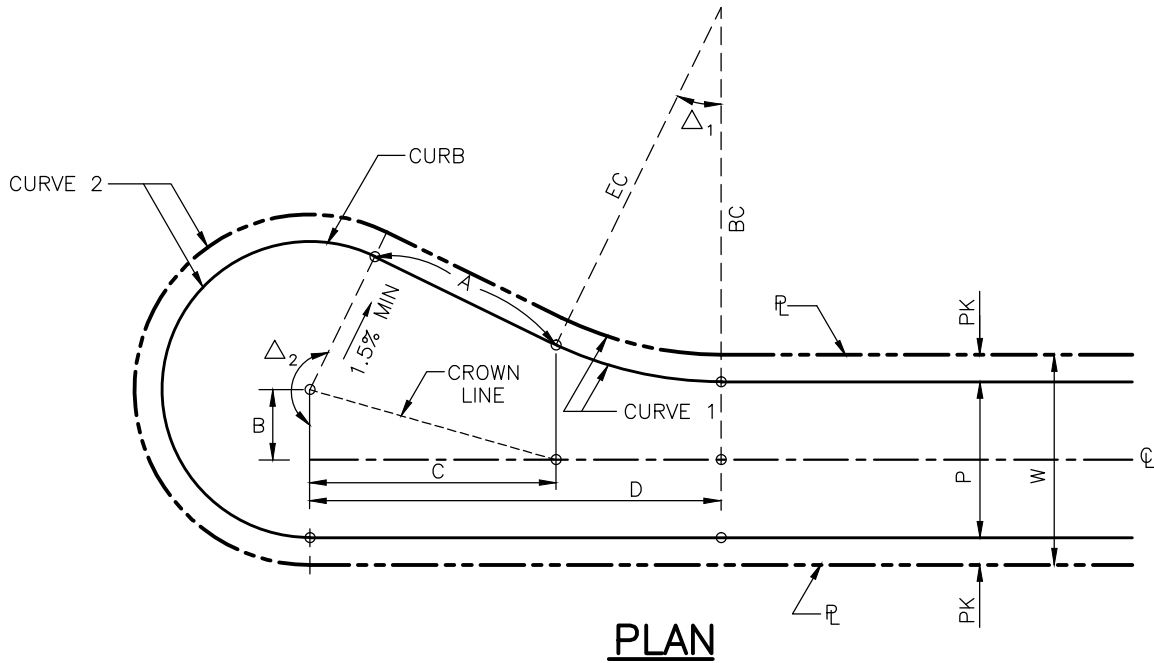
Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-110

ELEVATIONS ARE REQUIRED AT POINTS INDICATED BY "o".



CURVE 1

W	P	PK	Δ_1	CURB			PROP.LINE		
				R	L	T	R	L	T
54'	40'	7'	26° 03' 45"	100'	45.49'	23.14'	93'	42.30'	21.52'
60'	40'	10'	28° 04' 22"	100'	49.00'	25.00'	90'	44.10'	22.50'

CURVE 2

W	P	PK	A	B	C	D	Δ_2	CURB		PROP.LINE	
								R	L	R	L
54'	40'	7'	50'	18'	61.61'	105.55'	206° 03' 45"	38'	136.67'	45'	161.84'
60'	40'	10'	50'	20'	62.94'	110.00'	208° 04' 22"	40'	145.26'	50'	181.58'



City of
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OFFSET CUL-DE-SAC

Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

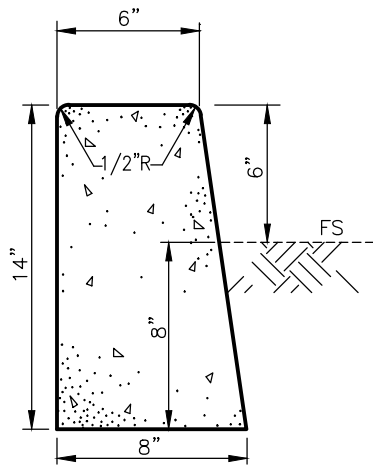
REVISIONS

BY

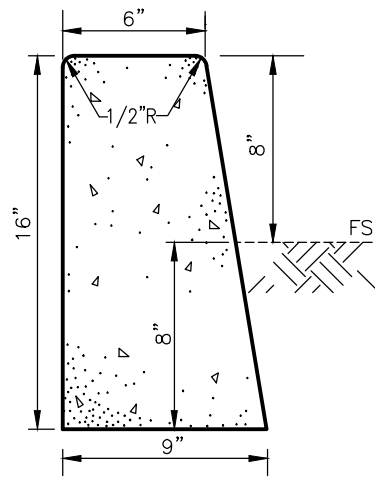
DATE

STD. PLAN NUMBER

B-111



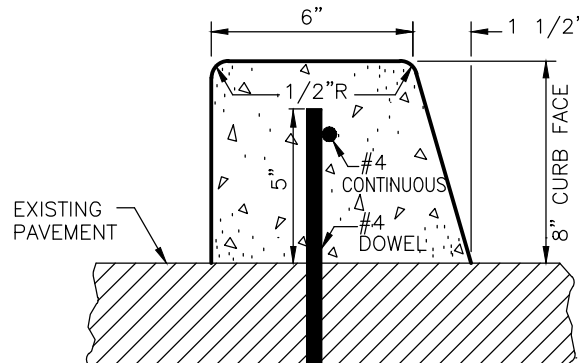
A-6*



A-8

NOTES

1. CONCRETE PER LIN. FT. = 0.025 C.Y. FOR 6" C.F. AND 0.031 C.Y. FOR 8" C.F.
2. CONCRETE SHALL BE 520-C-2500.
3. FULL FACE 3/4" FELT EXPANSION JOINTS SHALL BE PLACED AT THE END OF ALL CURB RETURNS.
1/4"x2" WEAKENED PLANE JOINTS SHALL BE PLACED AT 15' INTERVALS WITH 3/4" FULL FACE FELT EXPANSION JOINTS AT 45' O.C. MAX.
- * 4. STANDARD FOR A-6 CURB SHALL NOT TO BE USED IN THE PUBLIC RIGHT-OF-WAY WITHOUT APPROVAL OF CITY ENGINEER.
5. 95% RELATIVE COMPACTION REQUIRED IN UPPER 6" OF SUBGRADE.



B-8

N.T.S.

NOTES:

1. TYPE B SHALL BE USED FOR REPLACEMENT-IN-KIND ONLY - NOT FOR NEW CONSTRUCTION AND SHALL NOT BE USED TO REPLACE MEDIAN NOSES UP TO 10' FROM NOSE.
2. BOND CURB TO PAVEMENT SURFACE WITH APPROVED ADHESIVE. ADHESIVE SHALL COVER ENTIRE BASE AREA OF CURB.
3. CONCRETE PER LIN. FT. = 0.0138 C.Y.
4. CONCRETE SHALL BE CLASS 520-C-2500.
5. 1/4" x 2" WEAKENED PLANE JOINTS SHALL BE PLACED AT 15' INTERVALS.
6. INSTALL DOWELS AT 6'-0" ON CENTER. EMBED INTO PAVEMENT MIN. OF 6".



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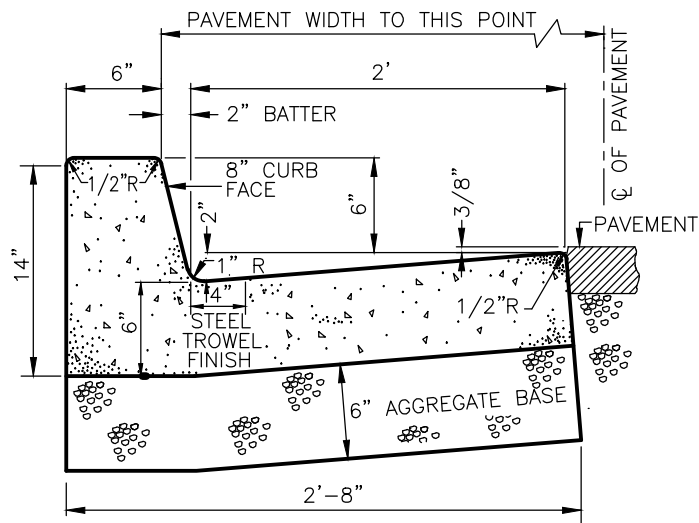
CONCRETE CURB ONLY TYPE "A" & "B"

Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

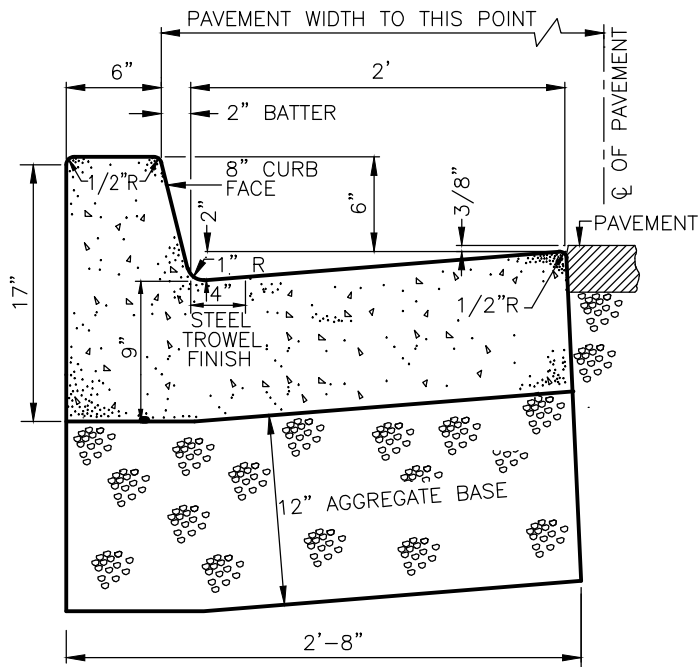
REVISIONS	BY	DATE

STD. PLAN NUMBER

B-112



C-8



C-8 (MODIFIED)

NOTES:

1. CONCRETE PER LIN. FT. = 0.0645 C.Y. FOR TYPE C-8 AND 0.0892 C.Y. FOR TYPE C-8 (MODIFIED).
2. CONCRETE SHALL BE CLASS 520-C-2500 FOR TYPE C-8 AND 660-CW-4000 FOR TYPE C-8 (MODIFIED).
3. FULL FACE 3/4" FELT EXPANSION JOINTS SHALL BE PLACED AT THE END OF ALL CURB RETURNS. 1/4"x2" WEAKENED PLANE JOINTS SHALL BE PLACED AT 15' INTERVALS WITH 3/4" FULL FACE FELT EXPANSION JOINTS AT 45' O.C. MAX. AND AT THE TOP OF "X'S" ON ALL DRIVEWAY APPROACHES.
4. AGGREGATE BASE SHALL BE CLASS II 3/4".
5. 95% RELATIVE COMPACTION REQUIRED FOR FULL DEPTH OF AGGREGATE BASE.



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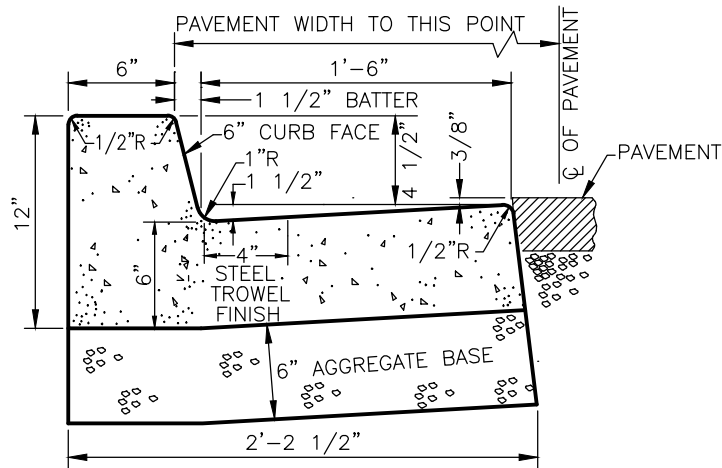
**CONCRETE CURB &
GUTTER TYPE "C"**

Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-113



NOTES:

D-6

1. CONCRETE PER LIN. FT. = 0.0505 C.Y.
2. CONCRETE SHALL BE CLASS 520-C-2500.
3. FULL FACE 3/4" FELT EXPANSION JOINTS SHALL BE PLACED AT THE END OF ALL CURB RETURNS. 1/4"x2" WEAKENED PLANE JOINTS SHALL BE PLACED AT 15' INTERVALS WITH 3/4" FULL FACE FELT EXPANSION JOINTS AT 45' O.C. MAX. AND AT THE TOP OF "X'S" ON ALL DRIVEWAY APPROACHES.
4. AGGREGATE BASE SHALL BE CLASS II 3/4".
5. 95% RELATIVE COMPACTION REQUIRED FOR FULL DEPTH OF AGGREGATE BASE.



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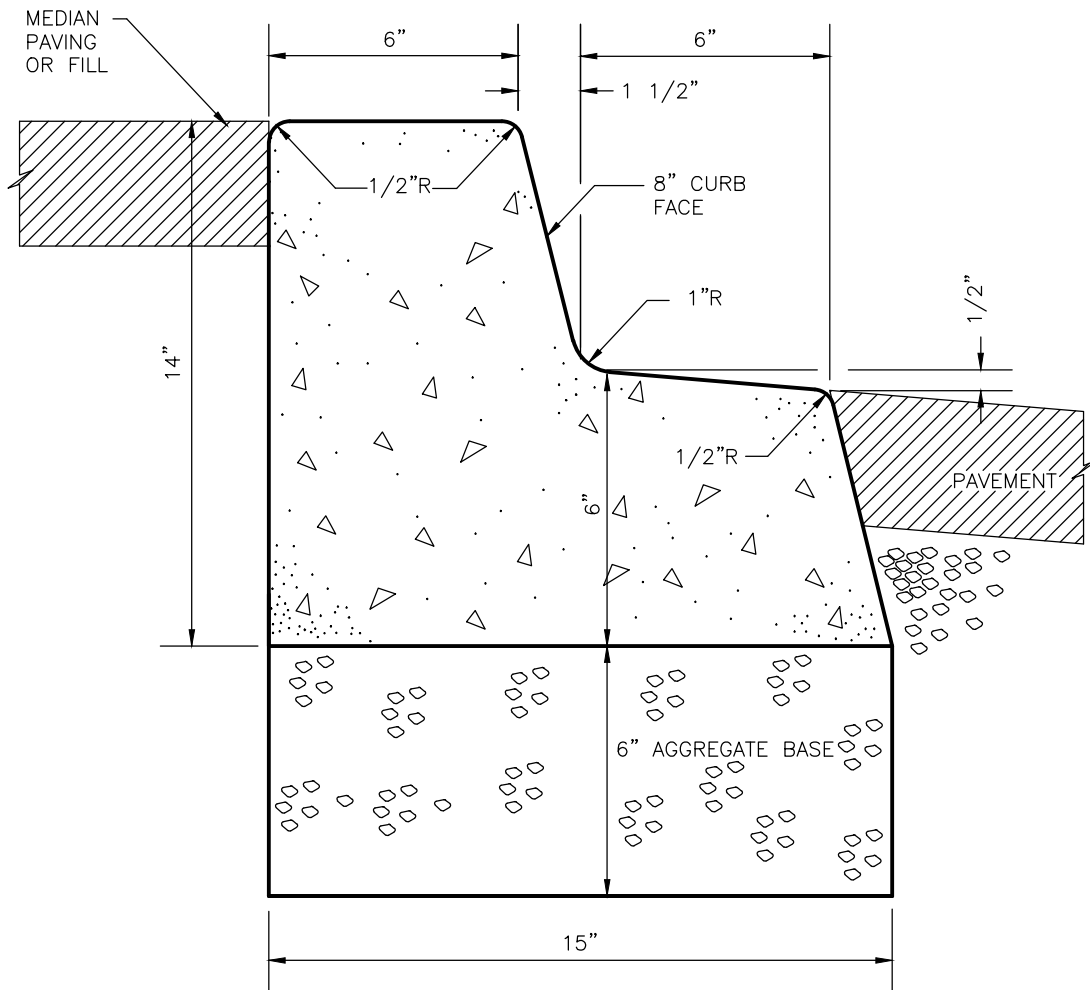
CONCRETE CURB & GUTTER TYPE "D"

Approved  Date 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-114



F-8

NOTES:

1. CONCRETE PER LIN. FT. = .032 C.Y.
2. CONCRETE SHALL BE CLASS 520-C-2500.
3. WEAKENED PLANE JOINT SHALL BE PLACED AT 15' INTERVALS. INSTALL 3/4" FELT JOINT 60' O.C. AND AT ALL CHANGES IN DIRECTION.
4. AGGREGATE BASE SHALL BE CLASS II 3/4".
5. 95% RELATIVE COMPACTION REQUIRED IN UPPER 6" OF SUBGRADE.

DO NOT USE THIS STANDARD FOR NEW CONSTRUCTION – TO BE USED ONLY FOR REPLACEMENT OF EXISTING MEDIAN CURB ORIGINALLY BUILT TO THIS STANDARD.



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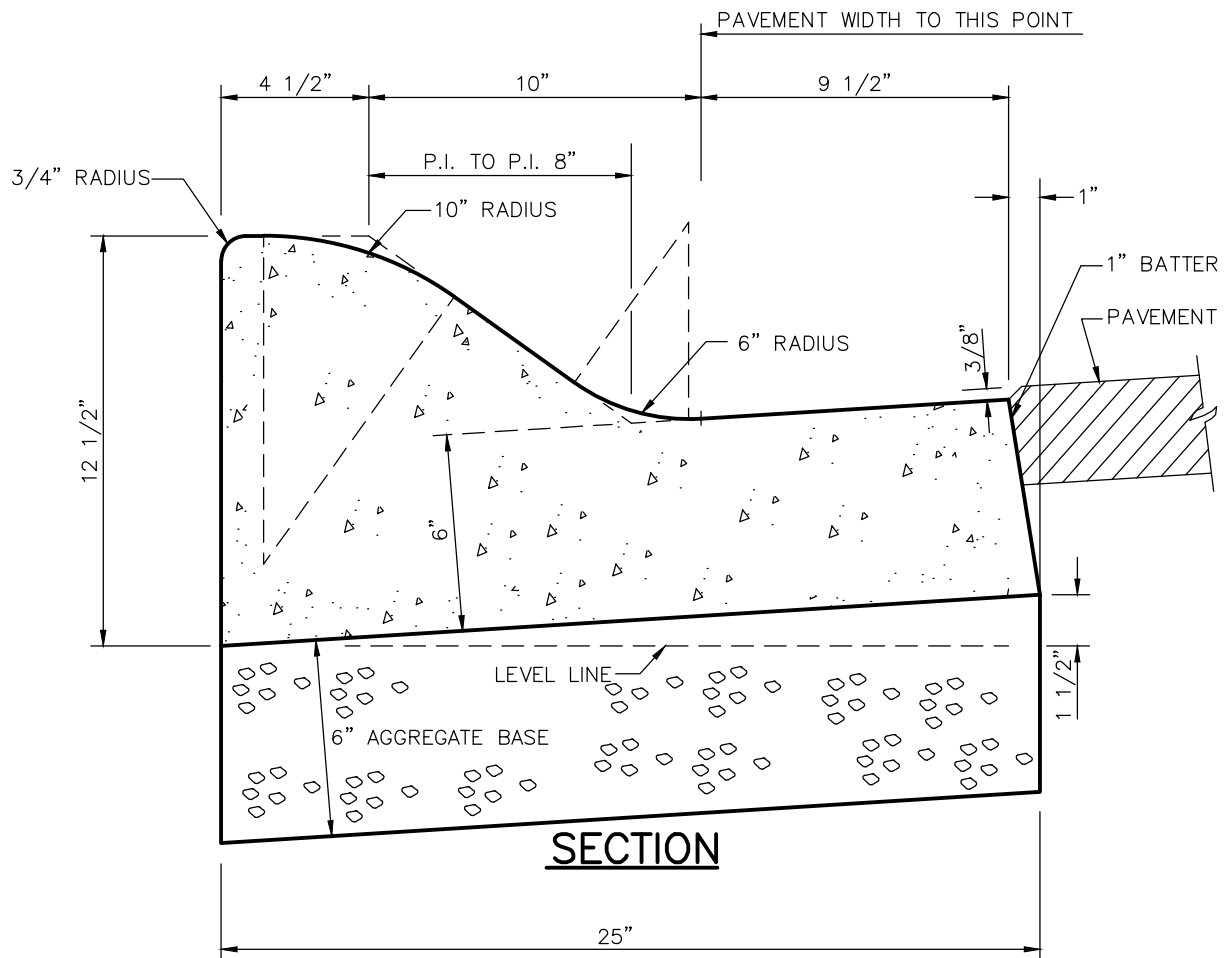
**CONCRETE CURB &
GUTTER TYPE "F"**

Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-115



NOTES:

1. TO BE USED FOR REPLACEMENT-IN-KIND ONLY — NOT FOR NEW CONSTRUCTION.
2. CONCRETE PER LIN. FT.= 0.0502 C.Y.
3. CONCRETE SHALL BE CLASS 520—C—2500.
4. AGGREGATE BASE SHALL BE CLASS II 3/4\".
5. 95% RELATIVE COMPACTION REQUIRED IN UPPER 6\" OF SUBGRADE.



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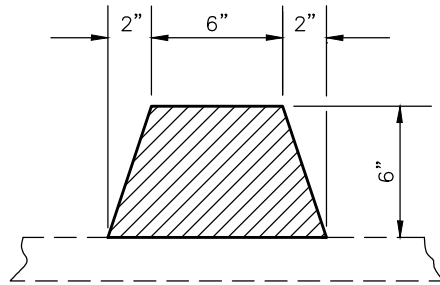
ROLLED CURB & GUTTER

Approved  Date 12-8-15
City Engineer R.C.E. 52125 Exp.12-31-16

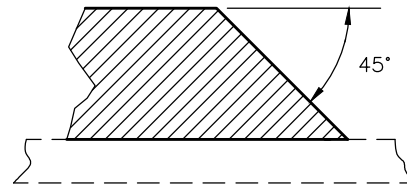
REVISIONS	BY	DATE

STD. PLAN NUMBER

B-116

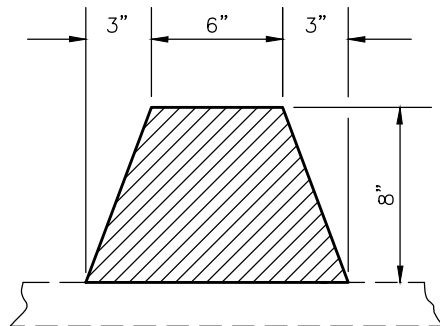


SECTION

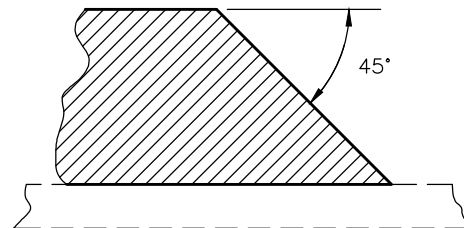


END SIDE VIEW

6" A.C. BERM



SECTION



END SIDE VIEW

8" A.C. BERM



City of
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A.C. BERM

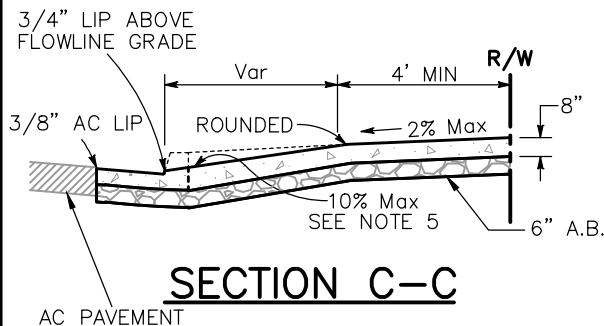
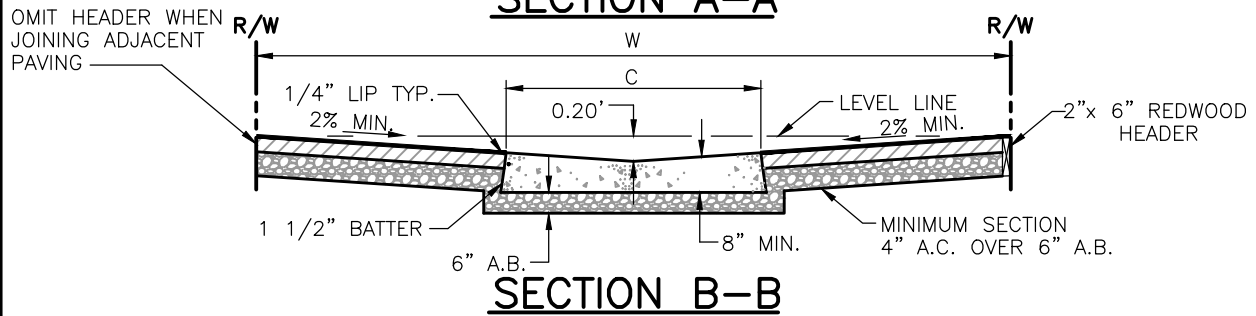
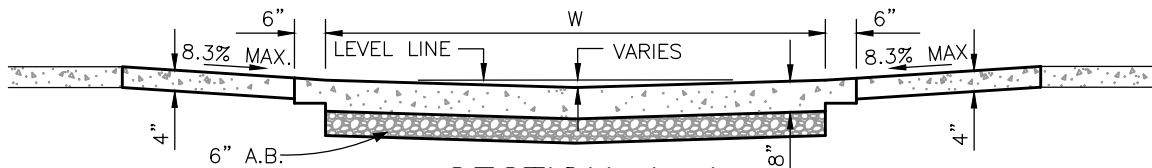
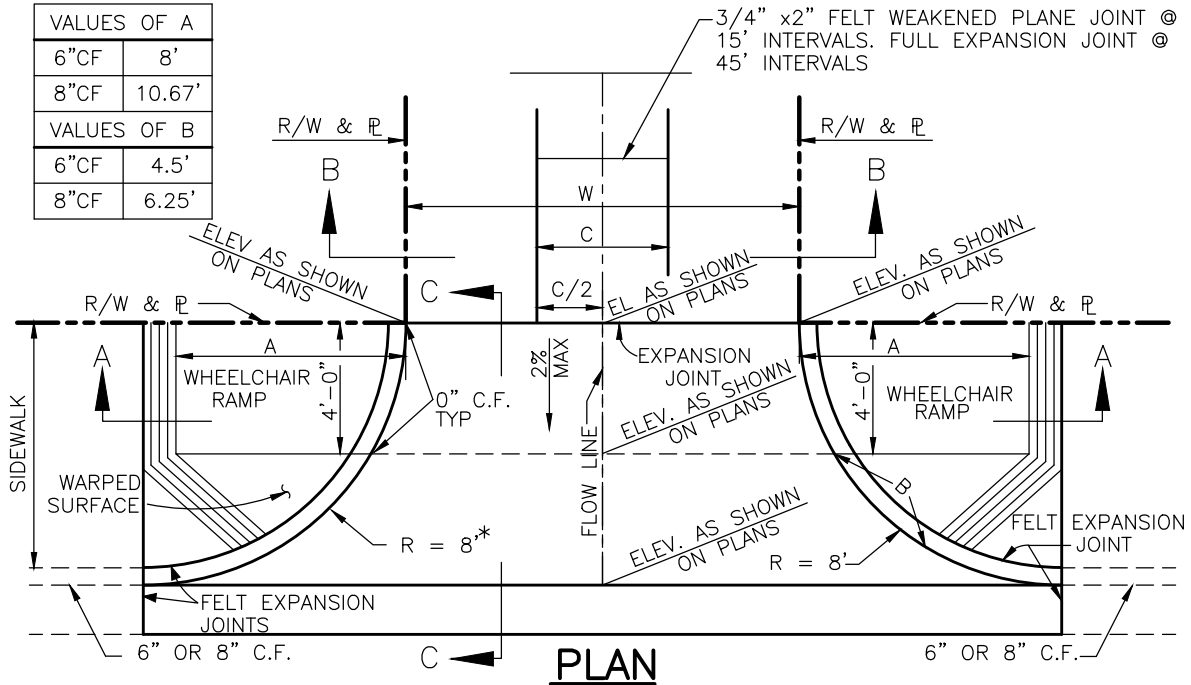
Approved  Date 12-8-15
City Engineer R.C.E. 52125 Exp.12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-117

VALUES OF A	
6"CF	8'
8"CF	10.67'
VALUES OF B	
6"CF	4.5'
8"CF	6.25'



NOTES:

1. C=4.0' WHERE ALLEY DOES NOT RECEIVE DRAINAGE FROM THE STREET. C=6.0' WHERE ALLEY DOES RECEIVE DRAINAGE FROM THE STREET.
2. W=R/W OR P/L WIDTH. (20' MIN.)
3. ALL CONCRETE SHALL BE 520-C-2500.
- *4. 8' MIN. RADIUS. USE RADIUS EQUAL TO PARKWAY WIDTH IF PARKWAY WIDTH IS LARGER THAN 8'.
5. DIFFERENCE IN SLOPE OF THE ALLEY RAMP AND THE SLOPE OF A LINE BETWEEN THE GUTTER AND A POINT ON THE ROADWAY 5' FROM GUTTER LINE SHALL NOT EXCEED 15%. REDUCE ALLEY RAMP SLOPE, NOT GUTTER SLOPE, WHERE REQUIRED.



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ALLEY AND ALLEY APRON

Approved:  Date 12-8-15
City Engineer R.C.E. 52125 Exp.12-31-16

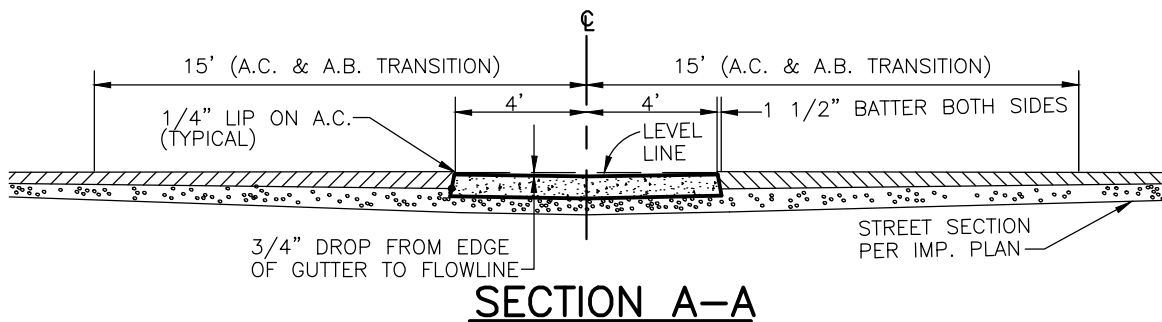
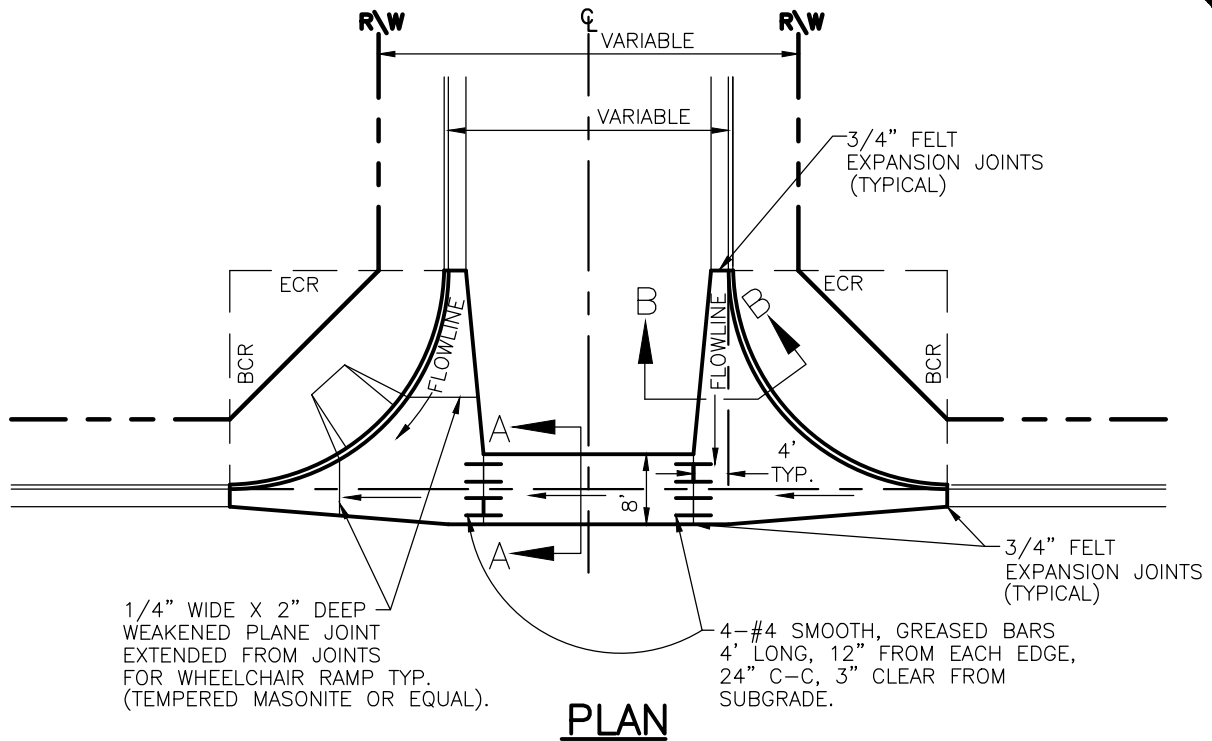
REVISIONS

BY

DATE

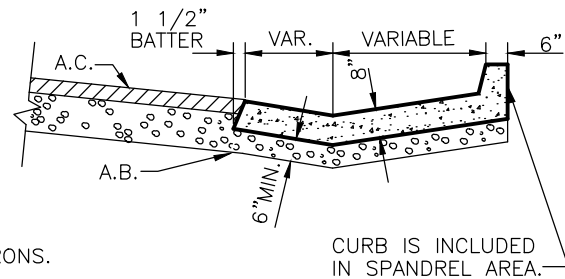
STD. PLAN NUMBER

B-118



NOTES:

1. ALL CONCRETE SHALL BE CLASS 560-C-3250.
2. STEEL TROWEL 8" WIDE FLOWLINE IN GUTTER AND APRONS.
3. AVOID ADVERSE FLOW LINES ON STREETS WHICH ARE NOT PERPENDICULAR TO EACH OTHER BY CONSTRUCTING FLOW LINES PERPENDICULAR TO EACH OTHER.
4. SEE STD. PLAN B-108 FOR WHEELCHAIR RAMPS.



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CROSS GUTTER

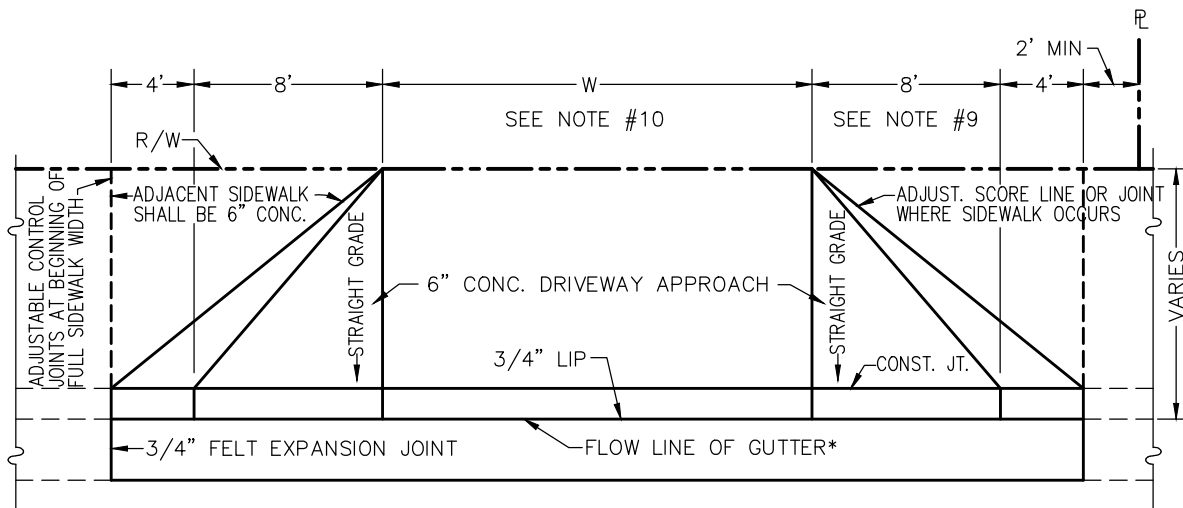
Approved  Date 12-8-15

City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

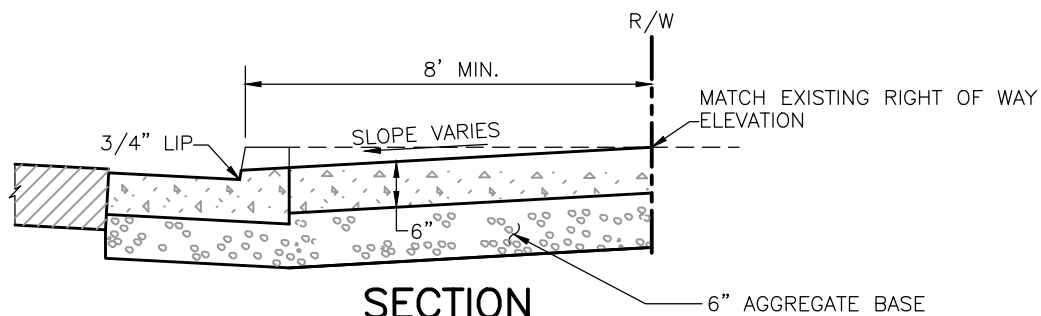
B-119



* A POSITIVE FLOWLINE SHALL BE MAINTAINED. EXISTING CURB & GUTTER SHALL BE REMOVED AND REPLACED AS DETERMINED BY THE CITY ENGINEER, TO ACHIEVE PROPER DRAINAGE.

PLAN – OPTION #1

N.T.S.



SECTION

N.T.S.

NOTES:

1. SIDEWALK AND RAMP THICKNESS SHALL BE 6"(MIN.). P.C.C. AND SHALL BE CONCRETE CLASS 560-C-3250.
2. TWO FEET (MIN.) OF FULL HEIGHT CURB IS REQUIRED BETWEEN DRIVEWAY AND EXTENDED SIDE PROPERTY LINE.
3. A MINIMUM OF 22' OF FULL HEIGHT CURB IS REQUIRED BETWEEN DRIVEWAYS SERVING THE SAME PARCEL.
4. COLORED ADDITIVES OR PATTERNED CONCRETE SHALL NOT BE USED IN PUBLIC R/W.
5. INSTALL 3/4"x2" FELT JOINTS AT 15' O.C. AND 3/4"x6" FELT JOINTS AT TOP OF X'S.
6. 95% RELATIVE COMPACTION REQUIRED IN UPPER 6" OF SUBGRADE.
7. NO HORIZONTAL CURB CUTS ALLOWED.
8. FOR NEW DRIVEWAY LOCATIONS REMOVE AND RECONSTRUCT CURB & GUTTER SEPARATELY FROM DRIVEWAY UNLESS OTHERWISE APPROVED BY THE ENGINEER.
9. WIDTH MAY BE REDUCED UNDER EXTENUATING CIRCUMSTANCES.
10. FOR RESIDENTIAL AREAS, W=18' MIN AND 30' MAX. FOR COMMERCIAL INDUSTRIAL & MULTI RESIDENTIAL W=30' OR AS APPROVED BY THE CITY TRAFFIC ENGINEER.



City of
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ARTERIAL STREET DRIVEWAY OPTION #1

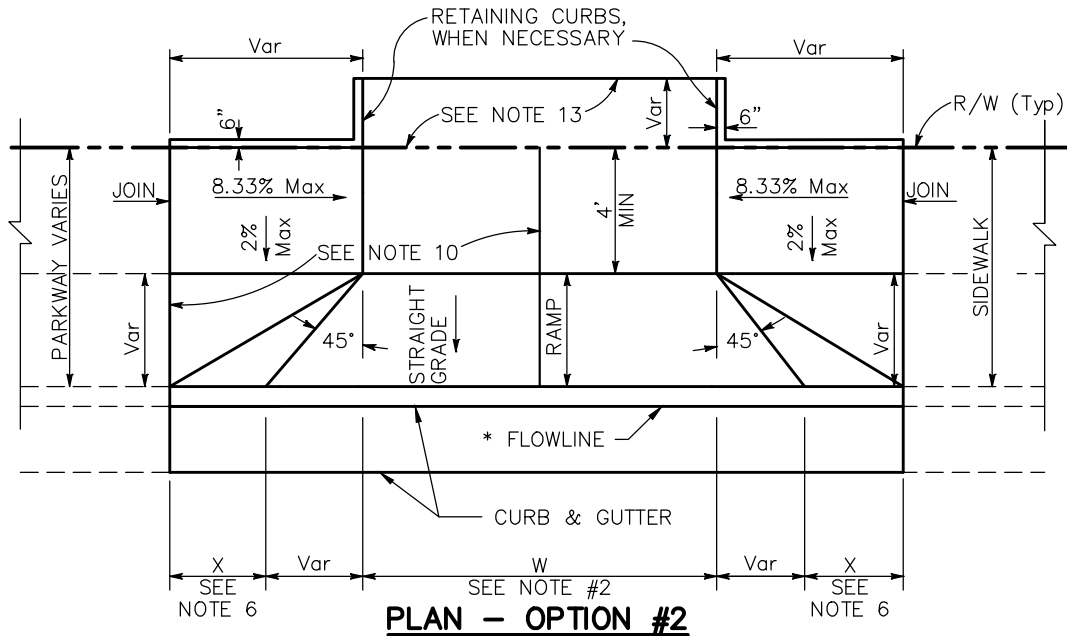
Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

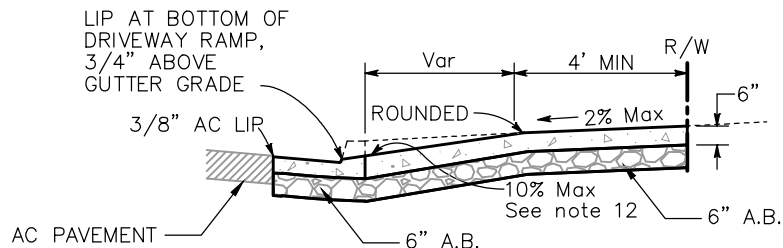
STD. PLAN NUMBER

B-120

SHEET 1 OF 4

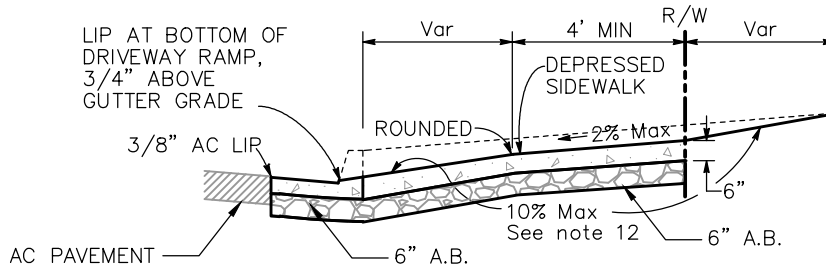


- * A POSITIVE FLOWLINE SHALL BE MAINTAINED. EXISTING CURB & GUTTER SHALL BE REMOVED AND REPLACED AS DETERMINED BY THE CITY ENGINEER, TO ACHIEVE PROPER DRAINAGE.



CASE A

Typical driveway, sidewalk not depressed



CASE B

Driveway with depressed sidewalk

SECTIONS

NOTE: FOR GENERAL NOTES SEE SHEET 4.



City of
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ARTERIAL STREET DRIVEWAY OPTION #2

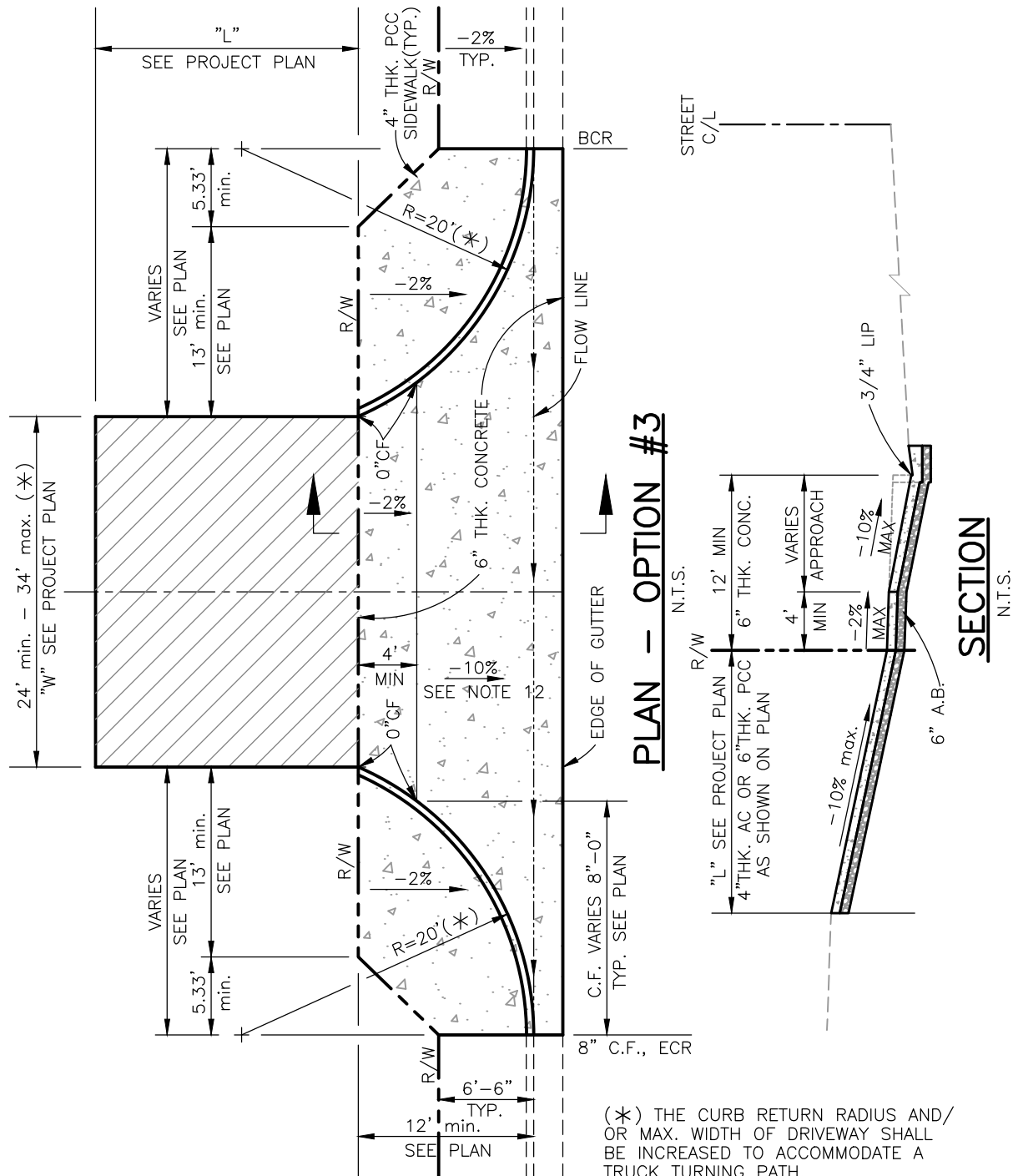
Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-120

SHEET 2 OF 4



NOTE : FOR GENERAL NOTES SEE SHEET 4. REPLACE NOTE #8 WITH - FOR NEW DRIVEWAY LOCATIONS, REMOVE AND RECONSTRUCT CURB MONOLITHICALLY WITH DRIVEWAY. CITY ENGINEER'S APPROVAL IS REQUIRED PRIOR TO SAWCUTTING EXISTING PUBLIC IMPROVEMENTS.



City of
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California

ARTERIAL STREET DRIVEWAY OPTION #3

Approved:  Date 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-120

SHEET 3 OF 4

NOTES:

1. SEE CITY STANDARD PLAN B-121 FOR NON-ARTERIAL MULTI-RESIDENTIAL & COMMERCIAL DRIVEWAYS AND B-122 FOR LOCAL STREET DRIVEWAYS.
2. W=18' MIN, 30' MAX FOR RESIDENTIAL AREAS, AND W=30' MIN FOR COMMERCIAL INDUSTRIAL & MULTI-FAMILY RESIDENTIAL AREAS OR AS APPROVED BY THE CITY TRAFFIC ENGINEER.
3. SIDEWALK AND RAMP THICKNESS SHALL BE 6"(MIN.). P.C.C. AND SHALL BE CONCRETE CLASS 560-C-3250.
4. TWO FEET (MIN.) OF FULL HEIGHT CURB IS REQUIRED BETWEEN DRIVEWAY AND EXTENDED SIDE PROPERTY LINE.
5. A MINIMUM OF 22' OF FULL HEIGHT CURB IS REQUIRED BETWEEN DRIVEWAYS SERVING THE SAME PARCEL.
6. X=3' FOR 6" CURB FACE AND X=4' FOR 8" CURB FACE. CURB HEIGHTS OVER 8" SHALL USE A 4:1 SLOPE. SPECIAL CONDITION FOR X SHALL BE MADE WHEN SIDEWALK IS LOCATED WHERE WHEELCHAIRS MAY TRAVERSE THE SURFACE. SLOPES SHALL NOT EXCEED 8.33% AND CROSS SLOPE FOR DRIVEWAY RAMP SHALL NOT EXCEED 2%.
7. 95% RELATIVE COMPACTION REQUIRED IN UPPER 6" OF SUBGRADE.
8. FOR NEW DRIVEWAY LOCATIONS REMOVE AND RECONSTRUCT CURB & GUTTER SEPARATELY FROM DRIVEWAY UNLESS OTHERWISE APPROVED BY THE ENGINEER.
9. NO HORIZONTAL CURB CUTS ALLOWED.
10. INSTALL 3/4"x2" FELT JOINTS AT 15' O.C. AND 3/4"x6" FELT JOINTS AT TOP OF X'S.
11. COLORED ADDITIVES OR PATTERNED CONCRETE SHALL NOT BE USED IN PUBLIC R/W.
12. DIFFERENCE IN SLOPE OF THE DRIVEWAY RAMP AND THE SLOPE OF A LINE BETWEEN THE GUTTER AND A POINT ON THE ROADWAY 5' FROM GUTTER LINE SHALL NOT EXCEED 15%. REDUCE DRIVEWAY RAMP SLOPE, NOT GUTTER SLOPE, WHERE REQUIRED.
13. RETAINING CURBS AND ADJUSTMENT OF DRIVEWAY GRADES MAY BE NECESSARY FOR NARROW SIDEWALKS OR CURB HEIGHTS IN EXCESS OF 6".
14. AGGREGATE BASE SHALL BE CLASS II 3/4".



City of
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ARTERIAL STREET DRIVEWAY OPTION #2 & #3

Approved

Date 12-8-15

REVISIONS

BY

DATE

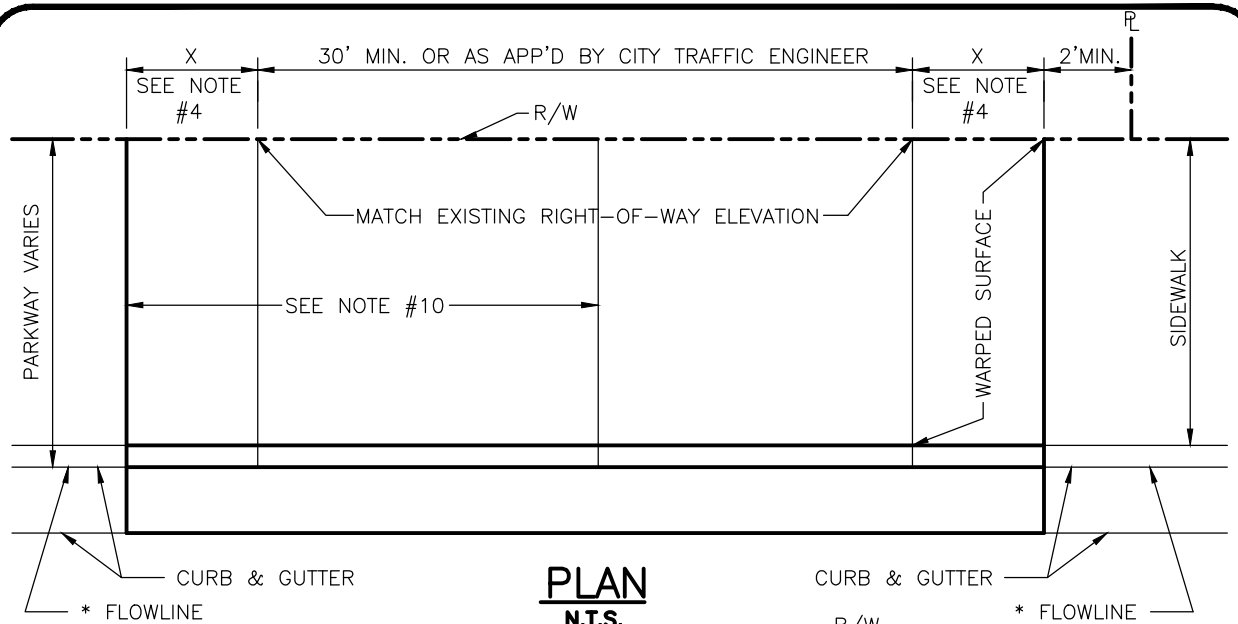
STD. PLAN NUMBER

City Engineer

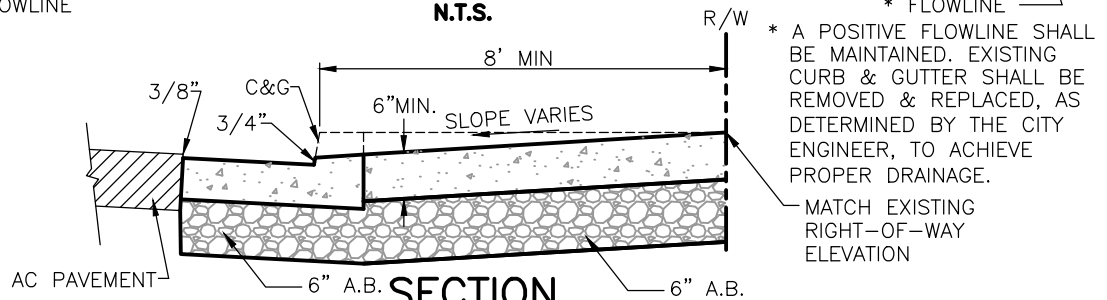
R.C.E. 52125 Exp.12-31-16

B-120

SHEET 4 OF 4



PLAN
N.T.S.



SECTION
N.T.S.

NOTES:

1. SEE CITY STANDARD PLAN B-120 FOR COMMERCIAL DRIVEWAYS ON ARTERIAL STREETS.
2. ALL CONCRETE SHALL BE CLASS 560-C-3250. INSPECTOR'S APPROVAL IS REQUIRED PRIOR TO ANY SAWCUT, .
3. APPROACH SHALL BE 6" MINIMUM THICKNESS.
4. X=3' FOR 6" CF, X=4' FOR 8" CF.
5. TWO FEET (MIN.) OF FULL HEIGHT CURB IS REQUIRED BETWEEN DRIVEWAY AND EXTENDED SIDE PROPERTY LINE.
6. A MINIMUM OF 22' OF FULL HEIGHT CURB IS REQUIRED BETWEEN DRIVEWAYS SERVING THE SAME PARCEL.
7. 95% RELATIVE COMPACTION REQUIRED IN UPPER 6" OF SUBGRADE.
8. FOR NEW DRIVEWAY LOCATIONS REMOVE AND RECONSTRUCT CURB & GUTTER SEPARATELY FROM DRIVEWAY UNLESS OTHERWISE APPROVED BY THE ENGINEER.
9. NO HORIZONTAL CURB CUTS ALLOWED.
10. INSTALL 3/4"x2" FELT JOINTS AT 15' O.C. AND 3/4"x6" FELT JOINTS AT TOP OF X'S.
11. COLORED ADDITIVES OR PATTERNED CONCRETE SHALL NOT BE USED IN PUBLIC R/W.



City of
Garden Grove
California

**NON-ARTERIAL MULTI-RESIDENTIAL
& COMMERCIAL DRIVEWAY**

Approved

Date 12-8-15

REVISIONS

BY

DATE

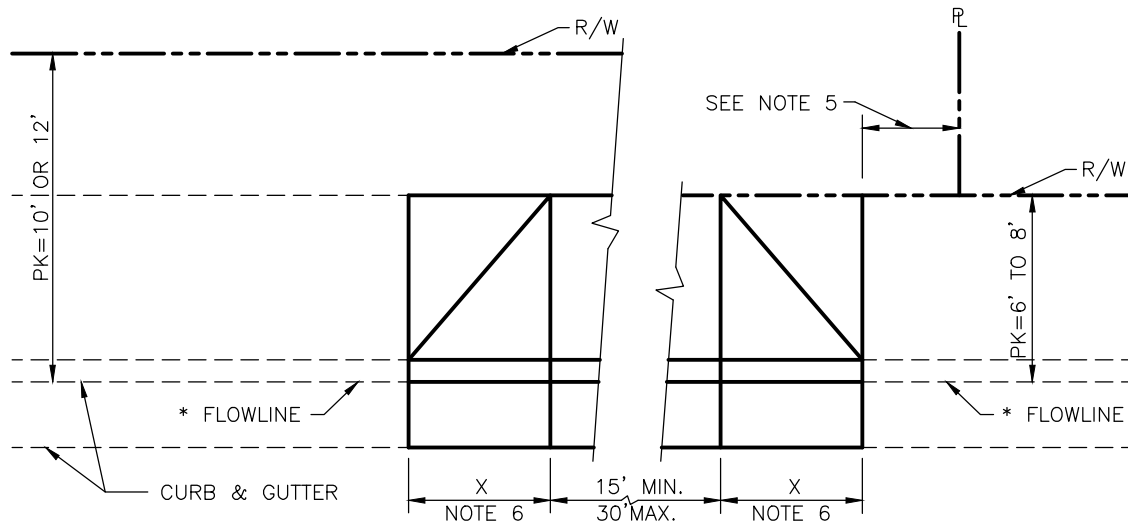
STD. PLAN NUMBER

City Engineer

R.C.E. 52125

Exp.12-31-16

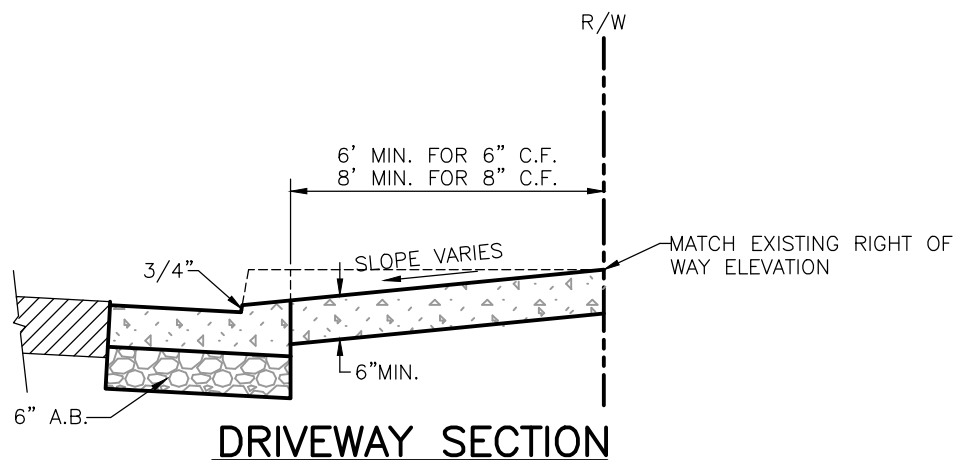
B-121



SEE NOTE 4 IF EXISTING CURB & GUTTER IS TO BE REMOVED FOR CONSTRUCTION OF NEW DRIVEWAY

* A POSITIVE FLOWLINE SHALL BE MAINTAINED. EXISTING CURB & GUTTER SHALL BE REMOVED AND REPLACED AS DETERMINED BY THE CITY ENGINEER, TO ACHIEVE PROPER DRAINAGE.

PLAN – OPTION #1 **N.T.S.**



DRIVEWAY SECTION

SEE SHEET 2 FOR CONSTRUCTION NOTES.



City of
Garden Grove
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LOCAL STREET DRIVEWAY OPTION #1

Approved

Date 12-8-15

REVISIONS

BY

DATE

STD. PLAN NUMBER

City Engineer

R.C.E. 52125 Exp.12-31-16

B-122

SHEET 1 OF 4

NOTES:

1. INSPECTOR'S APPROVAL IS REQUIRED PRIOR TO SAWCUTTING EXISTING PUBLIC IMPROVEMENTS.
2. ALL CONCRETE SHALL BE CLASS 520-C-2500.
3. APPROACH AND GUTTER SHALL BE 6" MINIMUM THICKNESS.
4. WHEN INSTALLING A NEW DRIVE APPROACH WHERE CURB AND GUTTER EXIST, SAWCUT THE CURB AT RIGHT ANGLES TO THE STREET CENTER LINE AND REMOVE THE ENTIRE CURB AND GUTTER. POUR DRIVE APPROACH MONOLITHICALLY WITH THE CURB DEPRESSION AND GUTTER. IF THE SAWCUT IS WITHIN 5' OF AN EXPANSION JOINT, WEAKENED PLANE JOINT, OR A CRACK, THEN REMOVE AND REPLACE THE CURB TO THE JOINT OR SAWCUT ON THE FAR SIDE OF THE CRACK.
5. TWO FEET (MIN) OF FULL HEIGHT CURB SHALL BE REQUIRED BETWEEN DRIVEWAY AND SIDE PROPERTY LINE EXTENDED.
6. X=3' FOR 6" CURB FACE.
X=4' FOR 8" CURB FACE.
7. R.C. 95% MIN. REQUIRED IN UPPER 6" SUBGRADE.
8. A MINIMUM OF 22' OF FULL HEIGHT CURB IS REQUIRED BETWEEN DRIVEWAYS SERVING THE SAME PARCEL.
9. HORIZONTAL CURB CUTS MAY BE ALLOWED ON A LIMITED BASIS AS DETERMINED BY THE CITY ENGINEER.
10. INSTALL 3/4"x6" FELT JOINT AT TOP OF X AND 3/4"x2" FELT JOINT AT 15' O.C.
11. COLORED ADDITIVES OR PATTERNED CONCRETE SHALL NOT BE USED IN PUBLIC R/W.



City of
Garden Grove
California

LOCAL STREET DRIVEWAY OPTION #1

Approved

Date 12-8-15

City Engineer

R.C.E. 52125 Exp.12-31-16

REVISIONS

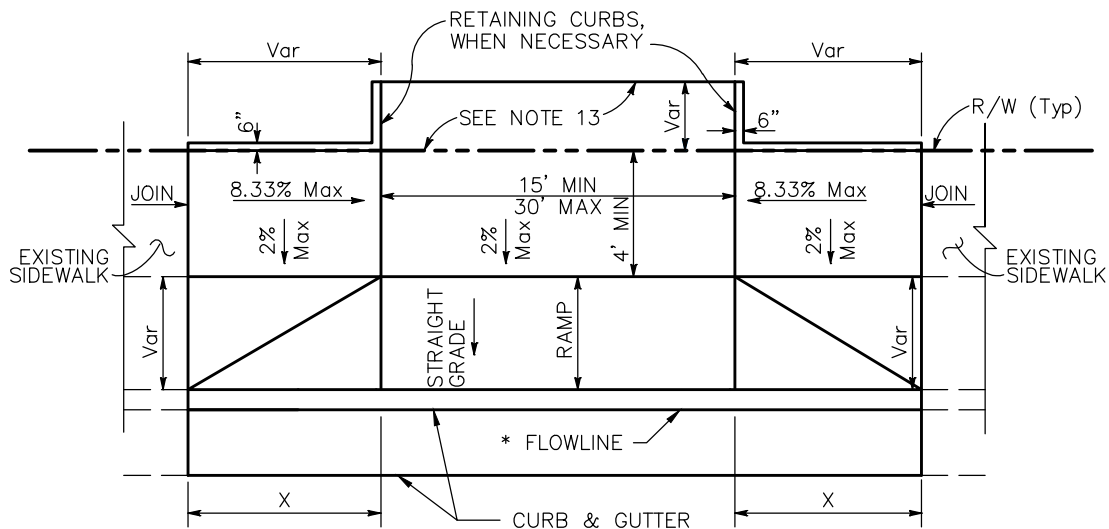
BY

DATE

STD. PLAN NUMBER

B-122

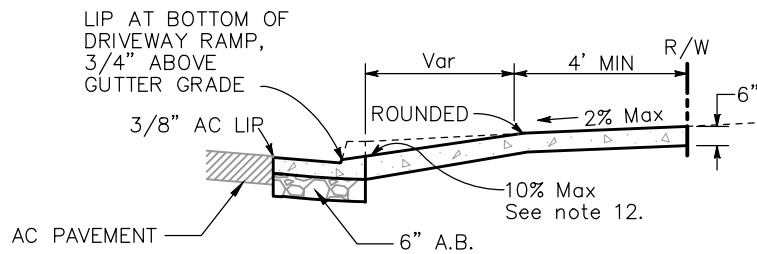
SHEET 2 OF 4



PLAN – OPTION #2

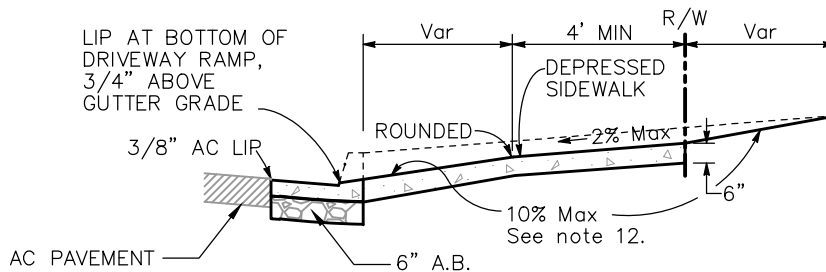
SEE NOTE 4 IF EXISTING CURB & GUTTER IS TO BE REMOVED FOR CONSTRUCTION OF NEW DRIVEWAY

* A POSITIVE FLOWLINE SHALL BE MAINTAINED. EXISTING CURB & GUTTER SHALL BE REMOVED AND REPLACED AS DETERMINED BY THE CITY ENGINEER, TO ACHIEVE PROPER DRAINAGE.



CASE A

Typical driveway, sidewalk not depressed



CASE B

Driveway with depressed sidewalk

SECTIONS

SEE SHEET 4 FOR CONSTRUCTION NOTES.



City of
Garden Grove
California

LOCAL STREET DRIVEWAY OPTION #2

Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-122

SHEET 3 OF 4

NOTES:

1. INSPECTOR'S APPROVAL IS REQUIRED PRIOR TO SAWCUTTING EXISTING PUBLIC IMPROVEMENTS.
2. ALL CONCRETE SHALL BE CLASS 520-C-2500.
3. APPROACH, SIDEWALK, AND GUTTER SHALL BE 6" MINIMUM THICKNESS.
4. WHEN INSTALLING A NEW DRIVE APPROACH WHERE CURB AND GUTTER EXIST, SAWCUT THE CURB AT RIGHT ANGLES TO THE STREET CENTER LINE AND REMOVE THE ENTIRE CURB AND GUTTER. POUR DRIVE APPROACH MONOLITHICALLY WITH THE CURB DEPRESSION AND GUTTER. IF THE SAWCUT IS WITHIN 5' OF AN EXPANSION JOINT, WEAKENED PLANE JOINT, OR A CRACK, THEN REMOVE AND REPLACE THE CURB TO THE JOINT OR SAWCUT ON THE FAR SIDE OF THE CRACK.
5. TWO FEET (MIN) OF FULL HEIGHT CURB SHALL BE REQUIRED BETWEEN DRIVEWAY AND SIDE PROPERTY LINE EXTENDED.
6. $X=3'$ FOR 6" CURB FACE AND $X=4'$ FOR 8" CURB FACE. CURB HEIGHTS OVER 8" SHALL USE A 4:1 SLOPE. SPECIAL CONDITION FOR X SHALL BE MADE WHEN SIDEWALK IS LOCATED WHERE WHEELCHAIRS MAY TRAVERSE THE SURFACE. SLOPES SHALL NOT EXCEED 8.33% AND CROSS SLOPE FOR DRIVEWAY RAMP SHALL NOT EXCEED 2%.
7. R.C. 95% MIN. REQUIRED IN UPPER 6" SUBGRADE.
8. A MINIMUM OF 22' OF FULL HEIGHT CURB IS REQUIRED BETWEEN DRIVEWAYS SERVING THE SAME PARCEL.
9. HORIZONTAL CURB CUTS MAY BE ALLOWED ON A LIMITED BASIS AS DETERMINED BY THE CITY ENGINEER.
10. INSTALL $3/4" \times 6"$ FELT JOINT AT TOP OF X AND $3/4" \times 2"$ FELT JOINT AT 15' O.C.
11. COLORED ADDITIVES OR PATTERNED CONCRETE SHALL NOT BE USED IN PUBLIC R/W.
12. DIFFERENCE IN SLOPE OF THE DRIVEWAY RAMP AND THE SLOPE OF A LINE BETWEEN THE GUTTER AND A POINT ON THE ROADWAY 5' FROM GUTTER LINE SHALL NOT EXCEED 15%. REDUCE DRIVEWAY RAMP SLOPE, NOT GUTTER SLOPE, WHERE REQUIRED.
13. RETAINING CURBS AND ADJUSTMENT OF DRIVEWAY GRADES MAY BE NECESSARY FOR NARROW SIDEWALKS OR CURB HEIGHTS IN EXCESS OF 6".



City of
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LOCAL STREET DRIVEWAY OPTION #2

Approved  Date 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS

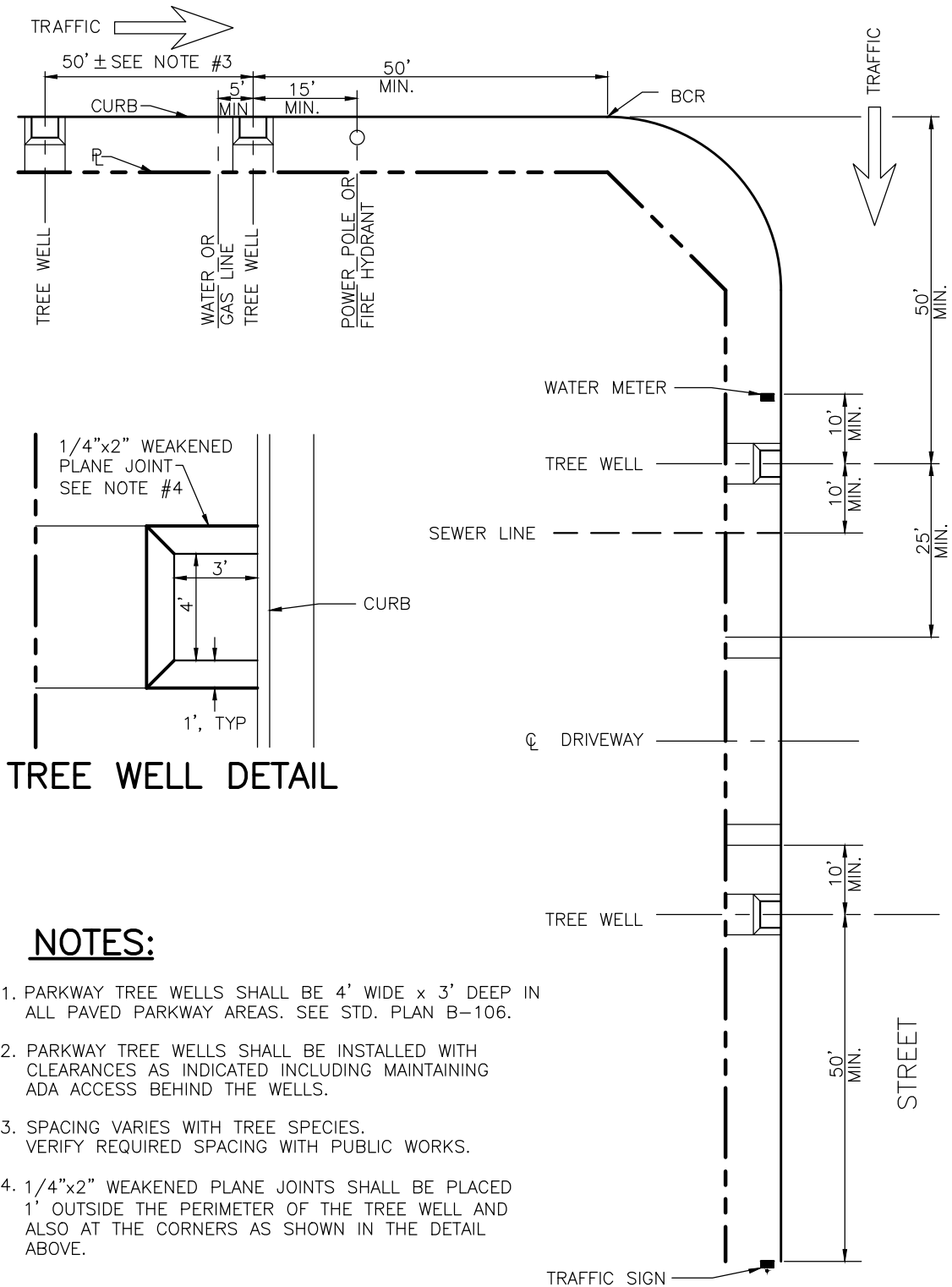
BY

DATE

STD. PLAN NUMBER

B-122

SHEET 4 OF 4



NOTES:

1. PARKWAY TREE WELLS SHALL BE 4' WIDE x 3' DEEP IN ALL PAVED PARKWAY AREAS. SEE STD. PLAN B-106.
2. PARKWAY TREE WELLS SHALL BE INSTALLED WITH CLEARANCES AS INDICATED INCLUDING MAINTAINING ADA ACCESS BEHIND THE WELLS.
3. SPACING VARIES WITH TREE SPECIES. VERIFY REQUIRED SPACING WITH PUBLIC WORKS.
4. 1/4"x2" WEAKENED PLANE JOINTS SHALL BE PLACED 1' OUTSIDE THE PERIMETER OF THE TREE WELL AND ALSO AT THE CORNERS AS SHOWN IN THE DETAIL ABOVE.



City of
Garden Grove
California

TYPICAL PARKWAY TREE WELL INSTALLATION

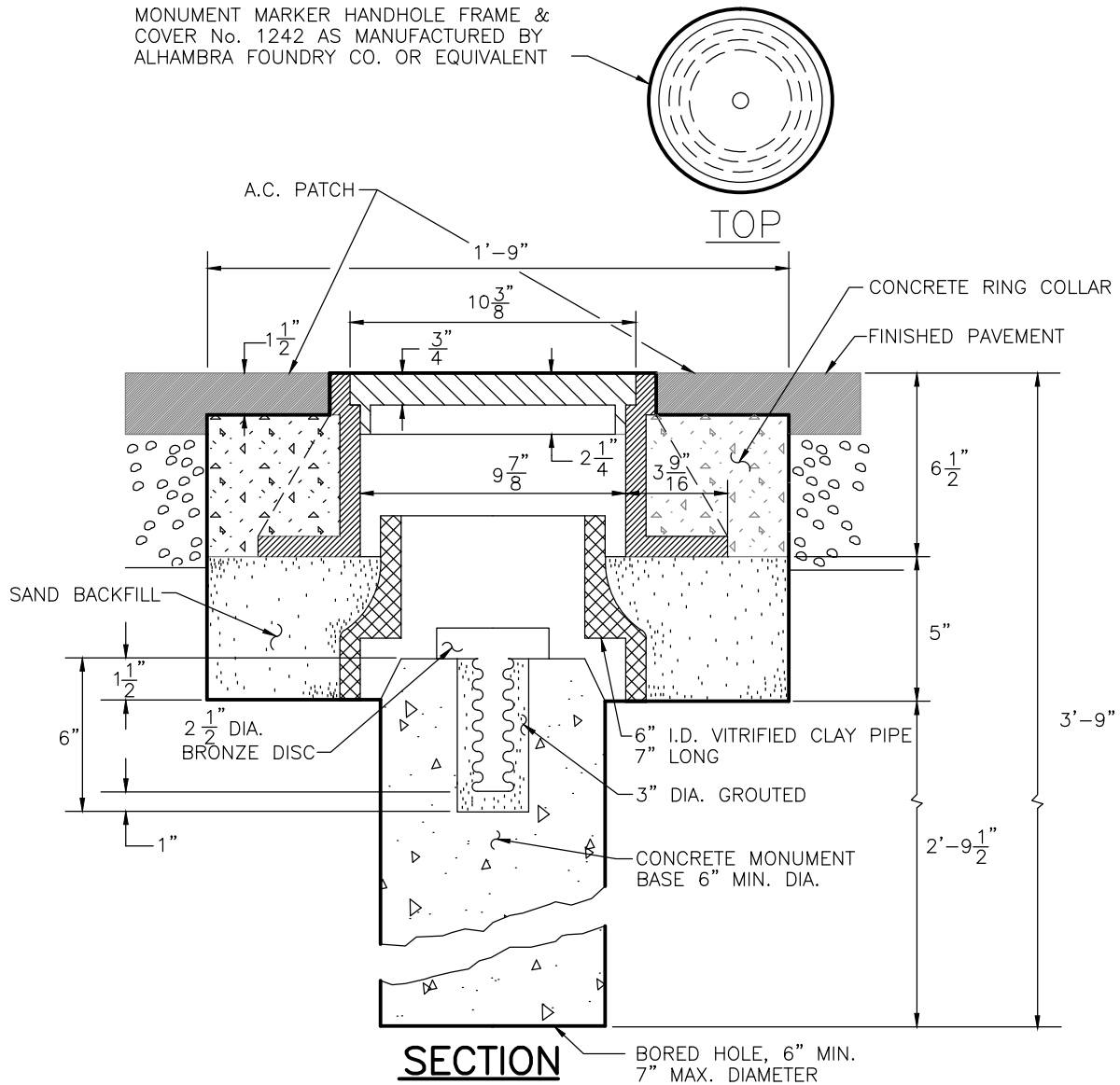
Approved  Date 12-8-15
City Engineer R.C.E. 52125 Exp.12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-123

MONUMENT MARKER HANDHOLE FRAME &
COVER No. 1242 AS MANUFACTURED BY
ALHAMBRA FOUNDRY CO. OR EQUIVALENT



NOTES:

1. FRAME AND COVER TO BE ASPHALT TREATED BY FOUNDRY.
2. IF MARKER IS INSTALLED UNDER CONTRACT, LEAVE 3" DIA. HOLE, 6" DEEP IN EXACT CENTER PER TIES.
3. MONUMENT MARKER SHALL BE SET BY A PROFESSIONAL, LICENSED TO PRACTICE SURVEYING IN THE STATE OF CALIFORNIA.
4. ALL CONCRETE SHALL BE CLASS 520-C-2500.



City of
Garden Grove
California

SURVEY MONUMENT TYPE "A"

Approved  Date 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS

BY

DATE

STD. PLAN NUMBER

B-124

1. ALL POSTS SHALL BE STANDARD (SCHEDULE 40) GALVANIZED PIPE & SHALL CONFORM TO THE FOLLOWING REQUIREMENTS:

FOR 72" FENCE & OVER

END, CORNER & INTERMEDIATE POSTS

LINE POSTS

DRIVE GATE POSTS—SINGLE TO 6' OR DOUBLE TO 12' OPENINGS.

DRIVE GATE POSTS—SINGLE OVER 6' TO 13' OR DOUBLE OVER

12' TO 26' OPENINGS.

FOR FENCE LESS THAN 72"

END, CORNER & INTERMEDIATE POSTS

LINE POSTS

DRIVE GATE POSTS—SINGLE TO 6' OR DOUBLE TO 12' OPENINGS.

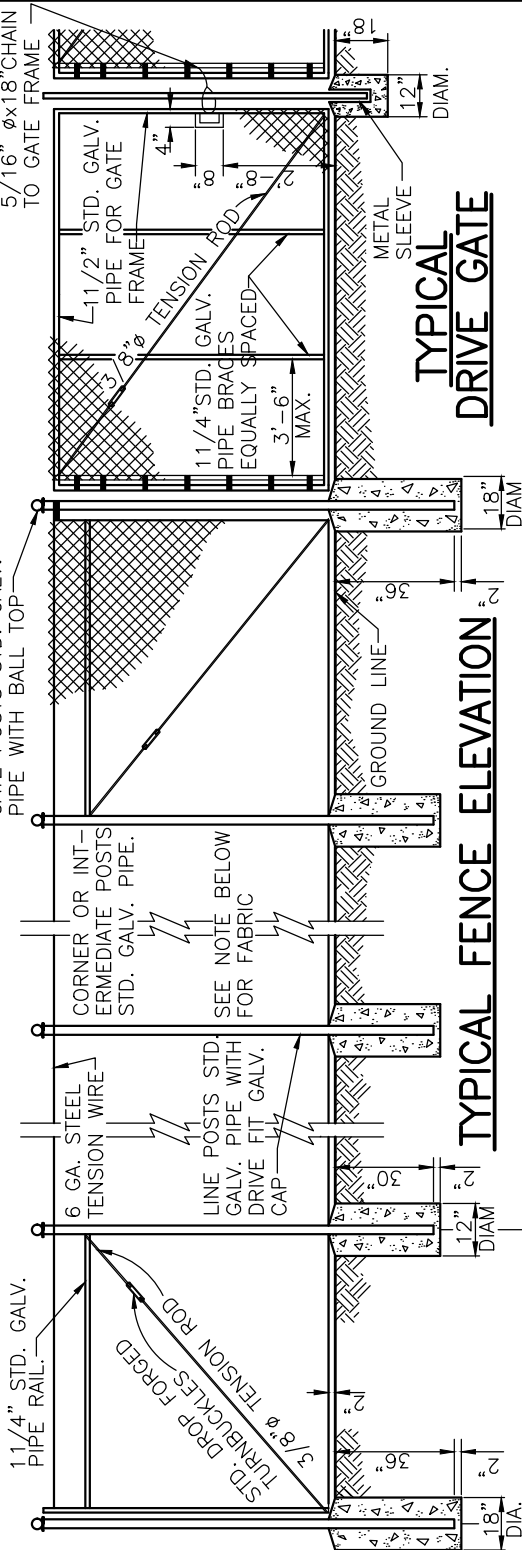
DRIVE GATE POSTS—SINGLE OVER 6' TO 13' OR DOUBLE OVER 12'

TO 26' OPENINGS.

2. ALL POSTS SHALL BE FITTED WITH APPROVED TOPS.

3. ALL WALK & DRIVE GATES SHALL BE HUNG BY TWO MALLEABLE IRON HINGES THE BOTTOM HINGE TO BE BALL & SOCKET TYPE.

SIZE OF PIPE	WT. PER LIN. FT.
2 1/2 IN.	BEFORE GALV.
2	5.79 LBS.
3	3.65 "
4	7.58 "
4 IN.	10.79 LBS.
2	3.65 "
1 1/2	2.72 "
2 1/2	5.79 "
3 1/2	8.11 "



9 GA-2" GALV. MESH CHAIN LINK FABRIC TO BE USED UNLESS OTHERWISE SPECIFIED BY ENGINEER. FASTEN FABRIC TO LINE POSTS AT INTERVALS OF APPROX. 12". Wires, AT INTERVALS OF APPROX. 18" WITH 12 GA. GALV. OR ALUM. TIE WIRES.

NOTE: CHAIN LINK FENCE FABRIC SHALL HAVE TWISTED & BARBED FINISH ON ALL EDGES. CHAIN LINK FENCE FABRIC SHALL BE FASTENED ON THE SIDE OF POSTS DESIGNATED BY ENGINEER. GATE SHALL HAVE A FULL HEIGHT LOCKING BAR WITH NOT FEWER THAN TWO SETS OF LOCKING PRONGS & A PAIR OF PERFORATED LUGS, OR EQUIVALENT DEVICE FOR INSTALLATION OF A PADLOCK.

INTERMEDIATE POSTS ARE TO BE BRACED & TRUSSED TO ADJACENT LINE POSTS AT 300' INTERVALS ALONG FENCE LINE & AT ALIGNMENT DEFLECTION ANGLES OF 15 DEGREES OR MORE.



City of
Garden Grove
California

CHAIN LINK FENCE DETAIL

Approved

Date 12-8-15

REVISIONS

BY

DATE

STD. PLAN NUMBER

B-125

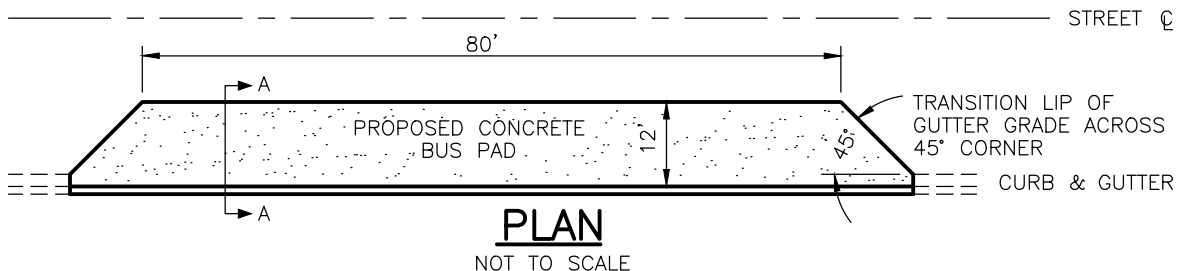
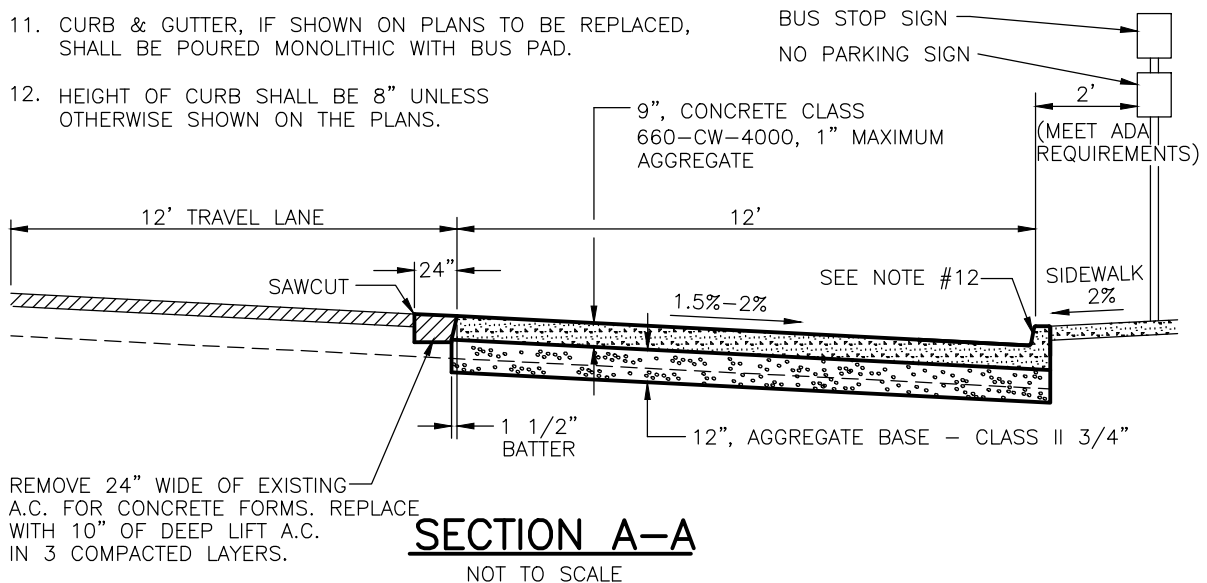
City Engineer

R.C.E. 52125

Exp. 12-31-16

CONSTRUCTION NOTES:

1. CURB SHALL BE POURED MONOLITHIC WITH PCC BUS PAD.
2. COMPACTION ON THE UPPER 6" OF NATIVE SOIL AND AGGREGATE BASE SHALL BE 95%.
3. CONCRETE CYLINDER TESTS SHALL BE TAKEN AS REQUIRED BY INSPECTOR.
4. CONCRETE SHALL HAVE A MAXIMUM OF 4" SLUMP.
5. NO FLY ASH PERMITTED IN CEMENT OR AS AN ADDITIVE.
6. CURING COMPOUND WITH FUGITIVE DYE SHALL BE APPLIED IMMEDIATELY AFTER FINAL FINISHING.
7. 3/4" X 3" DEEP FELT JOINTS SHALL BE INSTALLED AT 15' OC.
8. CONTRACTOR SHALL MAINTAIN TRAFFIC DETOUR, INCLUDING FLASHING ARROW BOARDS FOR A MINIMUM OF 5 DAYS TO ALLOW CONCRETE BUS PAD TO CURE BEFORE PLACING TRAFFIC ON IT.
9. FINAL LOCATION OF BUS PAD TO BE APPROVED IN FIELD BY OCTA PRIOR TO EXCAVATION.
10. CONTRACTOR SHALL FINISH CONCRETE PAD WITH MEDIUM TO HEAVY BROOM FINISH.
11. CURB & GUTTER, IF SHOWN ON PLANS TO BE REPLACED, SHALL BE POURED MONOLITHIC WITH BUS PAD.
12. HEIGHT OF CURB SHALL BE 8" UNLESS OTHERWISE SHOWN ON THE PLANS.



City of
Garden Grove
California

CONCRETE BUS PAD

Approved

Date 12-8-15

REVISIONS

BY

DATE

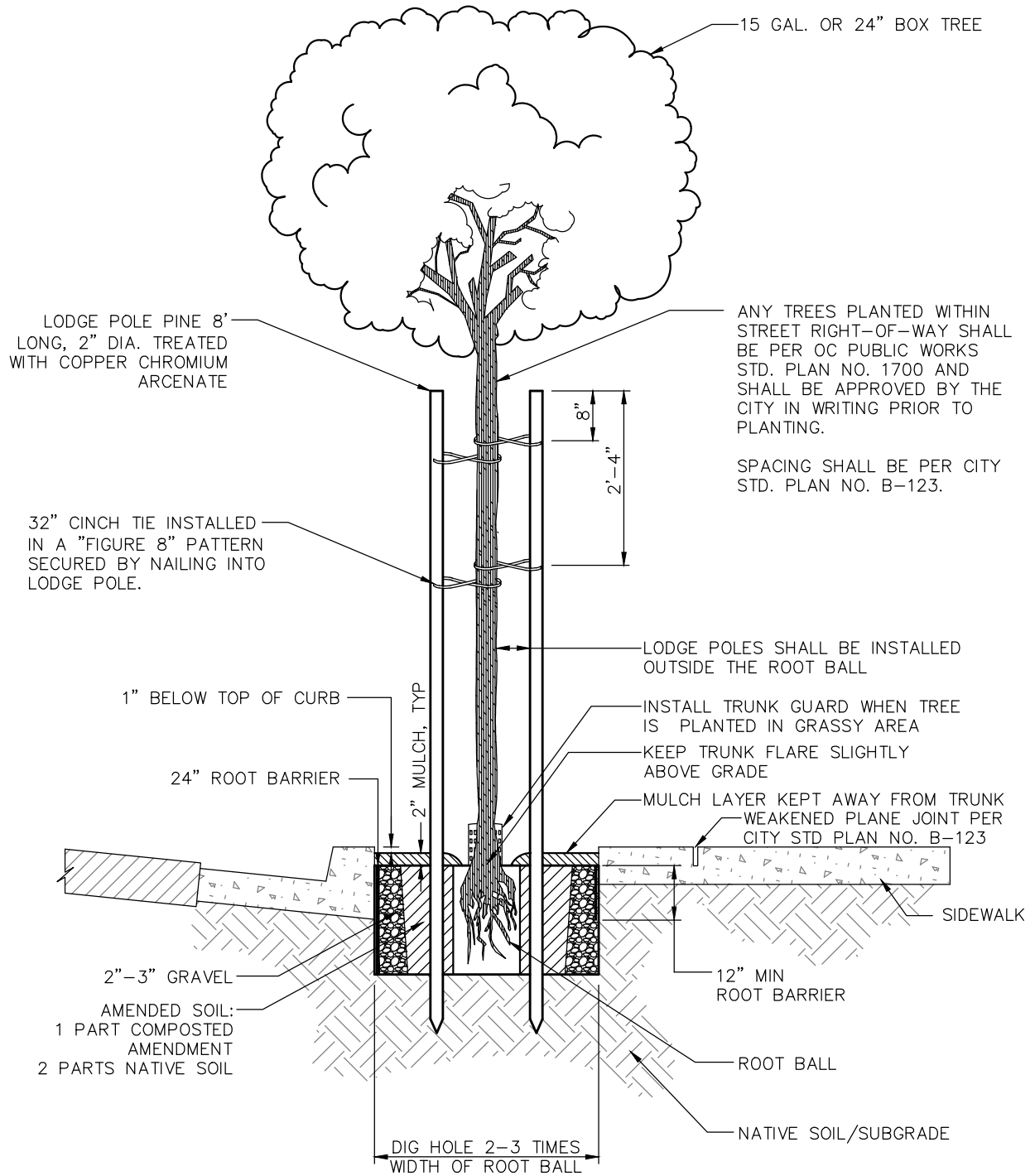
STD. PLAN NUMBER

B-126

City Engineer

R.C.E. 52125

Exp. 12-31-16



DOUBLE STAKING



City of
Garden Grove
California

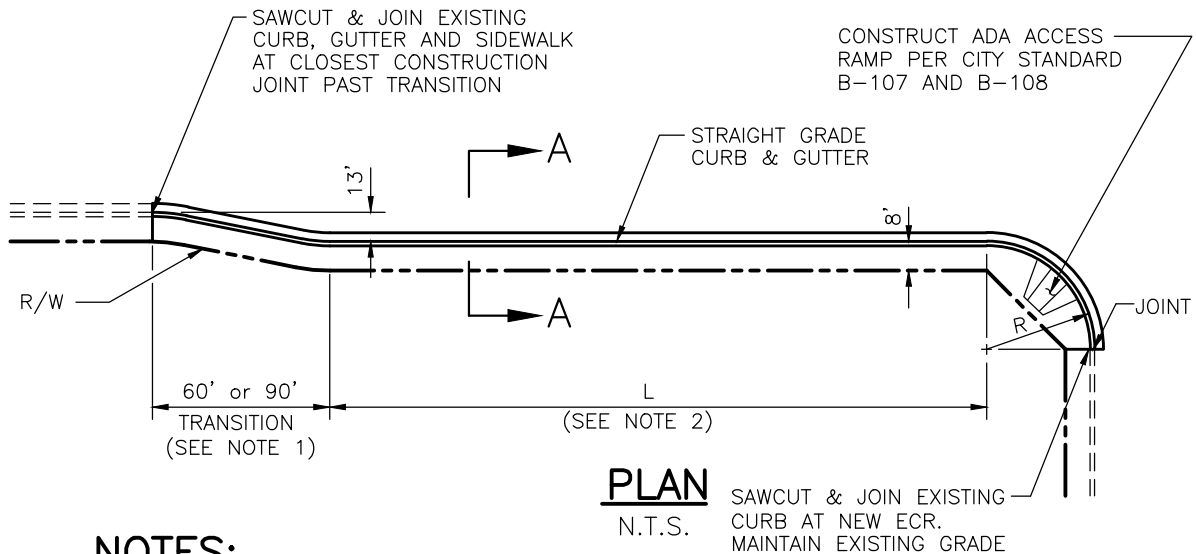
STREET TREE PLANTING DETAIL

Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

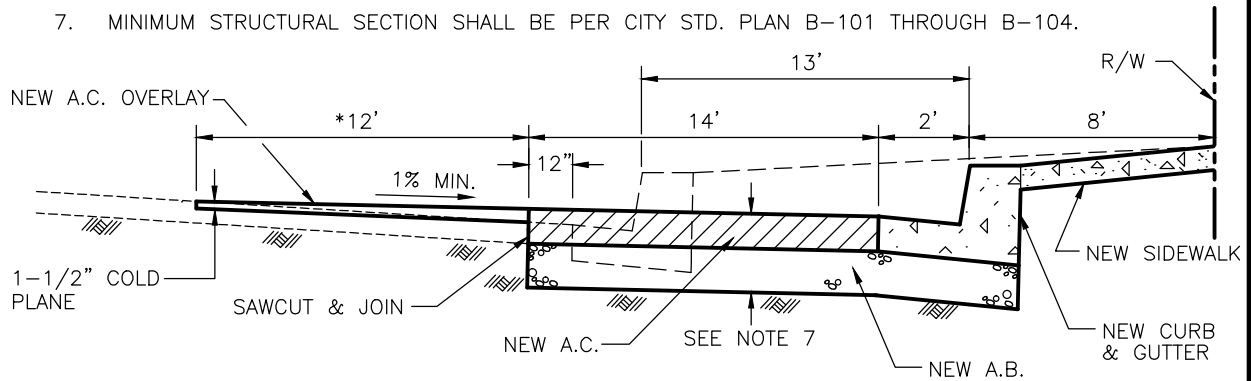
STD. PLAN NUMBER

B-127



NOTES:

1. PROVIDE REVERSE TAPER PER CITY STD. PLAN B-132.
2. "L" DIMENSION WILL BE AS SPECIFIED BY CITY ENGINEER WITH 100 FEET AS MIN. LENGTH.
3. CONSTRUCTION PLAN AND TOPO SURVEY SHALL BE PROVIDED PRIOR TO APPROVAL BY CITY ENGINEER.
4. R=35' FOR ARTERIAL STREET; R=25' FOR LOCAL STREETS PER B-107.
5. CONSTRUCT NEW CURB & GUTTER PER CITY STD. PLAN B-113 AND SIDEWALK PER B-106.
6. SURVEY REFERENCE POINTS TO BE RESET BY LICENSED SURVEYOR AND TIE NOTES OR BENCH MARK ELEVATIONS TO BE SUBMITTED TO CITY SURVEYOR.
7. MINIMUM STRUCTURAL SECTION SHALL BE PER CITY STD. PLAN B-101 THROUGH B-104.



* ACTUAL LOCATION OF JOIN TO BE DETERMINED BY CITY. SUBMIT CROSS SECTIONS AS REQUIRED BY CITY ENGINEER.



City of
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RIGHT TURN POCKET

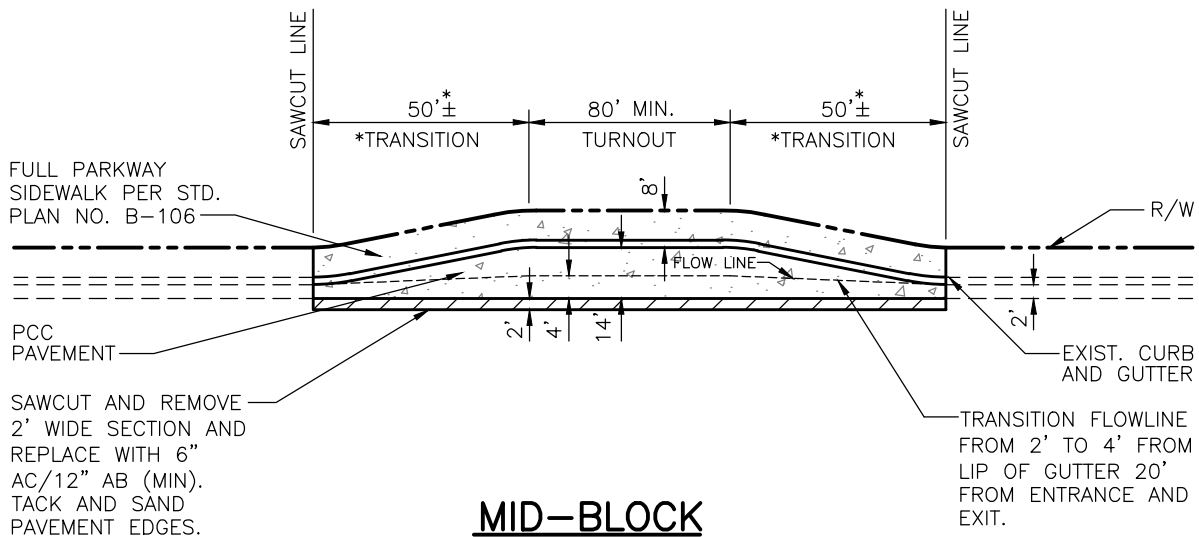
Approved:  Date: 12-8-15

City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-129



NOTES:

- *1. PROVIDE 50' RADIUS REVERSE CURVE.
2. P.C.C. PAVEMENT THICKNESS SHALL BE 9" OVER 12" CLASS II 3/4" AGG. BASE
3. BUS SHELTERS SHALL BE SET BACK FROM THE FACE OF THE CURB A MINIMUM CLEAR DISTANCE OF FOUR (4) FEET FOR PEDESTRIAN TRAVEL WAY.
4. CURB SHALL BE POURED MONOLITHIC WITH P.C.C. PAVEMENT.
5. MODIFICATIONS OF THIS STANDARD SHALL BE REVIEWED FOR ACCEPTABILITY BY THE CITY TRAFFIC ENGINEER.
6. CONSTRUCT 3" x 3/4" FELT CONTROL JOINTS AT 15' INTERVALS.
7. CATCH BASINS SHALL NOT BE LOCATED IN BUS TURNOUTS IF POSSIBLE.
8. DRIVEWAYS SHALL NOT BE LOCATED IN BUS TURNOUTS.
9. CURB HEIGHTS MAY VARY TO MATCH EXIST. GRADE BEHIND CURB; 5" MIN. 8" MAX.
10. CONSTRUCTION PLAN AND TOPO SURVEY SHALL BE PROVIDED PRIOR TO APPROVAL BY CITY ENGINEER.
11. CONCRETE SHALL BE CLASS 660-CW-4000 WITH 1" AGGREGATE.
12. MAINTAIN 2% MAX. CROSS FALL ON CONCRETE BUS PAD.



City of
Garden Grove
California

MID-BLOCK BUS TURNOUT

Approved

Date 12-8-15

REVISIONS

BY

DATE

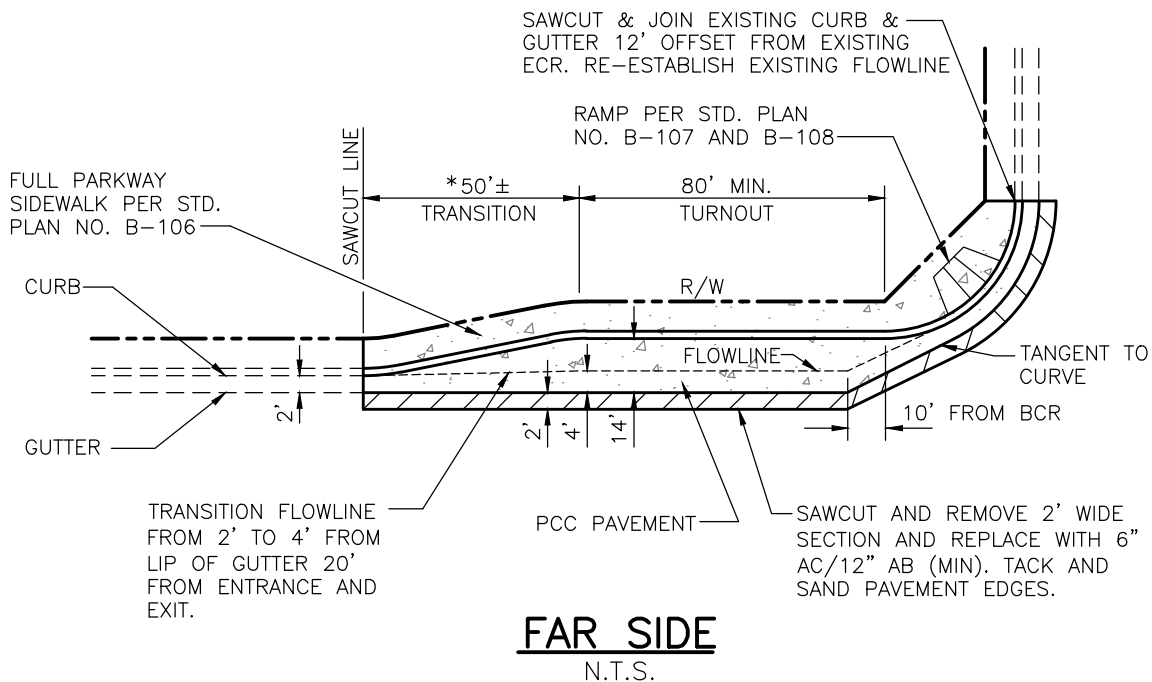
STD. PLAN NUMBER

City Engineer

R.C.E. 52125

Exp. 12-31-16

B-130



NOTES:

- * 1. PROVIDE 50' RADIUS REVERSE CURVE.
- 2. P.C.C. PAVEMENT THICKNESS SHALL BE 9" OVER 12" CLASS II 3/4" AGGREGATE BASE.
- 3. BUS SHELTERS SHALL BE SET BACK FROM THE FACE OF THE CURB A MINIMUM CLEAR DISTANCE OF FOUR (4) FEET FOR PEDESTRIAN TRAVEL WAY.
- 4. CURB SHALL BE POURED MONOLITHIC WITH P.C.C. PAVEMENT.
- 5. MODIFICATIONS OF THIS STANDARD SHALL BE REVIEWED FOR ACCEPTABILITY BY THE CITY TRAFFIC ENGINEER.
- 6. CONSTRUCT 3" x 3/4" FELT CONTROL JOINTS AT 15' INTERVALS.
- 7. CATCH BASINS SHOULD NOT BE LOCATED IN BUS TURNOUTS IF POSSIBLE.
- 8. DRIVEWAYS SHALL NOT BE LOCATED IN BUS TURNOUTS.
- 9. CURB HEIGHTS MAY VARY TO MATCH EXIST. GRADE BEHIND CURB; 5" MIN. 8" MAX.
- 10. CONSTRUCTION PLAN AND TOPO SURVEY SHALL BE PROVIDED PRIOR TO APPROVAL BY CITY ENGINEER.
- 11. CONCRETE SHALL BE CLASS 660-CW-4000 WITH 1" AGGREGATE.
- 12. MAINTAIN 2% MAX. CROSS FALL ON BUS PAD.



City of
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California

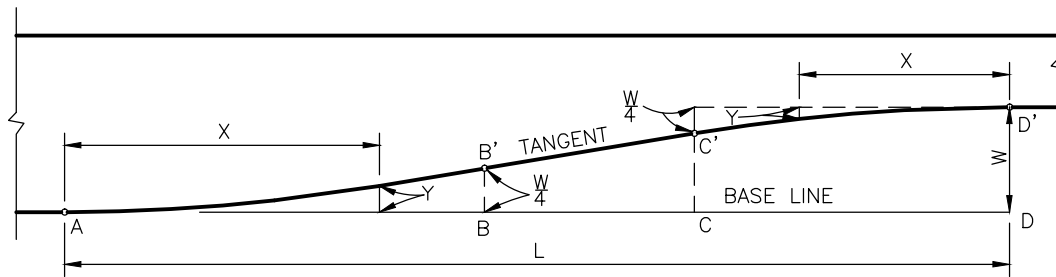
CORNER BUS TURNOUT

Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-131



W=WIDTH OF LEFT OR RIGHT TURN POCKET

L=LENGTH OF TAPER

$$AB=BC=CD=\frac{L}{3}$$

AB' AND C'D' ARE PARABOLIC CURVES EXCEPT ON CURVED ALIGNMENTS

X=DISTANCE FROM POINT "A" ALONG BASE LINE

Y=OFFSET FROM BASE LINE

SINGLE TURN POCKET

N.T.S.

L=90'

W=10',13'

X	0'	10'	20'	30'	40'	50'	60'	70'	80'	90'
Y ₁₀	0.00'	0.28'	1.11'	2.50'	4.17'	5.83'	7.50'	8.89'	9.72'	10.00'
Y ₁₃	0.00'	0.36'	1.44'	3.25'	5.42'	7.58'	9.75'	11.56'	12.64'	13.00'

L=60' *

W=10',13'

X	0'	10'	20'	30'	40'	50'	60'
Y ₁₀	0.00'	0.62'	2.50'	5.00'	7.50'	9.38'	10.00'
Y ₁₃	0.00'	0.81'	3.25'	6.50'	9.75'	12.19'	13.00'

NOTES:

IN THE CASE WHEN THE BASE LINE IS CURVED THE OFFSETS ARE CALCULATED BY ASSUMING THE BASE LINE TO BE TANGENT; THEY ARE THEN APPLIED TO THE CURVED BASE LINE. AB' AND C'D' ARE NO LONGER PARABOLIC AND B'C' IS NO LONGER A TANGENT.

* USE 60' TRANSITION WHEN INSUFFICIENT DISTANCE IS AVAILABLE FOR 90' TRANSITION. USE OF 60' TRANSITION SHALL BE APPROVED BY CITY TRAFFIC ENGINEER.



City of
Garden Grove
California

PARABOLIC CURB TRANSITION

Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

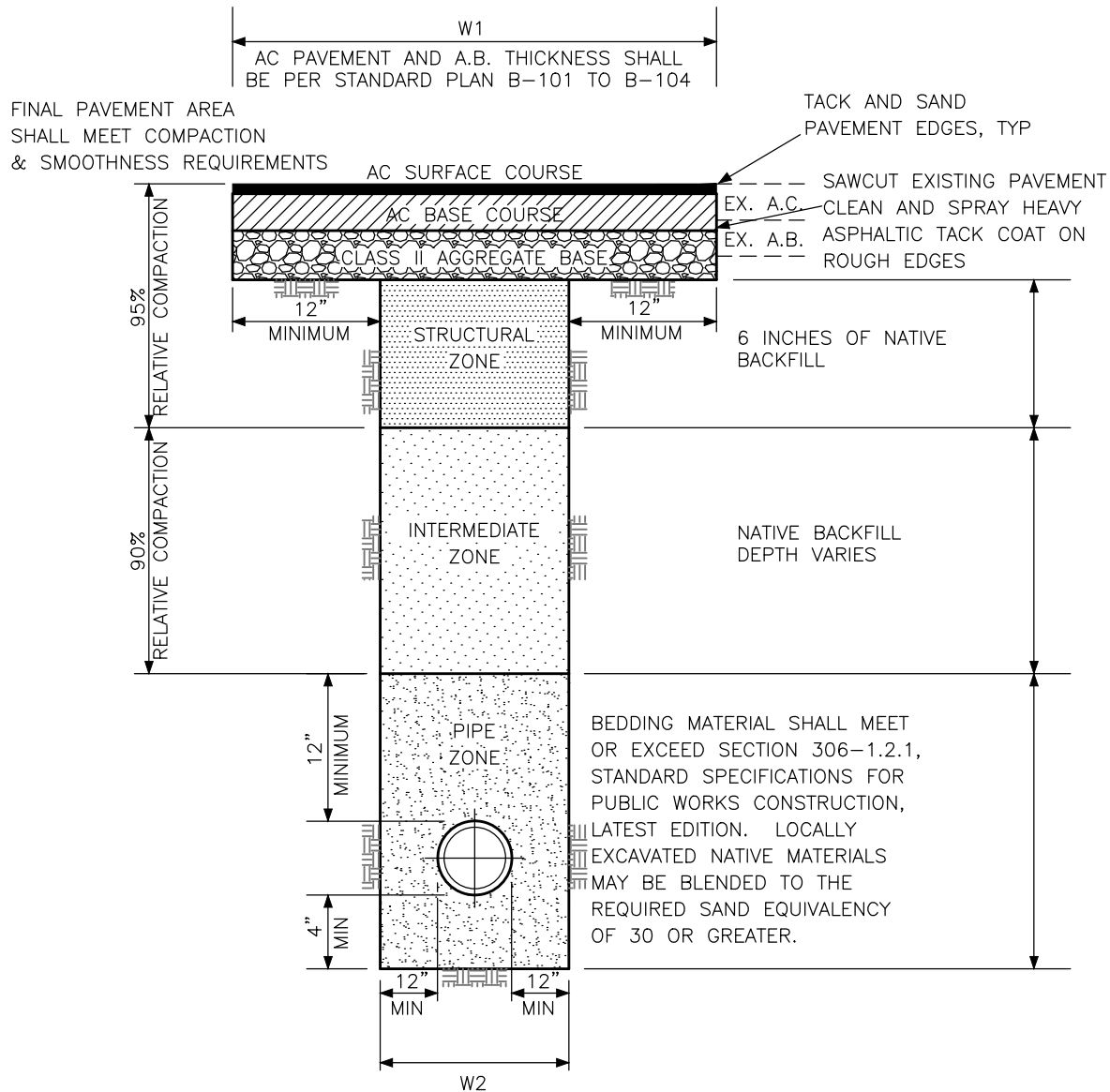
REVISIONS	BY	DATE

STD. PLAN NUMBER

B-132

LONGITUDINAL AND TRANSVERSE TRENCH BACKFILL SECTION

CASE A: T-CAP (NATIVE BACKFILL)



NOTES:

1. TRENCHES WITHIN 3 FEET OF CURB OR CURB & GUTTER SHALL BE PAVED TO JOIN CURB OR GUTTER.
2. WIDTH OF CAP, W1, EQUALS W2 PLUS A MINIMUM OF 12" ON BOTH SIDES AND SHALL BE SUBJECT TO CHANGE BY THE ENGINEER.
3. WIDTH OF TRENCH, W2 EQUALS DIAMETER OF PIPE PLUS A MINIMUM OF 12" ON BOTH SIDES UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
4. THERE SHALL BE 4 INCHES MINIMUM OF BEDDING BELOW THE PIPE UNLESS OTHERWISE SHOWN ON THE PLANS OR AS DIRECTED BY THE ENGINEER.



City of
Garden Grove
California

TRENCH BACKFILL DETAIL & STANDARD STREET RESURFACING

Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

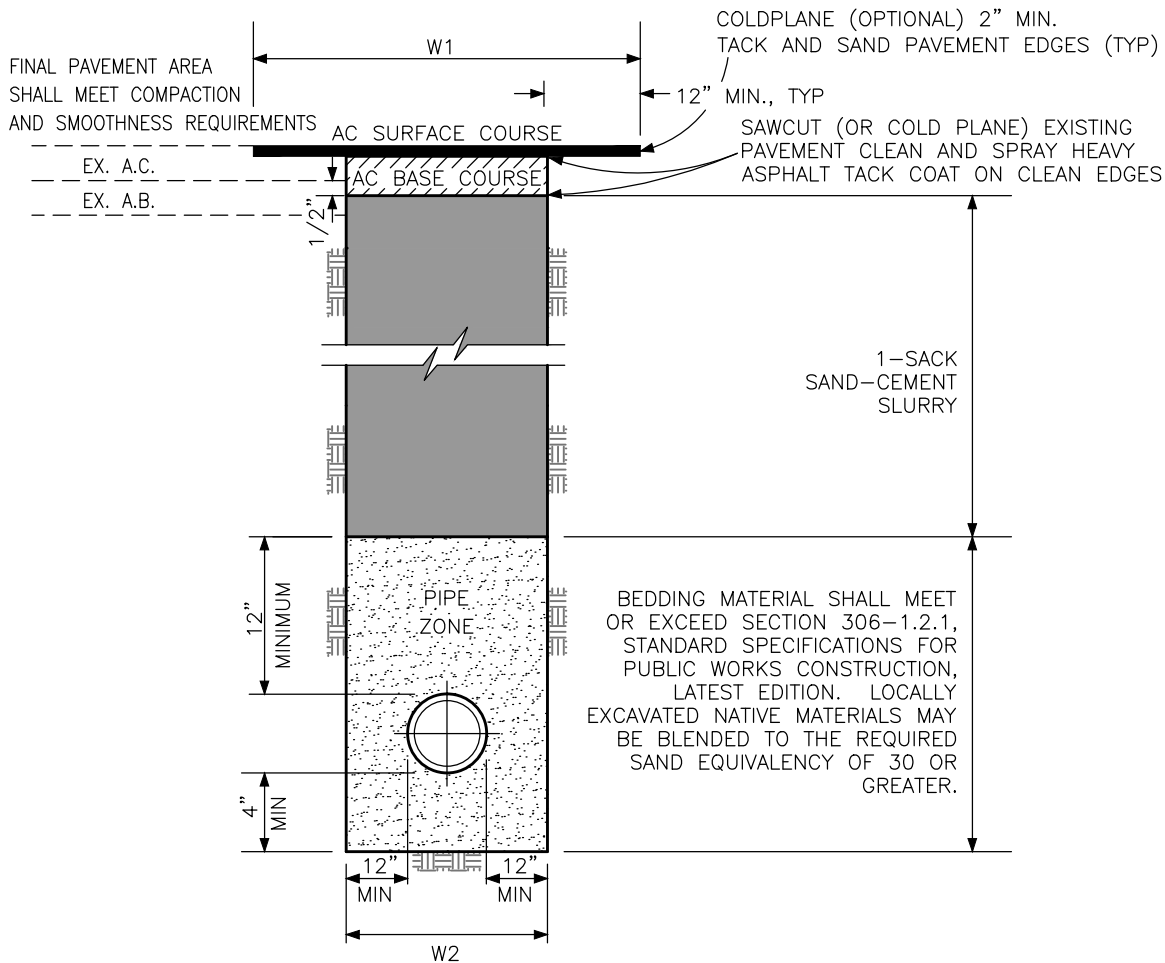
REVISIONS	BY	DATE

STD. PLAN NUMBER

B-134

SHEET 1 OF 2

LONGITUDINAL TRENCH BACKFILL SECTION CASE B: VERTICAL CUT ONLY (SLURRY BACKFILL)



NOTES:

1. REPLACE ASPHALT TO 1/2" BELOW EXISTING AS SHOWN ABOVE.
2. COLD PLANE MINIMUM 2" (OPTIONAL) OR SAWCUT EXISTING PAVEMENT.
3. MINIMUM COMPACTION FOR AC IS 95% RELATIVE COMPACTION.
4. TRENCHES WITHIN 3 FEET OF CURB OR CURB & GUTTER SHALL BE PAVED TO JOIN CURB OR GUTTER.
5. W1 SHALL HAVE A MINIMUM WIDTH EQUAL TO W2 PLUS A MINIMUM OF 12" ON ALL SIDES AND SHALL BE SUBJECT TO CHANGE BY THE ENGINEER.
6. ALL WORK AND MATERIAL SHALL MEET OR EXCEED THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION.
7. LONGITUDINAL TRENCHES IN EXCESS OF 600 FEET MAY BE REQUIRED TO ADDITIONAL RESURFACING REQUIREMENTS DEPENDING ON STREET CONDITION AS DETERMINED BY THE ENGINEER.
8. W2 EQUALS DIAMETER OF PIPE PLUS 12" ON BOTH SIDES UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
9. THERE SHALL BE 4 INCHES MINIMUM OF BEDDING BELOW THE PIPE UNLESS OTHERWISE SHOWN ON THE PLANS OR AS DIRECTED BY THE ENGINEER.



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TRENCH BACKFILL DETAIL & STANDARD STREET RESURFACING

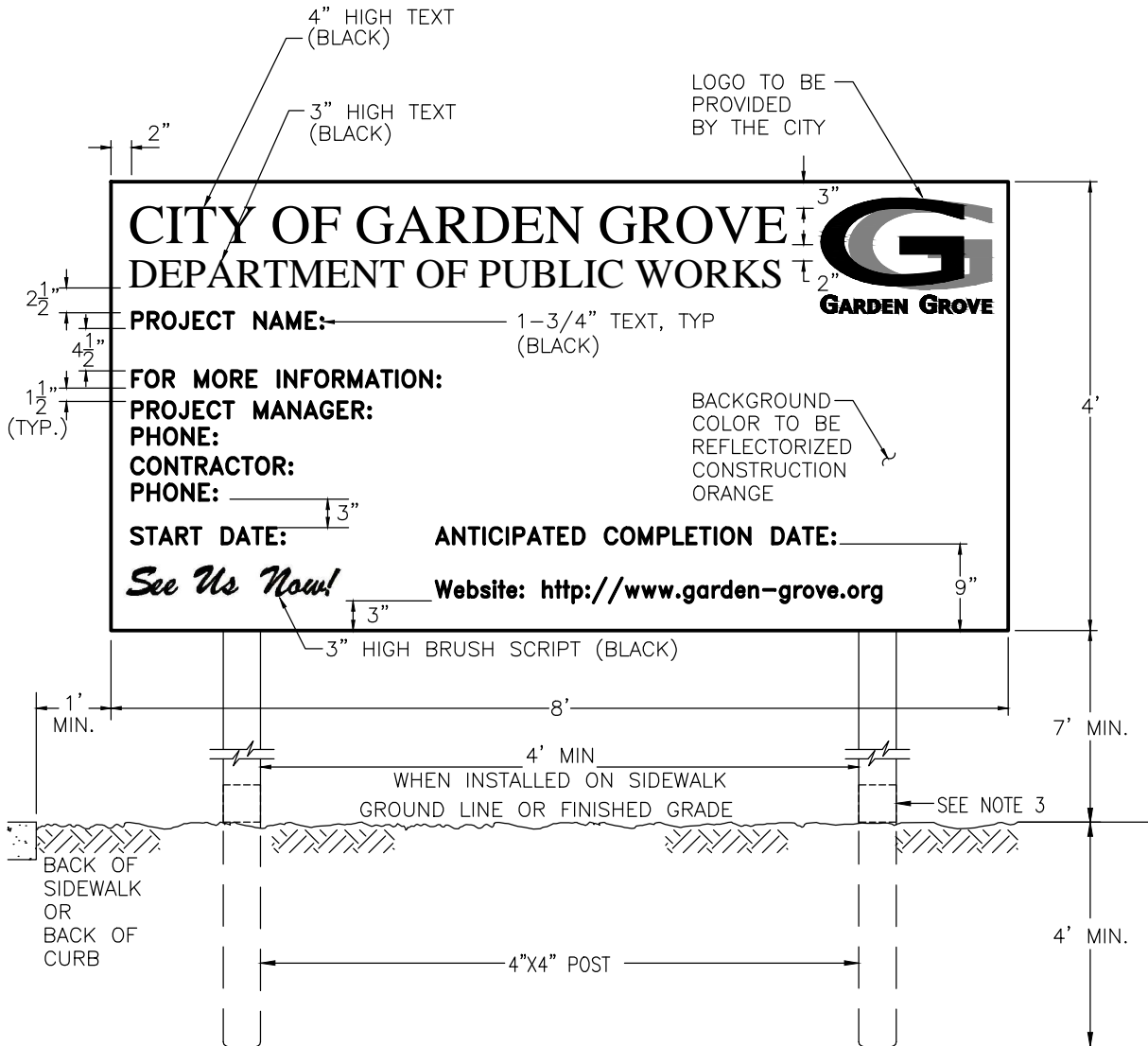
Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-134

SHEET 2 OF 2



OPTION 1

NOTES:

1. SIGN LOCATION TO BE DETERMINED IN THE FIELD BY CITY INSPECTOR.
2. MOUNT SIGN ON (2) 4" x 4" POST EMBEDDED 4' INTO GROUND.
3. IF INFORMATION SIGN IS TO BE PLACED ON SIDEWALK OR MEDIAN HARD SURFACE, USE ALTERNATE MOUNTING AS SHOWN ON SHEET 3.



City of
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CONSTRUCTION INFORMATION SIGN STANDARD INSTALLTION

Approved: _____ Date: 12-8-15

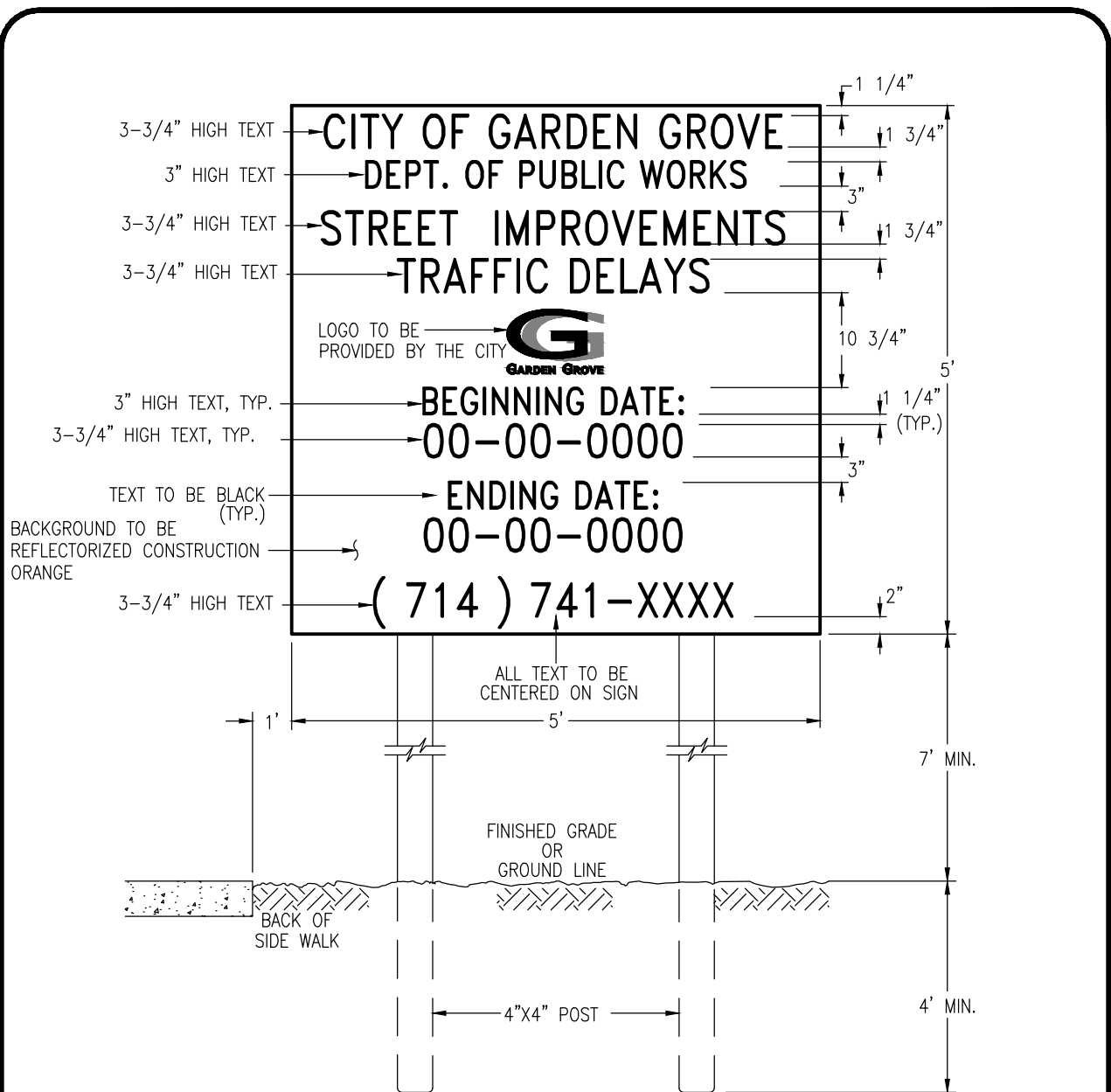
City Engineer R.C.E. 52125 Exp.12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-135

SHEET 1 OF 3



OPTION 2

NOTES:

1. SIGN LOCATION TO BE DETERMINED IN THE FIELD BY CITY INSPECTOR.
2. MOUNT SIGN ON (2) 4" x 4" POST EMBEDDED 4' INTO GROUND.



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CONSTRUCTION INFORMATION SIGN LIMITED RIGHT-OF-WAY

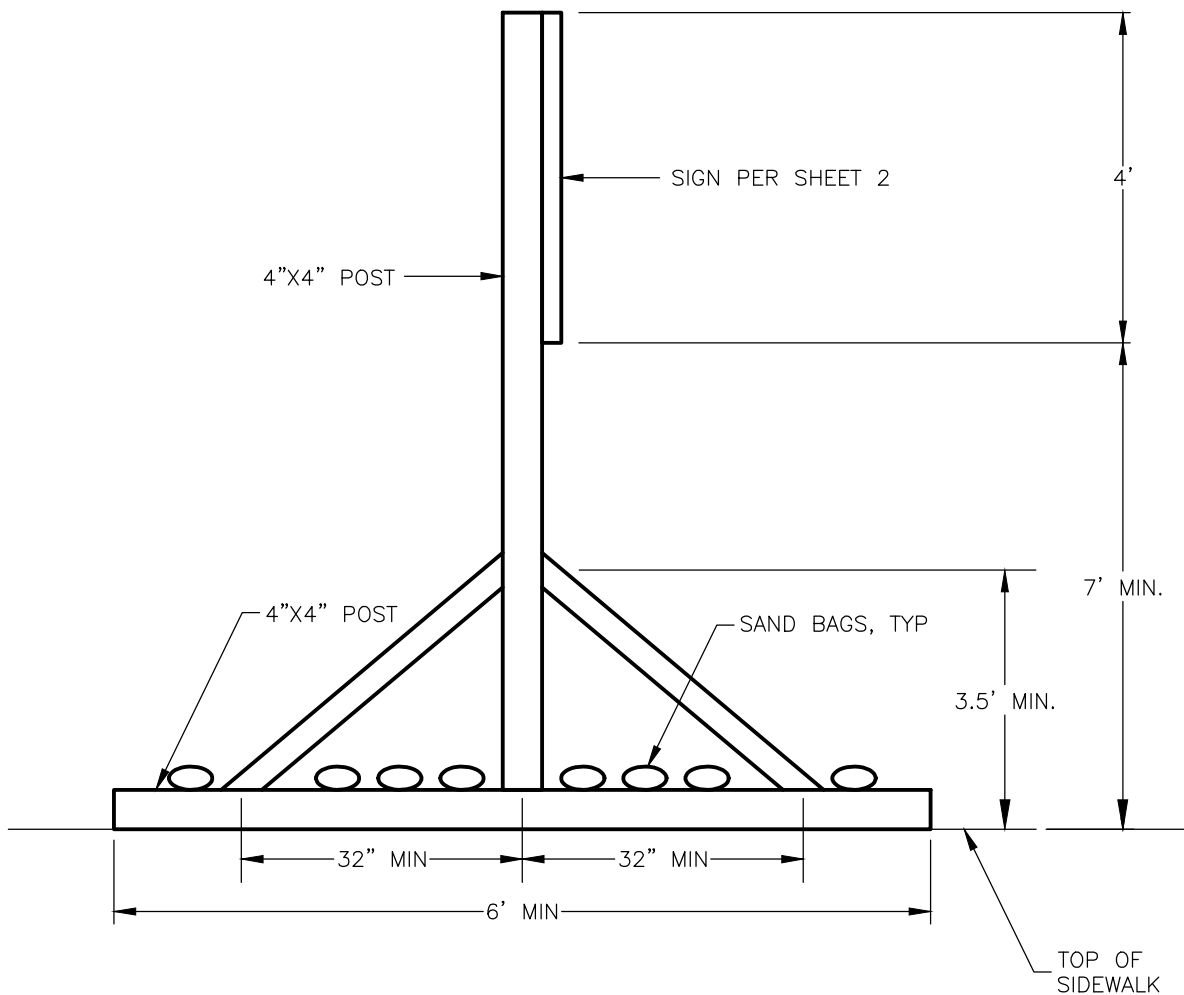
Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-135

SHEET 2 OF 3



ALTERNATE INSTALLATION ON HARD SURFACE SIDE VIEW

NOTES:

1. SIGN LOCATION TO BE DETERMINED IN THE FIELD BY CITY INSPECTOR.
2. FOOTINGS SHALL BE HELD DOWN BY SAND BAGS AND SHALL BE MAINTAINED THROUGHOUT ENTIRE PROJECT.



City of
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CONSTRUCTION INFORMATION SIGN ALTERNATE MOUNTING

Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

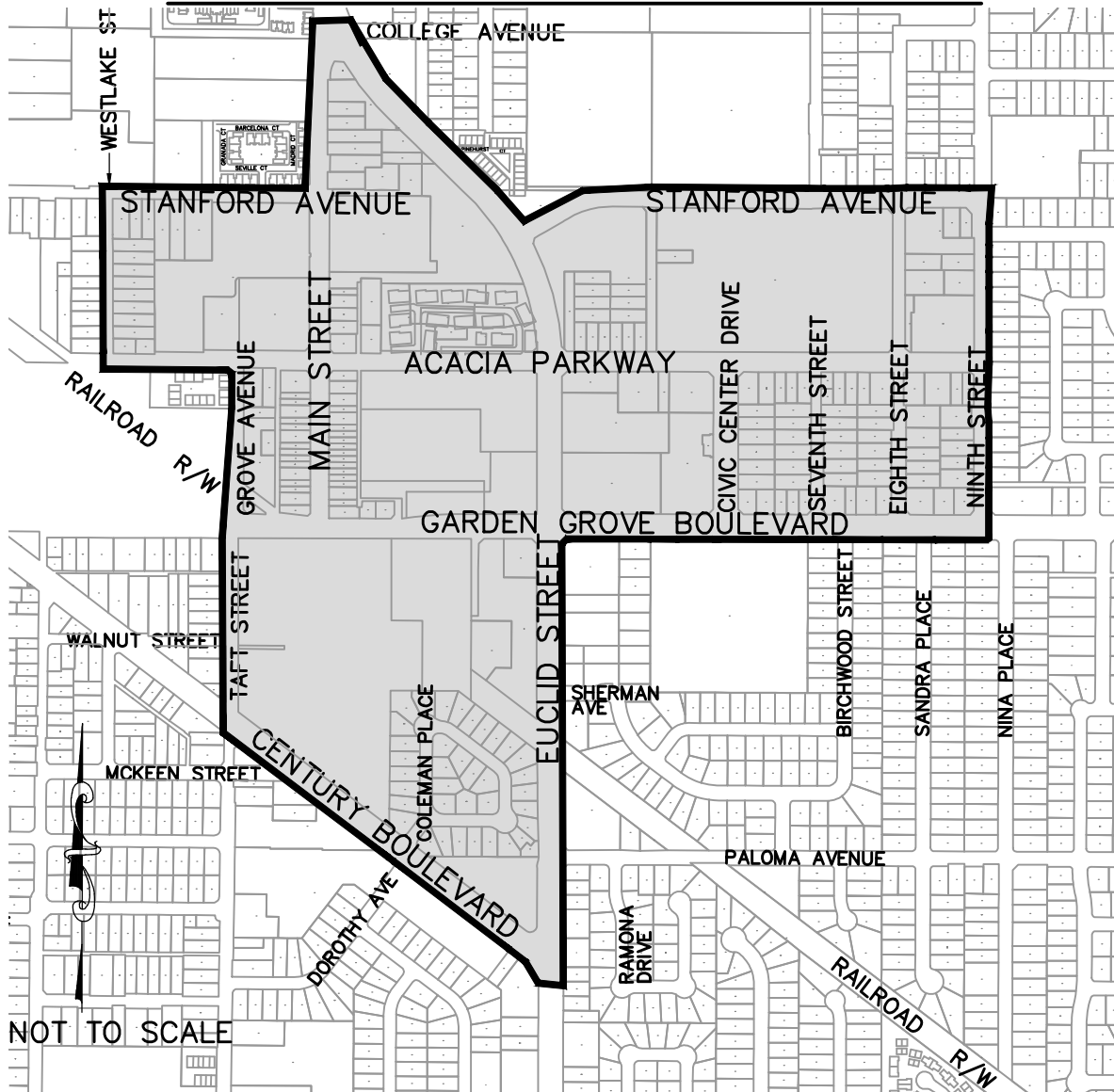
REVISIONS	BY	DATE

STD. PLAN NUMBER

B-135

SHEET 3 OF 3

CIVIC CENTER AREA DESIGNATION



ANY CONSTRUCTION IMPROVEMENTS MADE WITHIN THE CIVIC CENTER AREA AS DEFINED HERE SHALL MEET ALL REQUIREMENTS OF THIS STANDARD PLAN AND AS DIRECTED BY THE ENGINEER.

THIS STANDARD PLAN INCLUDES:

- SHT 2 — ENHANCED INTERSECTION LAYOUT
- SHT 3 — DECORATIVE SIDEWALK CURB RETURN AND LANDING
- SHT 4 — DECORATIVE CROSSWALK DETAILS



City of
Garden Grove
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CIVIC CENTER STREET IMPROVEMENT CRITERIA

Approved  Date 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

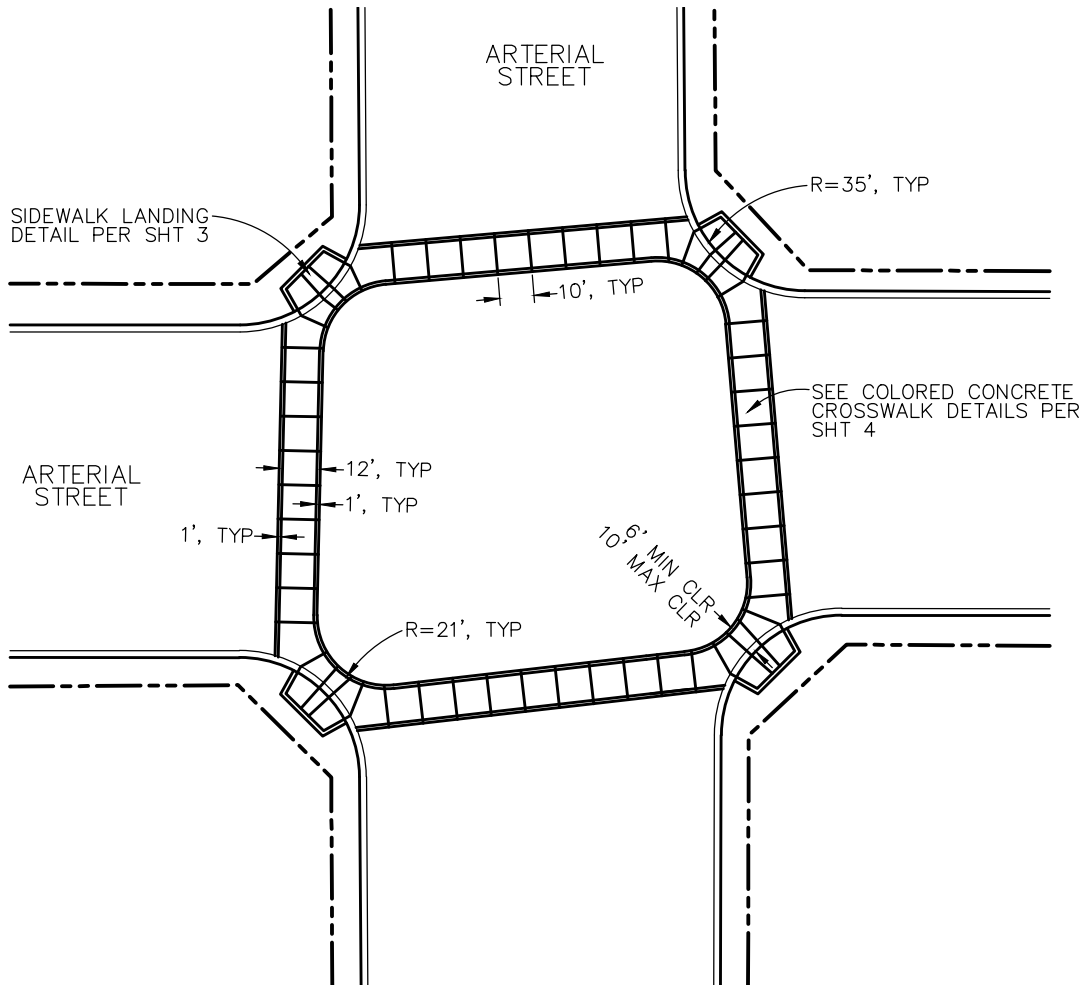
REVISIONS	BY	DATE

STD. PLAN NUMBER

B-136

SHEET 1 OF 4

ENHANCED ARTERIAL STREET INTERSECTION LAYOUT



NOTES:

1. LAYOUT OF CROSSWALK SHALL BE APPROVED BY CITY TRAFFIC ENGINEER.
2. SEE SHT 3 FOR DECORATIVE SIDEWALK LANDING.
3. SEE SHT 4 FOR DECORATIVE CROSSWALK DETAILS.



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CIVIC CENTER STREET IMPROVEMENT CRITERIA

Approved:  Date: 12-8-15
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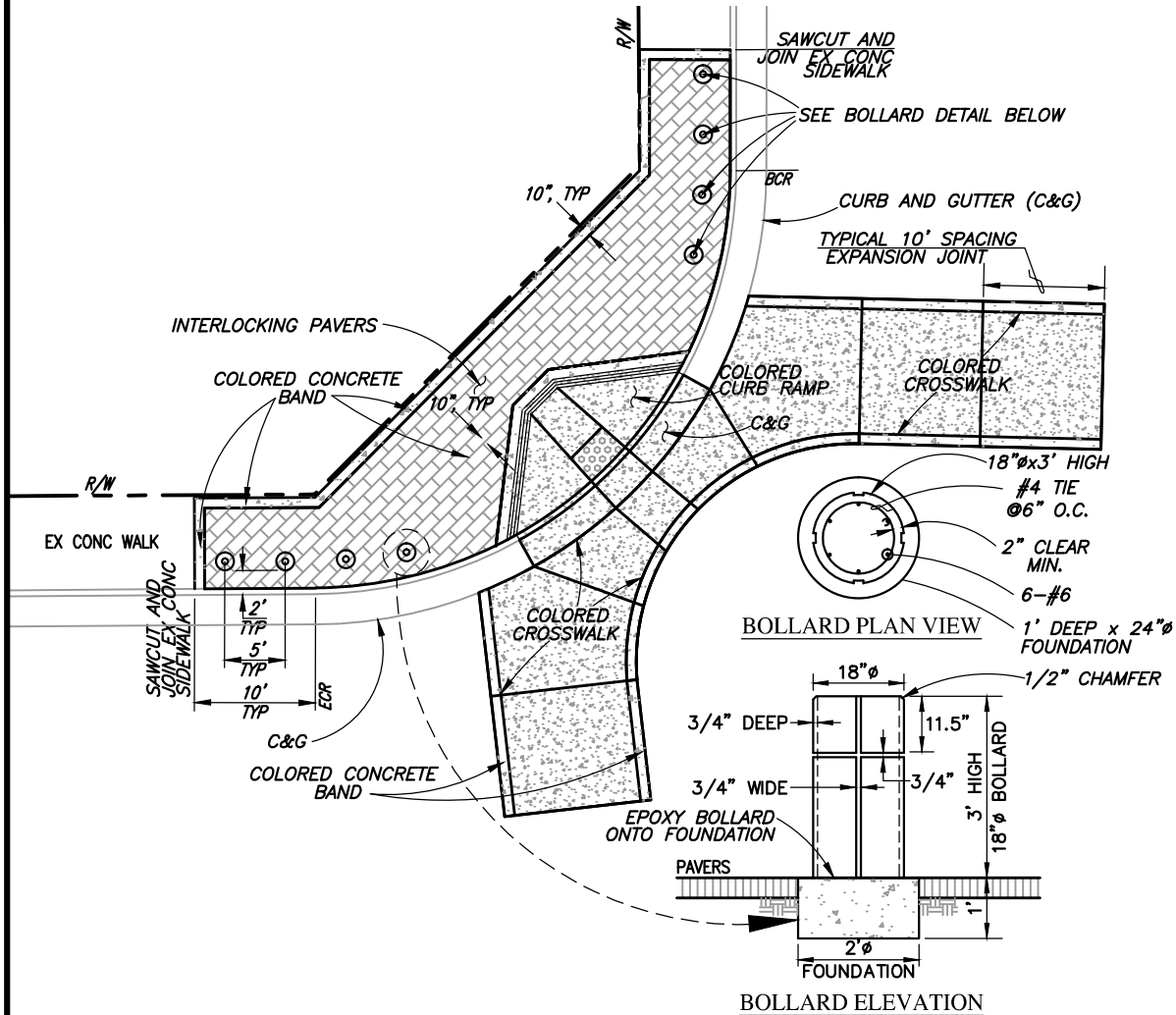
REVISIONS	BY	DATE

STD. PLAN NUMBER

B-136

SHEET 2 OF 4

TYPICAL DECORATIVE SIDEWALK LANDING



NOTES:

BOLLARDS SHALL BE 3' HIGH x 18"Ø COLORED CONCRETE AND EPOXIED ONTO A 2'Ø x 1' DEEP RIVERSIDE BUFF COLORED CONCRETE FOUNDATION. (SIZE, COLOR, PATTERN, ETC. SHALL MATCH EXISTING BOLLARD LOCATED ON ACACIA PARKWAY AND EUCLID ST).

SEE CALTRANS STD PLAN A88A FOR CURB RAMP DETAILS. RAMPS SHALL BE RIVERSIDE BUFF C-28 INTEGRAL COLOR (SCOFIELD COLORS).

COLORED CROSSWALK SHALL BE PER DETAILS SHOWN ON SHEET 4.

COLORED CONCRETE BAND SHALL BE PER DETAILS SHOWN ON SHEET 4.

INTERLOCKING PAVERS SHALL MATCH PATTERN, COLOR & SIZE AS EXISTING PAVERS LOCATED ON ACACIA PARKWAY AND EUCLID ST.

SEE STANDARD PLAN B-113 FOR CURB & GUTTER DETAILS.



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CIVIC CENTER STREET IMPROVEMENT CRITERIA

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City Engineer R.C.E. 52125 Exp. 12-31-16

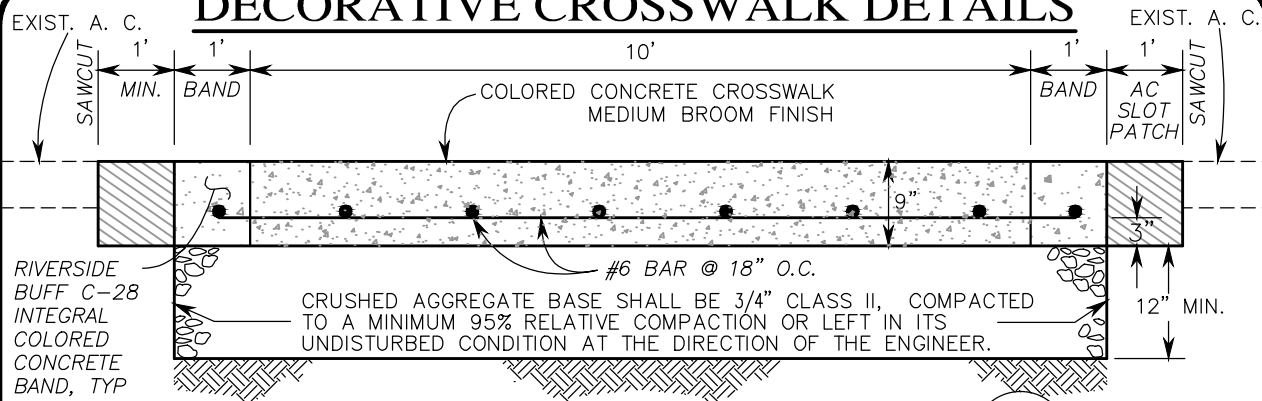
REVISIONS	BY	DATE

STD. PLAN NUMBER

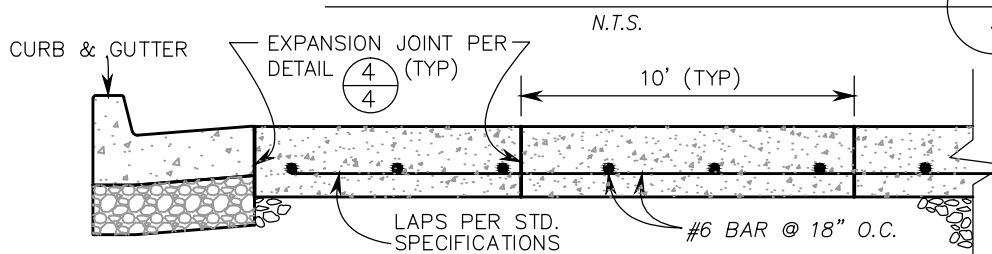
B-136

SHEET 3 OF 4

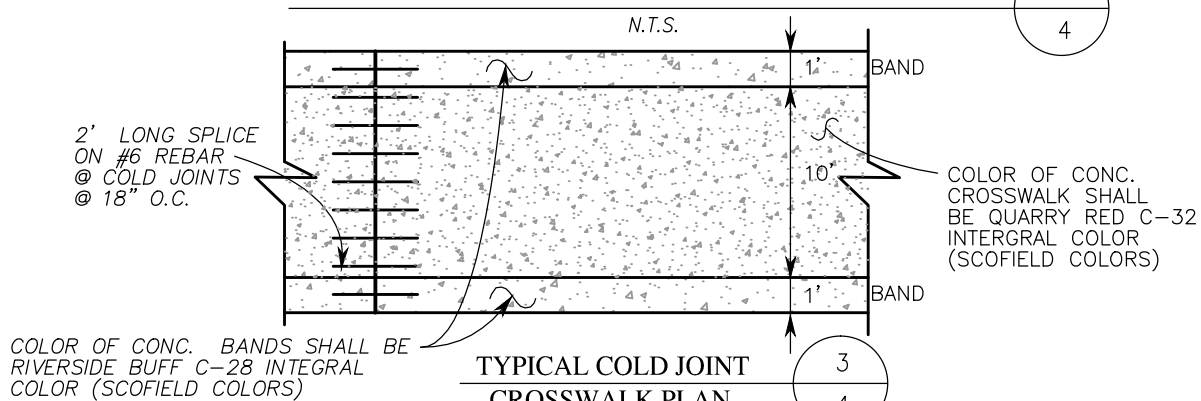
DECORATIVE CROSSWALK DETAILS



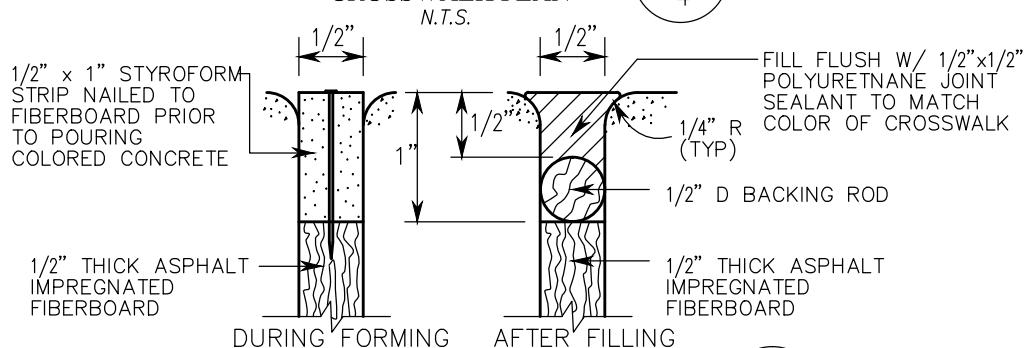
TYPICAL CROSSWALK SECTION



TYPICAL CROSSWALK EXPANSION JOINT LOCATION



TYPICAL COLD JOINT CROSSWALK PLAN



EXPANSION JOINT @ 10' O.C. DETAIL



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California

CIVIC CENTER STREET IMPROVEMENT CRITERIA

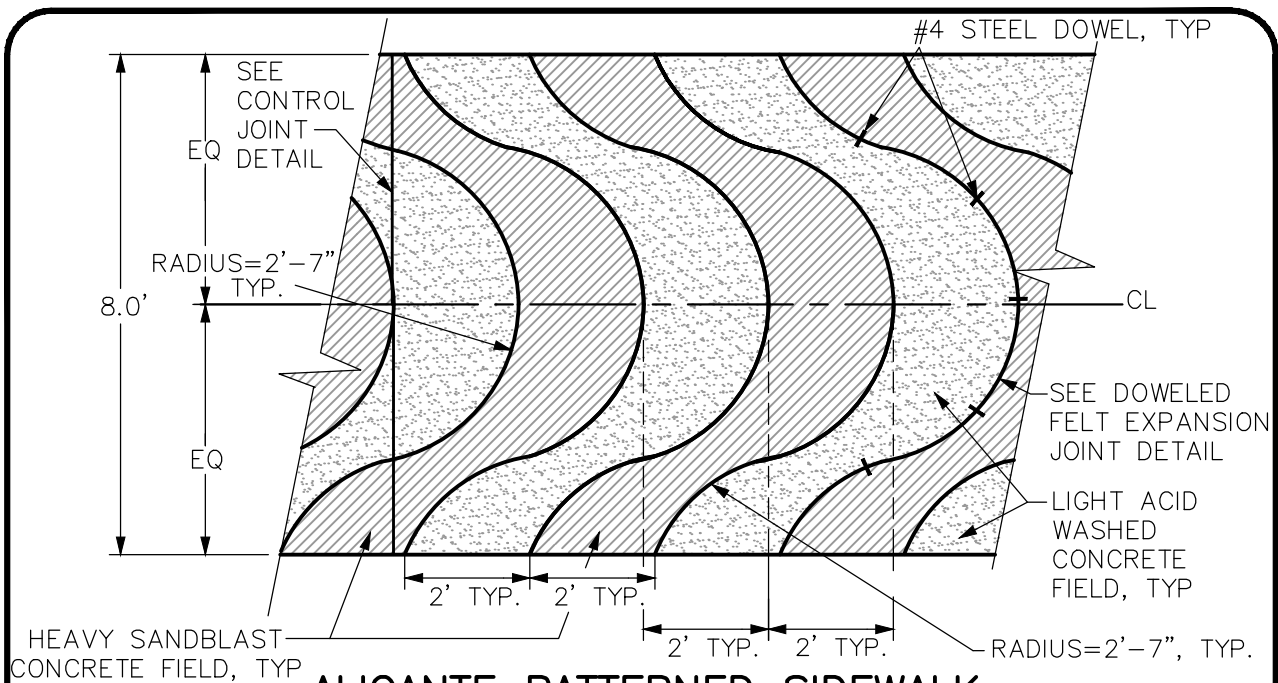
Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

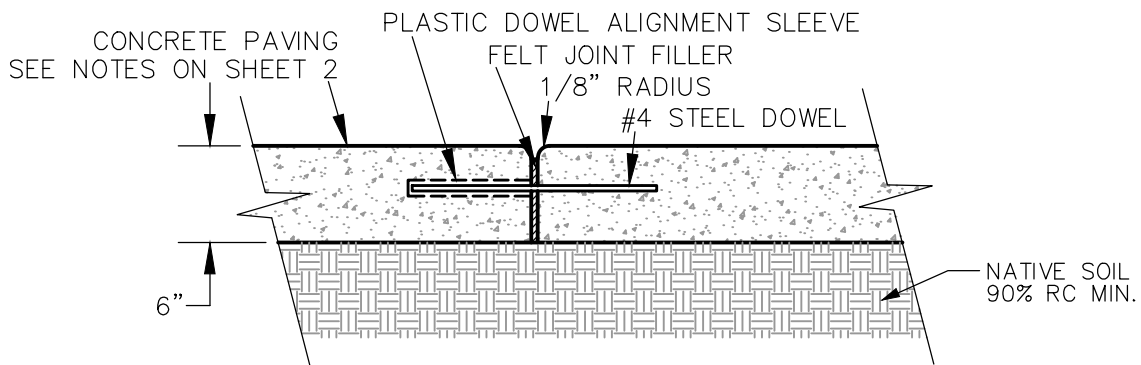
STD. PLAN NUMBER

B-136

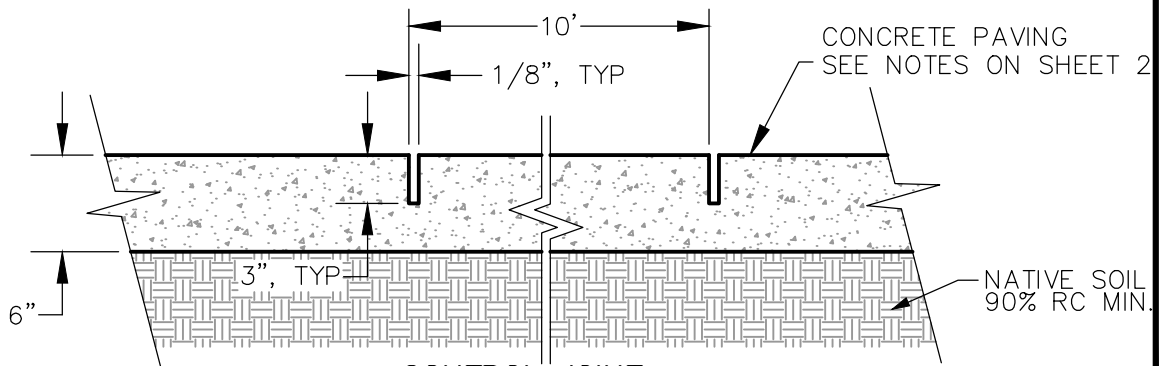
SHEET 4 OF 4



ALICANTE PATTERNED SIDEWALK



DOWELED FELT EXPANSION JOINT



CONTROL JOINT



City of
Garden Grove
California

HARBOR BOULEVARD DECORATIVE SIDEWALK IMPROVEMENTS

Approved

Date 12-8-15

REVISIONS

BY

DATE

STD. PLAN NUMBER

B-137

SHEET 1 OF 2

City Engineer

R.C.E. 52125

Exp.12-31-16

ALICANTE PATTERNED SIDEWALK NOTES:

1. A MOCK UP PANEL 8' x 10' SHALL BE COMPLETED BY CONTRACTOR AND APPROVED BY THE ENGINEER PRIOR TO COMMENCEMENT OF WORK.
2. CONCRETE SHALL HAVE DARK GREY INTEGRAL COLOR ACHIEVED BY USING 5LBS OF DAVIS 860 PIGMENT PER SACK OF CEMENT. PIGMENT 8084 IS UNACCEPTABLE.
3. THE 3/8" DIAMETER INYO WHITE AGGREGATE SHALL BE BROADCAST ONTO THE SURFACE OF THE CONCRETE AT A RATE OF 3 TO 4 LBS PER SF AND SHALL BE FLOATED INTO THE SURFACE OF THE CONCRETE AT THE APPROPRIATE TIME. IT CANNOT BE BROADCAST TOO EARLY OR TOO LATE IN THE FINISHING PROCESS.
4. THE CONCRETE SHALL BE FINISHED TO YIELD A SMOOTH (STEEL TROWEL) FINISH SURFACE.
5. THE CONCRETE SHALL BE LIGHT ACID WASHED AFTER AN INITIAL CURING PERIOD OF 2 TO 5 DAYS TO EXPOSE THE AGGREGATE IN THE CONCRETE. THE INYO WHITE AGGREGATE SHALL NOT BE EXPOSED DURING THIS PROCESS.
6. DOWELED FELT EXPANSION JOINT SHALL BE PLACED AT 30' O.C. MAX SPACING AND SHALL BE ALIGNED WITH ALICANTE TEMPLATE EDGE.
7. #4 STEEL DOWEL SHALL BE 18" LONG AT 24" O.C. AND CENTERED ON JOINT.
8. FELT JOINT FILLER SHALL BE PER CITY OF GARDEN GROVE STANDARD SIDEWALK DETAIL B-106.
9. SAWCUT CONTROL JOINTS SHALL BE PLACED IN THE CONCRETE AT 10' O.C., PERPENDICULAR TO THE STREET CENTERLINE, TO A MINIMUM OF 3" DEPTH AS SHOWN IN THE DETAIL ON SHEET 1.
10. TEMPLATE SANDBLAST MATS ARE APPLIED TO THE CONCRETE AFTER A MINIMUM OF ONE WEEK OF CURING. THE CONCRETE SHALL BE SANDBLASTED TO EXPOSE THE INYO WHITE AGGREGATE AND CREATE THE ALICANTE (WAVE) PATTERN.
11. THE CONCRETE SHALL BE CLEANED AFTER SANDBLASTING, AND THEN SEALED WITH PENETRATING SEALER SINAK HLQ-125, OR APPROVED EQUAL.
12. EXISTING "ALICANTE" SIDEWALK CAN BE FOUND ON EITHER SIDE OF HARBOR BOULEVARD BETWEEN LAMPSON AVENUE AND TWINTREE LANE.



City of
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HARBOR BOULEVARD DECORATIVE SIDEWALK IMPROVEMENTS

Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS

BY

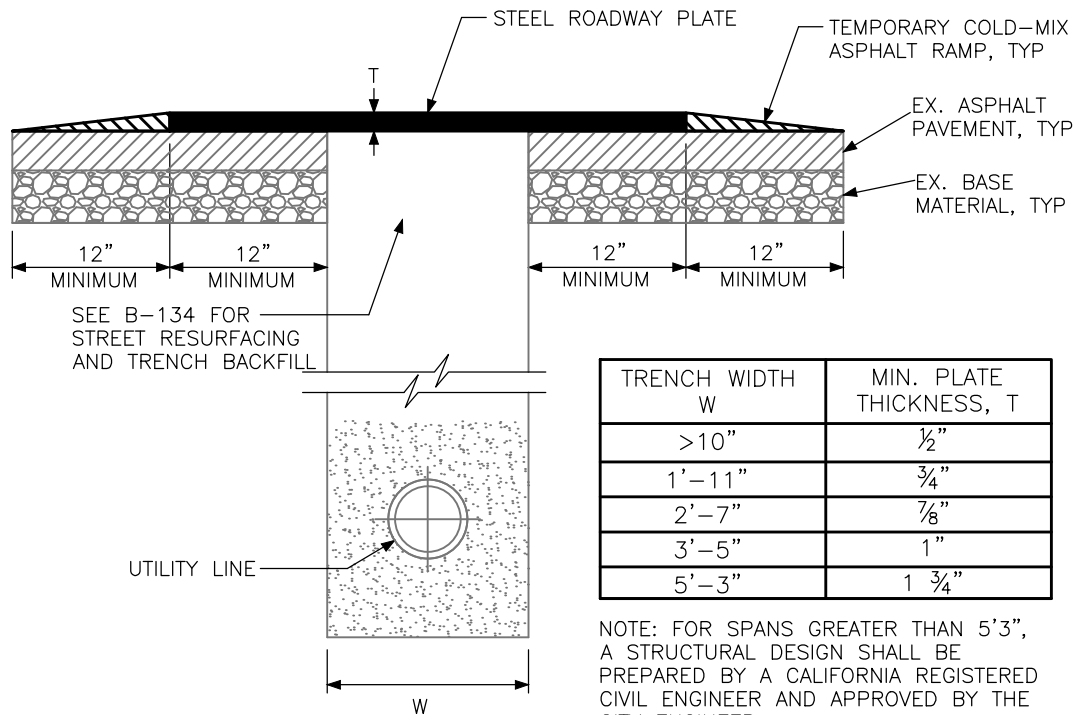
DATE

STD. PLAN NUMBER

B-137

SHEET 2 OF 2

TEMPORARY STEEL ROADWAY PLATE DETAIL



INSTALLATION NOTE:

APPROACH PLATE(S) AND ENDING PLATE (IF LONGITUDINAL PLACEMENT) SHALL BE ATTACHED TO THE ROADWAY BY A MINIMUM OF 2 DOWELS PRE-DRILLED INTO THE CORNERS OF THE PLATE AND DRILLED 2" INTO THE PAVEMENT. SUBSEQUENT PLATES ARE TO BE BUTTED AND TACK WELDED TO EACH OTHER. FINE GRADED TEMPORARY COLD-MIX ASPHALT SHALL BE COMPACTED TO FORM RAMP WITH A MINIMUM 12" TAPER TO COVER ALL EDGES OF THE STEEL PLATES. WHEN STEEL PLATES ARE REMOVED, THE DOWEL HOLES IN THE PAVEMENT SHALL BE BACKFILLED WITH EITHER GRADED FINES OF ASPHALT CONCRETE MIX, CONCRETE SLURRY, EPOXY, OR AN EQUIVALENT THAT IS SATISFACTORY TO THE ENGINEER.

NOTES:

1. THE CONTRACTOR IS RESPONSIBLE FOR MAINTENANCE OF THE STEEL PLATES, SHORING, TEMPORARY ASPHALT RAMP, AND ENSURING THAT THEY MEET THE MINIMUM SPECIFICATIONS. THESE STEEL PLATES SHALL REMAIN IN PLACE A MAXIMUM OF FIVE (5) DAYS; AFTER WHICH TIME THE PLATES SHALL BE REMOVED AND THE TRENCH BACKFILLED UNLESS OTHERWISE APPROVED IN WRITING BY THE ENGINEER.
2. ALL STEEL PLATES WITHIN THE RIGHT OF WAY WHETHER USED IN OR OUT OF THE TRAVELED WAY SHALL BE WITHOUT DEFORMATION.
3. STEEL PLATES USED IN THE TRAVELED PORTION OF THE HIGHWAY SHALL HAVE A SURFACE THAT WAS MANUFACTURED WITH A NOMINAL COEFFICIENT OF FRICTION OF 0.35 AS DETERMINED BY CALIFORNIA TEST METHOD 342. IF A DIFFERENT TEST METHOD IS USED, THE CONTRACTOR MAY UTILIZE STANDARD TEST PLATES WITH KNOWN COEFFICIENTS OF FRICTION AVAILABLE FROM EACH CALTRANS DISTRICT MATERIALS ENGINEER TO CORRELATE SKID RESISTANCE RESULTS TO CALIFORNIA TEST METHOD 342.
4. FRICTION REQUIREMENTS ARE NOT REQUIRED FOR STEEL PLATES USED IN PARKING STRIPS, ON SHOULDERS NOT USED FOR TURNING MOVEMENTS, OR ON CONNECTING DRIVEWAYS, ETC. NOT OPEN TO THE PUBLIC.



City of
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California

UTILITY TRENCH STEEL PLATE REQUIREMENTS

Approved: Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

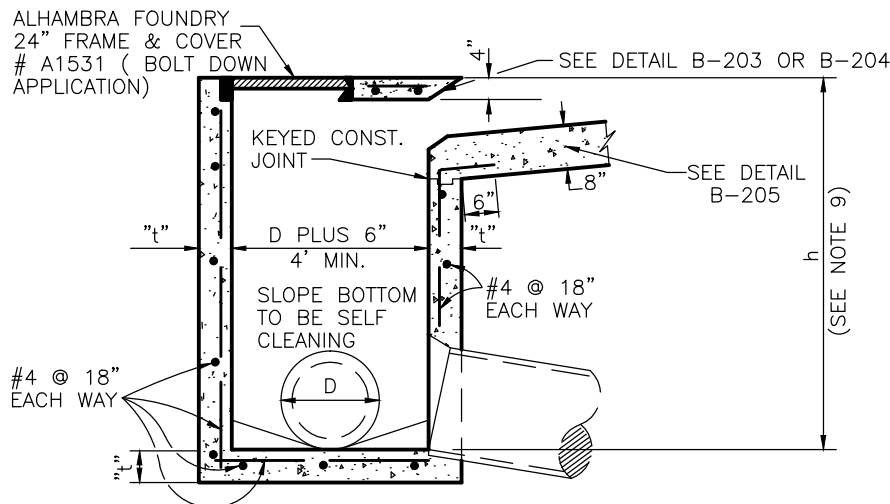
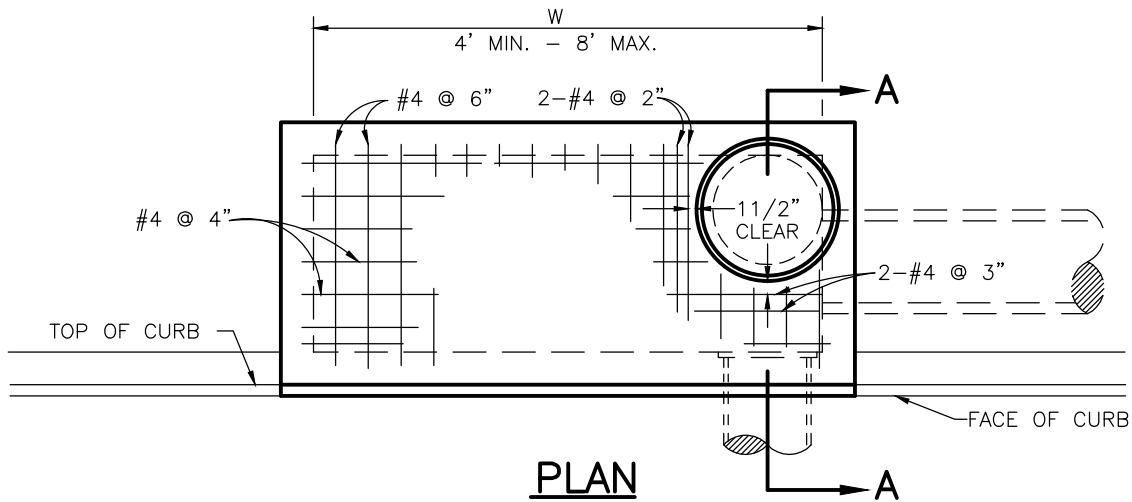
STD. PLAN NUMBER

B-138



GARDEN GROVE

SERIES B-200
STORM DRAIN



NOTES:

1. HORIZONTAL PROTECTION BAR SHALL BE USED WHEN INLET OPENING IS MORE THAN 8 INCHES. SEE STD. PLAN B-203 OR B-204 FOR DETAILS.
2. STEPS REQUIRED WHEN "h" IS GREATER THAN 3'-0". SEE STD. B-203.
3. OUTLET MAY BE MADE IN ANY DIRECTION.
4. PIPE INLETS AND OUTLETS SHALL BE AT BOTTOM OF BASIN UNLESS OTHERWISE SPECIFIED.
5. ALL EXPOSED CONCRETE SURFACES SHALL CONFORM IN GRADE, COLOR AND FINISH TO ALL ADJOINING CURB AND WALK.
6. ALL WALL AND BASE REINFORCING STEEL SHALL BE 1 1/2 INCHES CLEAR FROM INSIDE OR OUTSIDE FACE OF STRUCTURE.
7. WHEN "W" EXCEEDS 8 FEET, USE STD. PLAN B-202.
8. ALL CONCRETE SHALL BE CLASS 560-C-3250.
9. "h" SHALL BE 4' MIN. FOR MAINTENANCE PURPOSES IF POSSIBLE.
10. SLOPE BOTTOM OF CATCH BASIN TOWARDS OUTLET A MIN. OF 1" PER FOOT FROM ALL SIDES.



City of
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California

CATCH BASIN – TYPE OS (CURB OPENING – SMALL)

Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS

BY

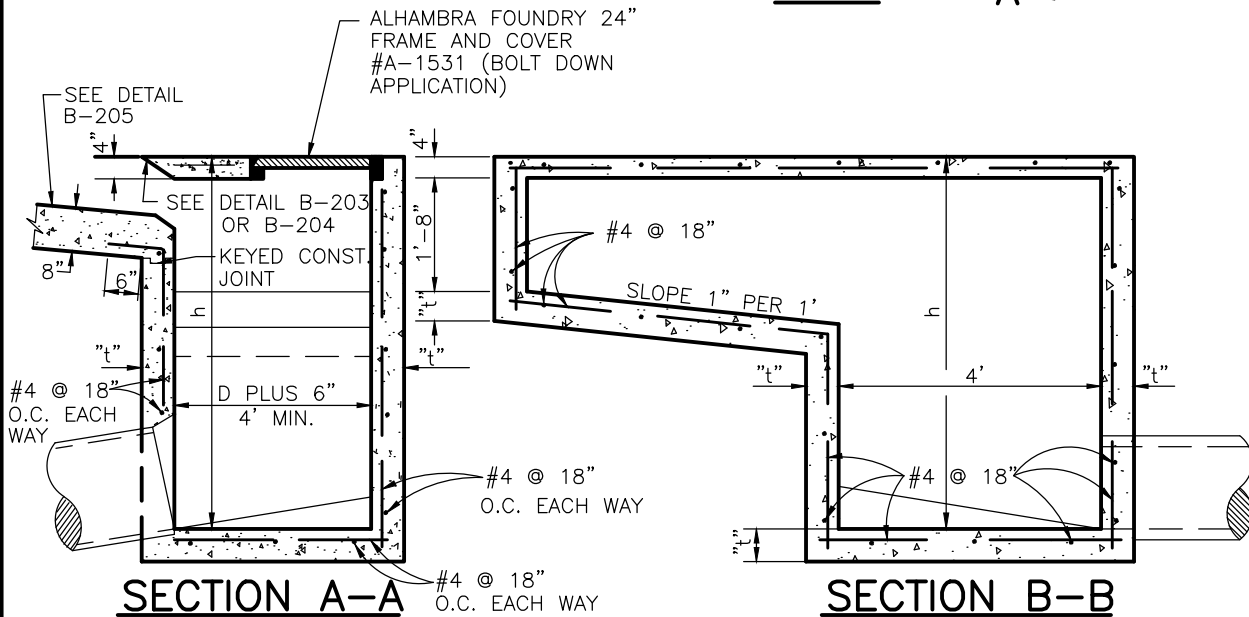
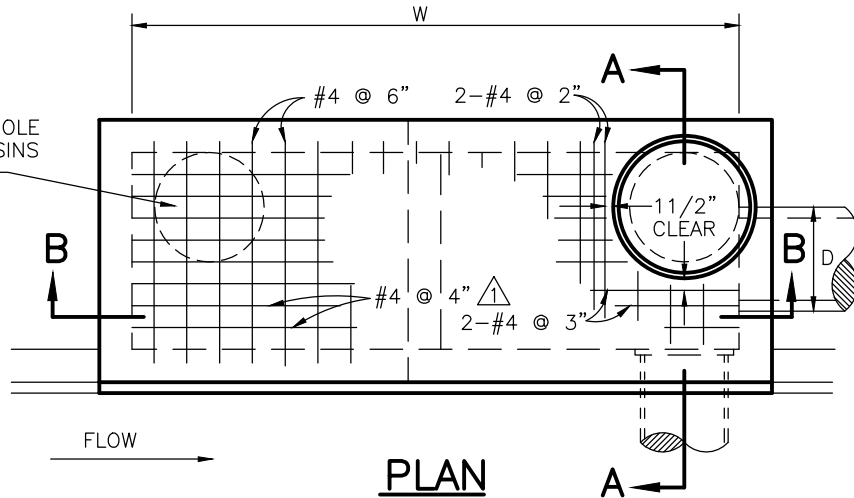
DATE

STD. PLAN NUMBER

B-201

h	"t"
UP TO 8'-0"	6"
UP TO 16'-0"	8"

INSTALL 2ND MANHOLE
ON ALL CATCH BASINS
14' AND LONGER



NOTES:

1. HORIZONTAL PROTECTION BAR SHALL BE USED WHEN INLET OPENING IS MORE THAN 8 INCHES. SEE STD. PLAN B-203 OR B-204 FOR DETAILS.
2. STEPS REQUIRED WHEN "h" IS GREATER THAN 3'-0". SEE STD. PLAN B-203.
3. OUTLET MAY BE MADE IN ANY DIRECTION.
4. PIPE INLETS AND OUTLETS SHALL BE AT BOTTOM OF BASIN UNLESS OTHERWISE SPECIFIED.
5. ALL EXPOSED CONCRETE SURFACES SHALL CONFORM IN GRADE, COLOR AND FINISH TO ALL ADJOINING CURB AND WALK.
6. ALL WALL AND BASE REINFORCING STEEL SHALL BE 1 1/2 INCHES CLEAR FROM INSIDE OR OUTSIDE FACE OF STRUCTURE.
7. WHEN "W" IS LESS THAN 8 FEET, USE STD. PLAN B-201.
9. ALL CONCRETE SHALL BE CLASS 560-C-3250.
10. SLOPE BOTTOM OF CATCH BASIN TOWARDS OUTLET A MIN. OF 1" PER FOOT FROM ALL SIDES.



City of
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California

CATCH BASIN – TYPE 01 (CURB OPENING – LARGE)

Approved

Date 12-8-15

REVISIONS

BY

DATE

STD. PLAN NUMBER

B-202

City Engineer

R.C.E. 52125 Exp. 12-31-16

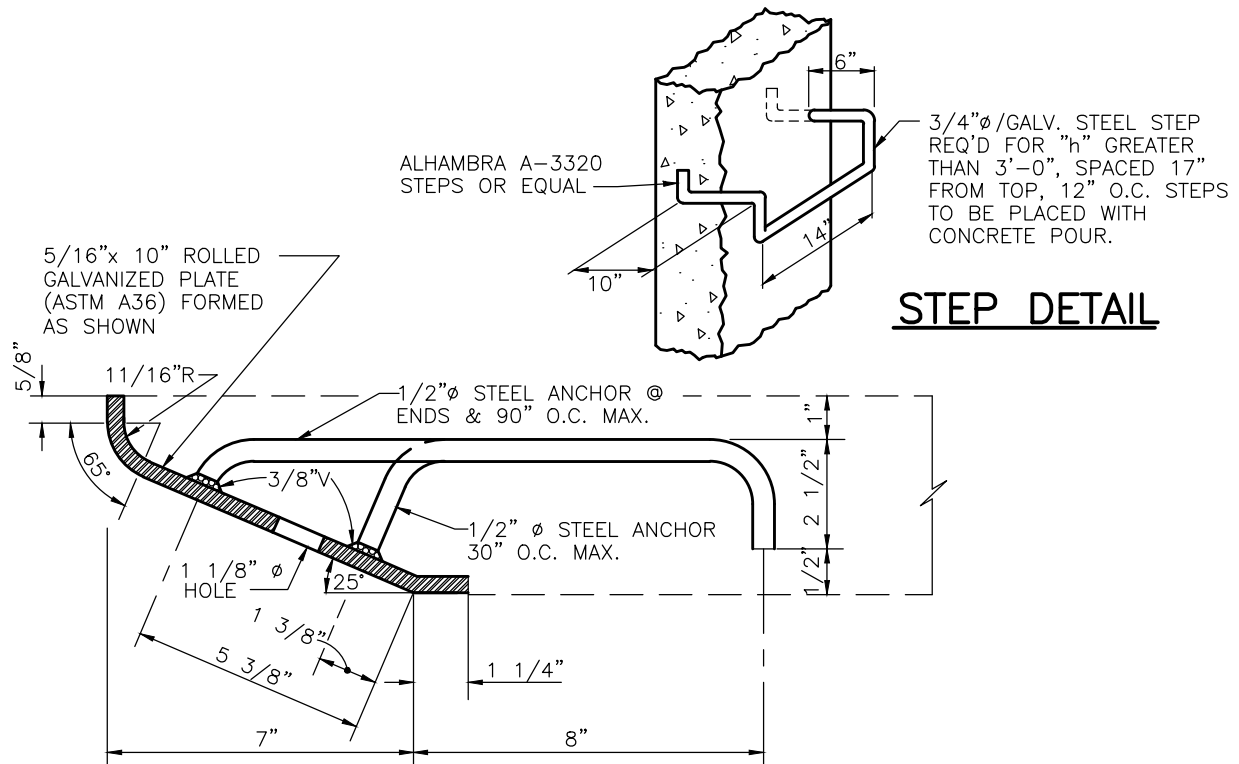
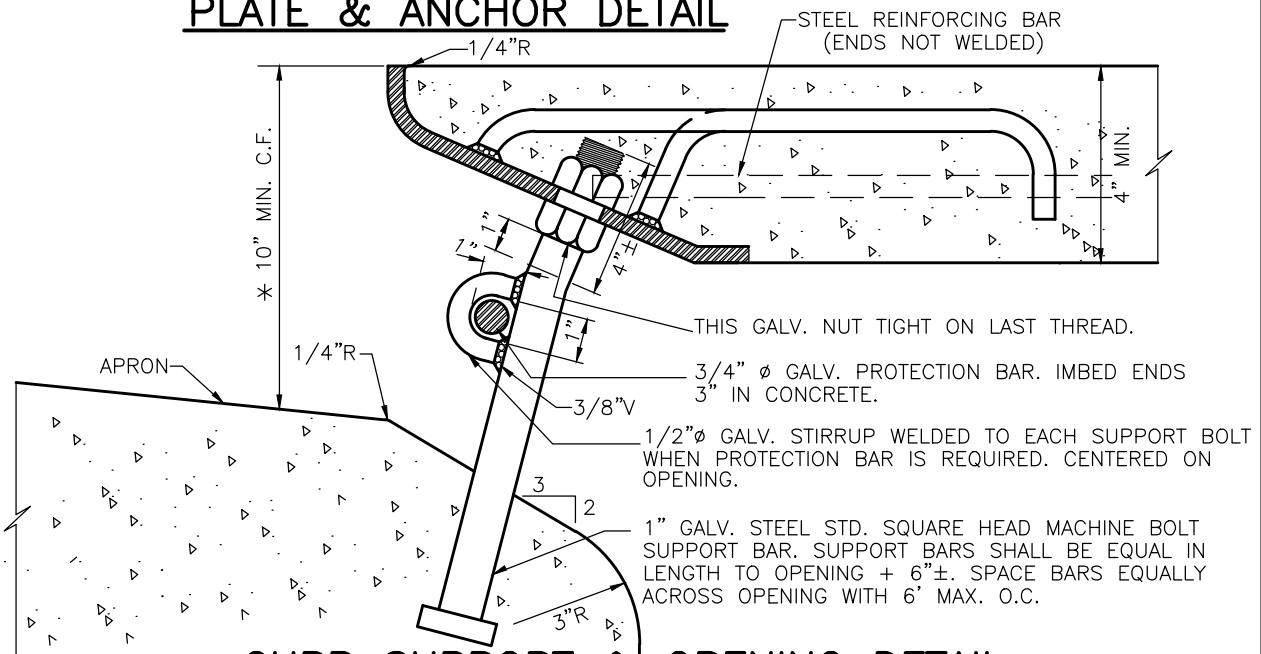


PLATE & ANCHOR DETAIL



**CURB SUPPORT & OPENING DETAIL
FOR TANGENTS AND CURVES GREATER THAN 100' RADIUS**

* - USE 8" C.F. FOR CURB LANES 14' OR LESS.



City of
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MISCELLANEOUS CATCH BASIN DETAILS

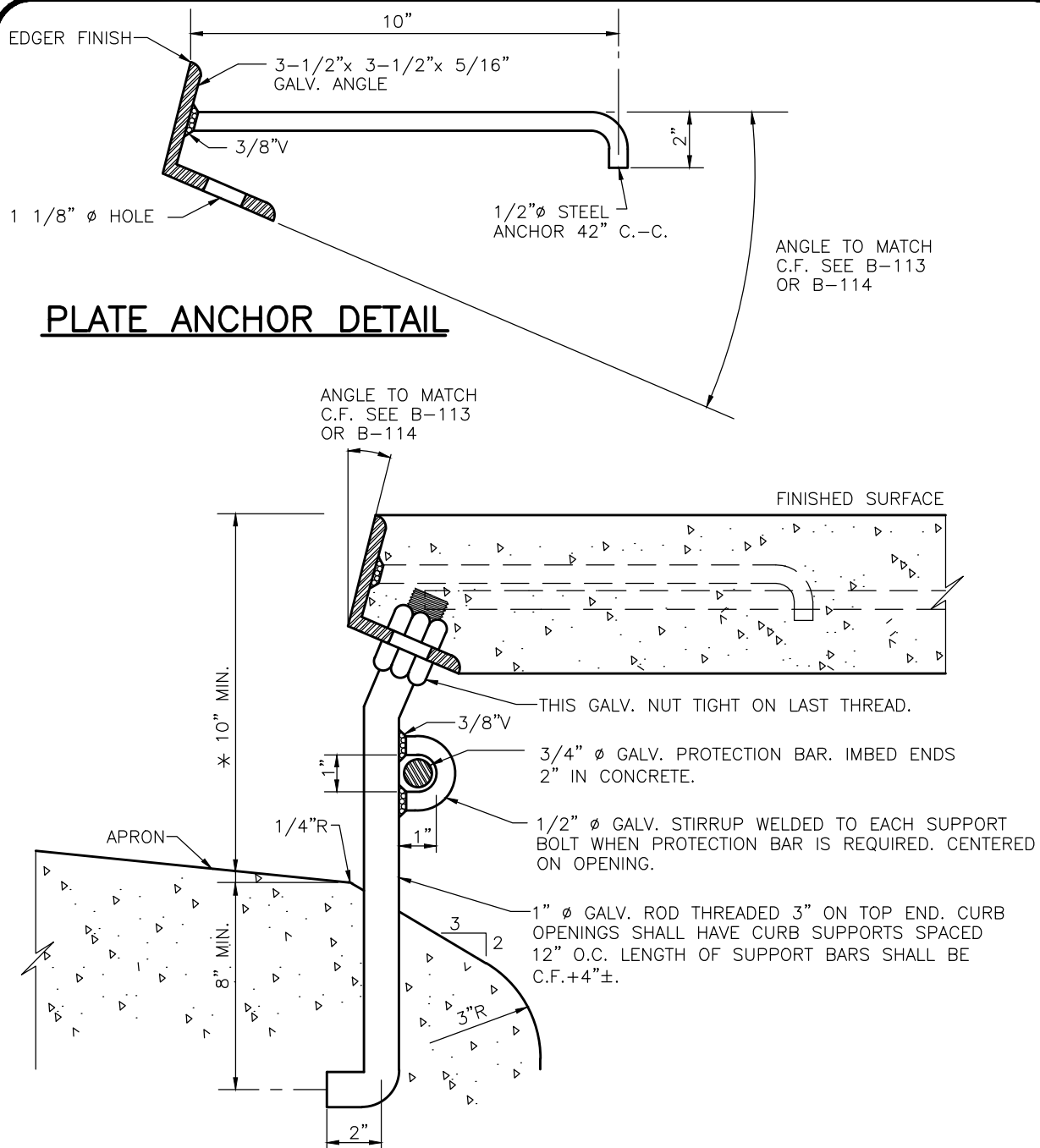
Approved  Date 12-8-15

City Engineer R.C.E. 52125 Exp.12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-203



**CURB SUPPORT AND OPENING DETAIL REQUIRED FOR
INDUSTRIAL AREAS, IN ADVANCE OF CURB RETURNS, AND
FOR CURVES OF RADIUS 100' OR LESS**

* - USE 8" C.F. FOR CURB LANES 14' OR LESS.



City of
Garden Grove
California

**MISCELLANEOUS
CATCH BASIN DETAILS**

Approved

Date 12-8-15

REVISIONS

BY

DATE

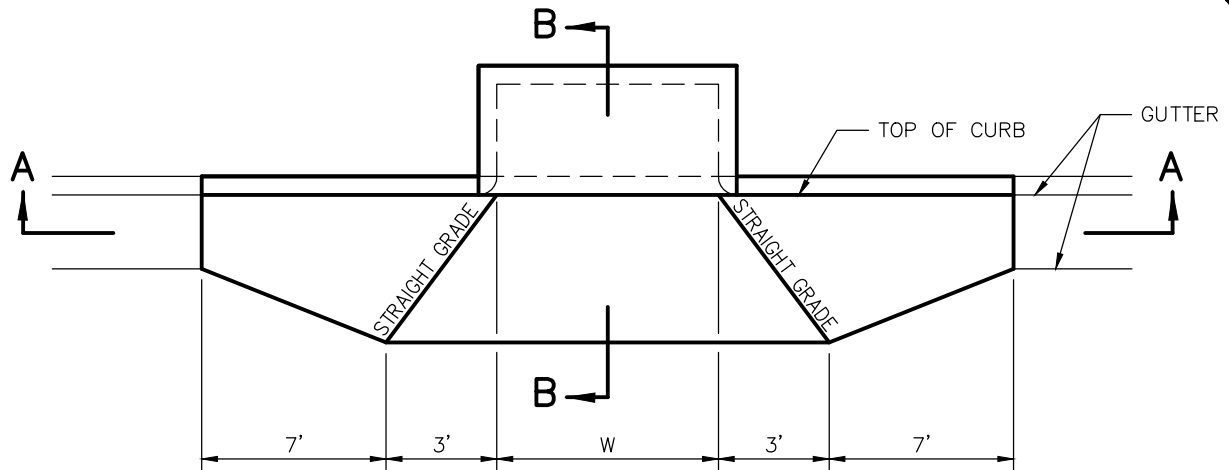
STD. PLAN NUMBER

City Engineer

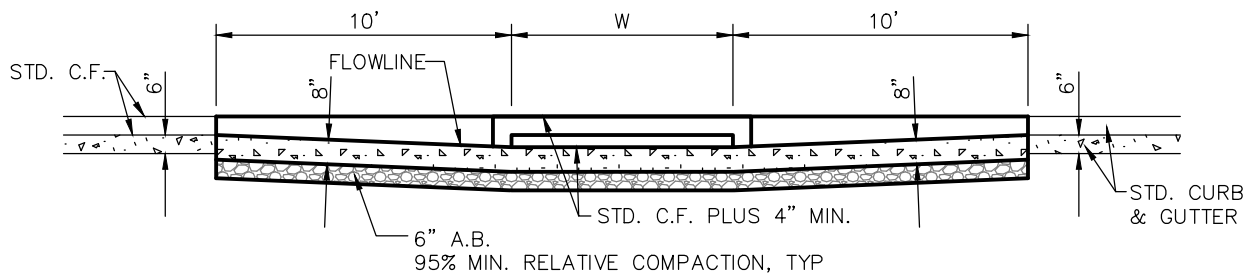
R.C.E. 52125

Exp. 12-31-16

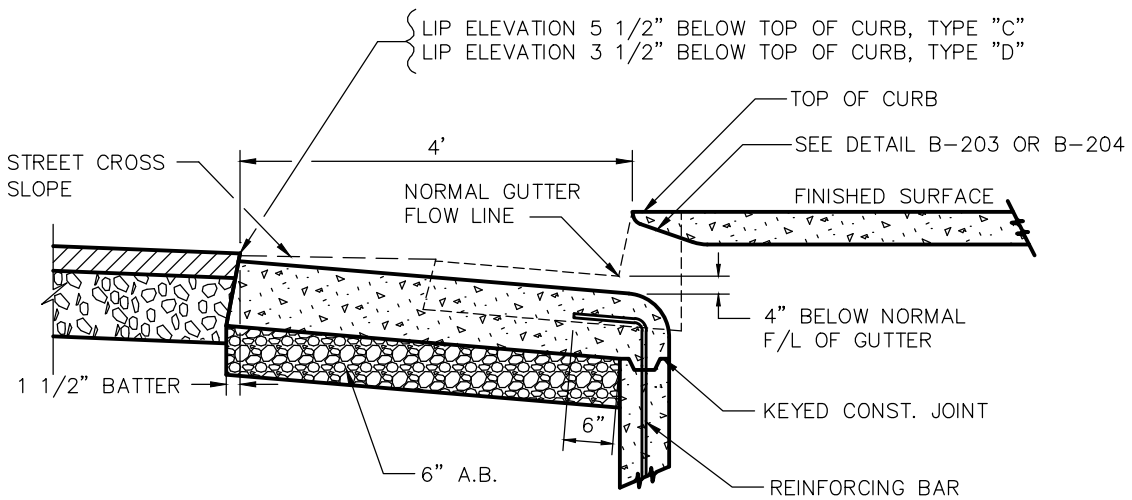
B-204



PLAN



SECTION A-A




SECTION B-B



City of
Garden Grove
California

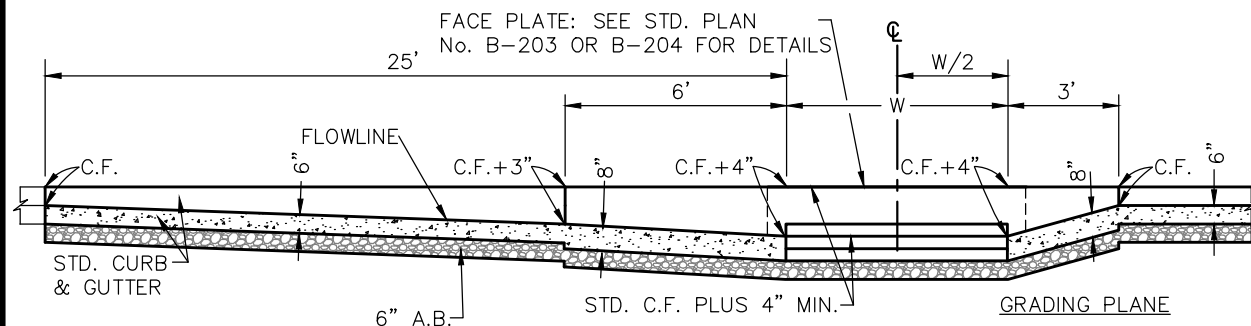
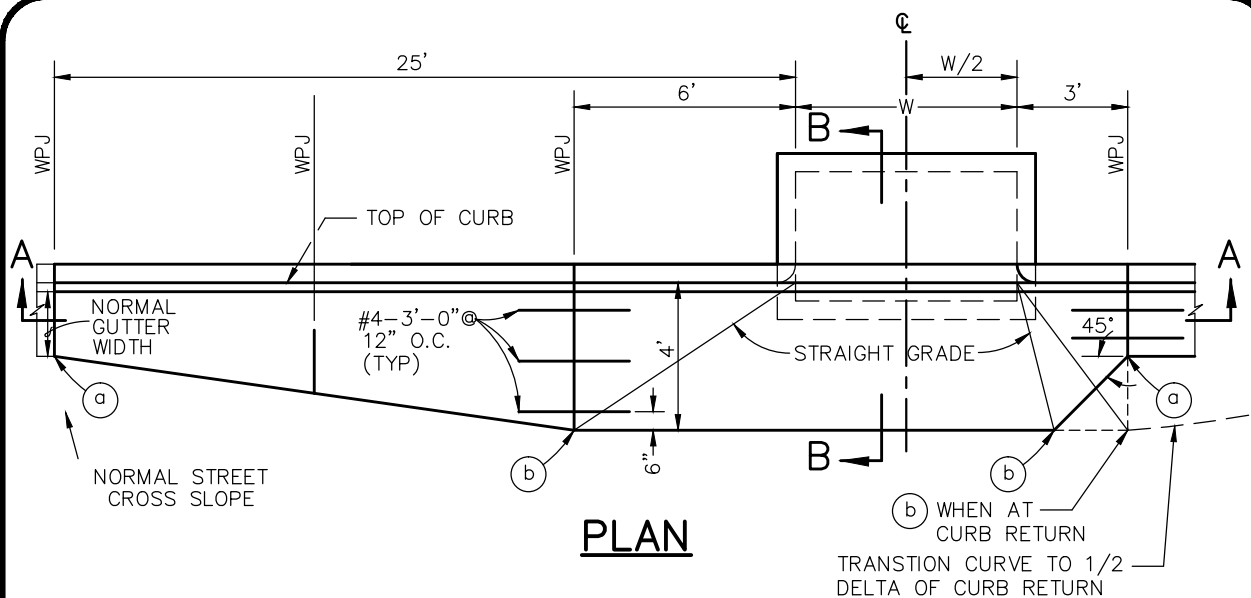
LOCAL DEPRESSION (SUMP CONDITION)

Approved  Date 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

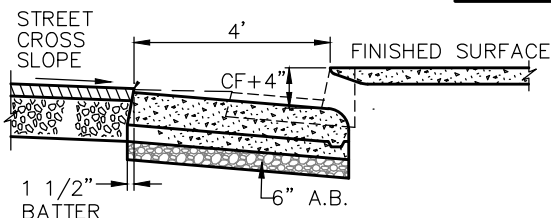
REVISIONS	BY	DATE

STD. PLAN NUMBER

B-205A



SECTION A-A



SECTION B-B

POINT	6" TO 10" CF TRANS DISTANCE BELOW TC	8" TO 12" CF TRANS DISTANCE BELOW TC
a	0.39'	0.51'
b	0.35'	0.48'

NOTES :

1. LOCAL DEPRESSION SHALL NOT BE CONSTRUCTED UNTIL CONNECTING CURB AND GUTTER HAS BEEN COMPLETED OR SHALL BE CONSTRUCTED MONOLITHICALLY WITH CONNECTING CURB AND GUTTER, UNLESS OTHERWISE APPROVED BY THE ENGINEER.
2. LOCAL DEPRESSION SHALL CONFORM TO SAME SHAPE WHETHER GRATE INLET OR CURB OPENING, OR BOTH, ARE USED.
3. LENGTH OF OPENING "W" SHALL BE SPECIFIED ON PLANS.
4. SEE STANDARD PLANS B-203 OR B-204, FOR CURB OPENING DETAIL.
5. 95% MIN. RELATIVE COMPACTION FOR UPPER 6" OF SUBGRADE.



City of
Garden Grove
California

LOCAL DEPRESSION (FLOW BY CONDITION)

Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

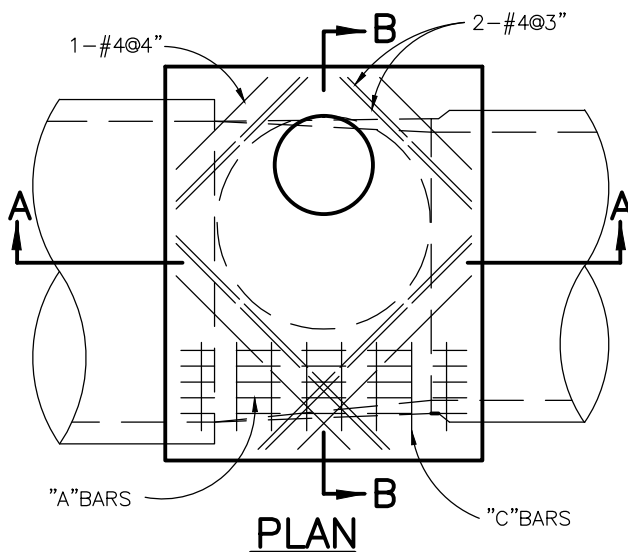
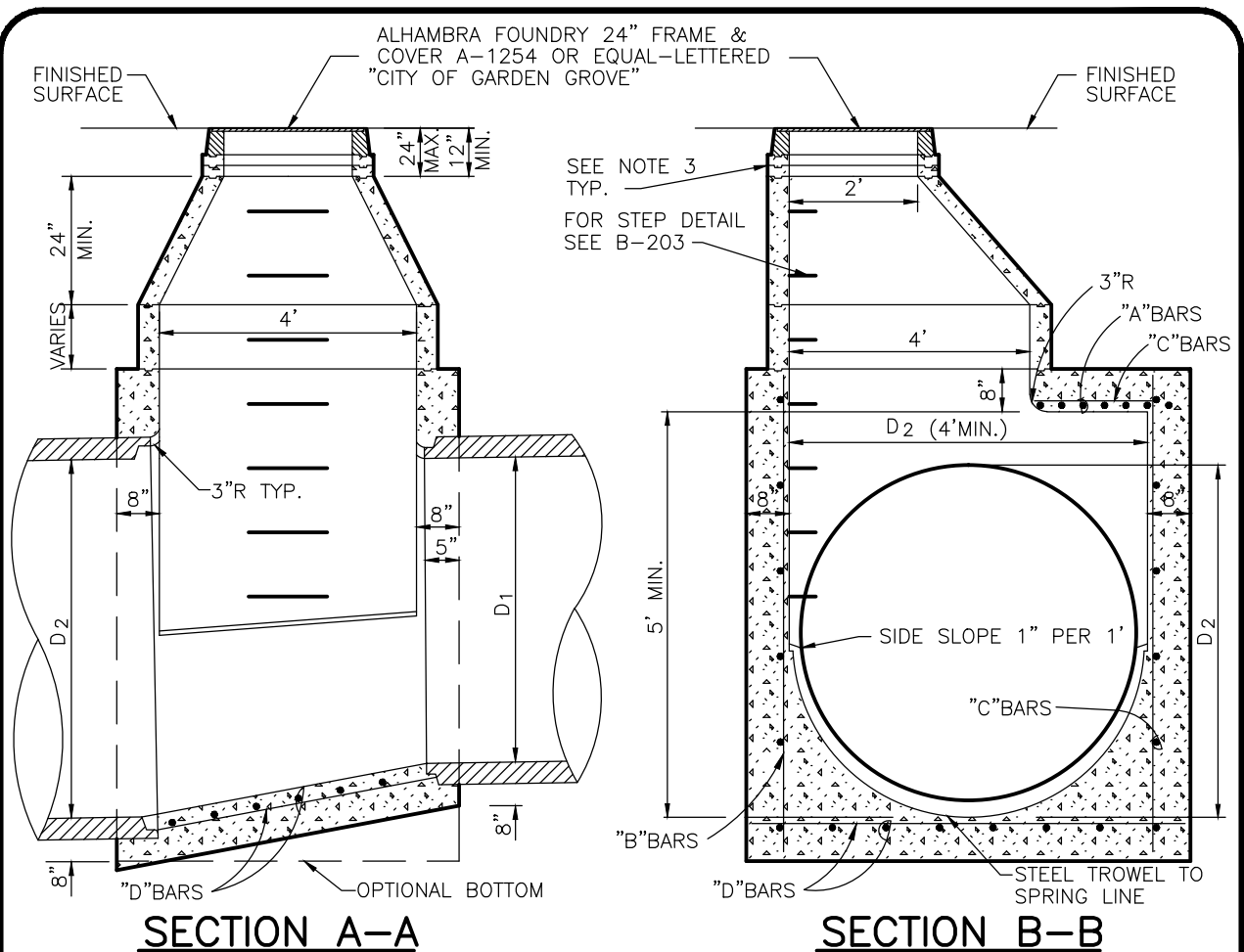
REVISIONS

BY

DATE

STD. PLAN NUMBER

B-205B



REINFORCING SCHEDULE		
BARS	D ₂ UP TO 60"	D ₂ 63" UP TO 84"
"A" BARS	#5@4"	#5@4"
"B" BARS	#4@7"	#5@6"
"C" BARS	#4@18"	#4@18"
"D" BARS	#5@8"	#6@6"

NOTES:

1. ROUND EDGES OF OUTLET TO 3" RADIUS
2. ALL REINFORCING STEEL IN BASE STRUCTURE SHALL BE 1-1/2" CLEAR FROM INSIDE FACE OF CONCRETE.
3. CONCRETE RINGS FOR ACCESS SHAFT SHALL BE CEMENTED IN PLACE WITH 1:2 MIX CEMENT MORTAR.
4. CONCRETE SHALL BE CLASS 560-C-3250.



City of
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California

STORM DRAIN MANHOLE

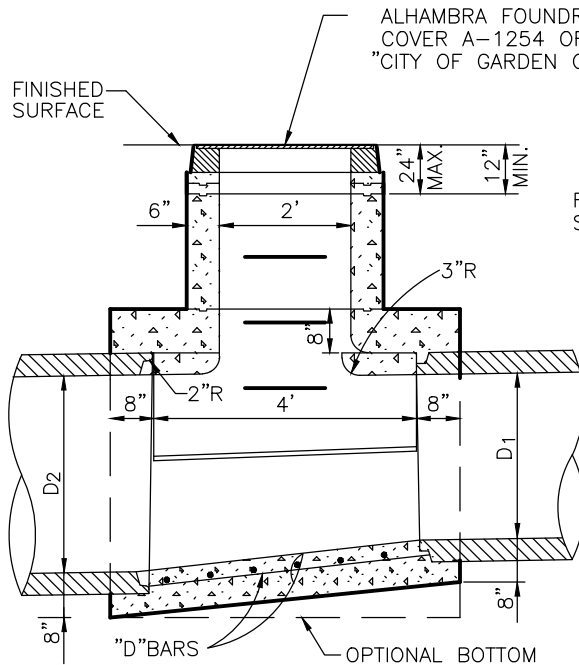
Approved:  Date 12-8-15

City Engineer R.C.E. 52125 Exp. 12-31-16

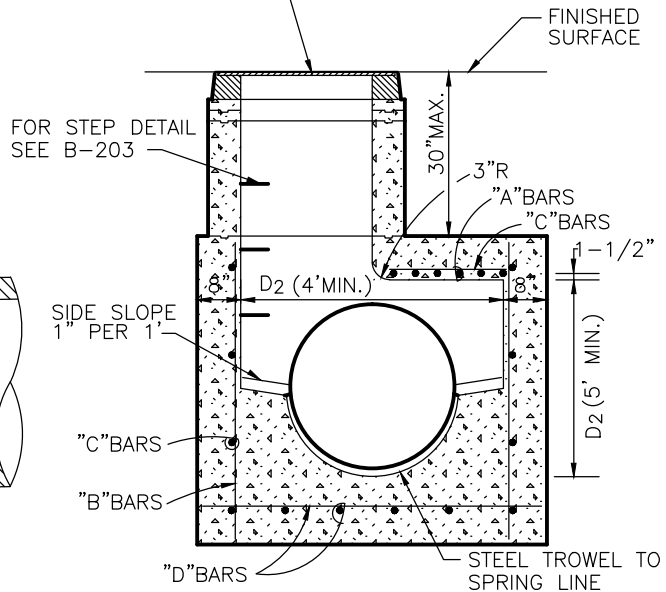
REVISIONS	BY	DATE

STD. PLAN NUMBER

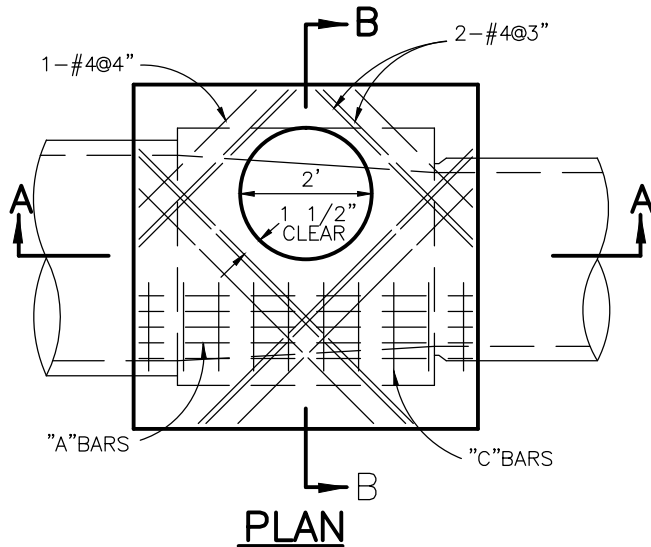
B-206



SECTION A-A



SECTION B-B



REINFORCING SCHEDULE		
BARS	D ₂ UP TO 60"	D ₂ 63" UP TO 84"
"A" BARS	#5@4"	#5@4"
"B" BARS	#4@7"	#5@6"
"C" BARS	#4@18"	#4@18"
"D" BARS	#5@8"	#6@6"

NOTES:

1. ROUND EDGES OF OUTLET TO 3" RADIUS
2. ALL REINFORCING STEEL IN BASE STRUCTURE SHALL BE 1-1/2" CLEAR FROM INSIDE FACE OF CONCRETE.
3. CONCRETE RINGS FOR ACCESS SHAFT SHALL BE CEMENTED IN PLACE WITH 1:2 MIX CEMENT MORTAR.
4. CONCRETE SHALL BE CLASS 560-C-3250.



City of
Garden Grove
California

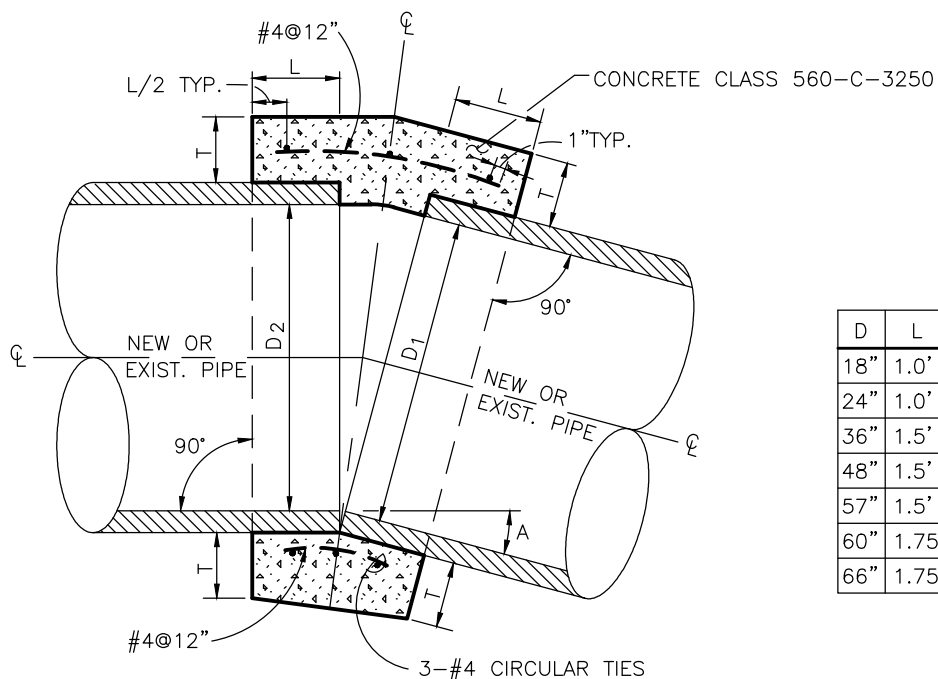
**STORM DRAIN MANHOLE
(SHALLOW DEPTH)**

Approved  Date 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-207



SECTION

NOTES:

1. WHERE PIPES OF DIFFERENT DIAMETERS ARE JOINED WITH A CONCRETE COLLAR, L AND T SHALL BE THOSE OF THE LARGER PIPE. $D=D_1$ OR D_2 , WHICHEVER IS GREATER.
2. FOR PIPE SIZE NOT LISTED USE NEXT SIZE LARGER.
3. OMIT REINFORCING ON PIPES 24" AND LESS IN DIAMETER AND ON ALL PIPES WHERE ANGLE A IS LESS THAN 10°.
4. WHERE REINFORCING IS REQUIRED THE DIAMETER OF THE CIRCULAR TIES SHALL BE $D + (2 \times \text{WALL THICKNESS}) + 6"$.
5. WHEN D_1 IS EQUAL TO OR LESS THAN D_2 , JOIN INVERTS AND WHEN D_1 IS GREATER THAN D_2 , JOIN SOFFITS.
6. PIPE MAY BE CORRUGATED METAL, CONCRETE OR REINFORCED CONCRETE PIPE.



City of
Garden Grove
California

CONCRETE COLLAR FOR PIPE 18"–66" DIAMETER

Approved

Date 12-8-15

REVISIONS

BY

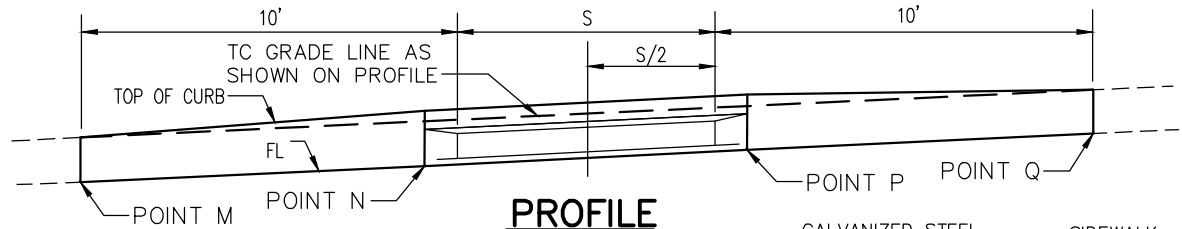
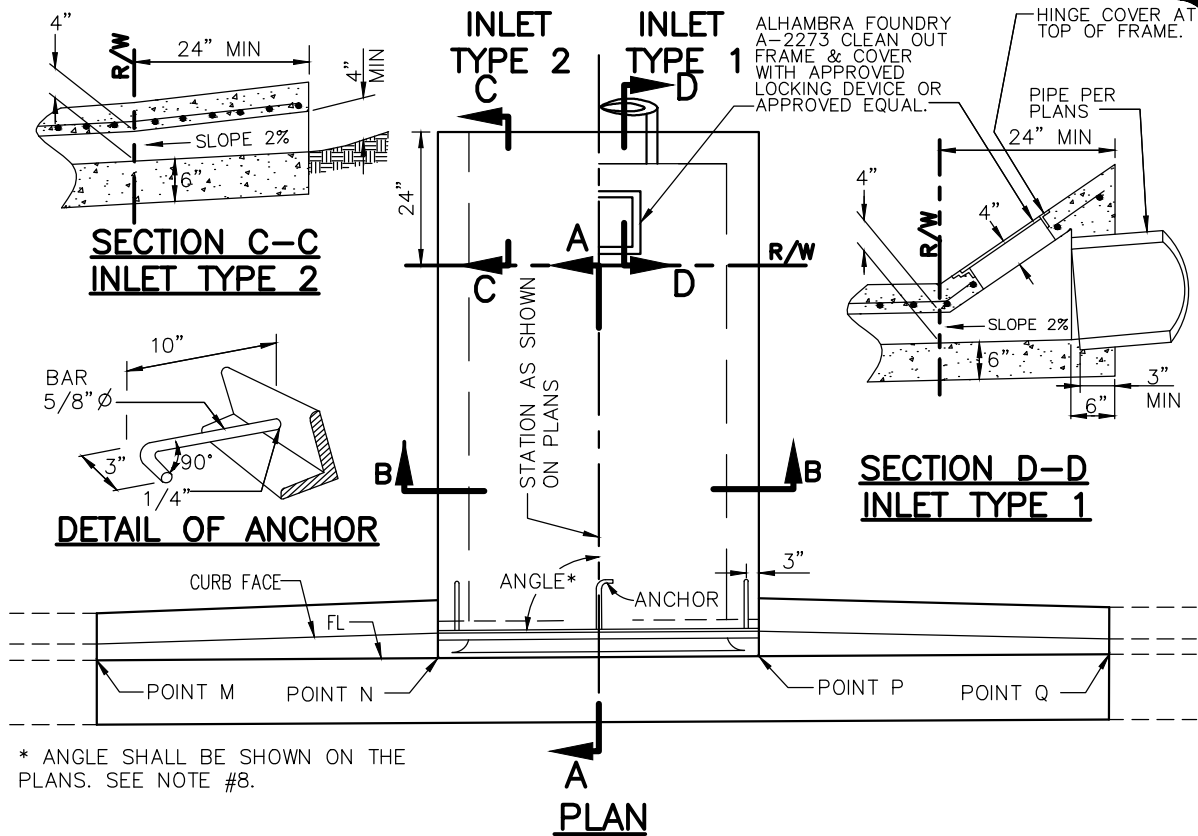
DATE _____

STD. PLAN NUMBER

B-208

City Engineer

R.C.E. 52125 Exp.12-31-16



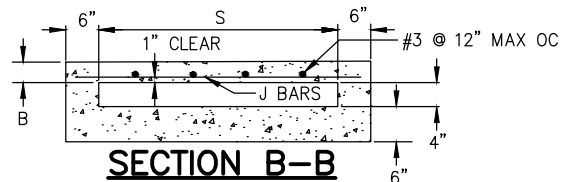
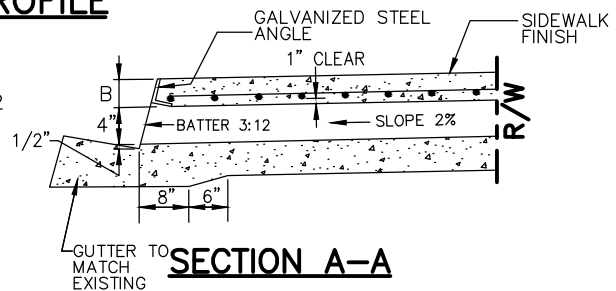
S, INCHES	J BAR SPACING
12"	7"
18"	7"
24"	7"
30"	7"
36"	7"
42"	6"
48"	5"
54"	6-1/2"
60"	5"
66"	4"
72"	3-1/2"

FOR S=30" AND LESS, USE 2 ANCHORS. OTHERWISE, USE 3 ANCHORS.

FOR S=48" AND LESS, B=3" AND 2-1/2"x2"x3/8" GALVANIZED STEEL ANGLE SHALL BE USED.

OTHERWISE, B=4" AND 3-1/2"x3"x1/2" GALVANIZED STEEL ANGLE SHALL BE USED.

J BARS ARE #3.



City of
Garden Grove
California

PARKWAY DRAIN

Approved  Date 12-8-15

City Engineer R.C.E. 52125 Exp.12-31-16

REVISIONS

BY

DATE

STD. PLAN NUMBER

B-209

SHEET 1 OF 2

NOTES:

1. FLOOR OF BOX SHALL BE TROWELED SMOOTH.
2. IF THE TOE OF SLOPE IS ALLOWED WITHIN THE R/W, INLET TYPE 1 BEGINS AT THE TOE RATHER THAN AT THE R/W LINE.
3. FOR OPEN DITCH (TYPE 2), THE 24" EXTENSION BEYOND THE R/W LINE IS NOT REQUIRED WHEN BACK OF WALK IS 24" OR MORE FROM THE R/W LINE; HOWEVER, THE PIPE SHALL EXTEND TO THE R/W LINE IN ANY EVENT.
4. TOP OF INLET STRUCTURE (TYPE 1 & 2) SHALL BE FLUSH WITH ADJACENT SURFACE WHERE PRACTICAL.
5. A HEADED STEED STUD 5/8" x 6-3/8" WITH A 1" HEAD ATTACHED BY A FULL PENETRATION BUTT WELD MAY BE USED AS AN ALTERNATE ANCHOR.
6. NORMAL CURB FACE AT POINT M AND Q. CURB FACE IS B + 5" AT POINTI N AND P.
7. THE 3" LEG OF THE 5/8" DIA ANCHORS SHALL BE PARALLEL TO THE TOP OF SIDEWALK.
8. THE ANGLE OF THE PARKWAY DRAIN SHALL BE 90° WHEN OUTLET VELOCITIES ARE LESS THAN 5 FEET PER SECOND, 60° WHEN OUTLET VELOCITIES ARE LESS THAN 10 FEET PER SECOND, OR 45° WHEN OUTLET VELOCITIES ARE MORE THAN 10 FEET PER SECOND.
9. REINFORCING STEEL SHALL BE 1" CLEAR TO INSIDE OF DRAIN.



City of
Garden Grove
California

PARKWAY DRAIN

Approved  Date 12-8-15
City Engineer R.C.E. 52125 Exp.12-31-16

REVISIONS

BY

DATE

STD. PLAN NUMBER

B-209

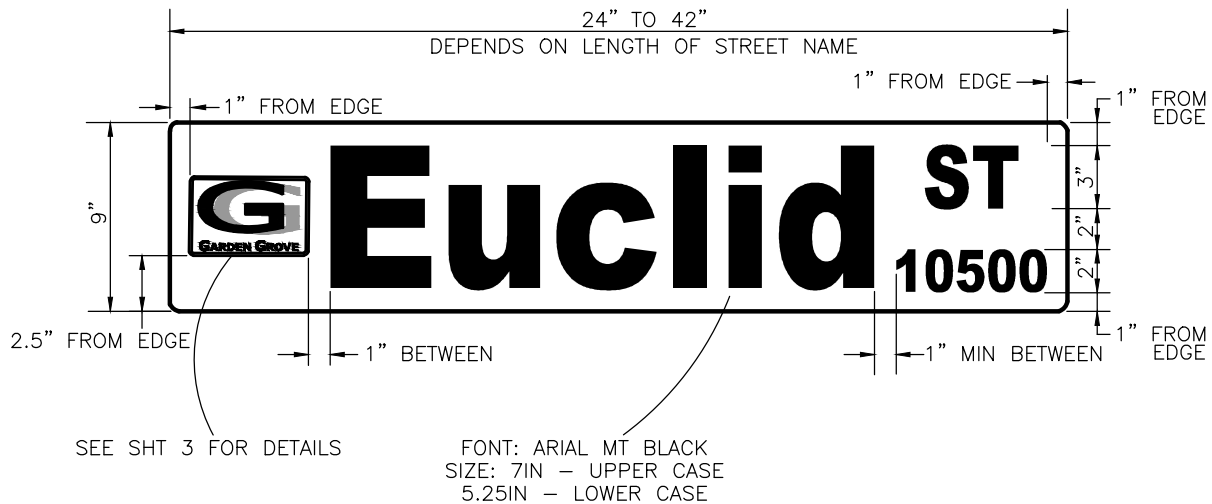
SHEET 2 OF 2



GARDEN GROVE

SERIES B-300

TRAFFIC AND LIGHTING



CLASS "A" SIGN FOR ARTERIAL STREETS

NOTES:

1. ALL SIGNS SHALL BE IN CITY STANDARD SIGN LENGTHS: 24", 30", 36", 42", EXTRUDED ALUMINUM SIGN BLANK.
2. SIGNS SHALL BE MADE USING 3M OR EQUIVALENT HIGH INTENSITY GRADE PRISMATIC (HIP) REFLECTIVE SHEETING WHITE BACKGROUND WITH BLUE TRANSPARENT SHEETING FOR THE LETTERS AND SUPPLEMENTAL INFORMATION.
3. SIGNS SHALL BE DOUBLE SIDED.
4. SIGNS SHALL BE SHEETED WITH 3M 1160 OR EQUIVALENT ANTI-GRAFFITI SHEETING.
5. A SCALED ELECTRONIC COPY OF SIGNS SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL PRIOR TO PRODUCTION.



City of
Garden Grove
California

STREET SIGN FOR PUBLIC STREETS

Approved  Date 12-8-15

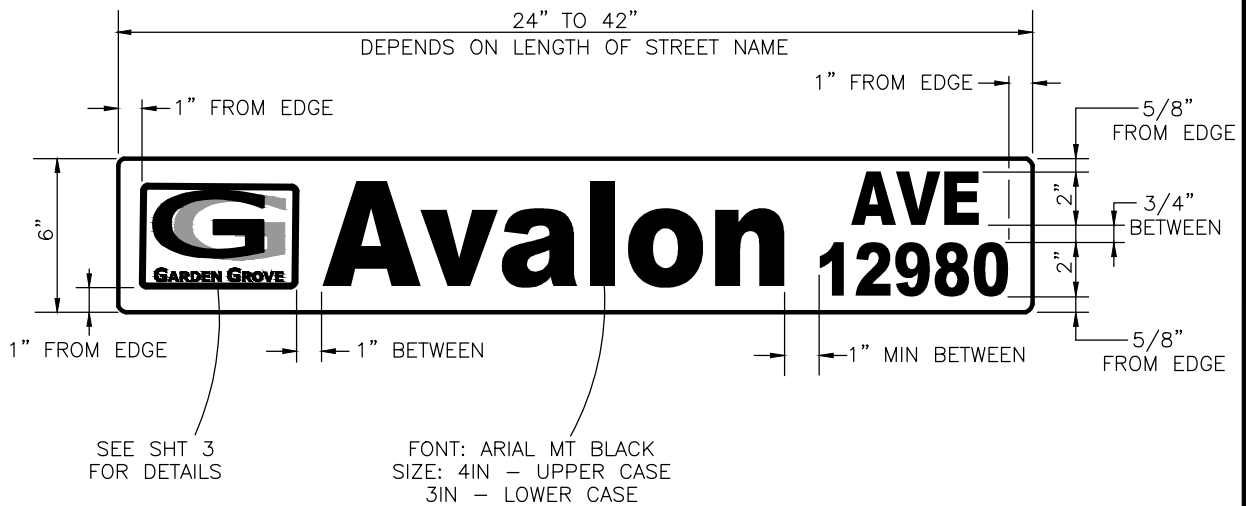
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-301

SHEET 1 OF 3



CLASS "B" SIGN FOR NON-ARTERIAL STREETS

NOTES:

1. ALL SIGNS SHALL BE IN CITY STANDARD SIGN LENGTHS: 24", 30", 36", 42", EXTRUDED ALUMINUM SIGN BLANK.
2. SIGNS SHALL BE MADE USING 3M OR EQUIVALENT HIGH INTENSITY GRADE PRISMATIC (HIP) REFLECTIVE SHEETING WHITE BACKGROUND WITH BLUE TRANSPARENT SHEETING FOR THE LETTERS AND SUPPLEMENTAL INFORMATION.
3. SIGNS SHALL BE DOUBLE SIDED.
4. SIGNS SHALL BE SHEETED WITH 3M 1160 OR EQUIVALENT ANTI-GRAFFITI SHEETING.
5. A SCALED ELECTRONIC COPY OF SIGNS SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL PRIOR TO PRODUCTION.



City of
Garden Grove
California

STREET SIGN FOR PUBLIC STREETS

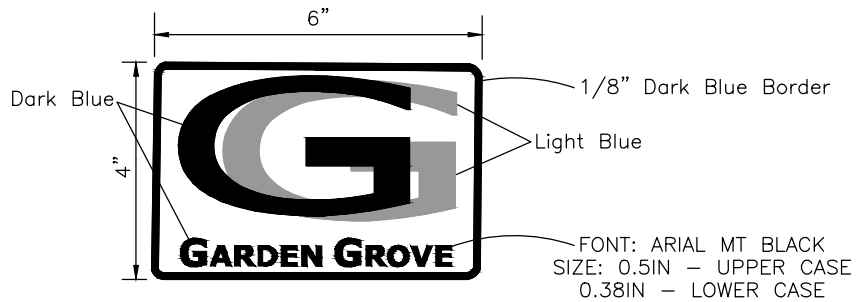
Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-301

SHEET 2 OF 3



CITY OF GARDEN GROVE LOGO

FOR PUBLIC AND PRIVATE STREETS

NOTES:

1. BACKGROUND: WHITE REFLECTIVE HIGH INTENSITY PRISMATIC SHEETING.
2. ALL LETTERING FONTS AND COLOR SHALL BE AS SHOWN ABOVE.



City of
Garden Grove
California

STREET SIGN FOR PUBLIC STREETS

Approved

Date 12-8-15

REVISIONS

BY

DATE

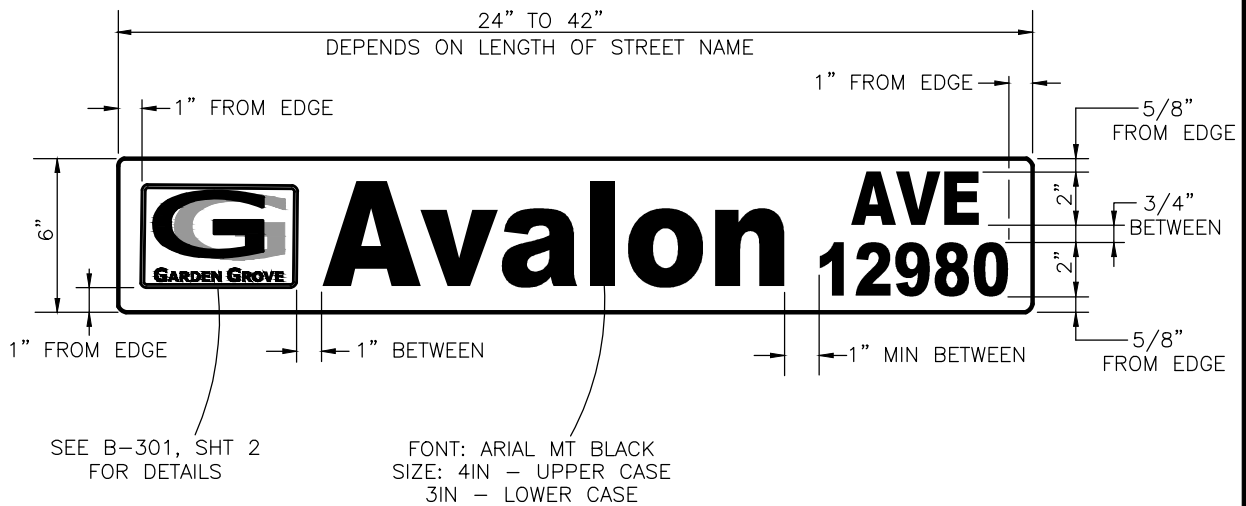
STD. PLAN NUMBER

City Engineer

R.C.E. 52125 Exp.12-31-16

B-301

SHEET 3 OF 3



SIGN FOR PRIVATE STREETS

NOTES:

1. ALL SIGNS SHALL BE IN CITY STANDARD SIGN LENGTHS: 24", 30", 36", 42", EXTRUDED ALUMINUM SIGN BLANK.
2. SIGNS SHALL BE MADE USING 3M OR EQUIVALENT HIGH INTENSITY GRADE PRISMATIC (HIP) REFLECTIVE SHEETING LIGHT BLUE IN BACKGROUND WITH CONTRASTING DARK BLUE TRANSPARENT SHEETING FOR THE LETTERS AND SUPPLEMENTAL INFORMATION.
3. SIGNS SHALL BE DOUBLE SIDED.
4. SIGNS SHALL BE SHEETED WITH 3M 1160 OR EQUIVALENT ANTI-GRAFFITI SHEETING.
5. INCLUDE A 4"x6" CITY TWO COLOR SCREEN-PRINTED LOGO. REFER TO B-301, SHEET 3 FOR DETAIL.
6. A SCALED ELECTRONIC COPY OF SIGNS SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL PRIOR TO PRODUCTION.



City of
Garden Grove
California

STREET SIGN FOR PRIVATE STREETS

Approved

Date 12-8-15

REVISIONS

BY

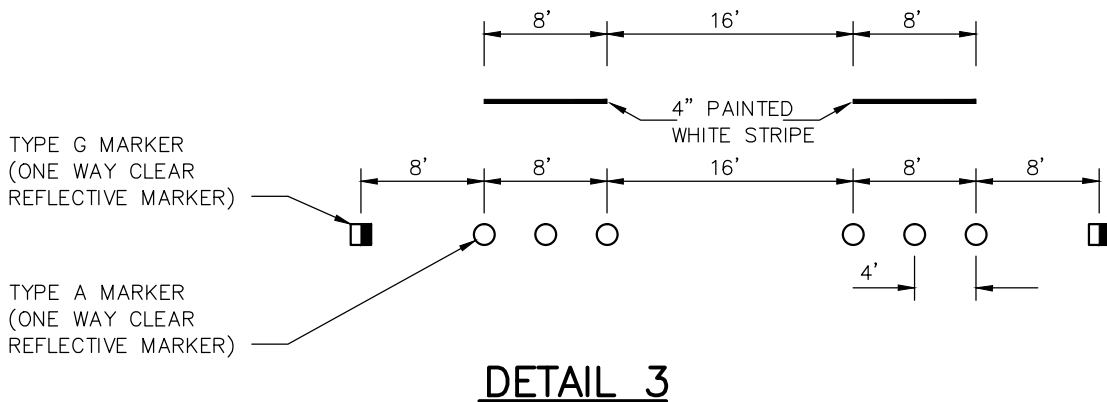
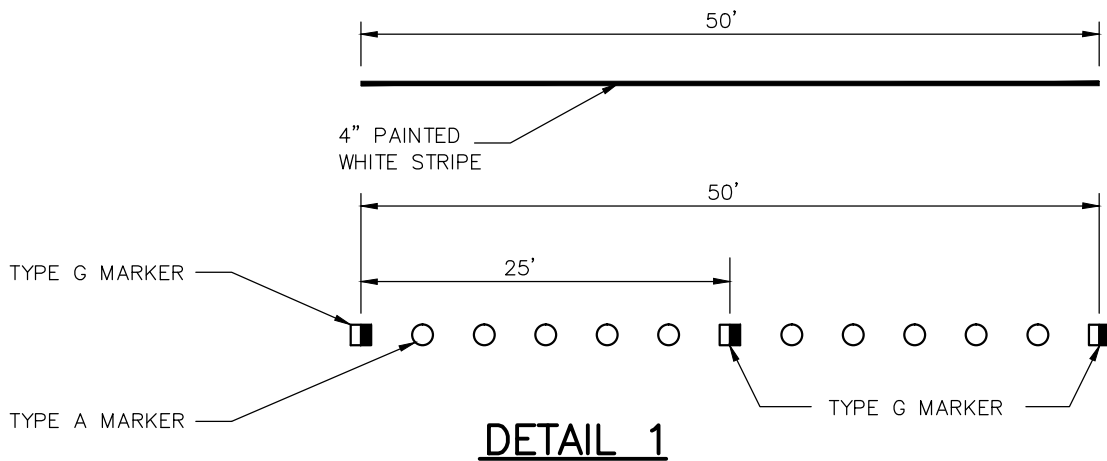
DATE

STD. PLAN NUMBER

City Engineer

R.C.E. 52125 Exp.12-31-16

B-302



NOTES:

1. BOTH PAINT AND MARKERS TO BE INSTALLED PER DETAIL AS SHOWN, WITH PAINT INSTALLED FIRST.
2. INSTALLATION OF ALL MARKERS SHALL CONFORM TO THE REQUIREMENTS OF THE LATEST CALTRANS STANDARD SPECIFICATIONS SECTION 85.

DO NOT USE THIS STANDARD FOR NEW STRIPING OF ENTIRE ROADWAYS – TO BE USED ONLY FOR REPLACEMENT OF EXISTING STRIPING IN ISOLATED AREAS TO MATCH ADJACENT STRIPING.



City of
Garden Grove
California

**ROADWAY STRIPING
DETAILS**

Approved  Date 12-8-15

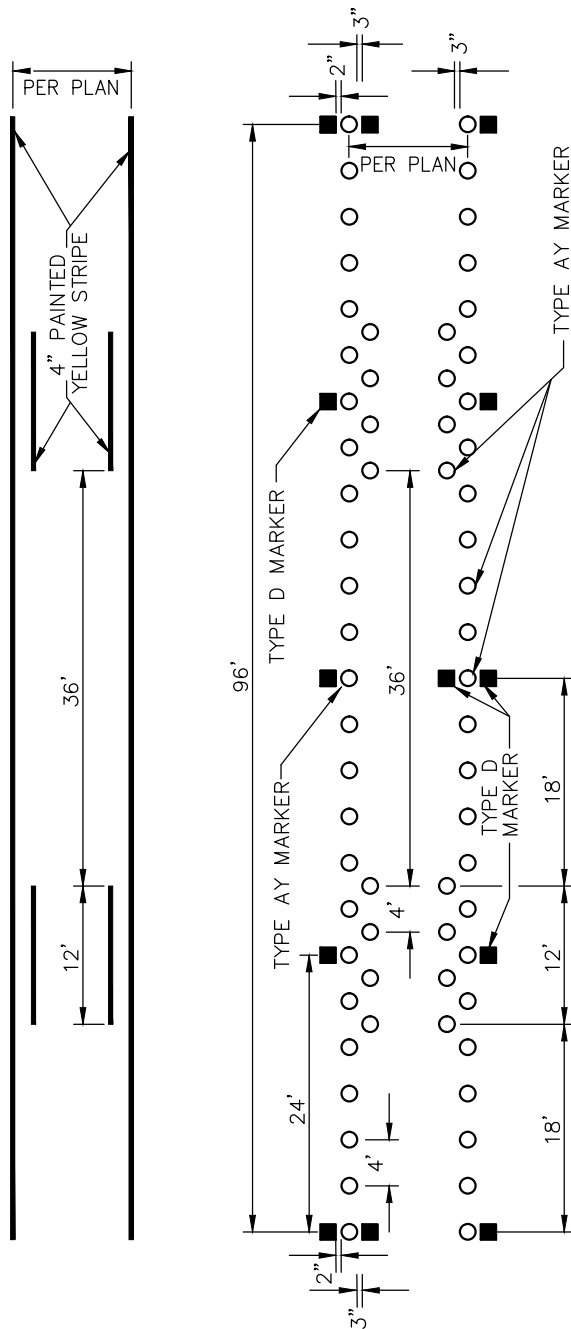
City Engineer R.C.E. 52125 Exp.12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-303

SHEET 1 OF 3



DETAIL 2

DO NOT USE THIS STANDARD FOR NEW STRIPING OF ENTIRE ROADWAYS - TO BE USED ONLY FOR REPLACEMENT OF EXISTING STRIPING IN ISOLATED AREAS TO MATCH ADJACENT STRIPING.

NOTES:

1. BOTH PAINT AND MARKERS TO BE INSTALLED PER DETAIL AS SHOWN, WITH PAINT INSTALLED FIRST.
2. INSTALLATION OF ALL MARKERS SHALL CONFORM TO THE REQUIREMENTS OF THE LATEST CALTRANS STANDARD SPECIFICATIONS SECTION 85.



City of
Garden Grove
California

ROADWAY STRIPING DETAILS

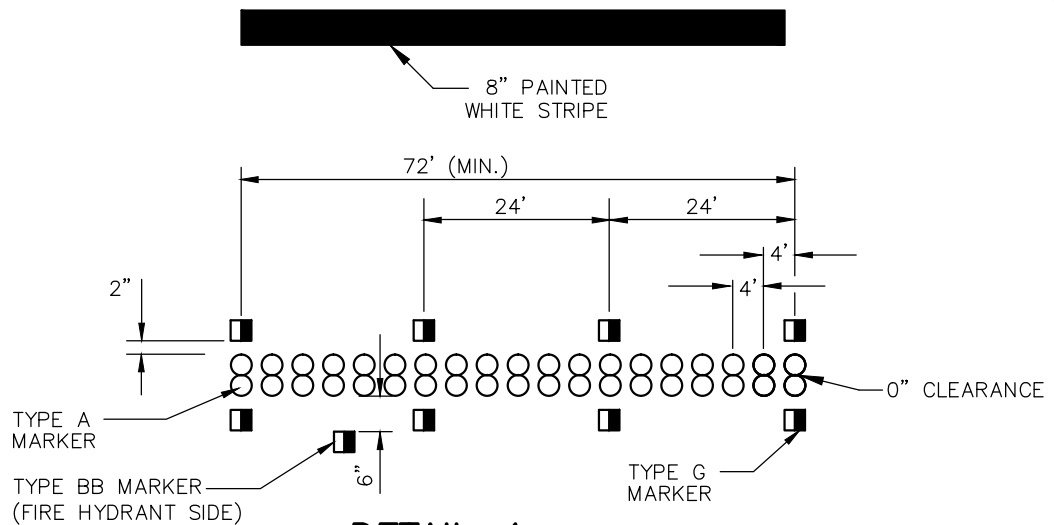
Approved:  Date 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

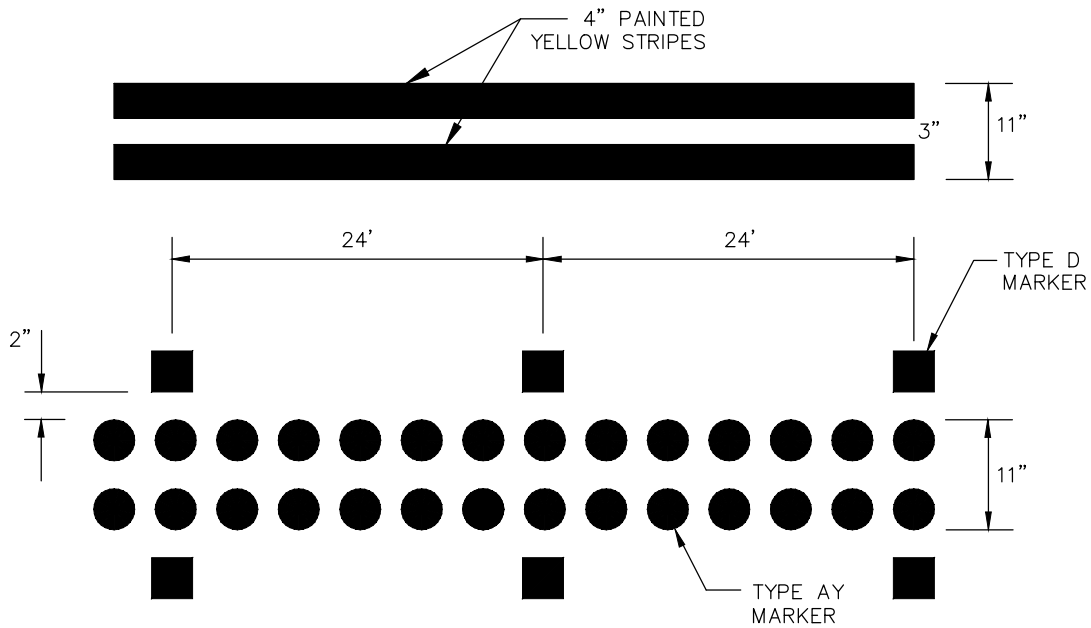
STD. PLAN NUMBER

B-303

SHEET 2 OF 3



DETAIL 4



DETAIL 5

NOTES:

1. BOTH PAINT AND MARKERS TO BE INSTALLED PER DETAIL AS SHOWN, WITH PAINT INSTALLED FIRST.
2. INSTALLATION OF ALL MARKERS SHALL CONFORM TO THE REQUIREMENTS OF THE LATEST CALTRANS STANDARD SPECIFICATIONS SECTION 85.

DO NOT USE THIS STANDARD FOR NEW STRIPING OF ENTIRE ROADWAYS – TO BE USED ONLY FOR REPLACEMENT OF EXISTING STRIPING IN ISOLATED AREAS TO MATCH ADJACENT STRIPING.



City of
Garden Grove
California

**ROADWAY STRIPING DETAILS
FOR SINGLE DOUBLE LINES**

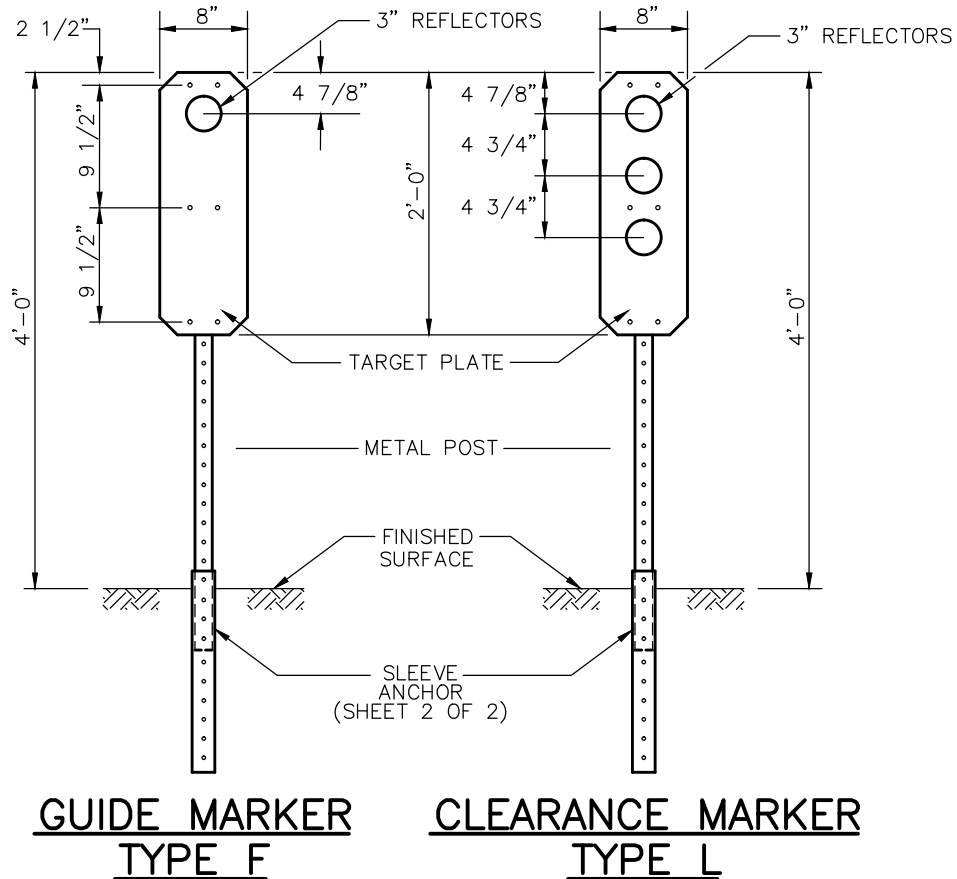
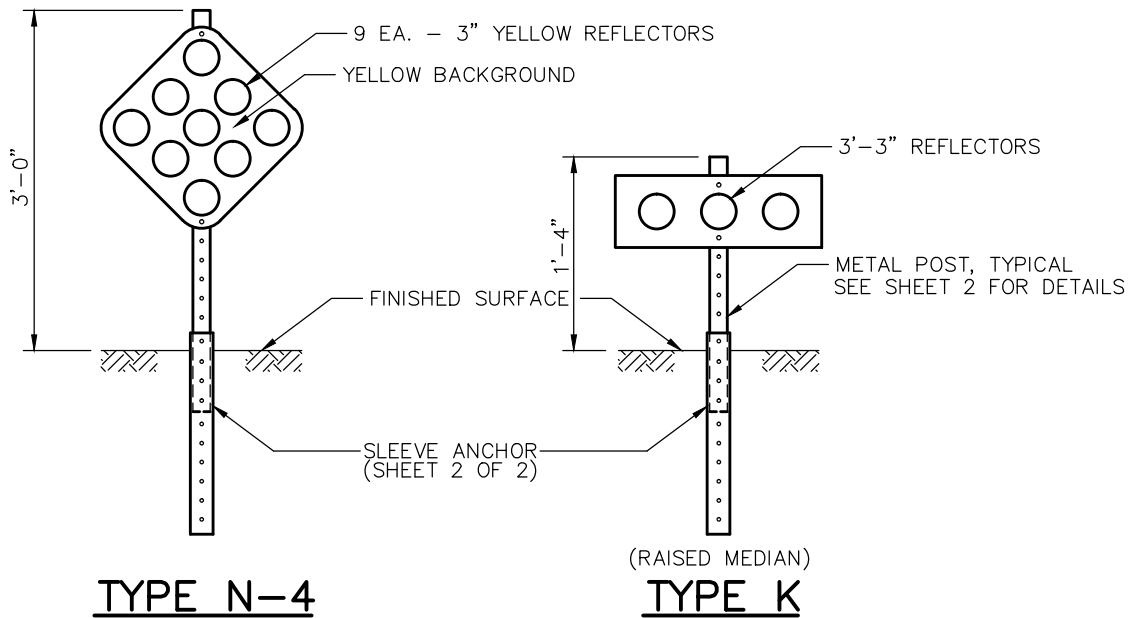
Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-303

SHEET 3 OF 3



City of
Garden Grove
California

TYPICAL TRAFFIC MARKER & SIGN INSTALLATION

Approved:  Date: 12-8-15

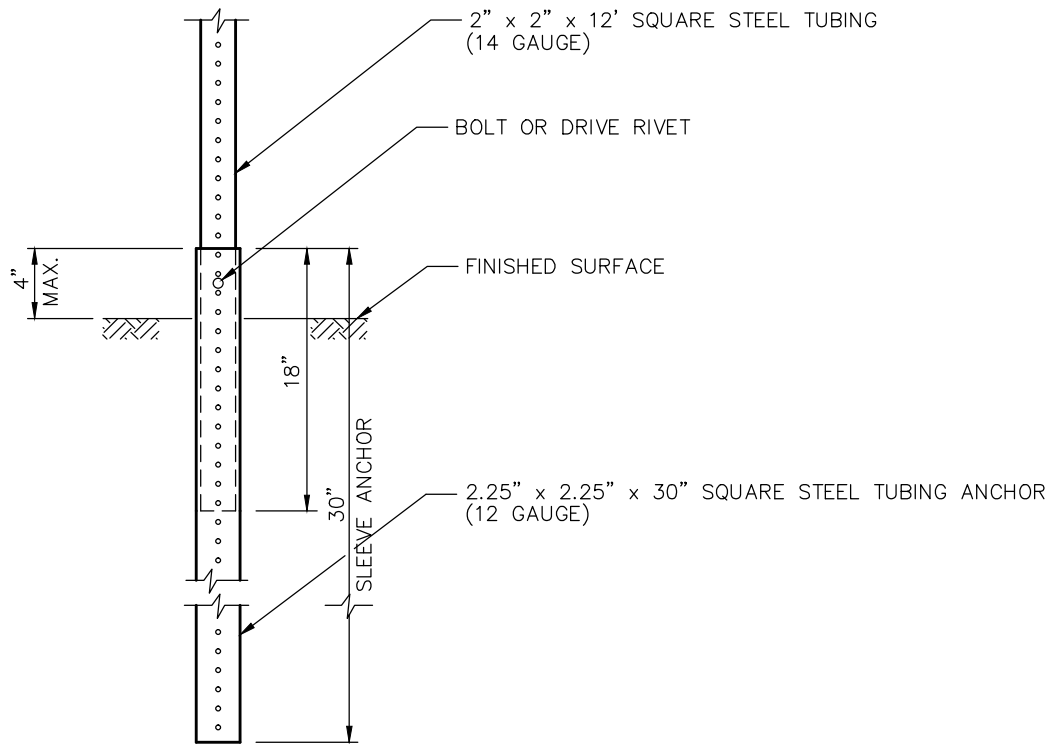
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-305

SHEET 1 OF 2



SECTION

NOTES:

1. SQUARE STEEL TUBING SHALL BE GALVANIZED, WITH 7/16" DIAMETER DIE - CUT KNOCKOUTS ON 1" CENTERS, FULL LENGTH ON FOUR SIDES, AS MANUFACTURED BY ALLIED TUBE CONDUIT, OR APPROVED EQUAL.
2. SIGNS SHALL BE MOUNTED WITH GALVANIZED NUTS, BOLTS, AND WASHERS, OR DRIVE RIVETS.



City of
Garden Grove
California

TYPICAL TRAFFIC MARKER & SIGN INSTALLATION

Approved

Date 12-8-15

REVISIONS

BY

DATE

STD. PLAN NUMBER

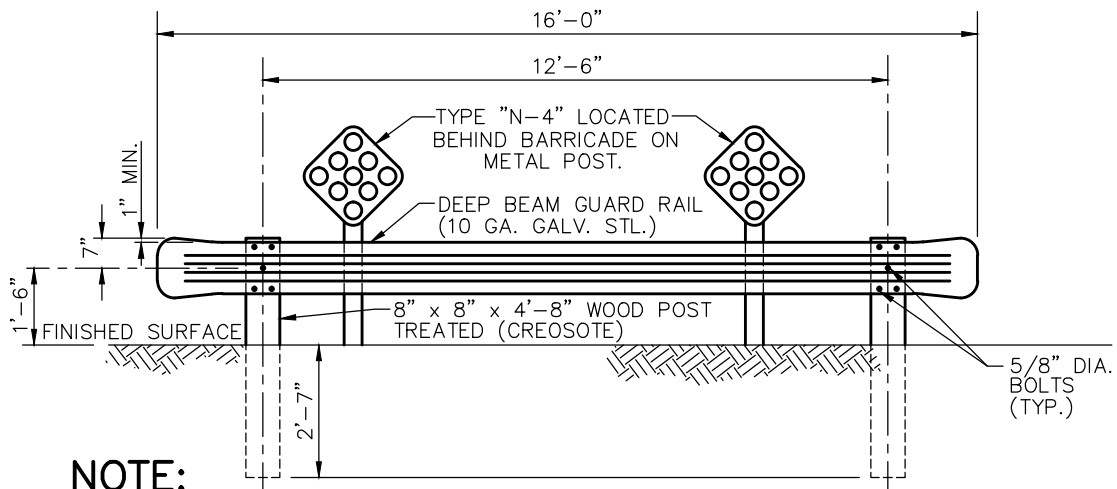
City Engineer

R.C.E. 52125

Exp.12-31-16

B-305

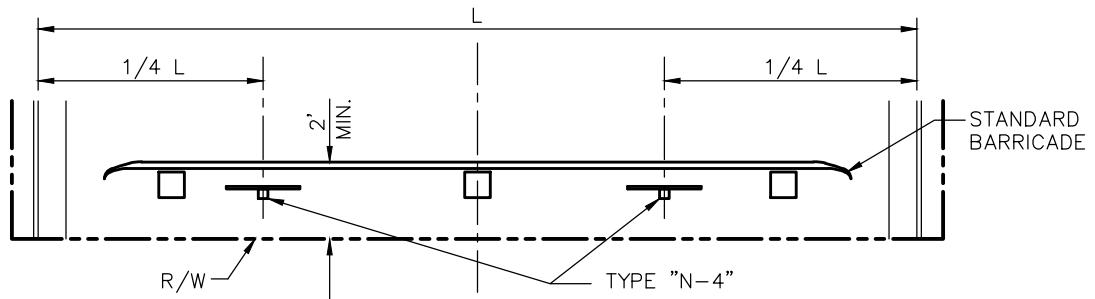
SHEET 2 OF 2



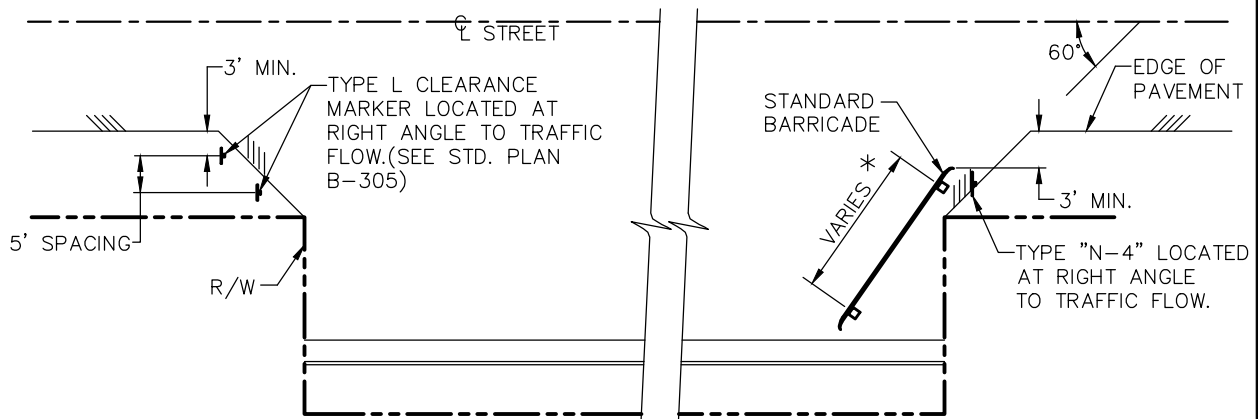
NOTE:

GUARD RAIL AND POSTS SHALL CONFORM TO THE PROVISIONS IN SECTION 83-1.02B OF THE STD. STATE SPECIFICATIONS & AS SHOWN IN THIS STD. PLAN.

STANDARD BARRICADE



TREATMENT FOR DEAD END STREET OR ALLEY



* LENGTH SHALL BE IN MULTIPLES OF 12'-6" WITH END SECTIONS OF 1'-9".

TREATMENT FOR WIDENING SECTION



City of
Garden Grove
California

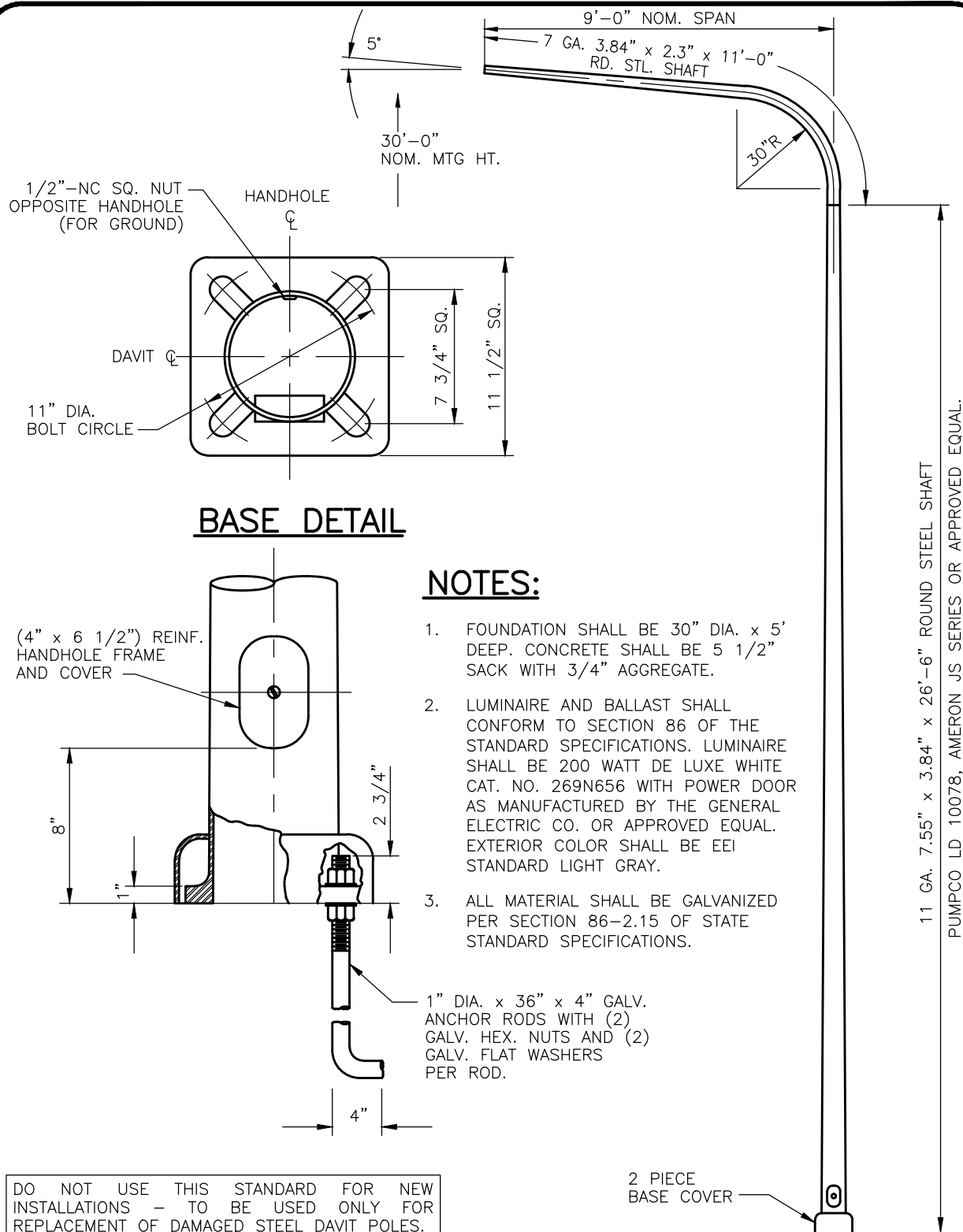
**STANDARD
BARRICADE**

Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-306



City of
Garden Grove
California

STEEL DAVIT STANDARD

Approved  Date 12-8-15

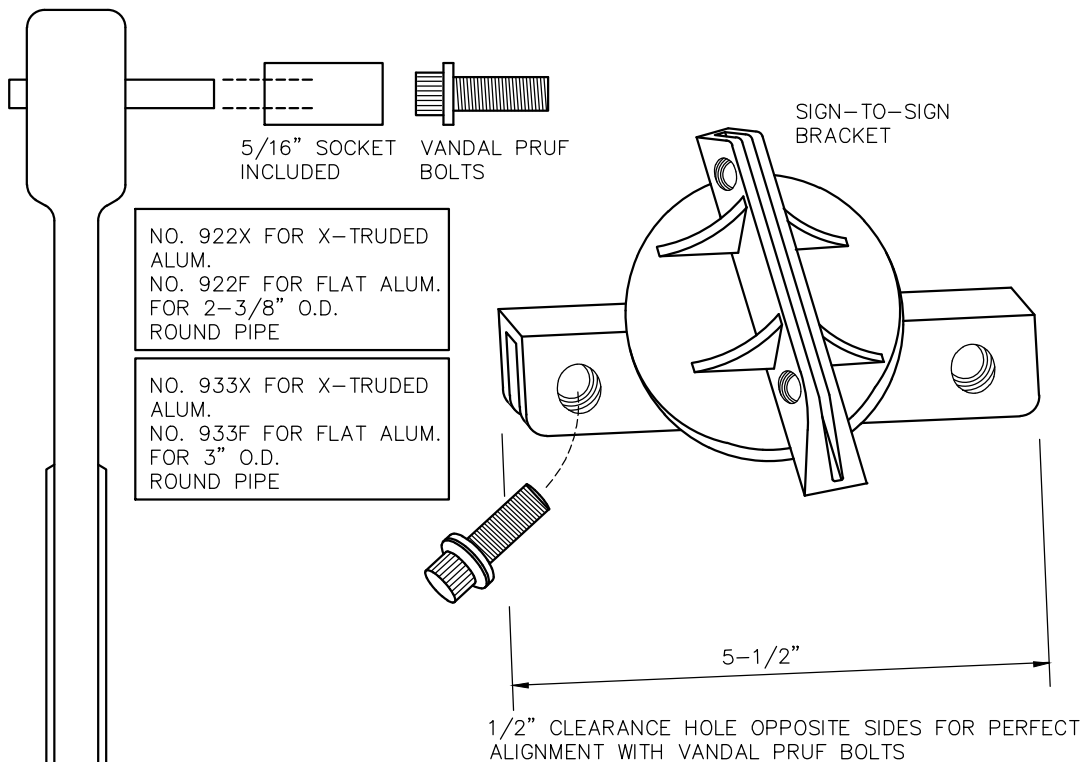
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

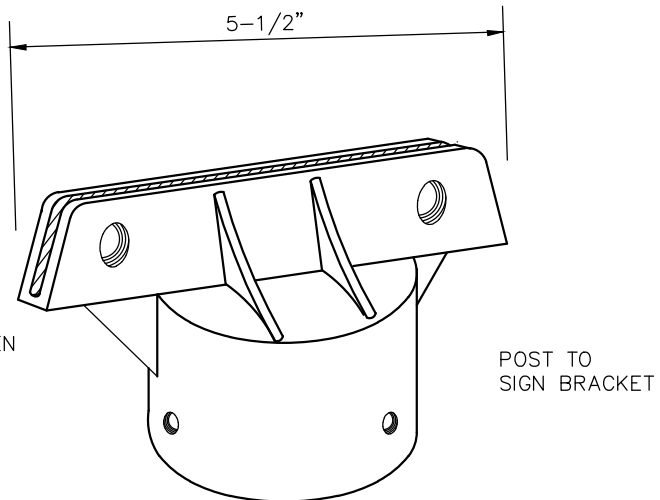
STD. PLAN NUMBER

B-307

B-308



SHALL BE DIE CAST OF NO. 380 ALLOY WITH TENSILE STRENGTH OF 49,000 PSI WITH EXCELLENT RESISTANCE TO CORROSION. THE BRACKETS SHALL BE SMOOTHLY FINISHED FREE OF HOLES, PITS OR FLAWS. ALL BRACKETS SHALL HAVE 2 ANGLED GUSSETS, OR RIBS ON EACH SIDE FOR EXTRA STRENGTH. ALL SETS OF BRACKETS SHALL BE TAPPED AND DRILLED FOR 10 EACH 5/16" ZINC DICHROMATE PLATED ALLEN TYPE SET SCREWS HAVING SELF LOCKING SAWTOOTH ENDS.



EXCLUSIVE FEATURE 4 FASTENERS IN BASE CAP PLUS LONGER BASE CAP FOR PERFECT ALIGNMENT

NOTE:

CAP SIZE 2-1/2" I.D.



City of
Garden Grove
California

**STREET NAME SIGN MOUNTING
BRACKET (FLAT OR EXTRUDED)**

Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

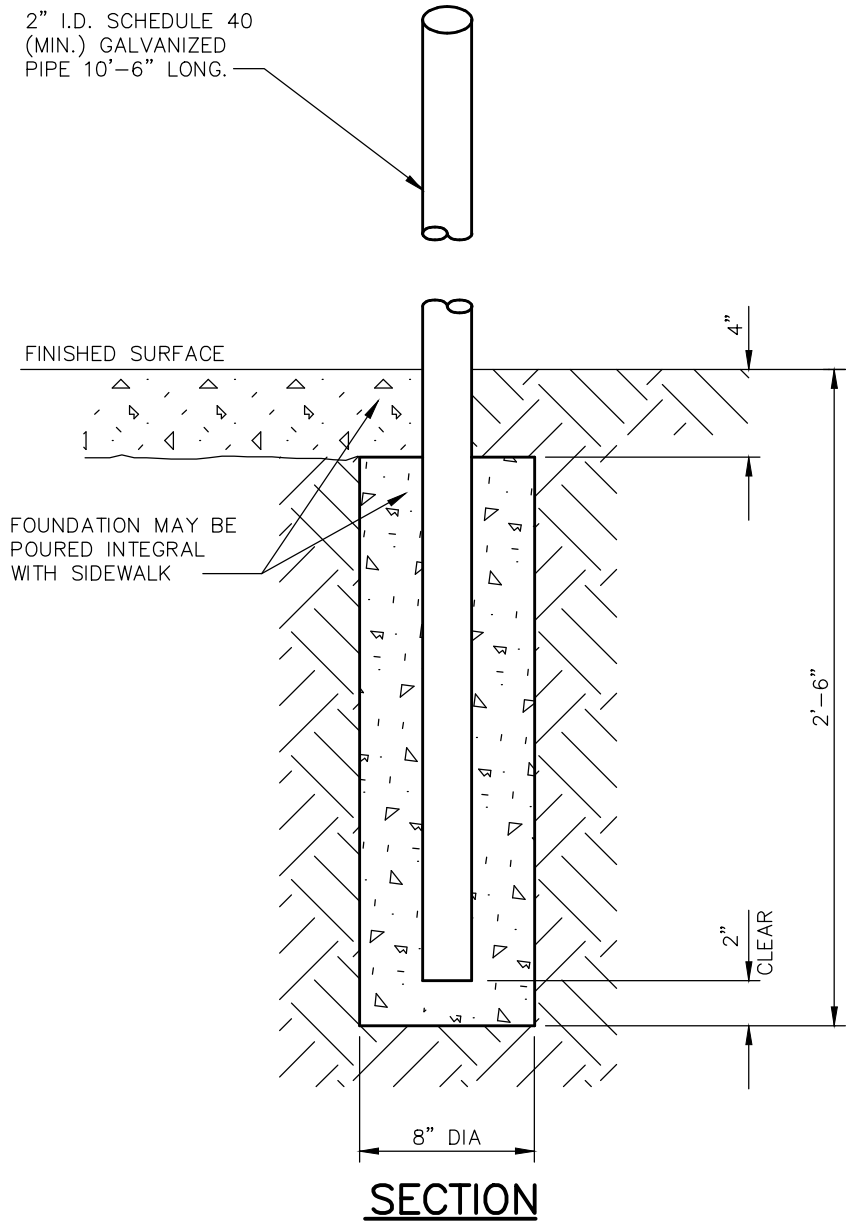
REVISIONS	BY	DATE

STD. PLAN NUMBER

B-309

NOTE:

SEE B-301 & B-302 FOR STREET SIGN DETAILS
AND B-305 FOR SIGN MOUNTING BRACKET DETAILS.



City of
Garden Grove
California

**STREET NAME SIGN
POLE DETAIL**

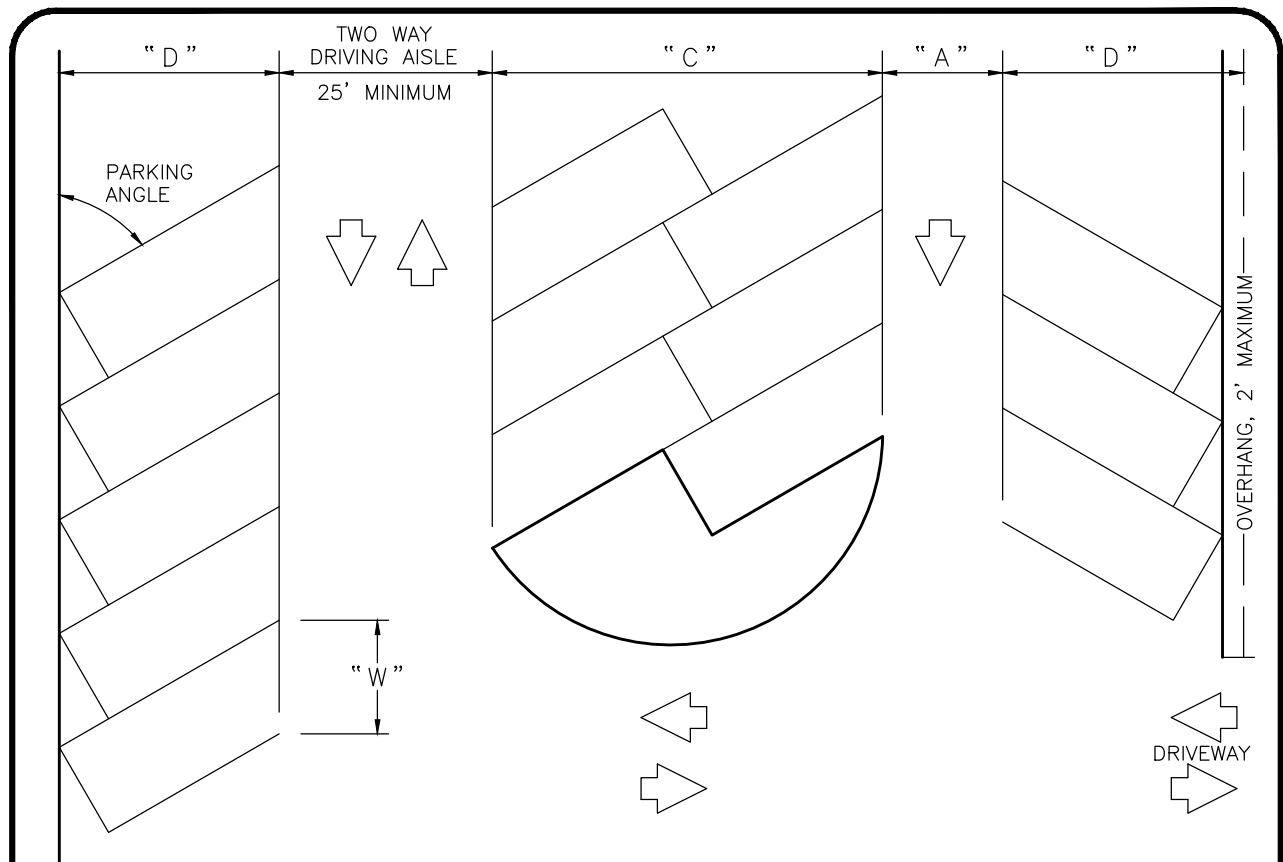
Approved  Date 12-8-15

City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

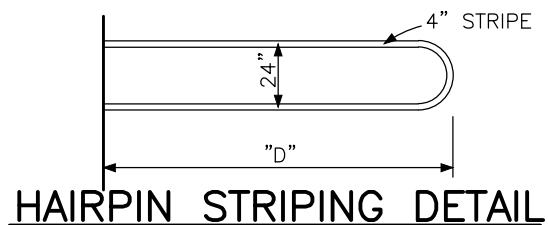
B-310



STALL TYPE	PARKING ANGLE (DEGREES)	"W" WIDTH of STALL PARALLEL to AISLE	"D" DEPTH of STALL PERPENDICULAR to AISLE	"A" MIN. WIDTH of DRIVING AISLE	"C" CENTER SECTION PARKING WIDTH
FULL SIZE	90	9'	19'	25'	38'
	60	10'-5"	20'-11"	17'	37'-5"
	45	12'-9"	19'-10"	14'-6"	33'-3"
	30	18'	17'-4"	14'	26'-10"
	0*	22'	**8'	14'	—
COMPACT	90	8'	15'	25'	30'
	60	9'-3"	17'	17'	30'
	45	11'-4"	16'-3"	14'-6"	26'-10"

* PARALLEL PARKING

** 9' AGAINST A WALL



City of
Garden Grove
California

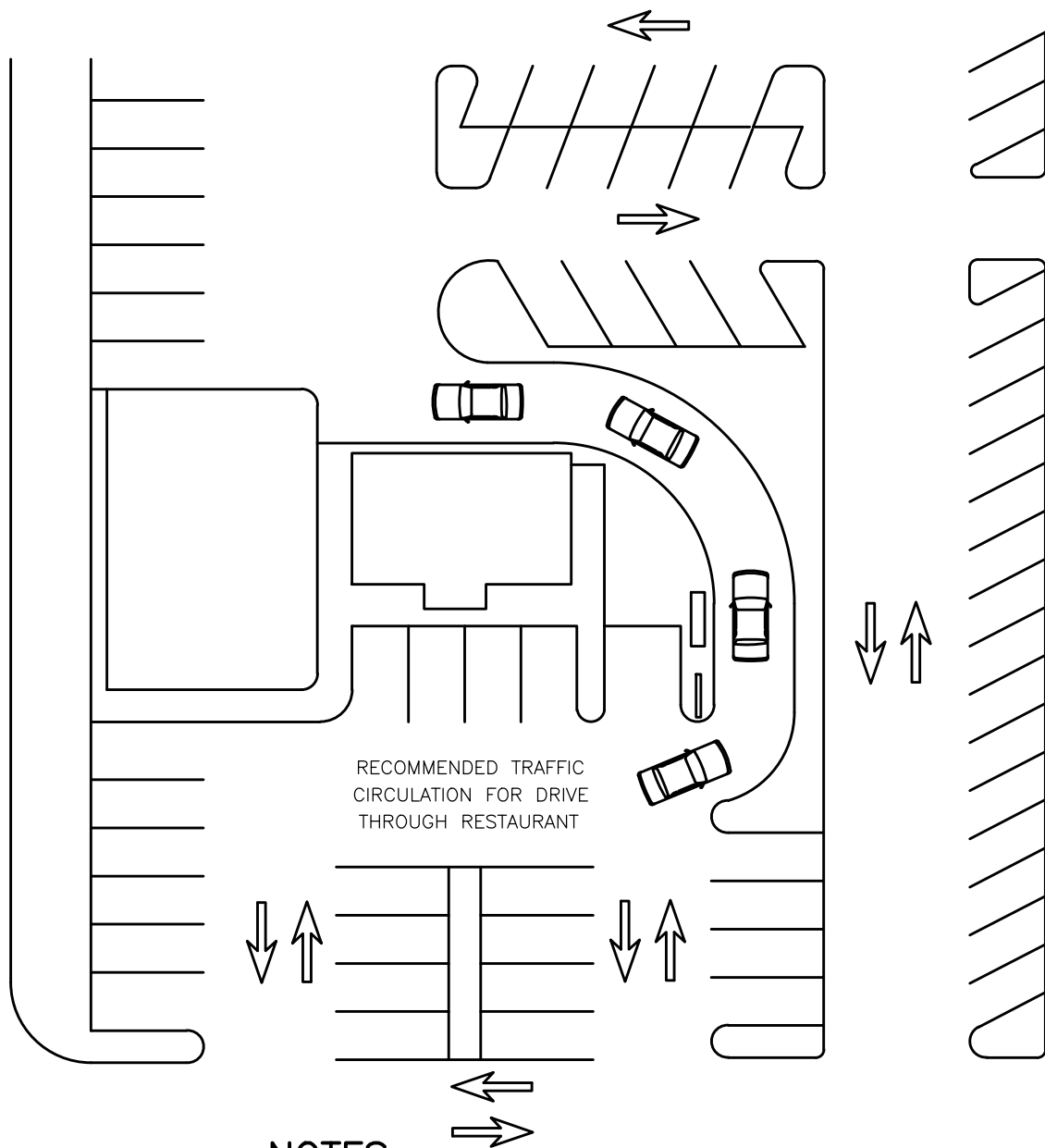
PARKING LOT LAYOUT

Approved  Date 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-311



NOTES:

1. QUEUEING CRITERIA OF APPROXIMATELY 80 FEET OR FOUR VEHICLE LENGTHS BETWEEN THE SERVICE WINDOW AND THE ORDER BOARD.
2. PROVIDE AN ADDITIONAL 80 FEET OR FOUR VEHICLE LENGTHS OF QUEUEING DISTANCE BEHIND THE ORDER BOARD.
3. BASED ON PEAK CONDITIONS OCCURRING, THE QUEUEING LENGTH OF 160 FEET UTILIZES THE ABSOLUTE MAXIMUM DEMAND THAT WOULD OCCUR.
4. MAINTAIN A CLEAR CIRCULATION PATTERN WITHIN THE SITE OR SHOPPING CENTER.
5. THE PARKING AISLE ORIENTATION SHOULD BE TO PROVIDE EASY PEDESTRIAN ACCESS BY WALKING THE LENGTH OF AISLES INSTEAD OF THROUGH ROWS OF PARKED VEHICLES.



City of
Garden Grove
California

PARKING & QUEUEING FOR DRIVE THROUGH RESTAURANTS

Approved

Date 12-8-15

REVISIONS

BY

DATE

STD. PLAN NUMBER

City Engineer

R.C.E. 52125

Exp. 12-31-16

B-312

STREET LIGHTING STANDARDS

GENERAL

WHERE STREET LIGHTING IS CALLED FOR, IT SHALL BE PROVIDED IN ACCORDANCE WITH CITY OF GARDEN GROVE STD. PLAN NO. B-313 ON CITY STREETS AND ALL OTHER LOCATIONS WHERE ILLUMINATION IS JUSTIFIED, AS DETERMINED BY THE ENGINEER. ALL STREET LIGHT LAYOUTS AND LIGHTING DESIGNS SHALL BE APPROVED BY THE ENGINEER PRIOR TO INSTALLATION.

ELECTROLIERS

ELECTROLIER IS DEFINED AS THE STREET LIGHT POLE, MAST ARM, AND LUMINAIRE. LUMINAIRE IS DEFINED AS THE LIGHT FIXTURE ON THE END OF THE MAST ARM.

ELECTROLIERS SHALL BE OF THE TYPE PROVIDED BY THE SERVING UTILITIES, OR AS APPROVED BY THE ENGINEER AND THE SERVING UTILITY WHERE AESTHETIC OR LIGHT DISTRIBUTION CONSIDERATIONS ARE WARRANTED.

ELECTROLIERS SHALL BE PLACED AT LOT LINES EXCEPT AS APPROVED BY THE ENGINEER. THE DISTANCE OF THE ELECTROLIER BEHIND CURB SHALL BE APPROVED BY THE ENGINEER.

AT INTERSECTIONS, WHERE PRACTICAL, ELECTROLIERS SHALL BE PLACED NEAR THE END OF THE CURB RETURN ON THE FAR RIGHT SIDE OF THE INTERSECTION. AT A "T" INTERSECTION AN ELECTROLIER SHALL BE PLACED AT THE HEAD OF THE INTERSECTION OR AT ALTERNATE LOCATIONS NEAR THE END OF CURB RETURN ON EITHER THE FAR RIGHT OR THE FAR LEFT SIDE OF THE INTERSECTION.

ELECTROLIERS IN MEDIAN ISLANDS SHALL NOT BE PLACED CLOSER THAN 100 FEET FROM AN ARTERIAL HIGHWAY OR COLLECTOR STREET INTERSECTION. ELECTROLIERS SHALL NOT BE PLACED IN MEDIAN ISLANDS LESS THAN SIX (6) FEET IN WIDTH.

ELECTROLIERS SHOULD BE PLACED ALTERNATELY ON EACH SIDE OF THE ROADWAY WHEN INSTALLED ALONG THE SIDES OF A ROADWAY.

ELECTROLIERS SHALL BE SPACED IN ACCORDANCE WITH THE FOLLOWING:

LOCATION	MINIMUM HPSV LAMP SIZE (LUMENS)	APPROX. SPACING (FEET)
A. LOCAL STREETS	9,500	100-150
B. SECONDARY ARTERIAL (4-LANE WITHOUT RAISED MEDIANS)	16,000	150-200
C. PRIMARY ARTERIAL (4-LANE WITH RAISED MEDIANS) (6-LANE WITHOUT RAISED MEDIANS)	16,000 22,000	150-200 200-250
D. MAJOR ARTERIAL (6-LANE WITH RAISED MEDIANS)	22,000	200-250

REQUIRED SPACING AND LUMEN LEVELS MAY BE MODIFIED ON AN EXCEPTIONAL BASIS FOR PURPOSES OF CRIME PREVENTION, ENERGY SAVINGS, AND/OR AS ADVISED BY THE ENGINEER. CONSISTENCY OF ELECTROLIER SPACING AND LAMP LUMEN LEVELS SHALL BE MAINTAINED ALONG ALL STREETS WHENEVER POSSIBLE.



City of
Garden Grove
California

STREET LIGHTING

Approved  Date 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS

BY

DATE

STD. PLAN NUMBER

B-313

SHEET 1 OF 2

STREET LIGHTING STANDARDS (Continued):

POLES, MAST ARMS, AND LUMINAIRES

POLES SHALL BE MARBELITE.

LENGTH OF MAST ARMS SHALL BE A MINIMUM OF 6- FEET.

MAST ARMS MAY BE MOUNTED ON EXISTING WOOD POLES WHERE:

A. THE PROXIMITY OR NUMBER OF EXISTING WOOD POLES WITHIN THE RIGHT-OF-WAY PRECLUDES THE INSTALLATION OF SEPARATE STREET LIGHTING POLES.

B. TEMPORARY LIGHTING IS TO BE INSTALLED IN UNDEVELOPED AREAS.

HEIGHT OF LUMINAIRES SHALL BE A MINIMUM OF 30- FEET.

LUMINAIRES SHALL BE OF THE TYPE USED BY THE SERVING UTILITY AND SHALL BE THE COBRA HEAD STYLE HOUSING.

LAMPS

LAMPS SHALL BE HIGH PRESSURE SODIUM VAPOR (HPSV).

MISCELLANEOUS MATERIALS AND WORKMANSHIP

MATERIAL AND WORK SHALL MEET OR EXCEED THE APPLICABLE REQUIREMENTS OF THE NATIONAL ELECTRIC CODE, THE ELECTRICAL SAFETY ORDERS OF THE DEPARTMENT OF INDUSTRIAL SAFETY, STATE OF CALIFORNIA, THE AMERICAN SOCIETY FOR TESTING MATERIALS AND SECTION 86 OF THE STANDARD SPECIFICATIONS OF THE CALIFORNIA STATE DEPARTMENT OF TRANSPORTATION, LATEST EDITION.

IN ADDITION TO THE ABOVE, NON-UTILITY-OWNED STREET LIGHTING INSTALLATIONS SHALL CONFORM TO THE LATEST PUBLICATION OF SECTION 307 OF THE SOUTHERN CALIFORNIA CHAPTER OF THE AMERICAN PUBLIC WORKS ASSOCIATION AND THE SOUTHERN CALIFORNIA DISTRICT OF ASSOCIATED GENERAL CONTRACTORS STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION AND THIS STANDARD PLAN.

THE CONSTRUCTION PRACTICES AND MATERIALS USED FOR STREET LIGHTS OWNED BY UTILITIES SUBJECT TO THE REGULATION OF THE CALIFORNIA PUBLIC UTILITIES COMMISSION ARE SPECIFIED EXCLUSIVELY BY THE ORDERS OF THE COMMISSION. ALL STREET LIGHTS OWNED BY REGULATED UTILITIES SHALL MEET OR EXCEED THE REQUIREMENTS OF GENERAL ORDERS 95 AND 128.

SERVICE AND MAINTENANCE

SERVICE AND MAINTENANCE SHALL BE THE RESPONSIBILITY OF THE OWNER OF THE ELECTROLIER.



City of
Garden Grove
California

STREET LIGHTING

Approved

Date 12-8-15

City Engineer

R.C.E. 52125 Exp.12-31-16

REVISIONS

BY

DATE

STD. PLAN NUMBER

B-313

SHEET 2 OF 2



GARDEN GROVE

SERIES B-500
BUILDING

9'-4" 10'-0"



N.T.S.

*PROVIDE SOLID ROOF OR AWNING TO PREVENT DIRECT PRECIPITATION FROM ENTERING ENCLOSURE.



REFUSE STORAGE
ENCLOSURE

Approved

Date 12-8-15

REVISIONS

BY

DATE

STD. PLAN NUMBER

City Engineer

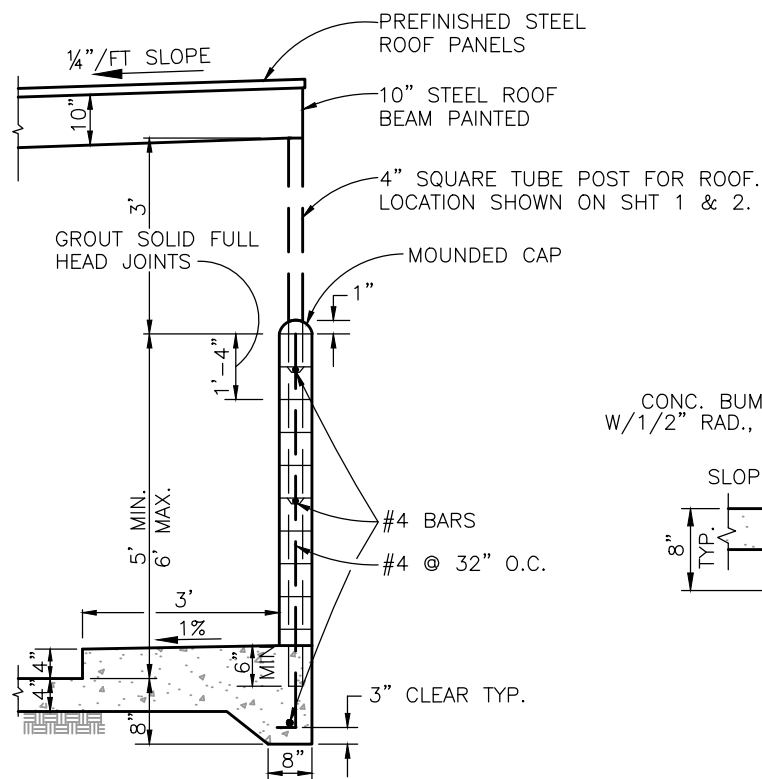
R.C.E. 52125 Exp.12-31-16

B-502

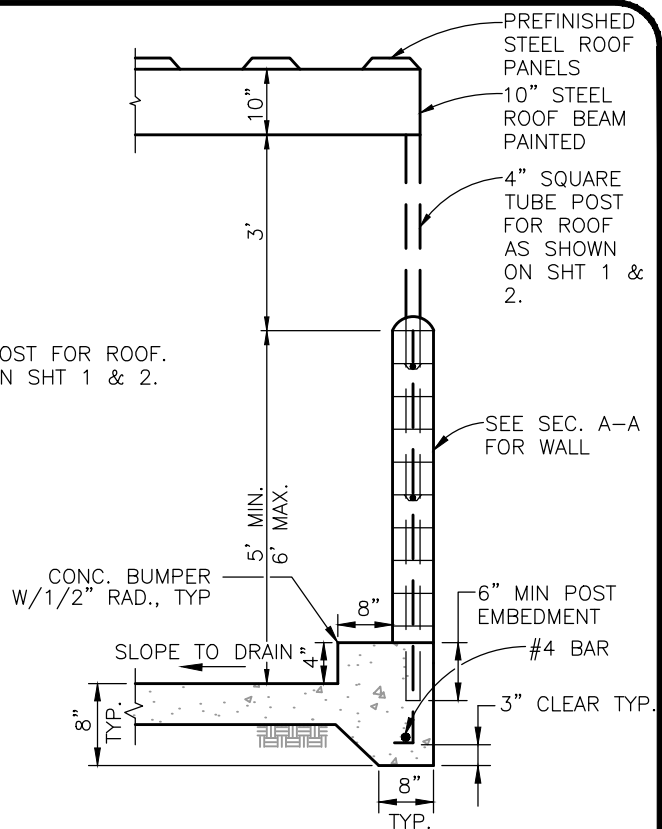
SHEET 2 OF 4

NOTE:

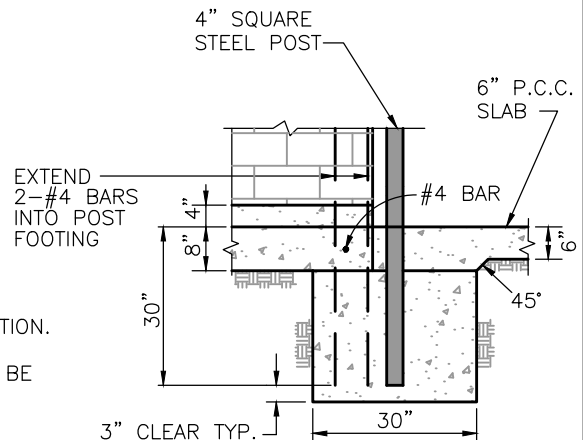
PLANNING DIVISION SHALL APPROVE
STYLE AND COLOR OF BLOCK PRIOR
TO CONSTRUCTION.



SECTION A-A



SECTION B-B



SECTION C-C

NOTES:

1. LOCATION SHALL BE APPROVED BY THE PUBLIC WORKS DEPARTMENT.
2. AREAS SHALL BE ACCESSIBLE FOR DELIVERY AND COLLECTION.
3. GATES SHALL BE CORRUGATED METAL DOORS, AND MUST BE APPROVED BY PUBLIC WORKS DEPARTMENT PRIOR TO INSTALLATION.
4. GATE LATCHES SHALL BE OF THE PLUNGER BAR TYPE OR EQUIVALENT AS APPROVED BY THE PUBLIC WORKS DEPARTMENT.
5. PLANNING SERVICES DIVISION SHALL APPROVE BLOCK, GATE AND ROOF COLOR & STYLE AND ANY OTHER MODIFICATIONS PRIOR TO CONSTRUCTION. CALL 714-741-5312.
6. SEE SPECIFICATIONS, NOTES, AND INSPECTION SCHEDULING ON SHEET 4 OF 4.



City of
Garden Grove
California

REFUSE STORAGE ENCLOSURE

Approved

Date 12-8-15

REVISIONS

BY

DATE

STD. PLAN NUMBER

City Engineer

R.C.E. 52125 Exp. 12-31-16

B-502

SHEET 3 OF 4

MATERIAL SPECIFICATIONS:

1. CONCRETE BLOCK: 8" MINIMUM IN SIZE, ASTM C90.
2. REINFORCING STEEL: ASTM 615, GRADE 40.
3. ACCEPTABLE SOIL TYPES:
 - a. MIN. ALLOWABLE BEARING: 1000 LBS./SQ. FT.
 - b. MIN. LATERAL BEARING: 100 LBS./SQ. FT./FT.
 - c. MAX. EXPANSION INDEX: 20
4. CONCRETE: 2500 LBS./SQ. IN. IN 28 DAYS.
5. MORTAR: 1:1/4:3 (PORTLAND CEMENT: HYDRATED LIME OR LIME PUTTY: SAND, BY VOLUME), MIXED TO PLASTIC CONSISTENCY.
6. GROUT: 1:1/10:3 (PORTLAND CEMENT: HYDRATED LIME OR LIME PUTTY: SAND BY VOLUME), MIX TO FLOW WITHOUT SEGREGATION. GROUT MAY CONTAIN 2 PARTS PEA GRAVEL (3/8" MAX. SIZE). MINIMUM COMPRESSIVE STRENGTH: 2500 LBS./SQ. IN.

GENERAL NOTES:

1. THIS DESIGN IS FOR AVERAGE CONDITIONS AND MAY NOT BE SUITABLE FOR ALL CASES. IT IS RECOMMENDED THAT A LICENSED CIVIL OR STRUCTURAL ENGINEER BE CONSULTED.
2. FOOTINGS SHALL BE IN NATIVE SOIL OR CERTIFIED FILL.
3. BLOCKS SHALL BE STAGGERED (RUNNING BOND).
4. ALL CELLS CONTAINING REINFORCING STEEL SHALL BE GROUTED.
5. APPROVED GROUT STOPS ARE REQUIRED BELOW HORIZONTAL STEEL IN PARTIALLY GROUTED WALLS. BAGS, NEWSPAPERS, ETC. ARE NOT APPROVED GROUT STOPS.
6. INITIAL BED JOINT SHALL BE 1/4"MIN., 1"MAX. SUBSEQUENT BED JOINTS SHALL BE 1/4"MIN., 5/8"MAX.
7. VERTICAL CONTINUITY OF CELLS SHALL BE UNOBSTRUCTED. MORTAR PROJECTIONS SHALL NOT EXCEED 1/2" FOR 6" AND LARGER BLOCK. MORTAR DROPPINGS OR OTHER FOREIGN MATTER ARE NOT PERMITTED IN CELLS AND MUST BE REMOVED.
8. EXPANSION JOINTS REQUIRED AT 60'-0" MAX. INTERVALS.
9. REQUIRED BAR LAPS (IF ANY): 24" MIN
 - a. WIRE JOINT REINFORCEMENT IN THE MORTARED BED JOINT: 75 WIRE DIAMETERS OR IN ALTERNATE BED JOINTS OF RUNNING BOND, 54 DIAMETERS PLUS TWICE THE BED JOINT SPACING.
10. WHERE HORIZONTAL WIRE JOINT REINFORCEMENT IS REQUIRED OR UTILIZED, IT SHALL BE EQUIVALENT TO TWO 3/16" DIAMETER BARS CONNECTED AT 16" INTERVALS BY NO. 9 GAUGE WELDED WIRE.
11. 3"MIN. COVER REQUIRED FOR REINFORCEMENT IN CONCRETE WHICH IS CAST AGAINST EARTH.

INSPECTION SCHEDULING:

1. FOUNDATION: AFTER TRENCHES ARE DUG, STEEL IS TIED IN PLACE, AND BEFORE ANY CONCRETE IS POURED.
2. PREGROUT: AFTER ALL BLOCKS (EXCEPT CAP) ARE IN PLACE, VERTICAL AND HORIZONTAL STEEL IS IN PLACE, GROUT STOPS (FOR PARTIALLY GROUTED MASONRY) ARE IN PLACE, AND PRIOR TO GROUTING.
3. FINAL: AFTER GROUT IS IN PLACE AND PRIOR TO PLACEMENT OF CAP.



City of
Garden Grove
California

REFUSE STORAGE ENCLOSURE

Approved

Date 12-8-15

City Engineer

R.C.E. 52125 Exp.12-31-16

REVISIONS

BY

DATE

STD. PLAN NUMBER

B-502

SHEET 4 OF 4

MATERIAL SPECIFICATIONS:

1. CONCRETE BLOCK: ASTM C-90
2. REINFORCING STEEL: ASTM 615, GRADE 40
3. ACCEPTABLE SOIL TYPES:
 - a. MIN. ALLOWABLE BEARING: 1000 LBS./SQ. FT
 - b. MIN. LATERAL BEARING: 100 LBS./SQ. FT./FT
 - c. MAX. EXPANSION INDEX: 20
4. CONCRETE: 2500 LBS./SQ. IN. COMPRESSIVE STRENGTH IN 28 DAYS.
5. MORTAR: 1:1/4:3 (PORTLAND CEMENT: HYDRATED LIME OR LIME PUTTY: SAND, BY VOLUME). MIXED TO PLASTIC CONSISTENCY. MORTAR SHALL CONFORM TO ASTM C270 AND ARTICLES 2.1 AND 2.6A OF TMS 602/ACI 530.1/ASCE 6.
6. GROUT: 1:1/10:3 (PORTLAND CEMENT: HYDRATED LIME OR LIME PUTTY: SAND BY VOLUME), MIX TO FLOW WITHOUT SEGREGATION. GROUT MAY CONTAIN 2 PARTS PEA GRAVEL (3/8" MAX. SIZE). MINIMUM COMPRESSIVE STRENGTH: 2500 LBS./SQ. IN. GROUT SHALL COMPLY WITH ARTICLE 2.2 OF TMS 602/ACI 530.1/ASCE 6.

GENERAL NOTES:

1. THIS DESIGN IS FOR MAXIMUM 2' GRADE DIFFERENCE CONDITIONS AND MAY NOT BE SUITABLE FOR ALL CASES. IT IS RECOMMENDED THAT A LICENSED CIVIL OR STRUCTURAL ENGINEER BE CONSULTED.
2. CONCRETE MASONRY UNITS SHALL BE LAID IN RUNNING BOND. (BLOCKS ARE STAGGERED).
3. ALL CELLS CONTAINING REINFORCING STEEL SHALL BE GROUTED.
4. APPROVED GROUT STOPS ARE REQUIRED BELOW HORIZONTAL STEEL IN PARTIALLY GROUTED WALLS. BAGS, NEWSPAPERS, ETC. ARE NOT APPROVED GROUT STOPS.
5. INITIAL BED JOINT SHALL BE 1/4" MIN., 1" MAX. SUBSEQUENT BED JOINTS SHALL BE 1/4" MIN., 5/8" MAX.
6. VERTICAL CONTINUITY OF CELLS SHALL BE UNOBSTRUCTED. MORTAR PROJECTIONS SHALL NOT EXCEED 1/2" FOR 6" AND LARGER BLOCK. MORTAR DROPPINGS OR OTHER FOREIGN MATTER ARE NOT PERMITTED IN CELLS AND MUST BE REMOVED.
7. VERTICAL EXPANSION JOINTS REQUIRED AT 60'-0" MAX. INTERVALS.
8. REQUIRED BAR LAPS: 24" MINIMUM
 - a. VERTICAL STEEL: 30 BAR DIAMETERS.
 - b. HORIZONTAL STEEL: 40 BAR DIAMETERS.
 - c. WIRE JOINT REINFORCEMENT IN THE MORTARED BED JOINT: 75 WIRE DIAMETERS OR IN ALTERNATE BED JOINTS OF RUNNING BOND, 54 DIAMETERS PLUS TWICE THE BED JOINT SPACING.
9. WHERE HORIZONTAL WIRE JOINT REINFORCEMENT IS REQUIRED OR UTILIZED, IT SHALL BE EQUIVALENT TO TWO 3/16" DIAMETER BARS CONNECTED AT 16" INTERVALS BY NO. 9 GAUGE WELDED WIRE.
10. 3" MIN. COVER REQUIRED FOR REINFORCEMENT IN CONCRETE WHICH IS CAST AGAINST EARTH.
11. NO BACKFILL SHALL BE PLACED AGAINST RETAINING WALL FOR A MINIMUM OF 7 DAYS.
12. METHOD OF COMPACTION WITHIN 4ft. OF RETAINING WALL TO BE APPROVED BY BUILDING INSPECTOR PRIOR TO START OF WORK.
13. FOR 6" SLUMPSTONE, PROVIDE CLEANOUTS AT THE BASE OF ALL CELLS CONTAINING VERTICAL REINFORCEMENT. FIRST COURSE MAY BE BURIED TO HIDE CLEANOUTS.

INSPECTION PROCEDURES:

1. FOUNDATION: AFTER TRENCHES ARE DUG, STEEL IS TIED IN PLACE, AND BEFORE ANY CONCRETE IS POURED. PREGROUT: AFTER ALL BLOCKS (EXCEPT CAP) ARE IN PLACE, VERTICAL AND HORIZONTAL STEEL
2. IS IN PLACE, GROUT STOPS (FOR PARTIALLY GROUTED MASONRY) ARE IN PLACE, AND PRIOR TO GROUTING. INSPECTION OF RETAINING PORTION TO BE DONE SEPERATLY.
3. THE INSPECTION OF THE COMPACTED BACKFILL SHALL BE DONE SEPERATELY A MINIMUM OF SEVEN DAYS AFTER THE PREGROUT INSPECTION.
4. FINAL: AFTER GROUT IS IN PLACE AND PRIOR TO PLACEMENT OF CAP.



City of
Garden Grove
California

BLOCK WALL RETAINING 2' OF SOIL

Approved  Date 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS

BY

DATE

STD. PLAN NUMBER

B-504

SHEET 2 OF 2

USE BOND BEAM BLOCK BELOW TOP COURSE.
GROUT BOND BEAM AND TOP COURSES

CONTINUOUS #4 HORIZONTAL BAR
(BELOW TOP COURSE)—TYPICAL

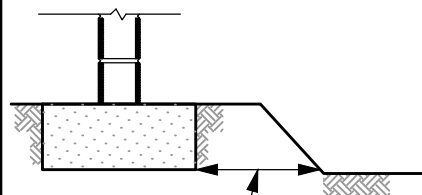
GROUT STOP (PLASTIC MESH)

VERTICAL REINFORCEMENT BAR (SEE
TABLE) 24" MIN LAP DISTANCE
6" OR 8" BLOCK

FINISH GRADE
1-#4 BAR CONTINUOUS (TYPICAL)

REVERSE DIRECTION EVERY OTHER BAR

ALL STEEL SHALL
BE A MINIMUM OF 3"
FROM EARTH



ALL FOOTINGS
SHALL BE A
MINIMUM 5'
TO DAYLIGHT

3"—CLEAR
TYP

VERTICAL REINFORCEMENT
SEE TABLE

SEE TABLE

SEE TABLE

SEE TABLE
"F"

SEE TABLE
"W2"

SEE TABLE
"W1"

SEE TABLE
VERTICAL
REINFORCEMENT

FILL CELLS SOLID WITH GROUT
WHERE STEEL OCCURS

"T" TYPE

"L" TYPE

"I" TYPE

DIMENSION AND REINFORCEMENT TABLE

	REINFORCEMENT BARS		"L" TYPE	"T" TYPE	"I" TYPE
"H"	VERTICAL	HORIZONTAL	"W1"	"W2"	"F"
3'	#4 @ 48"	AS SHOWN ABOVE AND ON SHEET 3	16"	22"	26"
4'	#4 @ 32"		20"	22"	30"
5'	#4 @ 32"		24"	22"	34"
6'	#4 @ 32"		30"	24"	38"
7'	#5 @ 32"		36"	28"	42"
8'	#5 @ 32"		42"	30"	46"



City of
Garden Grove
California

MINIMUM REQUIREMENTS FOR 6" OR 8" BLOCK WALL

Approved  Date 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS

BY

DATE

STD. PLAN NUMBER

B-505

SHEET 1 OF 3

MATERIAL SPECIFICATIONS:

1. CONCRETE BLOCK: ASTM C-90
2. REINFORCING STEEL: ASTM 615, GRADE 40
3. ACCEPTABLE SOIL TYPES:
 - a. MIN. ALLOWABLE BEARING: 1000 LBS./SQ. FT
 - b. MIN. LATERAL BEARING: 100 LBS./SQ. FT./FT
 - c. MAX. EXPANSION INDEX: 20
4. CONCRETE: 2500 LBS./SQ. IN. COMPRESSIVE STRENGTH IN 28 DAYS.
5. MORTAR: 1:1/4:3 (PORTLAND CEMENT: HYDRATED LIME OR LIME PUTTY: SAND, BY VOLUME), MIXED TO PLASTIC CONSISTENCY. MORTAR SHALL CONFORM TO ASTM C270 AND ARTICLES 2.1 AND 2.6A OF TMS 602/ACI 530.1/ASCE 6.
6. GROUT: 1:1/10:3 (PORTLAND CEMENT: HYDRATED LIME OR LIME PUTTY: SAND BY VOLUME), MIX TO FLOW WITHOUT SEGREGATION. GROUT MAY CONTAIN 2 PARTS PEA GRAVEL (3/8" MAX. SIZE). MINIMUM COMPRESSIVE STRENGTH: 2500 LBS./SQ. IN. GROUT SHALL COMPLY WITH ARTICLE 2.2 OF TMS 602/ACI 530.1/ASCE 6.

GENERAL NOTES:

1. THIS DESIGN IS FOR AVERAGE CONDITIONS AND MAY NOT BE SUITABLE FOR ALL CASES. IT IS RECOMMENDED THAT A LICENSED CIVIL OR STRUCTURAL ENGINEER BE CONSULTED.
2. CONCRETE MASONRY UNITS SHALL BE LAID IN RUNNING BOND. (BLOCKS ARE STAGGERED).
3. ALL VERTICAL CELLS CONTAINING REINFORCING STEEL SHALL BE GROUTED.
4. APPROVED GROUT STOPS ARE REQUIRED BELOW HORIZONTAL STEEL IN PARTIALLY GROUTED WALLS. BAGS, NEWSPAPERS, ETC. ARE NOT APPROVED GROUT STOPS.
5. INITIAL BED JOINT SHALL BE 1/4" MIN., 1" MAX. SUBSEQUENT BED JOINTS SHALL BE 1/4" MIN., 5/8" MAX.
6. VERTICAL CONTINUITY OF CELLS SHALL BE UNOBSTRUCTED. MORTAR PROJECTIONS SHALL NOT EXCEED 1/2" FOR 6" AND LARGER BLOCK. MORTAR DROPPINGS OR OTHER FOREIGN MATTER ARE NOT PERMITTED IN CELLS AND MUST BE REMOVED.
7. VERTICAL EXPANSION JOINTS REQUIRED AT 60'-0" MAX. INTERVALS.
8. REQUIRED BAR LAPS: 24" MINIMUM
 - a. VERTICAL STEEL: 30 BAR DIAMETERS.
 - b. HORIZONTAL STEEL: 40 BAR DIAMETERS.
 - c. WIRE JOINT REINFORCEMENT IN THE MORTARED BED JOINT: 75 WIRE DIAMETERS OR IN ALTERNATE BED JOINTS OF RUNNING BOND, 54 DIAMETERS PLUS TWICE THE BED JOINT SPACING.
9. WHERE HORIZONTAL WIRE JOINT REINFORCEMENT IS REQUIRED OR UTILIZED, IT SHALL BE EQUIVALENT TO TWO 3/16" DIAMETER BARS CONNECTED AT 16" INTERVALS BY NO. 9 GAUGE WELDED WIRE.
10. 3" MIN. COVER REQUIRED FOR REINFORCEMENT IN CONCRETE WHICH IS CAST AGAINST EARTH. NO BACKFILL TO BE PLACED AGAINST RETAINING WALL FOR A MINIMUM OF 7 DAYS.
11. METHOD OF COMPACTION WITHIN 4ft. OF RETAINING WALL TO BE APPROVED BY BUILDING INSPECTOR
12. PRIOR TO START OF WORK. FOR 6" SLUMPSTONE, PROVIDE CLEANOUTS AT THE BASE OF ALL CELLS CONTAINING VERTICAL REINFORCEMENT.
13. FIRST COURSE MAY BE BURIED TO HIDE CLEANOUTS.

INSPECTION PROCEDURES:

- INSPECTION REQUESTS SHALL BE MADE BEFORE 4:00 PM ON THE BUSINESS DAY PRIOR TO THE DESIRED INSPECTION DATE.
1. FOUNDATION: AFTER TRENCHES ARE DUG, STEEL IS TIED IN PLACE, AND BEFORE ANY CONCRETE IS POURED.
 2. PREGROUT: AFTER ALL BLOCKS (EXCEPT CAP) ARE IN PLACE, VERTICAL AND HORIZONTAL STEEL IS IN PLACE, GROUT STOPS (FOR PARTIALLY GROUTED MASONRY) ARE IN PLACE, AND PRIOR TO GROUTING. INSPECTION OF RETAINING PORTION TO BE DONE SEPARATELY.
 3. FINAL: AFTER GROUT IS IN PLACE AND PRIOR TO PLACEMENT OF CAP.



City of
Garden Grove
California

MINIMUM REQUIREMENTS FOR 6" OR 8" BLOCK WALL

Approved  Date 12-8-15
City Engineer R.C.E. 52125 Exp.12-31-16

REVISIONS

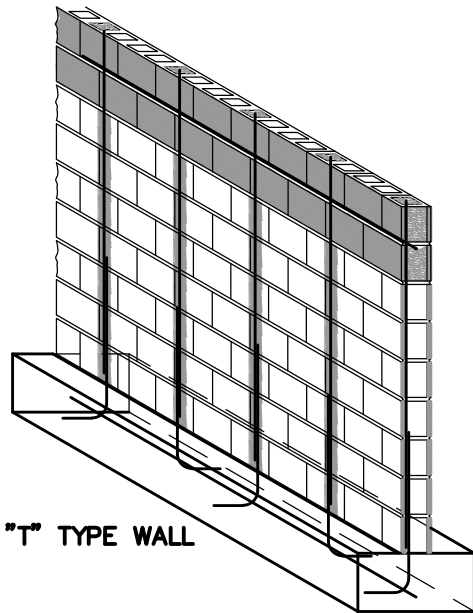
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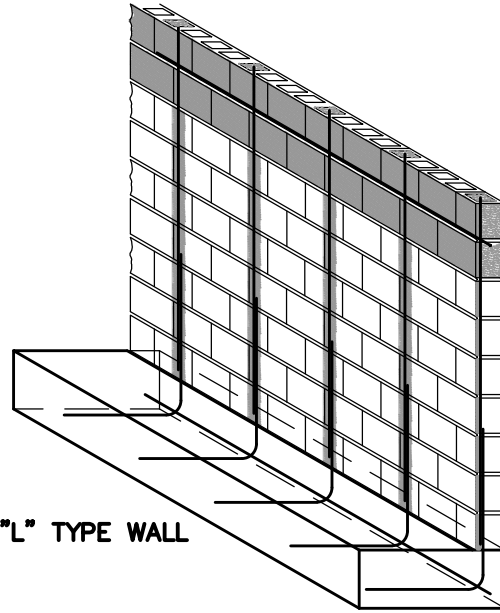
STD. PLAN NUMBER

B-505

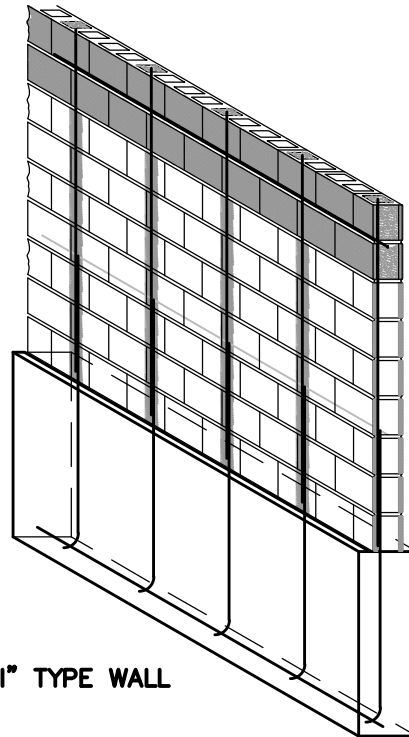
SHEET 2 OF 3



"T" TYPE WALL



"L" TYPE WALL



"I" TYPE WALL

NOTE:

THIS DETAIL IS PROVIDED AS A COURTESY TO ASSIST IN THE CONSTRUCTION OF A TYPICAL PRIVACY WALL ON PRIVATE PROPERTY AND MAY NOT BE SUITABLE FOR ALL CONDITIONS. PERMIT APPLICANTS WISHING TO USE THIS DETAIL SHOULD CONSULT WITH A PROPERLY LICENSED DESIGN PROFESSIONAL FOR SUITABILITY OF DESIGN PRIOR TO THE START OF CONSTRUCTION. SECTIONS OF WALLS MUST BE SHOWN ON PLANS. PLANNING DIVISION SHALL APPROVE STYLE AND COLOR OF BLOCK FOR ALL COMMERCIAL AND MULTI-FAMILY RESIDENTIAL DEVELOPMENTS PRIOR TO CONSTRUCTION.



City of
Garden Grove
California

MINIMUM REQUIREMENTS FOR 6" OR 8" BLOCK WALL

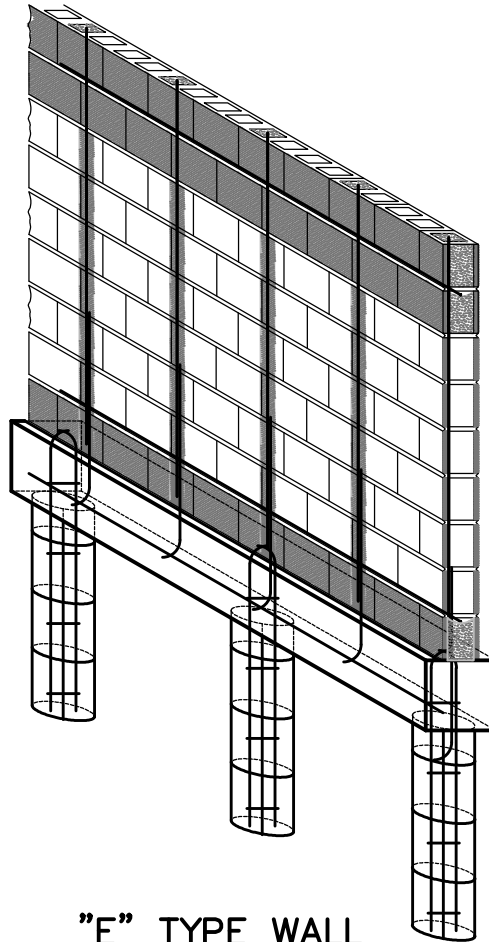
Approved  Date 12-8-15
City Engineer R.C.E. 52125 Exp.12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-505

SHEET 3 OF 3



"E" TYPE WALL

NOTES:

1)REFER TO STANDARD PLAN NUMBER B-505 FOR MATERIAL SPECIFICATIONS, GENERAL NOTES, AND INSPECTION PROCEDURES.

2) THIS DETAIL IS PROVIDED AS A COURTESY TO ASSIST IN THE CONSTRUCTION OF A TYPICAL PRIVACY WALL ON PRIVATE PROPERTY AND MAY NOT BE SUITABLE FOR ALL CONDITIONS. PERMIT APPLICANTS WISHING TO USE THIS DETAIL SHOULD CONSULT WITH A PROPERLY LICENSED DESIGN PROFESSIONAL FOR SUITABILITY OF DESIGN PRIOR TO THE START OF CONSTRUCTION.

PLANNING DIVISION SHALL APPROVE STYLE AND COLOR OF BLOCK FOR ALL COMMERCIAL AND MULTI-FAMILY RESIDENTIAL DEVELOPMENTS PRIOR TO CONSTRUCTION.



City of
Garden Grove
California

ALTERNATIVE FOOTING FOR WALL STANDARD No. 505

Approved  Date 12-8-15

City Engineer R.C.E. 52125 Exp.12-31-16

REVISIONS

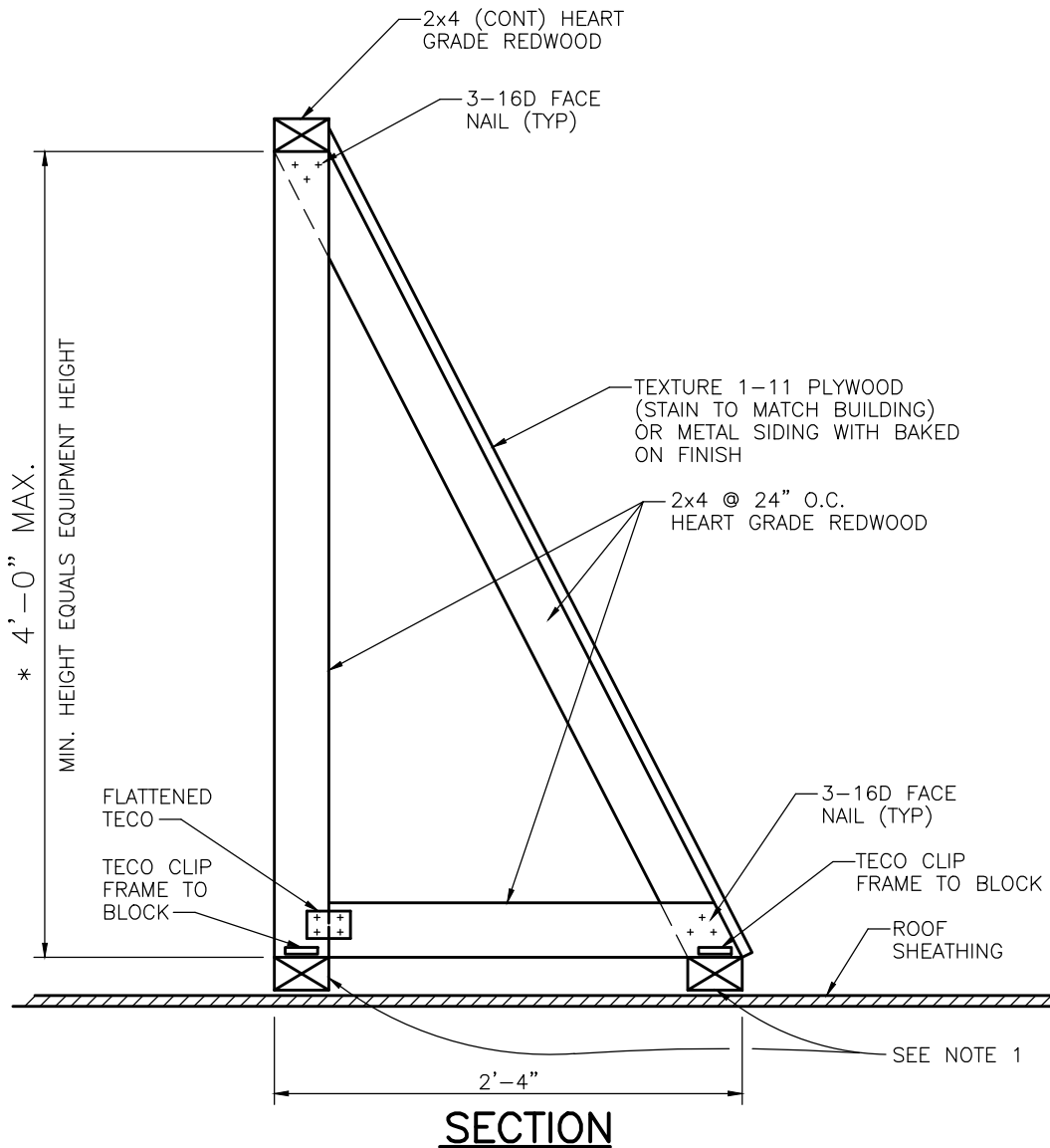
BY

DATE

STD. PLAN NUMBER

B-506

SHEET 2 OF 2



NOTES:

1. SET 2"x4"x24" LONG BLOCK IN MASTIC TYPICAL @ 48" O.C. ATTACH EACH BLOCK TO PURLINS OR SUBPURLINS WITH 2-3/8" DIA. x 5" LAG BOLTS. SEAL HEAD OF LAG BOLT WITH MASTIC. BLOCKS TO BE HEART GRADE REDWOOD.
2. ALL NAILS, SCREWS, BOLTS AND TECO CLIPS TO BE GALVANIZED METAL.
3. PROVIDE ACCESS GATE TO EQUIPMENT.

* OVER 4'-0" HIGH REQUIRES DETAILED PLAN



City of
Garden Grove
California

EQUIPMENT VIEW OBSCURING SCREEN DETAIL

Approved  Date 12-8-15

City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-507



SHEET 1 OF 2

MATERIAL SPECIFICATIONS:

1. CONCRETE BLOCK: ASTM C-90
2. REINFORCING STEEL: ASTM 615, GRADE 40
3. ACCEPTABLE SOIL TYPES:
 - a. MIN. ALLOWABLE BEARING: 1000 LBS./SQ. FT
 - b. MIN. LATERAL BEARING: 100 LBS./SQ. FT./FT
 - c. MAX. EXPANSION INDEX: 20
4. CONCRETE: 2500 LBS./SQ. IN. COMPRESSIVE STRENGTH IN 28 DAYS.
5. MORTAR: 1:1/4:3 (PORTLAND CEMENT: HYDRATED LIME OR LIME PUTTY: SAND, BY VOLUME), MIXED TO PLASTIC CONSISTENCY. MORTAR SHALL CONFORM TO ASTM C270 AND ARTICLES 2.1 AND 2.6A OF TMS 602/ACI 530.1/ASCE 6.
6. GROUT: 1:1/10:3 (PORTLAND CEMENT: HYDRATED LIME OR LIME PUTTY: SAND BY VOLUME), MIX TO FLOW WITHOUT SEGREGATION. GROUT MAY CONTAIN 2 PARTS PEA GRAVEL (3/8" MAX. SIZE). MINIMUM COMPRESSIVE STRENGTH: 2500 LBS./SQ. IN. GROUT SHALL COMPLY WITH ARTICLE 2.2 OF TMS 602/ACI 530.1/ASCE 6.

GENERAL NOTES:

1. THIS DESIGN IS FOR AVERAGE CONDITIONS AND MAY NOT BE SUITABLE FOR ALL CASES. IT IS RECOMMENDED THAT A LICENSED CIVIL OR STRUCTURAL ENGINEER BE CONSULTED.
2. FOOTINGS SHALL BE IN NATURAL SOIL OR CERTIFIED FILL.
3. BLOCKS TO BE STAGGERED (RUNNING BOND).
4. ALL CELLS SHALL BE GROUTED SOLID.
5. APPROVED GROUT STOPS, IF NECESSARY ARE REQUIRED BELOW HORIZONTAL STEEL IN PARTIALLY GROUTED WALLS. BAGS, NEWSPAPERS, ETC. ARE NOT APPROVED GROUT STOPS.
6. INITIAL BED JOINT SHALL BE 1/4"MIN., 1"MAX. SUBSEQUENT BED JOINTS SHALL BE 1/4"MIN., 5/8"MAX.
7. VERTICAL CONTINUITY OF CELLS SHALL BE UNOBSTRUCTED. MORTAR PROJECTIONS SHALL NOT EXCEED 1/2" FOR 6" AND LARGER BLOCK. MORTAR DROPPINGS OR OTHER FOREIGN MATTER ARE NOT PERMITTED IN CELLS AND MUST BE REMOVED.
8. EXPANSION JOINTS REQUIRED AT 60'-0" MAX. INTERVALS.
9. REQUIRED BAR LAPS (IF ANY): 24" MIN.
 - a. WIRE JOINT REINFORCEMENT IN THE MORTARED BED JOINT: 75 WIRE DIAMETERS OR IN ALTERNATE BED JOINTS OF RUNNING BOND, 54 DIAMETERS PLUS TWICE THE BED JOINT SPACING.
10. WHERE HORIZONTAL WIRE JOINT REINFORCEMENT IS REQUIRED OR UTILIZED, IT SHALL BE EQUIVALENT TO TWO 3/16" DIAMETER BARS CONNECTED AT 16" INTERVALS BY NO. 9 GAUGE WELDED WIRE.
11. 3"MIN. COVER REQUIRED FOR REINFORCEMENT IN CONCRETE WHICH IS CAST AGAINST EARTH.



City of
Garden Grove
California

GARDEN WALL

Approved

Date 12-8-15

City Engineer

R.C.E. 52125 Exp. 12-31-16

REVISIONS

BY

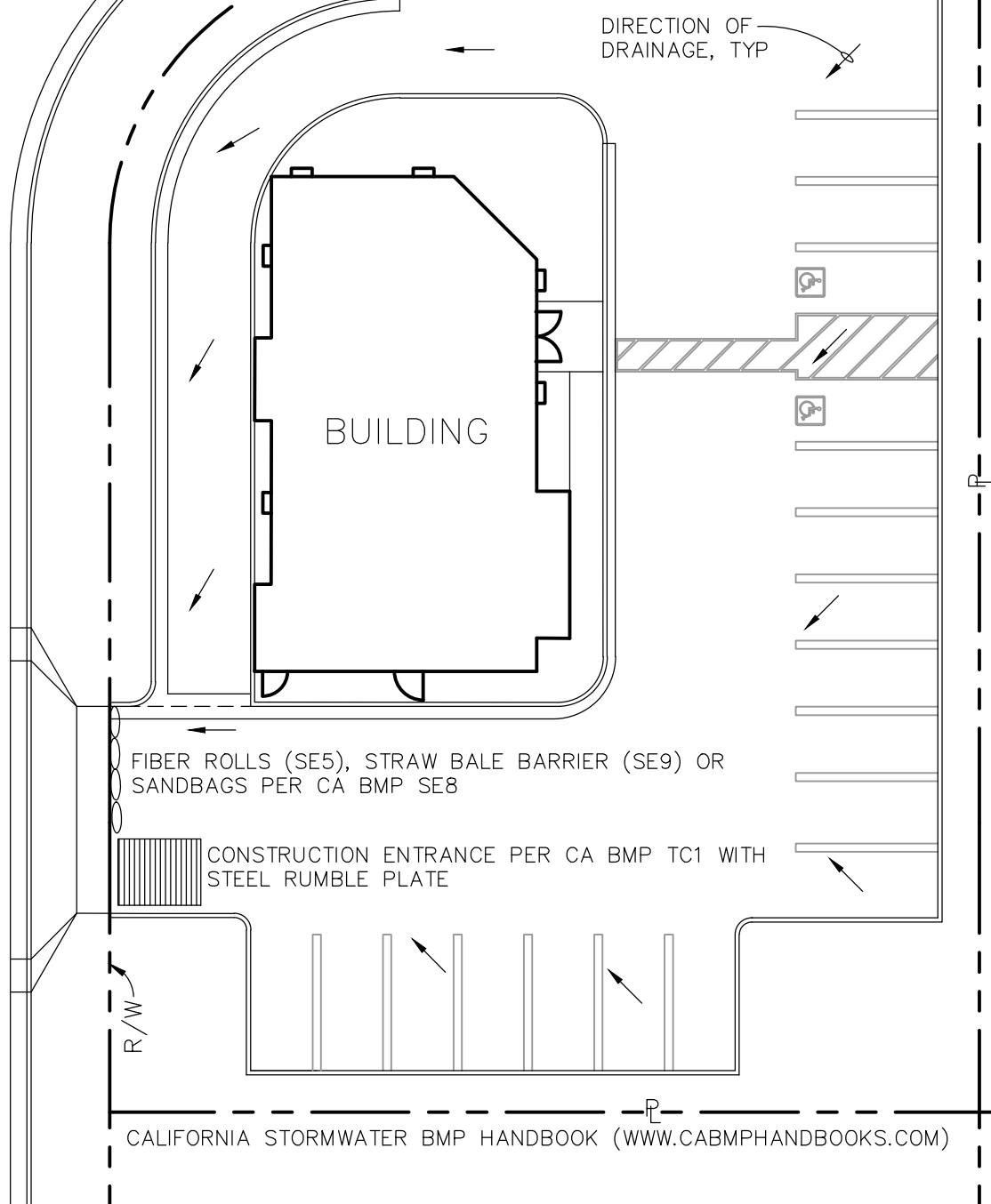
DATE

STD. PLAN NUMBER

B-508

SHEET 2 OF 2

NOTE: THESE SEDIMENT CONTROL MEASURES ARE MINIMUM REQUIREMENTS PRIOR TO CONSTRUCTION OF FINAL HARD SURFACES (PAVEMENT AND BUILDING SLAB). FOR PROJECTS ONE ACRE OR LARGER, THE CONTRACTOR SHALL PREPARE AND SUBMIT A SWPPP.



FIBER ROLLS (SE5), STRAW BALE BARRIER (SE9) OR SANDBAGS PER CA BMP SE8

CONSTRUCTION ENTRANCE PER CA BMP TC1 WITH STEEL RUMBLE PLATE

CALIFORNIA STORMWATER BMP HANDBOOK (WWW.CABMPHANDBOOKS.COM)



City of
Garden Grove
California

COMMERCIAL BMP DEVICES FOR BUILDING SITES LESS THAN 1.0 ACRE

Approved

Date 12-8-15

REVISIONS

BY

DATE

STD. PLAN NUMBER

City Engineer

R.C.E. 52125

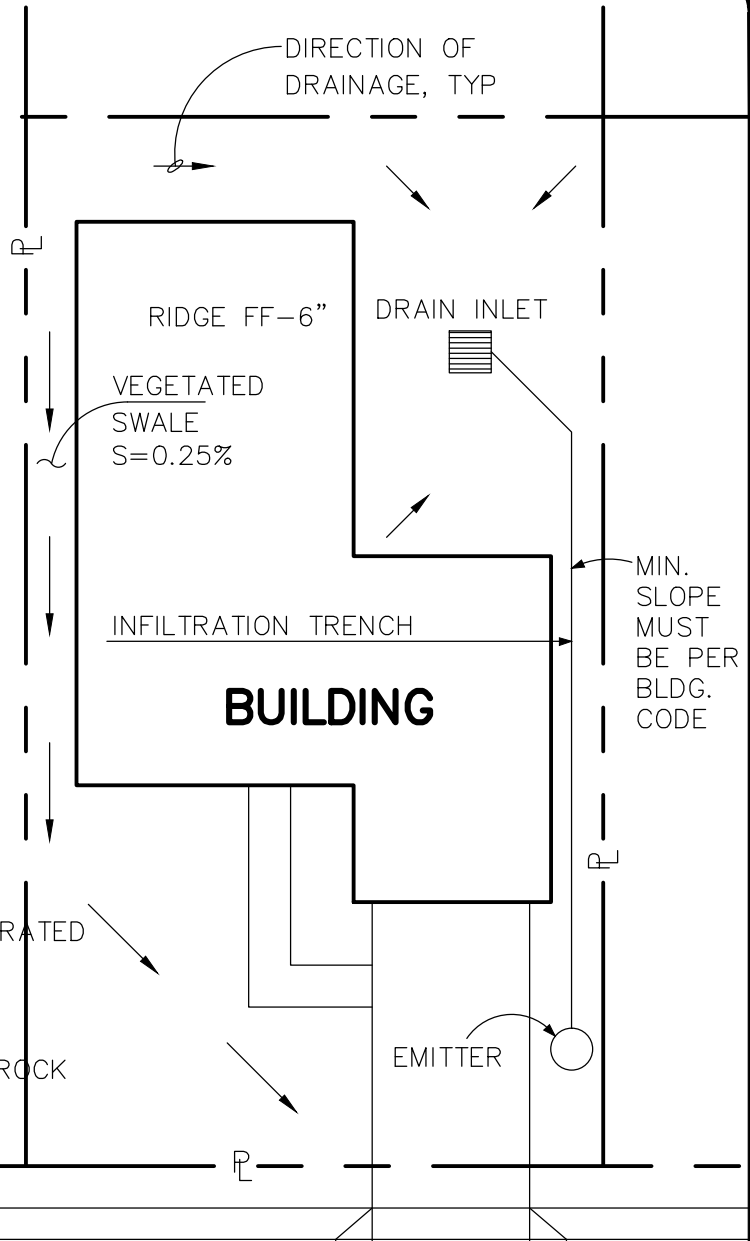
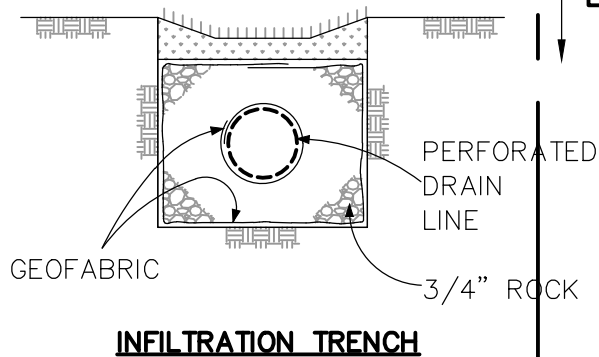
Exp.12-31-16

B-509

NOTE:

AT A MINIMUM, AN EROSION CONTROL PLAN IS REQUIRED FOR ALL GRADING AND CONSTRUCTION.

ONSITE DRAINAGE SYSTEM MAY INCLUDE AN INFILTRATION TRENCH — A PERFORATED DRAIN LINE WRAPPED IN GEOFABRIC CENTERED IN 3/4" ROCK BACKFILL



A RESIDENTIAL DWELLING MAY USE ANY COMBINATION OF THE FOLLOWING OPTIONS:

- INFILTRATION TRENCH PER CA BMP TC10
- VEGETATED SWALE PER CA BMP TC30

SEE CALIFORNIA STORMWATER BMP HANDBOOK (WWW.CABMPHANDBOOKS.COM)



City of
Garden Grove
California

RESIDENTIAL WATER QUALITY SYSTEMS

Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-510



GARDEN GROVE

SERIES B-700

WATER



SHEET 1 OF 2

NOTES:

1. PROVIDE 24" X 36" EXPANSION JOINT AROUND FIRE HYDRANT FOR NEW SIDEWALK CONSTRUCTION.
2. FIRE HYDRANT SHALL BE LOCATED A MINIMUM OF 5' FROM BCR, ECR, OR DRIVEWAY APPROACH.
3. 4" OUTLET TO BE FACING STREET, PERPENDICULAR TO CURB.
4. DISTANCE TO BE 5'-3" WHEN 4' SIDEWALK IS ADJACENT TO CURB. FOR MORE DETAIL, REFER TO STD PLAN B-705.
5. FOR ALL CASES, THE LOCATION OF FIRE HYDRANT SHALL MEET ADA REQUIREMENTS THAT A MINIMUM 48" CLEARANCE SHALL BE MAINTAINED FROM ANY OBSTRUCTION IN THE WALKWAY.
6. BREAK-AWAY FEATURES OTHER THAN BOLTS WILL NOT BE ALLOWED.
7. FIRE HYDRANT SHALL BE PAINTED IN ACCORDANCE WITH SECTION 2-14.
8. CONTRACTOR SHALL USE ADDITIONAL RESTRAINED BEND(S) NECESSARY TO AVOID OTHER EXISTING OR PROPOSED UTILITIES WHEN REQUIRED.
9. FOR ROLLED CURB, THE DISTANCE FROM THE EDGE OF PAVEMENT TO THE FIRE HYDRANT SHALL BE AS DIRECTED BY THE WATER SERVICES DIVISION.



City of
Garden Grove
California

WET BARREL FIRE HYDRANT COMMERCIAL/INDUSTRIAL

Approved

Date 12-8-15

City Engineer

R.C.E. 52125 Exp.12-31-16

REVISIONS

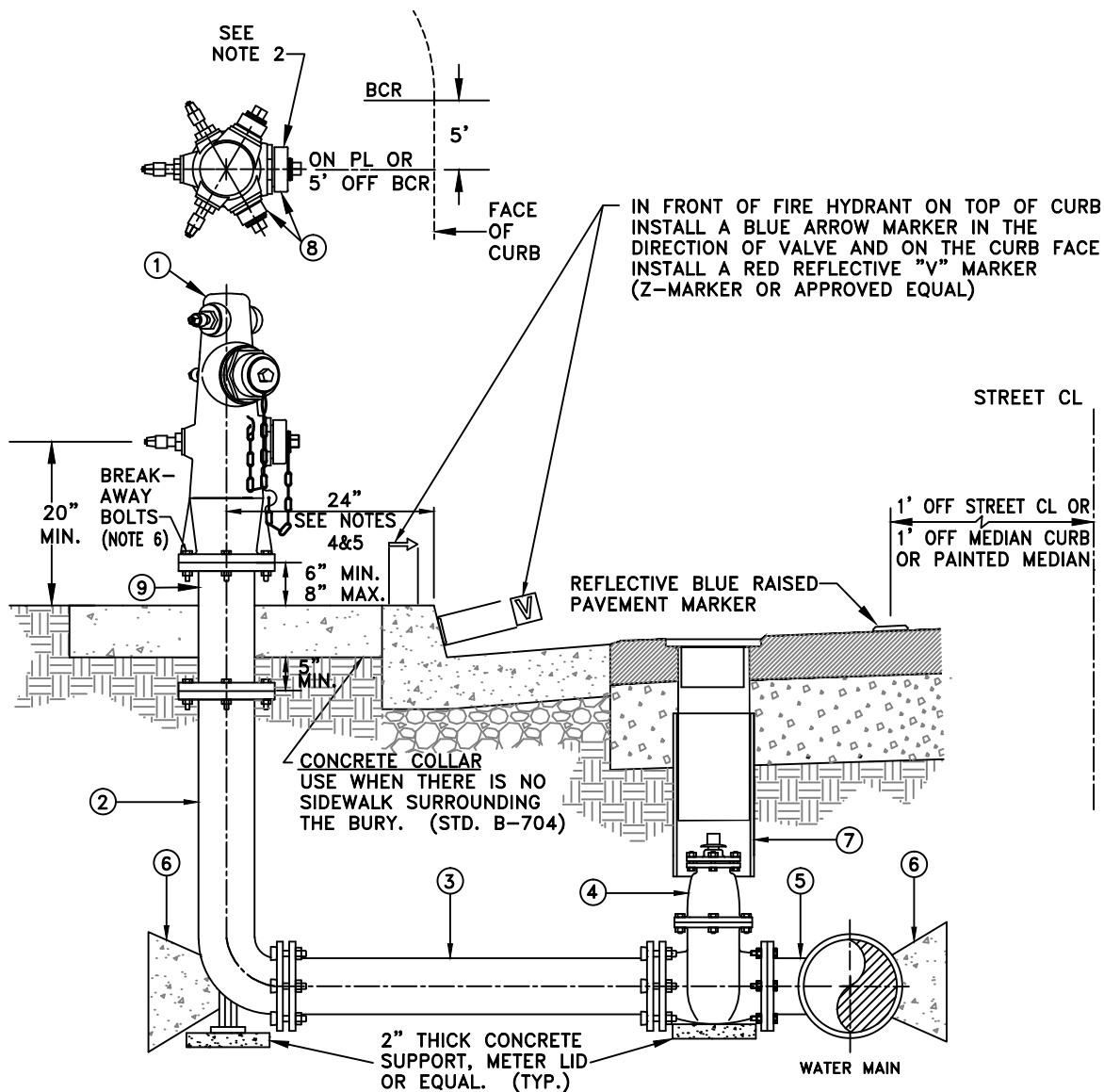
BY

DATE

STD. PLAN NUMBER

B-701

SHEET 2 OF 2



ALL UNDERGROUND BOLTS TO BE COATED WITH NO-OX-ID WATER WORKS OR APPROVED EQUAL

MATERIAL LIST

ITEM NO.	QUAN.	DESCRIPTION	MFR.
①	1	WET BARREL FIRE HYDRANT, (2) 2-1/2" AND (1) 4" OUTLETS; 1-1/2" PENTAGON OPERATING NUT; 6 BOLT PATTERN.	CLOW, MODEL F-860
②	1	MECHANICAL JOINT FIRE HYDRANT BURY W/ RESTRAINT IN 24", 30", 36", 42", & 48" LENGTHS AS NEEDED; 6 BOLT PATTERN.	CLOW OR APPROVED EQUAL
③	—	6" AWWA C900 PVC PIPE, DR14, CLASS 305, PER STD. B-763, AS REQUIRED	—
④	1	6" RESILIENT WEDGE GATE VALVE, FLG. x MJ W/ JOINT RESTRAINT	SEE SECTION 2-05.03
⑤	1	TEE OR TAPPING SLEEVE, TAPPING TO BE PER STD. B-750	—
⑥	—	THRUST BLOCK PER STD. B-710.	—
⑦	1	GATE VALVE CAN ASSEMBLY PER STD. B-752, B-753 IF WITHIN CONCRETE.	—
⑧	—	(1) 4" AND (2) 2-1/2" IRON PROTECTOR CAPS W/ 1-1/2" OPERATING NUTS AND CHAINS.	—
⑨	1	6" x 12", 18", OR 24" SOLID EXTENSION, WITH 6 BOLT PATTERN. (THIS SPOOL IS MANDATORY)	—



City of
Garden Grove
California

WET BARREL FIRE HYDRANT RESIDENTIAL

Approved  Date 12-8-15

City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS

BY

DATE

STD. PLAN NUMBER

B-702

SHEET 1 OF 2

NOTES:

1. PROVIDE 24" X 36" EXPANSION JOINT AROUND FIRE HYDRANT FOR NEW SIDEWALK CONSTRUCTION.
2. FIRE HYDRANT SHALL BE LOCATED A MINIMUM OF 5' FROM BCR, ECR, OR DRIVEWAY APPROACH.
3. 4" OUTLET TO BE FACING STREET, PERPENDICULAR TO CURB.
4. DISTANCE TO BE 5'-3" WHEN 4' SIDEWALK IS ADJACENT TO CURB. FOR MORE DETAIL, REFER TO STD PLAN B-705.
5. FOR ALL CASES, THE LOCATION OF FIRE HYDRANT SHALL MEET ADA REQUIREMENTS THAT A MINIMUM 48" CLEARANCE SHALL BE MAINTAINED FROM ANY OBSTRUCTION IN THE WALKWAY.
6. BREAK-AWAY FEATURES OTHER THAN BOLTS WILL NOT BE ALLOWED.
7. FIRE HYDRANT SHALL BE PAINTED IN ACCORDANCE WITH SECTION 2-14.
8. CONTRACTOR SHALL USE ADDITIONAL RESTRAINED BEND(S) NECESSARY TO AVOID OTHER EXISTING OR PROPOSED UTILITIES WHEN REQUIRED.
9. FOR ROLLED CURB, THE DISTANCE FROM THE EDGE OF PAVEMENT TO THE FIRE HYDRANT SHALL BE AS DIRECTED BY THE WATER SERVICES DIVISION.



City of
Garden Grove
California

WET BARREL FIRE HYDRANT RESIDENTIAL

Approved

Date 12-8-15

City Engineer

R.C.E. 52125 Exp.12-31-16

REVISIONS

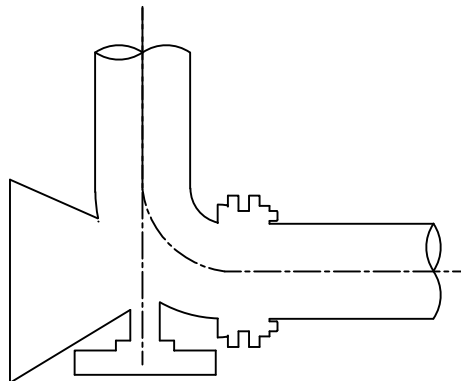
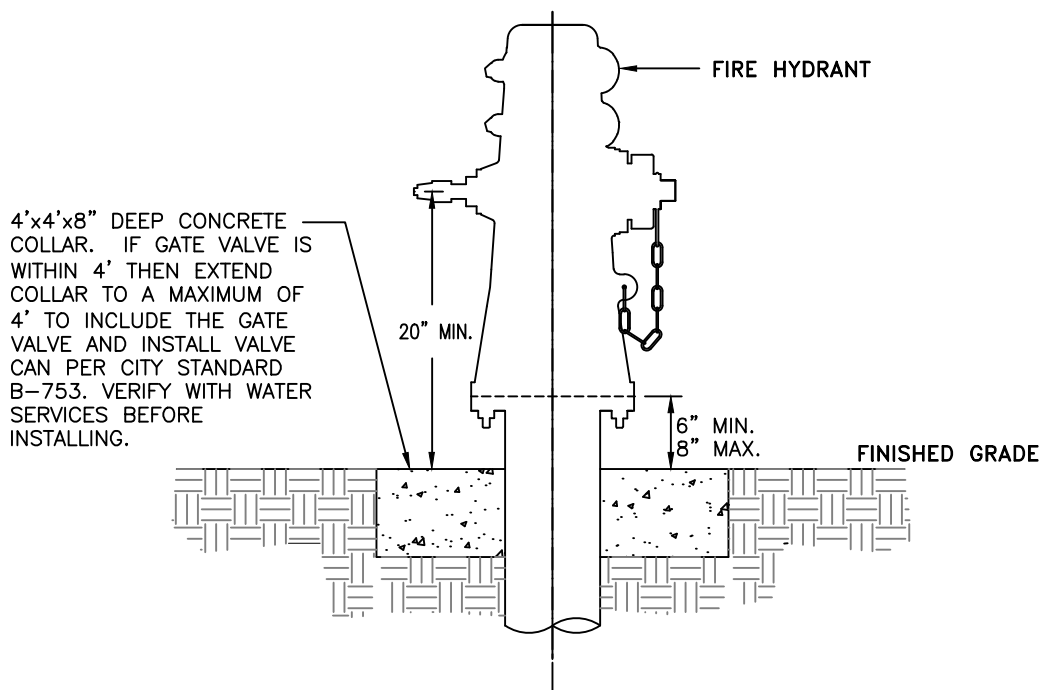
BY

DATE

STD. PLAN NUMBER

B-702

SHEET 2 OF 2



NOTES:

CONCRETE COLLAR NOT TO BE USED ON FIRE HYDRANTS WHERE THERE IS NO CONCRETE SIDEWALK UNLESS DIRECTED BY THE WATER SERVICES DIVISION.



City of
Garden Grove
California

CONCRETE COLLAR DETAIL

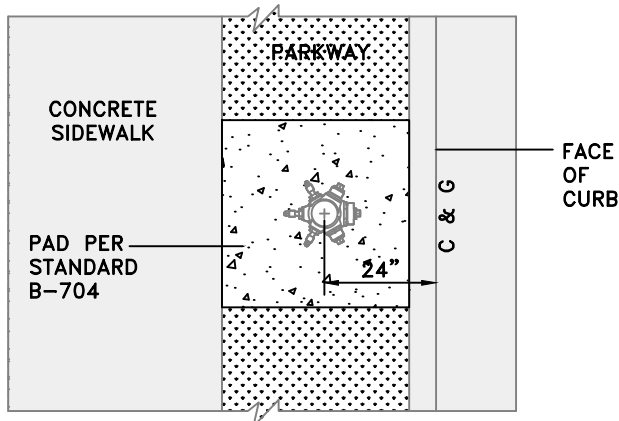
Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-704

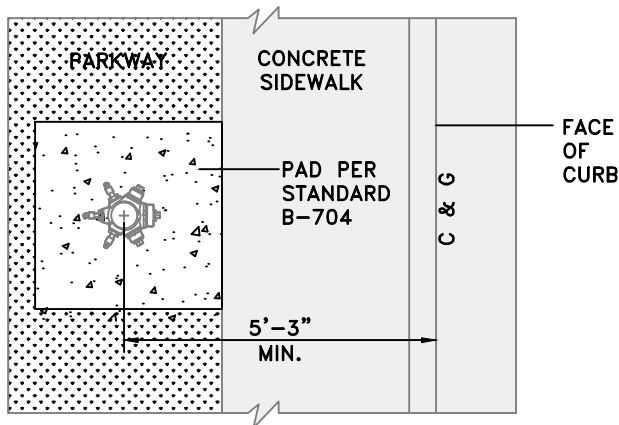
SHEET 1 OF 1



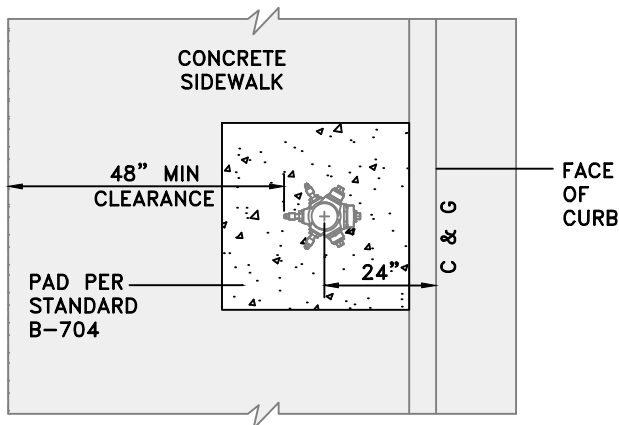
DETACHED SIDEWALK

NOTE:

FOR ALL CASES, THE LOCATION OF FIRE HYDRANT SHALL MEET ADA REQUIREMENTS THAT A MINIMUM 48" CLEARANCE SHALL BE MAINTAINED FROM ANY OBSTRUCTION IN THE WALKWAY.



4' WIDE ATTACHED SIDEWALK



6' OR WIDER SIDEWALK



City of
Garden Grove
California

FIRE HYDRANT SETBACK DETAIL

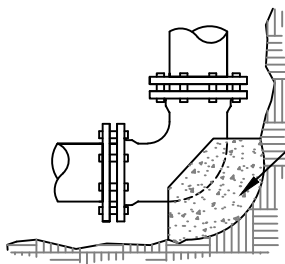
Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

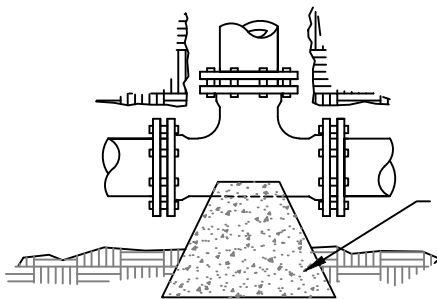
STD. PLAN NUMBER

B-705

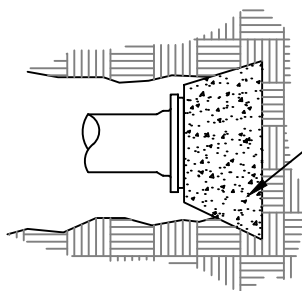
SHEET 1 OF 1



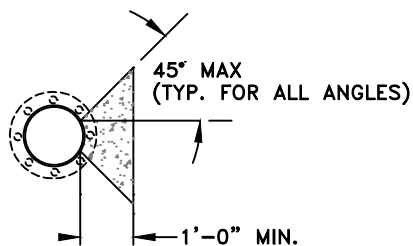
ANCHOR BLOCK FOR C.I. BEND



ANCHOR BLOCK FOR TEE OUTLET



ANCHOR BLOCK FOR DEAD END



TYPICAL SECTION THRU ANCHOR BLOCK

ANCHOR BLOCK AREA REQUIRED (SQ. FT.)	
FITTINGS	ALLOWABLE SOIL BEARING VALUE: 2000 LB/SQ.FT
6"-11 1/4" BEND	1.0
6"-22 1/2"	1.5
6"-45°	3.0
6"-90°	5.5
6"-TEE OUTLET	4.0
6"-DEAD END	4.0
8"-11 1/4" BEND	1.5
8"-22 1/2"	3.0
8"-45°	5.0
8"-90°	9.5
8"-TEE OUTLET	6.5
8"-DEAD END	6.5
10"-11 1/4" BEND	2.5
10"-22 1/2"	4.5
10"-45°	8.5
10"-90°	15.5
10"-TEE OUTLET	11.0
10"-DEAD END	11.0
12"-11 1/4"	3.0
12"-22 1/2"	6.0
12"-45°	12.0
12"-90°	22.0
12"-TEE OUTLET	15.0
12"-DEAD END	15.0

NOTES:

1. ANCHOR BLOCKS SHALL BE 560-C-3250 CONCRETE (GREENBOOK) AND POURED AGAINST UNDISTURBED SOIL.
2. ANCHOR BLOCK REQUIREMENTS ON ALL 4" FITTINGS ARE THE SAME AS FOR 6" FITTINGS.
3. CONCRETE SHALL HAVE 3" MINIMUM CLEARANCE AROUND ALL JOINTS.
4. FOR THRUST BLOCKS ON FITTINGS LARGER THAN 12" CONTACT WATER ENGINEER AT (714) 741-5395.



City of
Garden Grove
California

ANCHOR BLOCK DETAILS FOR 4" THRU 12" D.I. FITTINGS

Approved  Date 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS

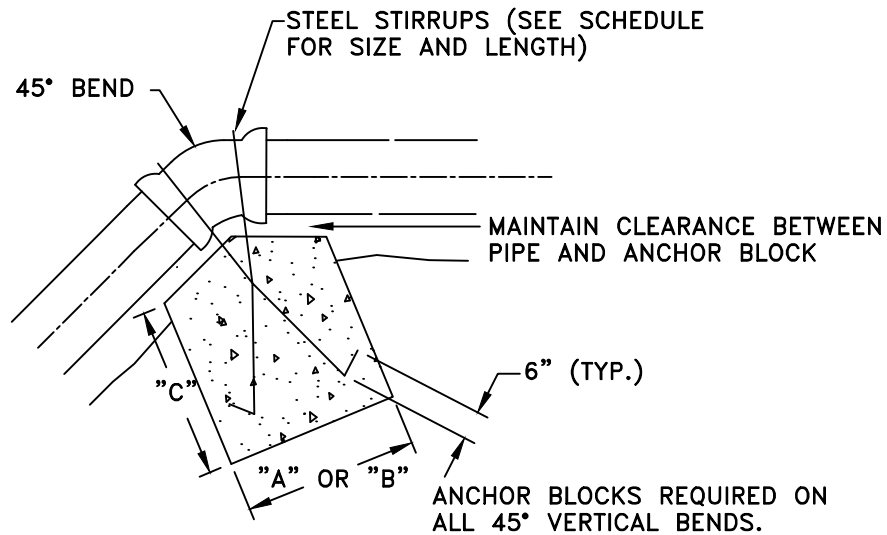
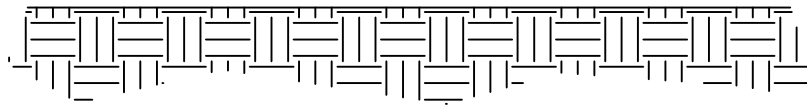
BY

DATE

STD. PLAN NUMBER

B-710

SHEET 1 OF 1



NOTES:

1. ANCHOR BLOCK SHALL BE 560-C-3250 CONCRETE (GREENBOOK) AND POURED AGAINST UNDISTURBED SOIL.
2. ALL STEEL STIRRUPS NOT EMBEDDED IN CONCRETE SHALL BE COATED WITH 1/8" THICK KOPPER BITUMASTIC #50 OR AS APPROVED BY THE ENGINEER.

SCHEDULE

CONCRETE ANCHOR BLOCK FOR 45° UPPER BEND AT VERTICAL OFFSET

FITTING	CONCRETE ANCHOR BLOCK			STEEL STIRRUPS		
	"A" LENGTH	"B" LENGTH	"C" LENGTH	SIZE	QUANTITY	LENGTH
4" & 6" x 45° BEND	2'-0"	2'-0"	2'-0"	NO. 4	2	8'-6"
8" x 45° BEND	2'-6"	2'-6"	2'-6"	NO. 4	2	9'-0"
10" x 45° BEND	3'-0"	3'-0"	3'-6"	NO. 4	2	11'-6"
12" x 45° BEND	4'-0"	4'-0"	4'-0"	NO. 4	2	12'-0"



City of
Garden Grove
California

**ANCHOR BLOCK DETAIL
FOR 45° VERTICAL BEND**

Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS

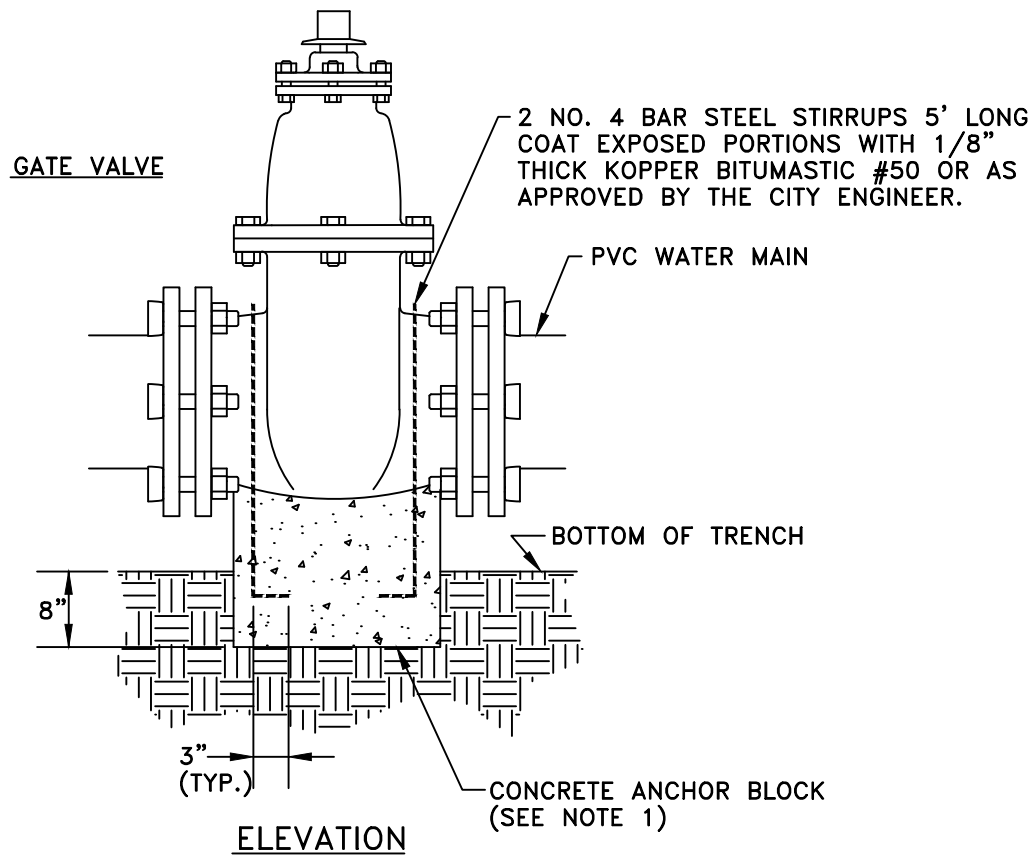
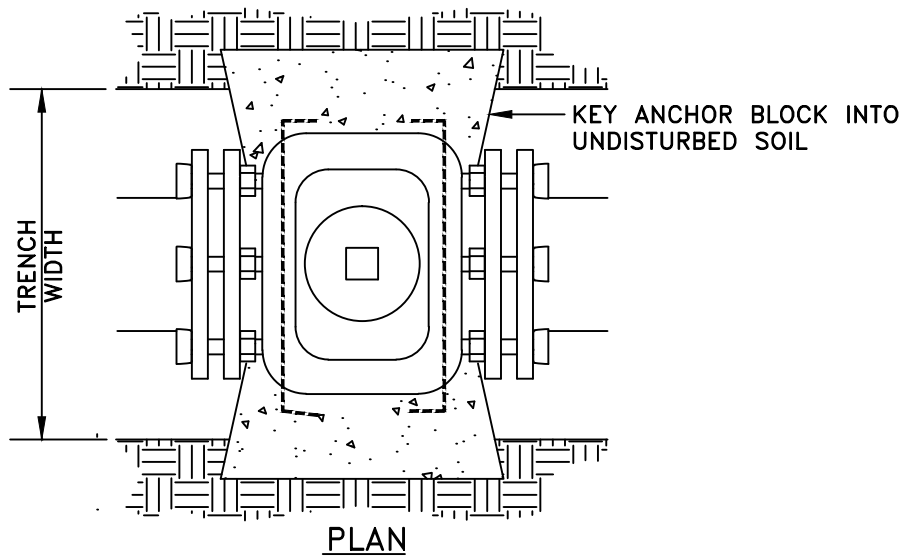
BY

DATE

STD. PLAN NUMBER

B-711

SHEET 1 OF 1




NOTES:

1. ANCHOR BLOCK SHALL BE 560-C-3250 CONCRETE (GREENBOOK) AND POURED AGAINST UNDISTURBED SOIL.



City of
Garden Grove
California

ANCHOR BLOCK DETAIL FOR PVC WATER MAIN VALVES

Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS

BY

DATE

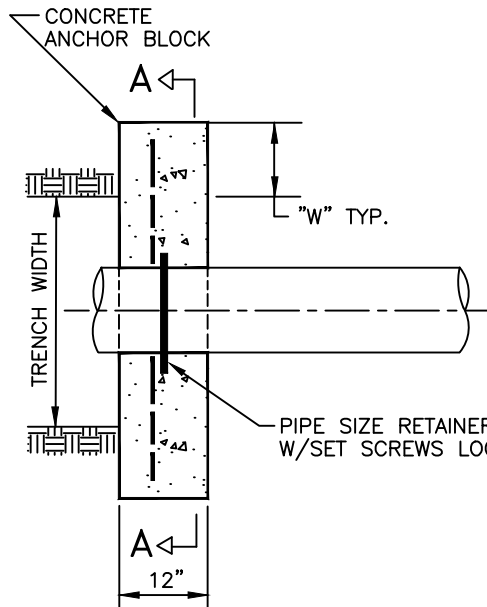
STD. PLAN NUMBER

B-712

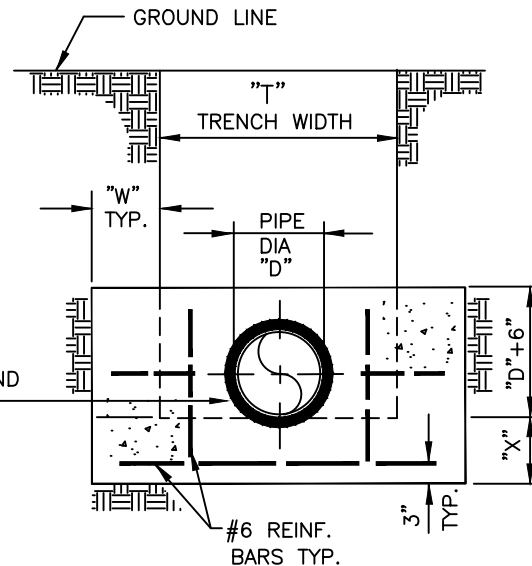
SHEET 1 OF 1

ANCHOR BLOCK DIMENSIONS

T	D	VARIABLE	STATIC WATER PRESSURE – PSI										
			100	110	120	130	140	150	160	170	180	190	200
30"	6"	AREA SF	2.1	2.3	2.5	2.8	3.0	3.2	3.4	3.6	3.8	4.0	4.2
		W (INCHES)	14	14	16	18	18	13	14	15	15	16	17
		X (INCHES)	0	0	0	0	0	6	6	6	6	6	6
30"	8"	AREA SF	3.8	4.1	4.5	4.9	5.3	5.7	6.0	6.4	6.8	7.2	7.5
		W (INCHES)	10	12	12	14	16	16	14	16	16	18	18
		X (INCHES)	6	6	6	6	6	6	9	9	9	9	9
30"	10"	AREA SF	5.9	6.5	7.1	7.7	8.2	8.8	9.4	10.0	10.6	11.2	11.8
		W (INCHES)	16	18	16	18	16	18	18	20	22	24	24
		X (INCHES)	6	6	9	9	12	12	12	12	12	12	12
36"	12"	AREA SF	8.5	9.3	10.2	11.0	11.9	12.7	13.6	14.4	15.3	16.1	17.0
		W (INCHES)	18	16	18	20	22	24	20	20	22	24	26
		X (INCHES)	9	12	12	12	12	12	18	18	18	18	18
36"	16"	AREA SF	15.1	16.6	18.1	19.6	21.1	22.6	24.1	25.6	27.1	28.7	30.2
		W (INCHES)	18	18	18	18	18	18	20	20	22	22	24
		X (INCHES)	15	15	18	21	25	30	30	30	30	30	30



PLAN



SECTION A-A

NOTES

1. ANCHOR BLOCK SHALL BE 560-C-3250 CONCRETE (GREEN BOOK)
2. ALL STEEL REINFORCEMENT BOLTS, ETC., IN CONTACT WITH THE SOIL SHALL BE COATED WITH BITUMASTIC OR APPROVED EQUAL
3. CONCRETE SHALL BE PORED AGAINST UNDISTURBED EARTH.
4. DIMENSIONS ARE BASED ON 1.5 TIMES STATIC WATER PRESSURE, 2000 P.S.F. SOIL BEARING CAPACITY PRESSURE & 60,000 LB. REINFORCE BAR TENSILE STRENGTH.



City of
Garden Grove
California

ANCHOR BLOCK DETAILS FOR 6" THRU 16" PIPE

Approved:  Date: 12-8-15

City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS

BY

DATE

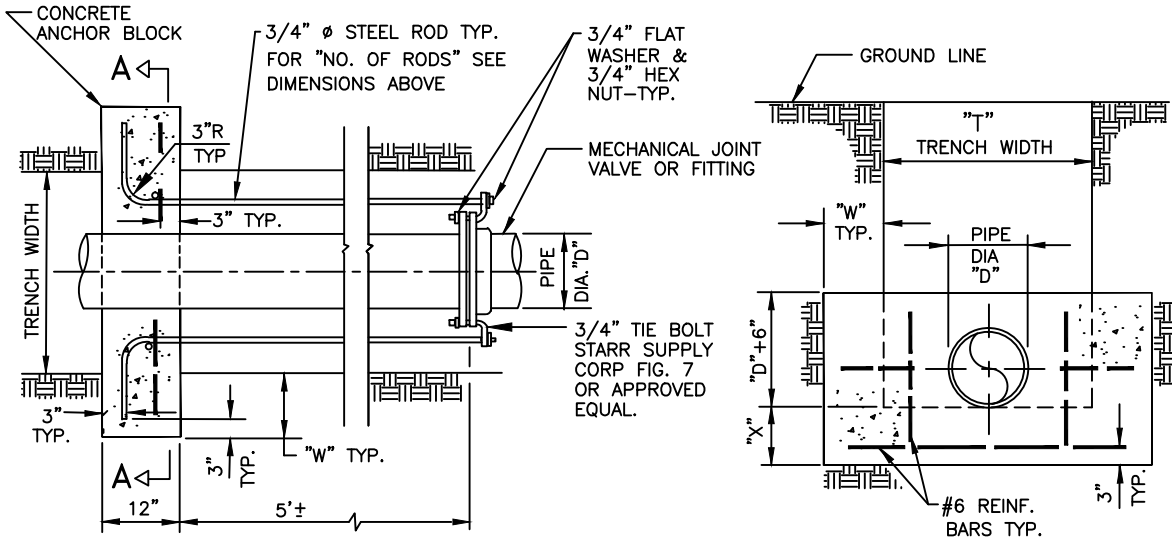
STD. PLAN NUMBER

B-713

SHEET 1 OF 1

ANCHOR BLOCK DIMENSIONS

T	D	VARIABLE	STATIC WATER PRESSURE — PSI										
			100	110	120	130	140	150	160	170	180	190	200
30"	6"	AREA SF	2.1	2.3	2.5	2.8	3.0	3.2	3.4	3.6	3.8	4.0	4.2
		W (INCHES)	14	14	16	18	18	10	10	10	12	12	12
		X (INCHES)	0	0	0	0	0	6	6	6	6	6	6
		NO. OF RODS	2	2	2	2	2	2	2	2	2	2	2
30"	8"	AREA SF	3.8	4.1	4.5	4.9	5.3	5.7	6.0	6.4	6.8	7.2	7.5
		W (INCHES)	10	12	12	14	16	16	14	16	16	18	18
		X (INCHES)	6	6	6	6	6	6	9	9	9	9	9
		NO. OF RODS	2	2	2	2	2	2	3	3	3	3	3
30"	10"	AREA SF	5.9	6.5	7.1	7.7	8.2	8.8	9.4	10.0	10.6	11.2	11.8
		W (INCHES)	16	18	16	18	16	18	18	20	22	24	24
		X (INCHES)	6	6	9	9	12	12	12	12	12	12	12
		NO. OF RODS	3	3	3	3	3	3	4	4	4	4	4
36"	12"	AREA SF	8.5	9.3	10.2	11.0	11.9	12.7	13.6	14.4	15.3	16.1	17.0
		W (INCHES)	18	16	18	20	22	24	20	20	22	24	26
		X (INCHES)	9	12	12	12	12	12	18	18	18	18	18
		NO. OF RODS	4	4	4	4	4	5	5	5	6	6	6
36"	16"	AREA SF	15.1	16.6	18.1	19.6	21.1	22.6	24.1	25.6	27.1	28.7	30.2
		W (INCHES)	18	18	18	18	18	18	20	20	22	22	24
		X (INCHES)	15	15	18	21	25	30	30	30	30	30	30
		NO. OF RODS	6	6	7	7	8	8	9	9	10	10	11



PLAN

SECTION A-A

NOTES

1. ANCHOR BLOCK SHALL BE 560-C-3250 CONCRETE (GREEN BOOK)
2. ALL STEEL REINFORCEMENT BOLTS, ETC., IN CONTACT WITH THE SOIL SHALL BE COATED WITH BITUMASTIC OR APPROVED EQUAL
3. CONCRETE SHALL BE PORED AGAINST UNDISTURBED EARTH.
4. DIMENSIONS ARE BASED ON 1.5 TIMES STATIC WATER PRESSURE, 2000 P.S.F. SOIL BEARING CAPACITY PRESSURE & 60,000 LB. REINFORCE BAR TENSILE STRENGTH.



City of
Garden Grove
California

REVERSE TIE ANCHOR BLOCK ASSEMBLY FOR 6" THRU 16" PIPE

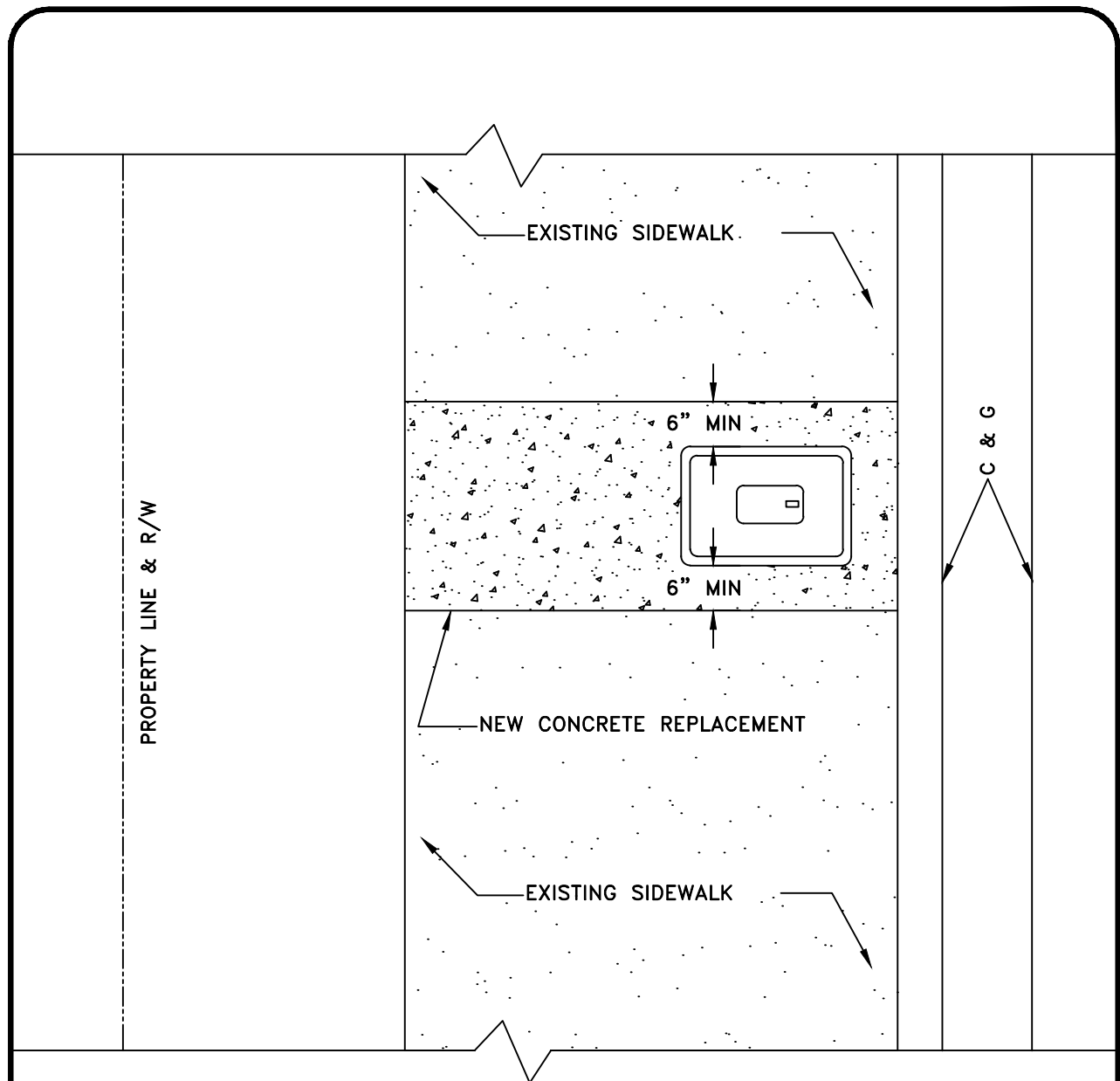
Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-714

SHEET 1 OF 1



NOTES:

1. INSTALL CONCRETE REPLACEMENT PER STANDARD PLAN B-105



City of
Garden Grove
California

METER BOX INSTALLATION WITH NEW CONCRETE REPLACEMENT

Approved

Date 12-8-15

City Engineer

R.C.E. 52125 Exp. 12-31-16

REVISIONS

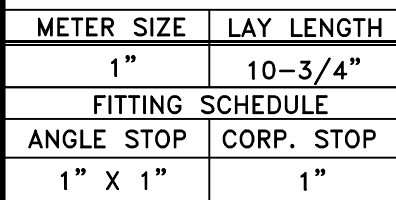
BY

DATE

STD. PLAN NUMBER

B-718

SHEET 1 OF 1

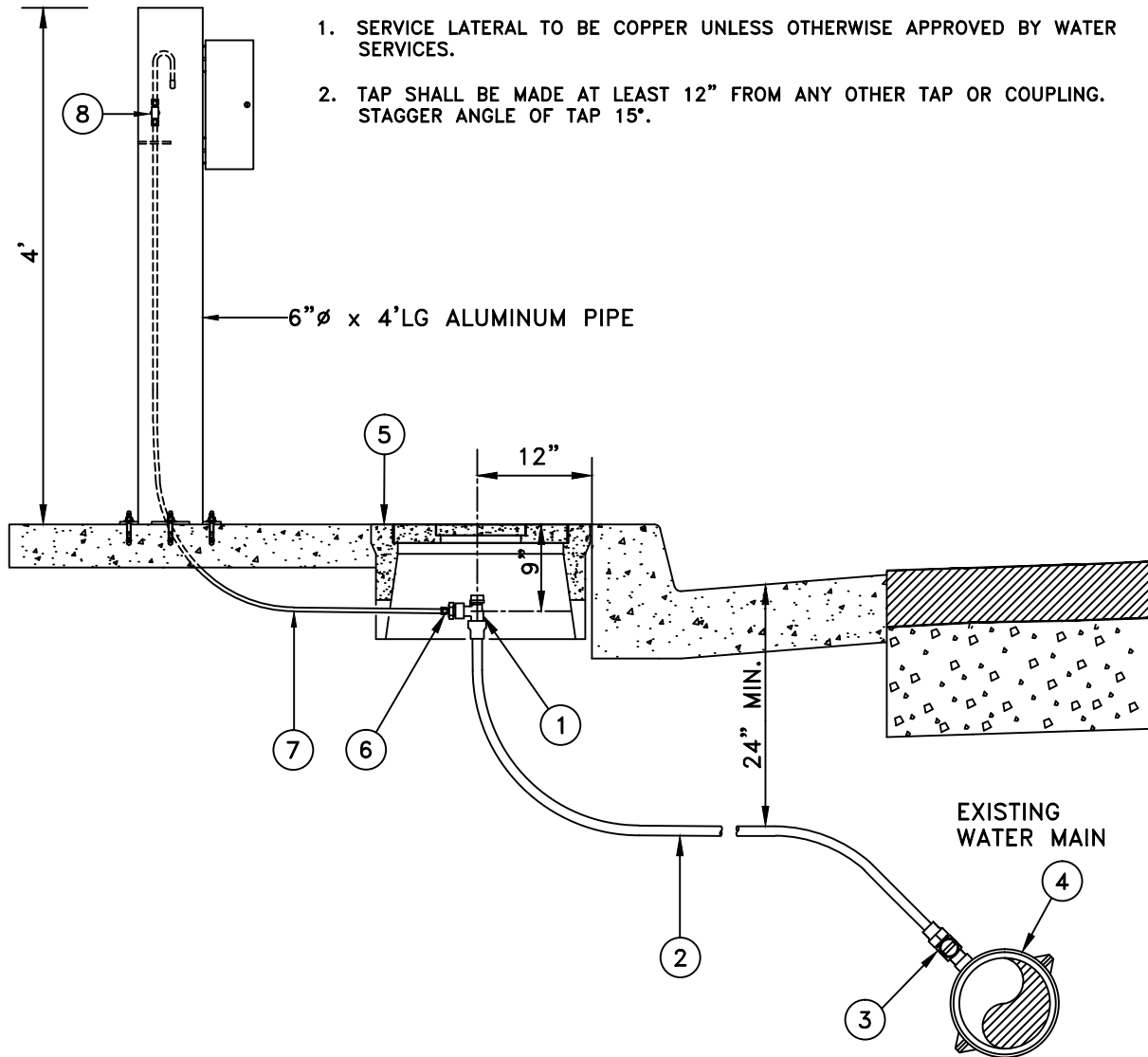


SHEET 1 OF 1

R.C.E. 52125 Exp.12-31-16

NOTES

1. SERVICE LATERAL TO BE COPPER UNLESS OTHERWISE APPROVED BY WATER SERVICES.
2. TAP SHALL BE MADE AT LEAST 12" FROM ANY OTHER TAP OR COUPLING. STAGGER ANGLE OF TAP 15°.



MATERIAL LIST

ITEM NO.	QUAN.	DESCRIPTION	MFR.
1	1	3/4" x 1" ANGLE METER VALVE COMPRESSION TYPE OR APPROVED EQUAL	MUELLER, JONES, OR FORD
2	AS NEEDED	1# SOFT COPPER TUBING, TYPE "K"	
3	1	1" CORPORATION STOP (COMPRESSION TYPE), BALL TYPE, C.C. THREAD	MUELLER, JONES, OR FORD
4	1	SERVICE SADDLE (FORD 202BS OR APPROVED EQUAL)	MUELLER, JONES, OR FORD
5	1	#37 METER BOX W/ 2 PIECE CONCRETE COVER	
6	1	3/4" MALE THREAD x 3/8" SWAGelok TUBING ADAPTER, STAINLESS STEEL	
7	AS NEEDED	3/8" STAINLESS STEEL TUBING	
8	1	3/8" SWAGelok BALL VALVE	



City of
Garden Grove
California

1" COPPER WATER SERVICE SAMPLE CONNECTION

Approved  Date 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS

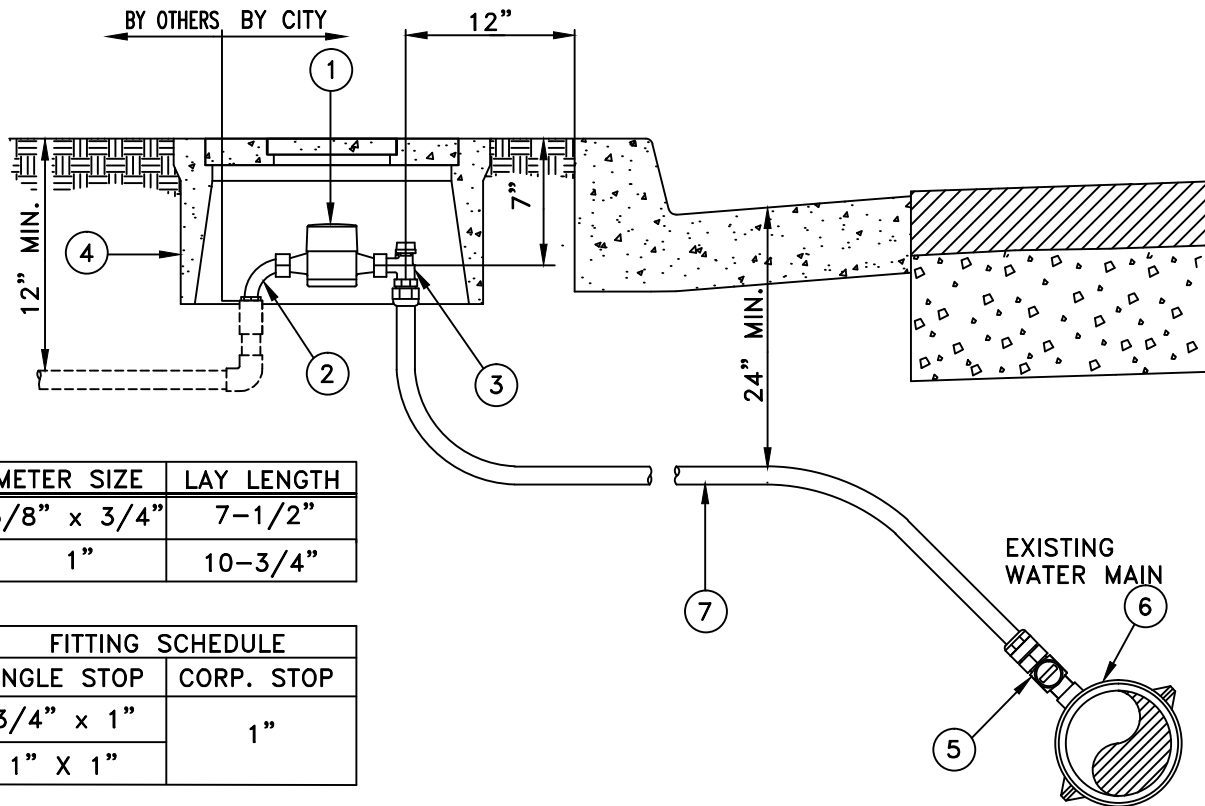
BY

DATE

STD. PLAN NUMBER

B-720

SHEET 1 OF 1



METER SIZE	LAY LENGTH
5/8" x 3/4"	7-1/2"
1"	10-3/4"

FITTING SCHEDULE	
ANGLE STOP	CORP. STOP
3/4" x 1"	1"
1" X 1"	

NOTES

1. ALL CITY SERVICES TO BE TYPE "K" SOFT COPPER.
2. TUBING TO BE ONE CONTINUOUS PIECE, NO SPLICES OR HEATING PERMITTED UNLESS APPROVED BY WATER SERVICES.
3. TAPS SHALL BE MADE AT LEAST 12" FROM ANY OTHER TAP OR COUPLING. STAGGER ANGLE OF TAPS MADE NEXT TO EACH OTHER 15°.
4. METER, METER BOX, ANGLE METER VALVE AND TAILPIECE, BY CITY AT CONTRACTOR'S EXPENSE, UNLESS OTHERWISE APPROVED.


MATERIAL LIST

ITEM NO.	QUAN.	DESCRIPTION	MFR.
①	1	5/8" OR 1" METER	SENSUS, SRII
②	1	3/4" OR 1" ANGLE METER COUPLING	
③	1	3/4" x 1" OR 1" x 1" ANGLE METER VALVE, COMPRESSION TYPE OR APPROVED EQUAL	MUELLER, JONES OR FORD
④	1	#37 METER BOX W/ 2 PC. CONCRETE COVER	
⑤	1	1" CORPORATION STOP (COMPRESSION TYPE), BALL TYPE, C.C. THREAD	MUELLER, JONES OR FORD
⑥	1	SERVICE SADDLE (FORD 202BS OR APPROVED EQUAL)	MUELLER, JONES OR FORD
⑦	AS NEEDED	1" SOFT COPPER TUBING, TYPE "K"	



City of
Garden Grove
California

1" COPPER WATER SERVICE INSTALLATION FOR 5/8" & 1" METERS

Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS

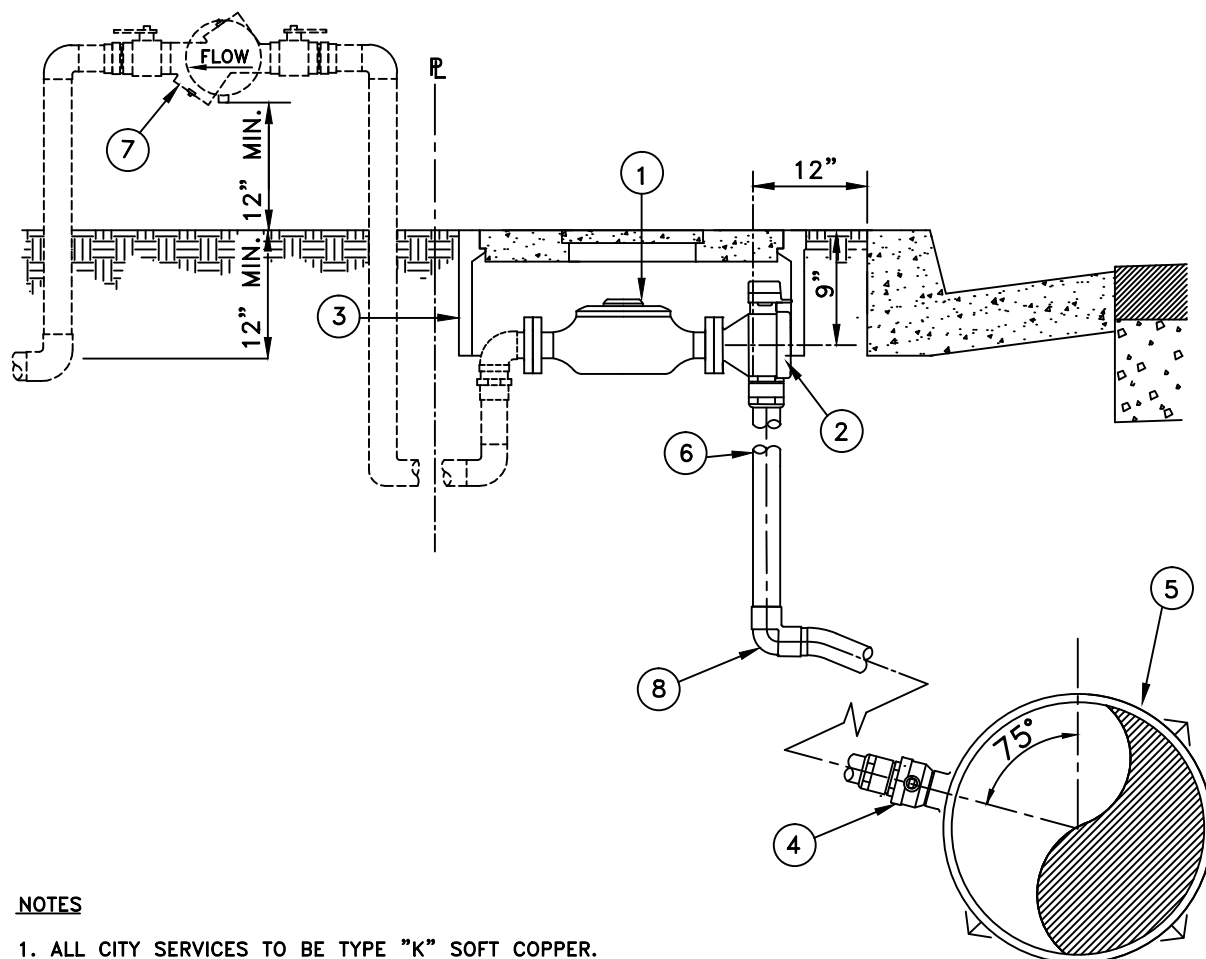
BY

DATE

STD. PLAN NUMBER

B-721

SHEET 1 OF 1



NOTES

1. ALL CITY SERVICES TO BE TYPE "K" SOFT COPPER.
2. TUBING TO BE ONE CONTINUOUS PIECE, NO SPLICES OR HEATING PERMITTED UNLESS APPROVED BY WATER SERVICES.
3. TAPS SHALL BE MADE AT LEAST 12" FROM ANY OTHER TAP OR COUPLING. STAGGER ANGLE OF TAPS MADE NEXT TO EACH OTHER 15°.
4. METER, METER BOX, ANGLE METER VALVE AND TAILPIECE, BY CITY AT CONTRACTOR'S EXPENSE, UNLESS OTHERWISE APPROVED.

MATERIAL LIST

ITEM NO.	QUAN.	DESCRIPTION	MFR.
(1)	1	1-1/2" OR 2" OMNI R2 100 CF 5 WHEEL METER.	SENSUS (DR)
(2)	1	GROUND KEY 2" ANGLE METER VALVE, COMPRESSION TYPE MUELLER OR APPROVED EQUAL	MUELLER, JONES OR FORD
(3)	1	#65 CONCRETE METER BOX W/ 2 PC. CONCRETE COVER	
(4)	1	2" CORPORATION STOP (COMPRESSION TYPE), BALL TYPE, C.C. THREAD	MUELLER, JONES OR FORD
(5)	1	SERVICE SADDLE (FORD 202BS OR APPROVED EQUAL)	MUELLER, JONES OR FORD
(6)	1	2"Ø SOFT COPPER TUBING (TYPE "K"), OR RIGID AS APPROVED BY THE ENGINEER	
(7)	1	REDUCED PRESSURE PRINCIPLE DEVICE PER STD B-771 (BY OTHERS)	
(8)	1	2" CU 45° OR 90° SLIP x SLIP	



City of
Garden Grove
California

1"-1/2" & 2" OMNI R2 - C2 METERS AND 2" COPPER WATER SERVICE INSTALLATION

Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS

BY

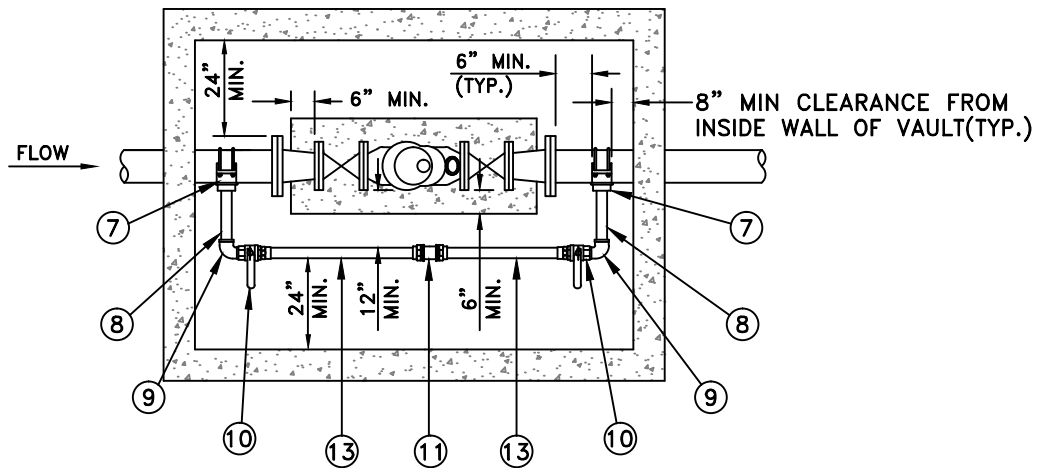
DATE

STD. PLAN NUMBER

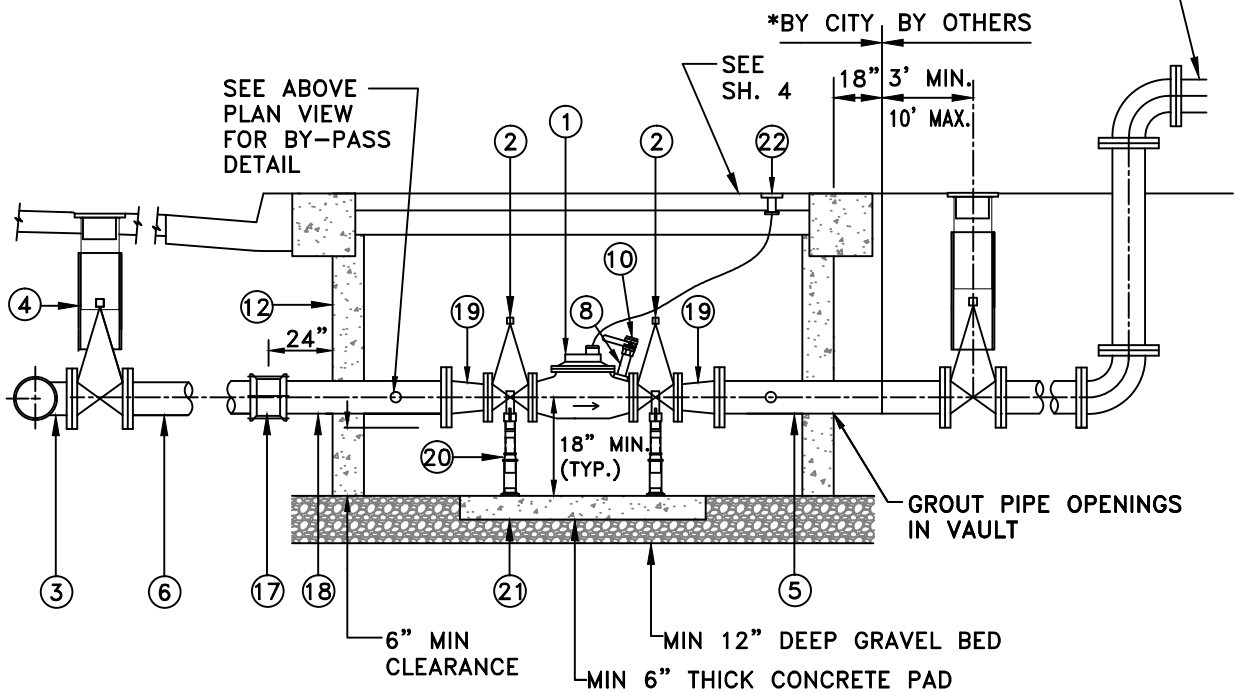
B-722

SHEET 1 OF 1

3" METER



REDUCED PRESSURE PRINCIPAL DEVICE (RPPD) PER CITY STD PLAN B-771, BY OTHERS



* DEVELOPER'S CONTRACTOR MAY BE RESPONSIBLE FOR INSTALLATION. DETERMINATION TO BE MADE BY CITY DURING PLAN CHECK PROCESS. INSTALLATION TO BE PER THIS STANDARD AND INSPECTED BY CITY. CONTRACTOR TO HAVE C-34, OR CLASS A LICENSE.

PROPERTY OWNER MUST OPEN A WATER ACCOUNT UPON INSTALLATION OF METER.



City of
Garden Grove
California

3", 4" & 6" COMPOUND WATER METER AND SERVICE INSTALLATION

Approved:  Date 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

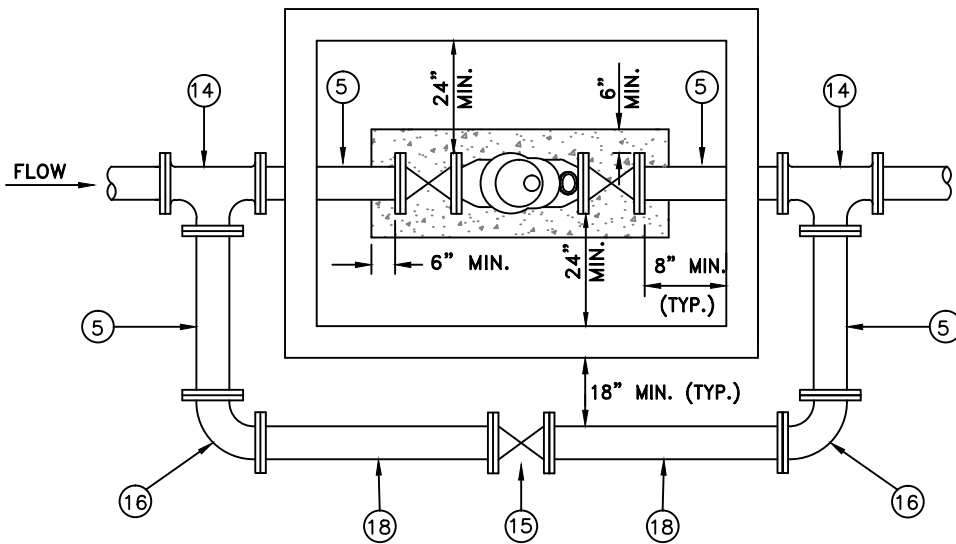
REVISIONS	BY	DATE

STD. PLAN NUMBER

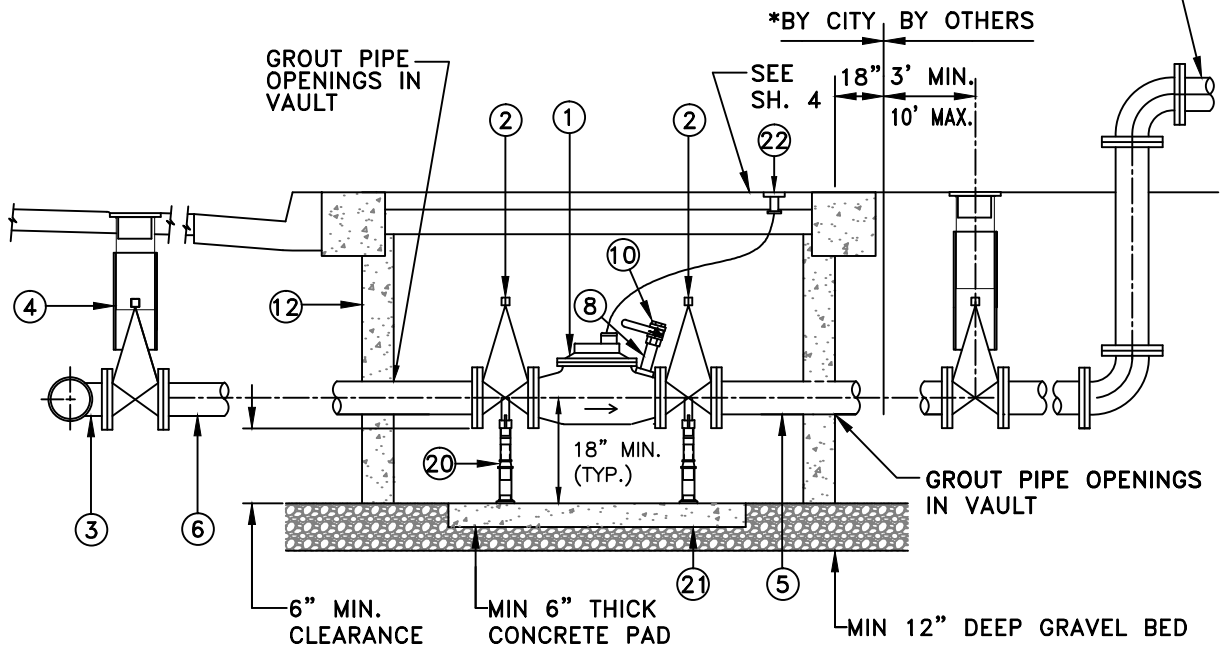
B-724

SHEET 1 OF 4

4" & 6" METER



REDUCED PRESSURE PRINCIPAL DEVICE
(RPPD) PER CITY STD PLAN B-771,
BY OTHERS



* DEVELOPER'S CONTRACTOR MAY BE RESPONSIBLE FOR INSTALLATION. DETERMINATION TO BE
MADE BY CITY DURING PLAN CHECK PROCESS. INSTALLATION TO BE PER THIS STANDARD
AND INSPECTED BY CITY. CONTRACTOR TO HAVE C-34, OR CLASS A LICENSE.

PROPERTY OWNER MUST OPEN A WATER ACCOUNT UPON INSTALLATION OF METER.



City of
Garden Grove
California

3", 4" & 6" COMPOUND WATER METER AND SERVICE INSTALLATION

Approved  Date 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-724

SHEET 2 OF 4

LIST OF MATERIALS

ITEM NO.	DESCRIPTION	3" METER		4" METER		6" METER	
		QTY.	SIZE	QTY.	SIZE	QTY.	SIZE
1	OMNI C2 100 CU FT 5 WHEEL W/ TOUCH READ METER	1	3"	1	4"	1	6"
2	RESILIENT WEDGE GATE VALVE, FLG'D W/2" OPERATING NUT	2	3"	2	4"	2	6"
3	TAPPING SLEEVE AND GATE VALVE PER STD. B-750	1	4"	1	4"	1	6"
4	GATE VALVE CAN ASSEMBLY PER STD. B-752						
5	DUCTILE IRON PIPE SPOOL OR PVC C900 DR14, CLASS 305	1	4"	1	4"	1	6"
6	PVC C900 DR14, CLASS 305		4"		4"		6"
7	SERVICE SADDLE FOR DIP OR PVC PIPE, WITH 2" FEMALE I.P. THREADS	2					
8	2" BRASS NIPPLE, 7" LONG UNLESS OTHERWISE APPROVED	3					
9	2" ELL, BRASS	2					
10	2" FULL PORT BALL VALVE, BRASS BODY MUELLER 300 OR APPROVED EQUAL	2	2"				
11	2" COMPRESSION COUPLING, BRASS	1					
12	METER VAULT	1		1		1	
13	2" COPPER – TYPE K RIGID						
14	DUCTILE IRON TEE, FLG'D OR MJ			2	4"	2	6"
15	RESILIENT WEDGE GATE VALVE, FLG'D WITH 2" OPERATING NUT			2	4"	2	6"
16	DUCTILE IRON 90° BEND, FLG'D OR MJ x MJ			2	4"	2	6"
17	FLEX COUPLING (Smith & Blair) OR APPROVED EQUAL	1	4"				
18	DUCTILE IRON PIPE OR PVC C 900 DR14, CLASS 305		4"		4"		6"
19	3" x 4" FLG. x FLG. OR FLG x MJ REDUCER – 3" METER ONLY	2	3"x4"				
20	SADDLE PIPE STAND (SUBMIT FOR APPROVAL)	2		2		2	
21	CONCRETE PAD (560-C-3250) W/ #3 REBAR WIRE TIED 12" O.C. BOTH WAYS	1		1		1	
22	TOUCH READ COUPLER (PURCHASE FROM CITY)	1		1		1	

NOTES

1. ALL GATE VALVES SHALL BE U.S. PIPE, MUELLER OR APPROVED EQUAL.
2. CONCRETE VAULT SHALL BE SIZED TO HOUSE METER INSTALLATION WITH MINIMUM CLEARANCES SHOWN IN SHEETS 1 & 2.
3. TRAFFIC RATING LIDS SHALL BE APPROVED BY WATER SERVICES DIVISION.
4. ALL MJ FITTINGS MUST BE JOINT RESTRAINED.



City of
Garden Grove
California

3", 4", & 6" COMPOUND WATER METER AND SERVICE INSTALLATION

Approved

Date 12-8-15

City Engineer

R.C.E. 52125 Exp.12-31-16

REVISIONS

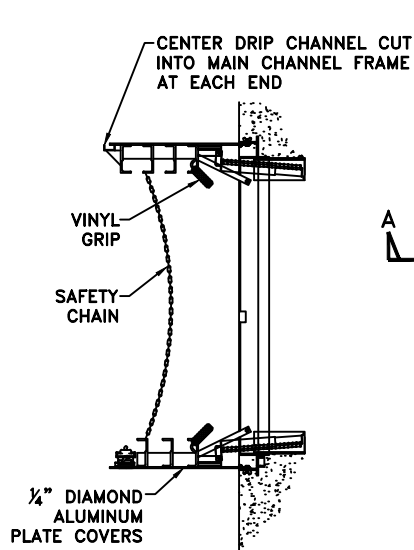
BY

DATE

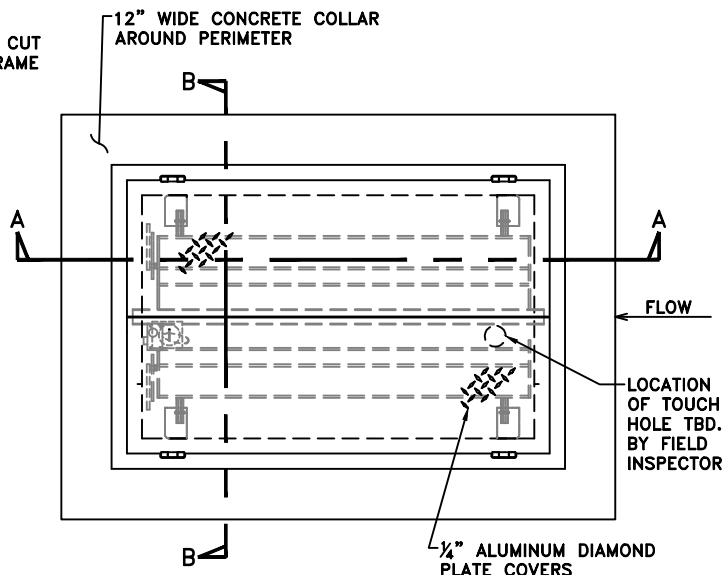
STD. PLAN NUMBER

B-724

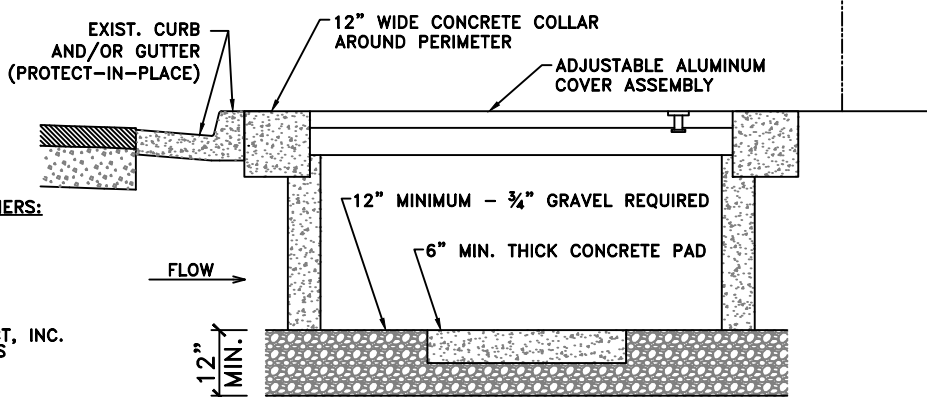
SHEET 3 OF 4



SECTION "B-B"



METER VAULT COVER, TYPICAL



SECTION "A-A"

APPROVED VAULT COVER SUPPLIERS:

1. BILCO
2. ACCESS MANUFACTURING
3. USF FABRICATION

APPROVED VAULT SUPPLIERS:

1. BROOKS-JENSEN PRODUCT, INC.
2. BES CONCRETE PRODUCTS
3. UTILITY VAULT CO.
4. ASSOCIATED CONCRETE

NOTES:

1. VAULTS GREATER THAN 4' IN DEPTH REQUIRE A FIBER REINFORCED PLASTIC (FRP) LADDER SET PERPENDICULAR TO HINGE.
2. HOLES TO BE SEALED WITH NON-SHRINK GROUT, LINK SEALS, OR APPROVED EQUAL.
3. THE CONTRACTOR SHALL SUBMIT TO THE ENGINEER FOR REVIEW AND APPROVAL THE VAULT AND VAULT COVER DETAIL INDICATING THE LOCATION OF THE HINGED LID OPENING PRIOR TO FABRICATION. THE LOCATION OF THE HINGED LID SHALL ALLOW FOR CLEAR ACCESS TO THE METER READING REGISTER.
4. THE CONTRACTOR SHALL ONE SACK SLURRY BACK FILL UNDERNEATH THE CURB & GUTTER. REMOVE AND REPLACE THE CURB & GUTTER, SIDEWALK AND LANDSCAPE AT THE CONTRACTOR'S EXPENSE IF CONTRACTOR DAMAGED DURING CONSTRUCTION.
5. JOIN NEW METER TO EXISTING CUSTOMER SERVICE LINE INCLUDING ALL REQUIRED PARTS AT THE CONTRACTOR'S EXPENSE AFTER PASSING REQ'D TEST(S) & SERVICE IN NEW LINE FROM NEW MAIN.



City of
Garden Grove
California

**3", 4", & 6" COMPOUND
WATER METER
AND SERVICE INSTALLATION**

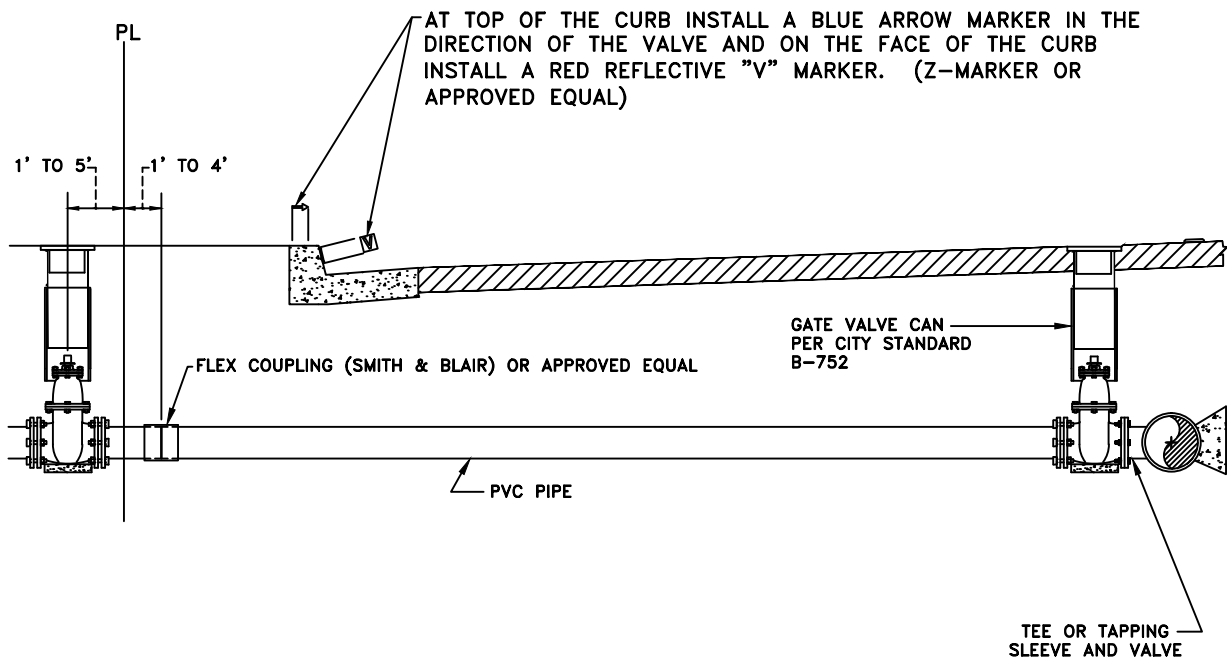
Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-724

SHEET 4 OF 4



* DEVELOPER'S CONTRACTOR MAY BE RESPONSIBLE FOR INSTALLATION. DETERMINATION TO BE MADE BY CITY DURING PLAN CHECK PROCESS. INSTALLATION TO BE PER THIS STANDARD AND INSPECTED BY CITY. CONTRACTOR TO HAVE C-34, OR CLASS A LICENSE.



City of
Garden Grove
California

SERVICE LATERAL INSTALLATION FOR PRIVATE FIRE HYDRANTS

Approved

Date 12-8-15

REVISIONS

BY

DATE

STD. PLAN NUMBER

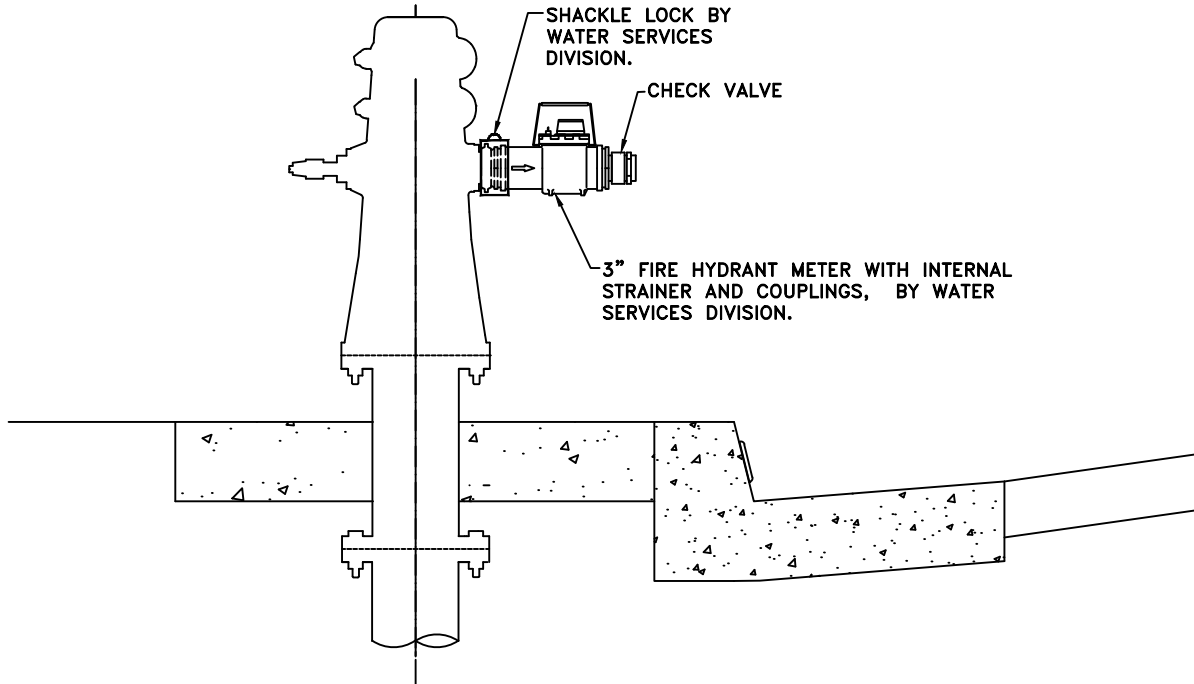
City Engineer

R.C.E. 52125 Exp. 12-31-16

B-729

SHEET 1 OF 1

FIRE HYDRANT



NOTES

1. OPENING AND CLOSING OF HYDRANT IS PERMITTED ONLY WITH A HYDRANT WRENCH.
2. CONSTRUCTION METER MAY BE MOVED FROM ONE LOCATION TO ANOTHER ONLY BY THE WATER SERVICES DIVISION UNLESS OTHERWISE APPROVED.
3. BACKFLOW DEVICES MAY BE REQUIRED FOR CERTAIN USES.
4. SERVICE CONNECTION MAY BE TERMINATED AT ANY TIME AT THE DISCRETION OF THE WATER SERVICES DIVISION.
5. CHARGES FOR LOSS OR DAMAGE TO ANY SERVICE MATERIAL WILL BE BASED UPON CURRENT PRICES.



City of
Garden Grove
California

2-1/2" TEMPORARY WATER SERVICE

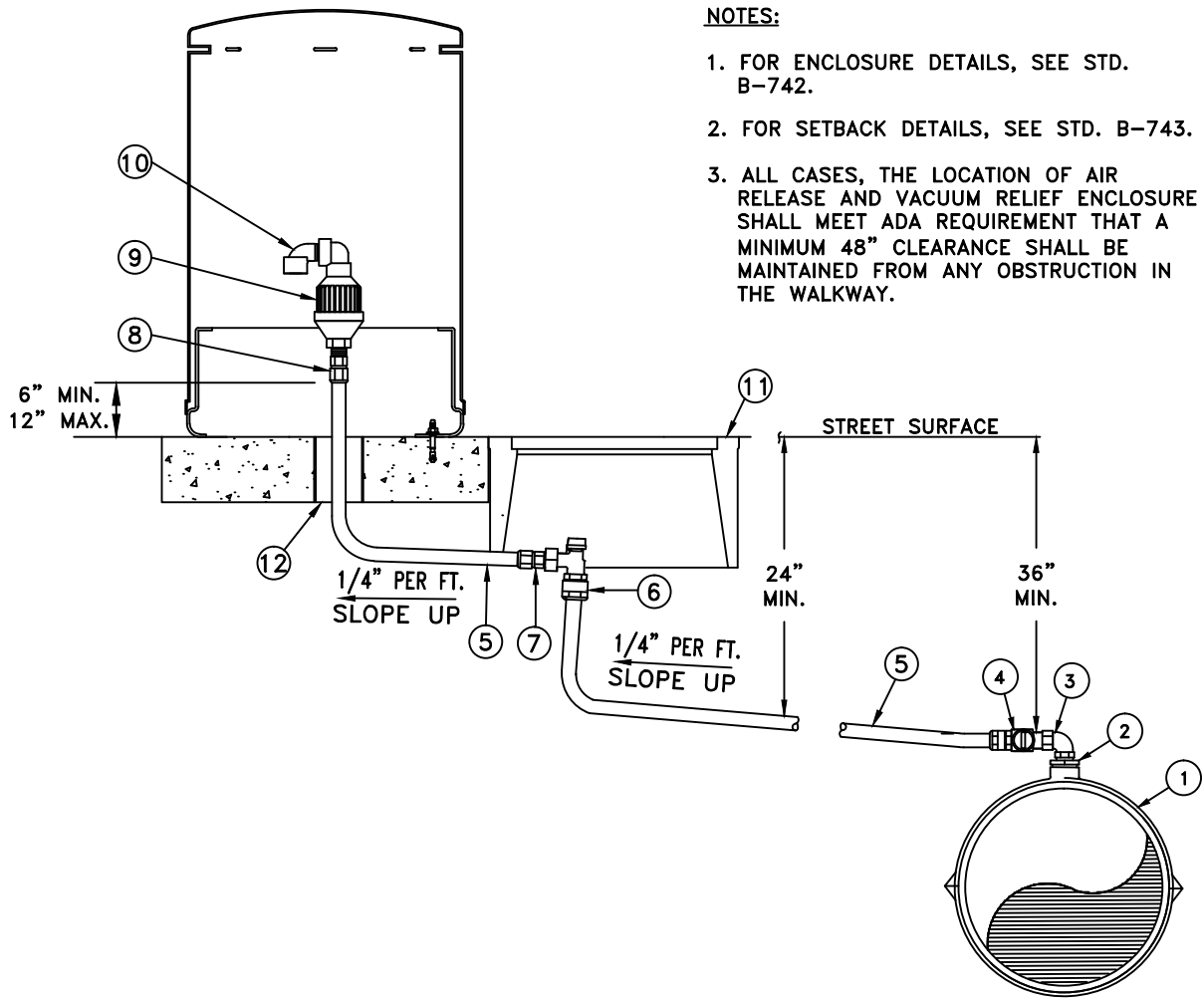
Approved  Date 12-8-15
City Engineer R.C.E. 52125 Exp.12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-730

SHEET 1 OF 1



MATERIAL LIST

ITEM NO.	QUAN.	DESCRIPTION	MFR.
①		2" SERVICE SADDLE, DOUBLE STRAP, WITH 2" F.I.P.T.	
②		2" x 1" BRASS BUSHING, I.P.T.	
③		1" BRASS STREET ELL, M.I.P.T. x F.I.P.T.	
④		1" CORPORATION STOP, I.P.T.	FORD OR APP'D EQUAL
⑤		1"Ø TYPE "K" SOFT COPPER TUBING	
⑥		1" ANGLE METER VALVE	
⑦		1" M.I.P. x COMPRESSION FITTING	
⑧		1" F.I.P. x COMPRESSION COUPLING	
⑨		AIR AND VACUUM RELIEF VALVE, PLASTIC BODY	
⑩		1" PVC STREET ELBOW	
⑪		#37 METER BOX W/ 2 PC. CONCRETE COVER	
⑫		PIPE INSULATION (FOAM)	



City of
Garden Grove
California

2" TAP TO 1" AIR AND VACUUM RELIEF VALVE ASSEMBLY

Approved  Date 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS

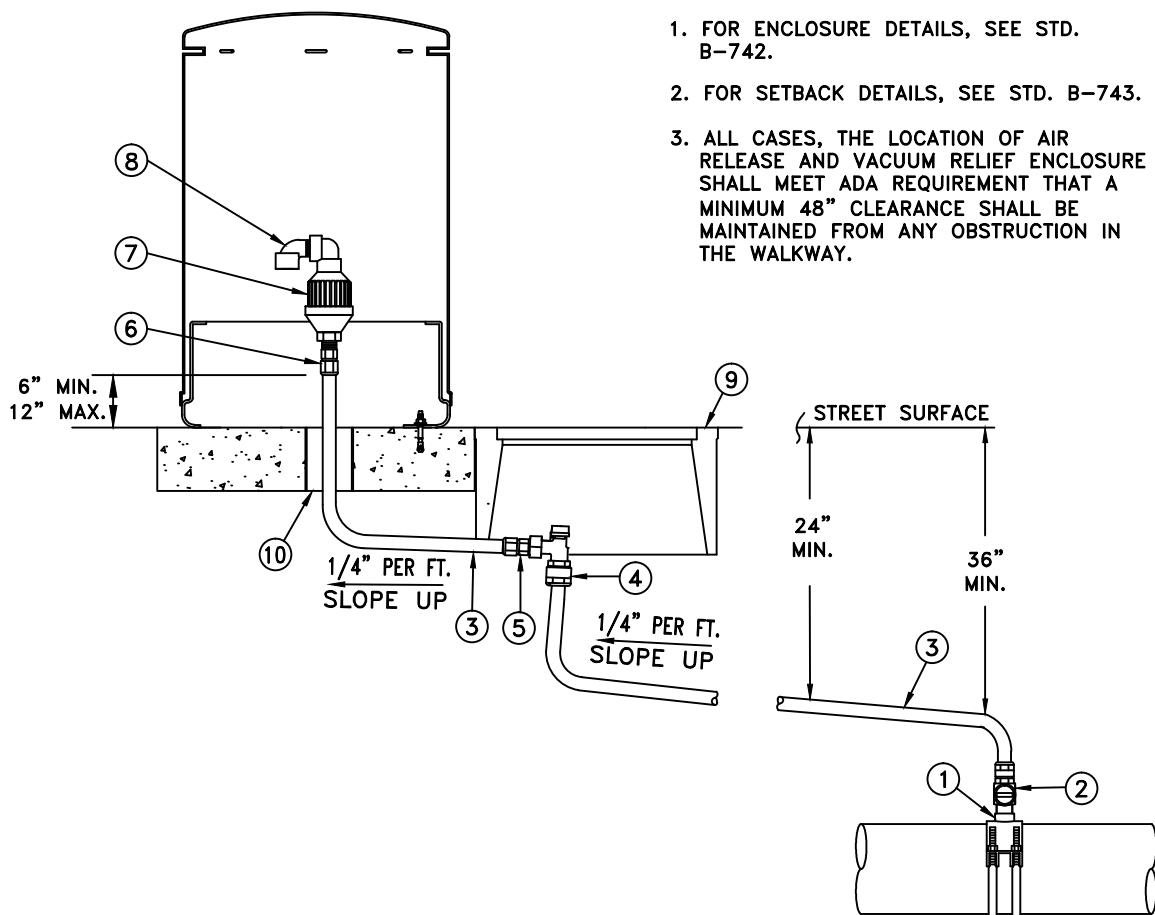
BY

DATE

STD. PLAN NUMBER

B-739

SHEET 1 OF 1



NOTES:

1. FOR ENCLOSURE DETAILS, SEE STD. B-742.
2. FOR SETBACK DETAILS, SEE STD. B-743.
3. ALL CASES, THE LOCATION OF AIR RELEASE AND VACUUM RELIEF ENCLOSURE SHALL MEET ADA REQUIREMENT THAT A MINIMUM 48" CLEARANCE SHALL BE MAINTAINED FROM ANY OBSTRUCTION IN THE WALKWAY.

MATERIAL LIST

ITEM NO.	QUAN.	DESCRIPTION	MFR.
①		2" SERVICE SADDLE WITH 2" x 1" F.I.P. CONNECTION UNLESS OTHERWISE APPROVED	
②		1" CORPORATION STOP, I.P.T.	FORD OR APP'D EQUAL
③		1"Ø TYPE "K" SOFT COPPER TUBING	
④		1" ANGLE METER VALVE	
⑤		1" M.I.P. x COMPRESSION FITTING	
⑥		1" F.I.P. x COMPRESSION COUPLING	
⑦		AIR AND VACUUM RELIEF VALVE, PLASTIC BODY	
⑧		1" PVC STREET ELBOW	
⑨		#37 METER BOX W/ 2 PC. CONCRETE COVER	
⑩		PIPE INSULATION (FOAM)	



City of
Garden Grove
California

**1" AIR AND VACUUM RELIEF
VALVE ASSEMBLY**

Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS

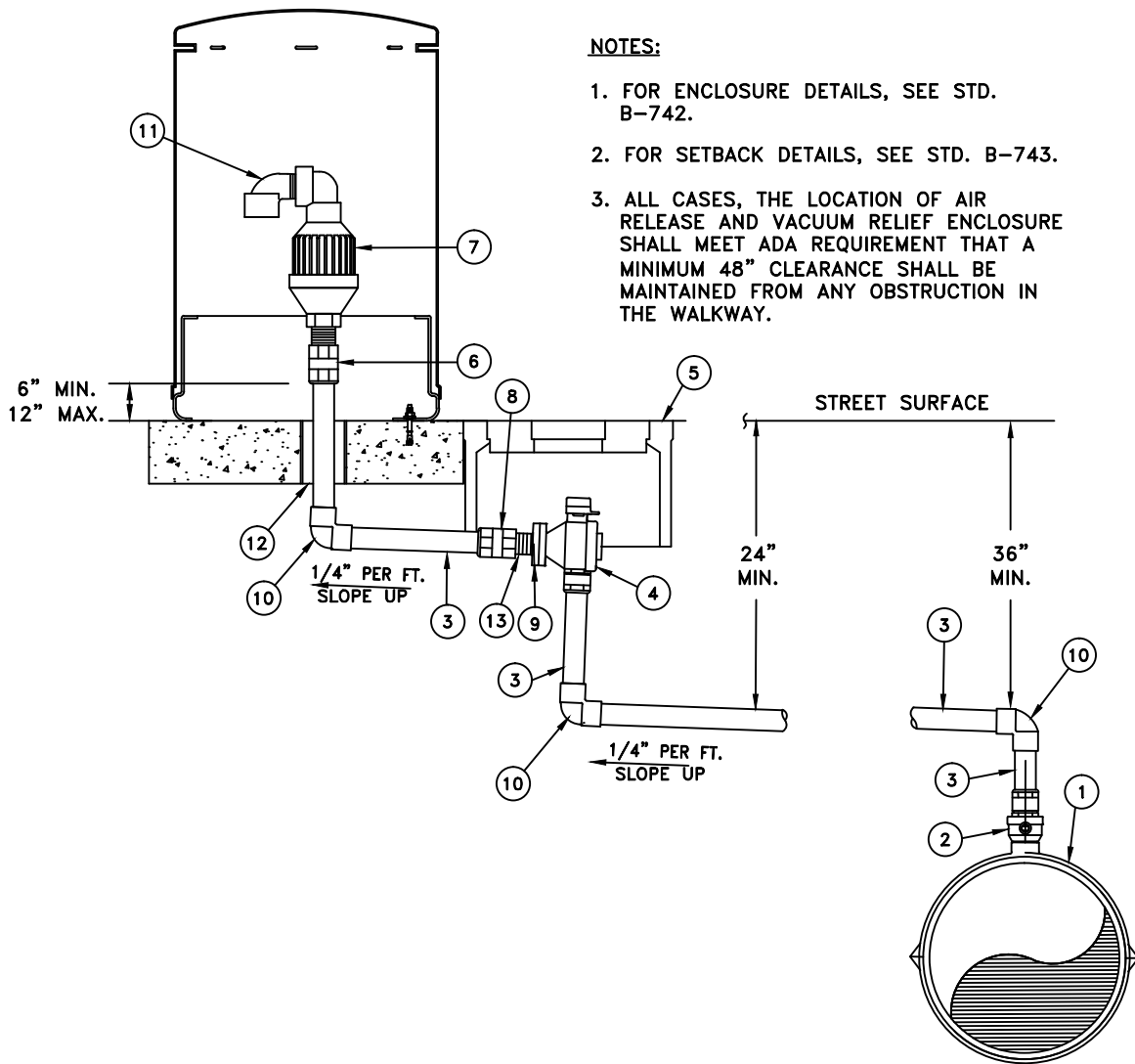
BY

DATE

STD. PLAN NUMBER

B-740

SHEET 1 OF 1



MATERIAL LIST

ITEM NO.	QUAN.	DESCRIPTION	MFR.
1		2" SERVICE SADDLE, DOUBLE STRAP, WITH 2" F.I.P.T.	
2		2" CORPORATION STOP, COMPRESSION FITTING W/ I.P.T.	
3		2"Ø TYPE "K" SOFT COPPER	
4		2" ANGLE METER VALVE COMPRESSION TYPE (MUELLER OR APPROVED EQUAL) W/ SS BOLTS	
5		#37 CONCRETE METER BOX W/ 2 PC CONCRETE COVER	
6		2" F.I.P. x COMPRESSION COUPLING	
7		2" AIR AND VACUUM RELIEF VALVE, PLASTIC BODY	
8		2" CU SLIP x M.I.P. COUPLING	
9		2" METER FLANGE WITH 2" F.I.P.	
10		2" CU 90° SLIP x SLIP COUPLING	
11		2" 90° PVC STREET ELBOW	
12		PIPE INSULATION (FOAM)	
13		2" x 4" BRASS NIPPLE	



City of
Garden Grove
California

2" AIR AND VACUUM RELIEF VALVE ASSEMBLY

Approved

Date 12-8-15

REVISIONS

BY

DATE

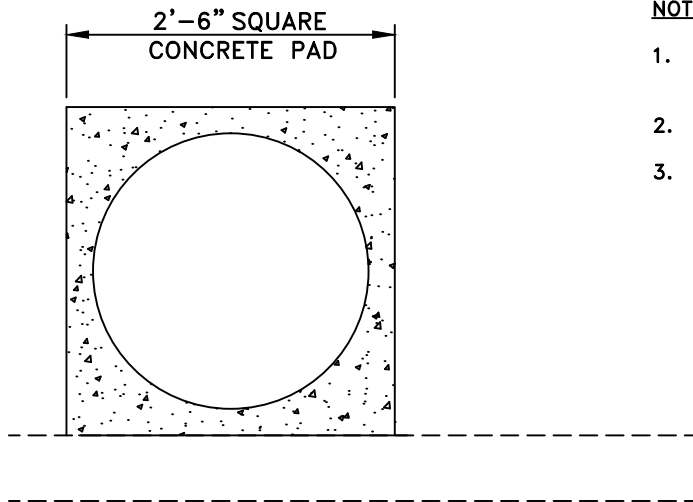
STD. PLAN NUMBER

City Engineer

R.C.E. 52125 Exp.12-31-16

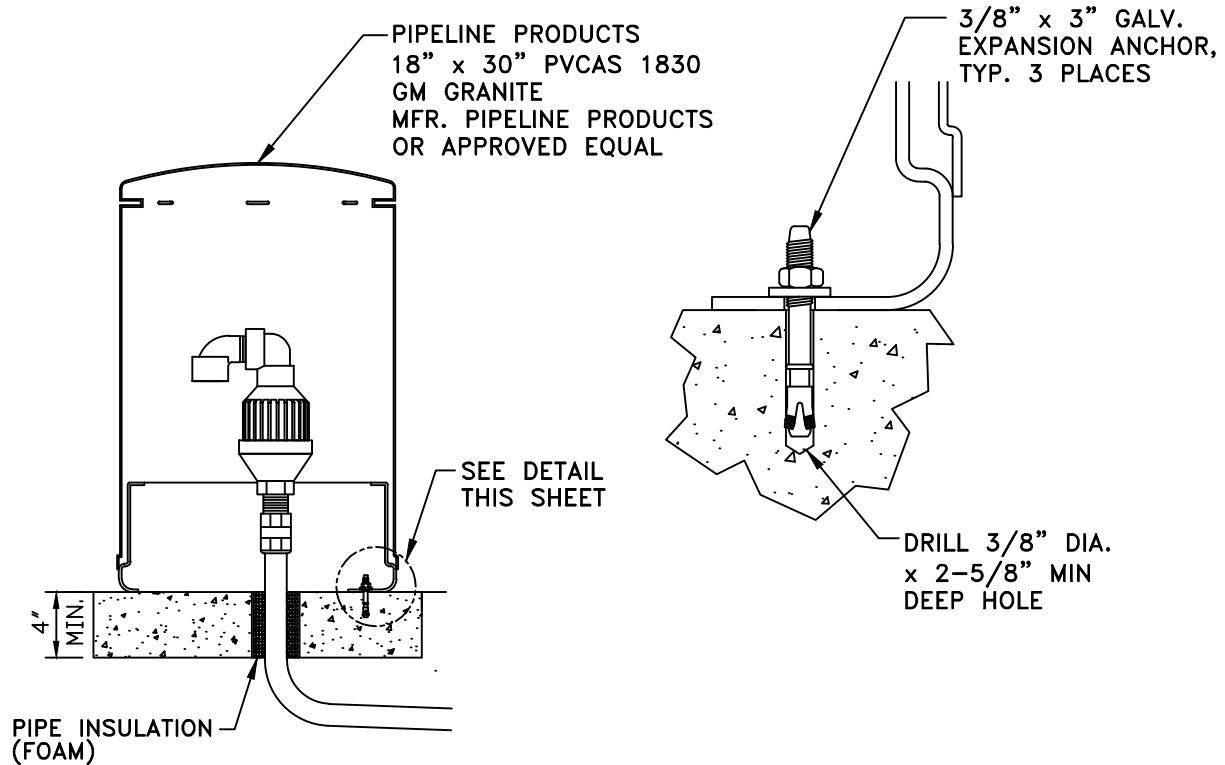
B-741

SHEET 1 OF 1



NOTES:

1. FOR ENCLOSURE DETAILS, SEE STD. B-742.
2. FOR SETBACK DETAILS, SEE STD. B-743.
3. ALL CASES, THE LOCATION OF AIR RELEASE AND VACUUM RELIEF ENCLOSURE SHALL MEET ADA REQUIREMENT THAT A MINIMUM 48" CLEARANCE SHALL BE MAINTAINED FROM ANY OBSTRUCTION IN THE WALKWAY.



City of
Garden Grove
California

**AIR RELEASE & VACUUM RELIEF
ENCLOSURE ASSEMBLY**

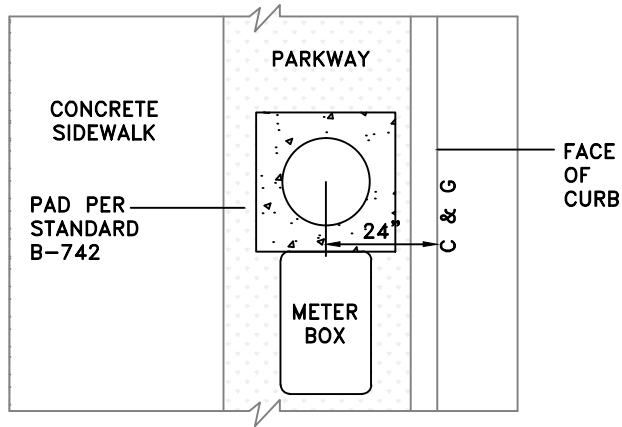
Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-742

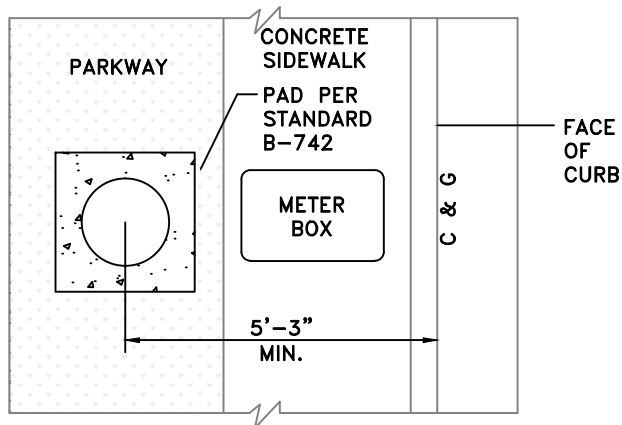
SHEET 1 OF 1



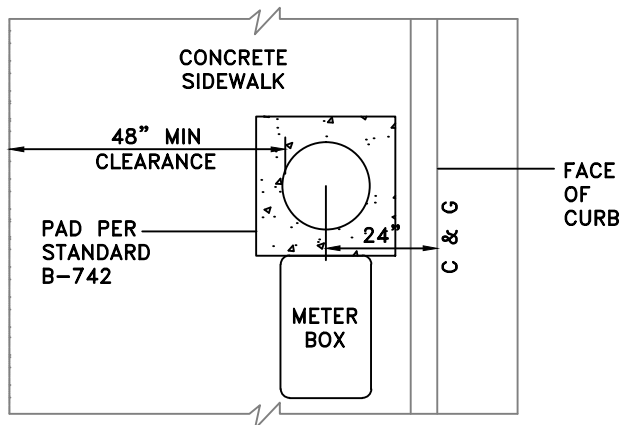
DETACHED SIDEWALK

NOTE:

FOR ALL CASES, THE LOCATION OF AIR RELEASE AND VACUUM RELIEF ENCLOSURE SHALL MEET ADA REQUIREMENTS THAT A MINIMUM 48" CLEARANCE SHALL BE MAINTAINED FROM ANY OBSTRUCTION IN THE WALKWAY.



4' WIDE ATTACHED SIDEWALK



6' OR WIDER SIDEWALK



City of
Garden Grove
California

**AIR RELEASE & VACUUM RELIEF
ENCLOSURE SETBACK DETAIL**

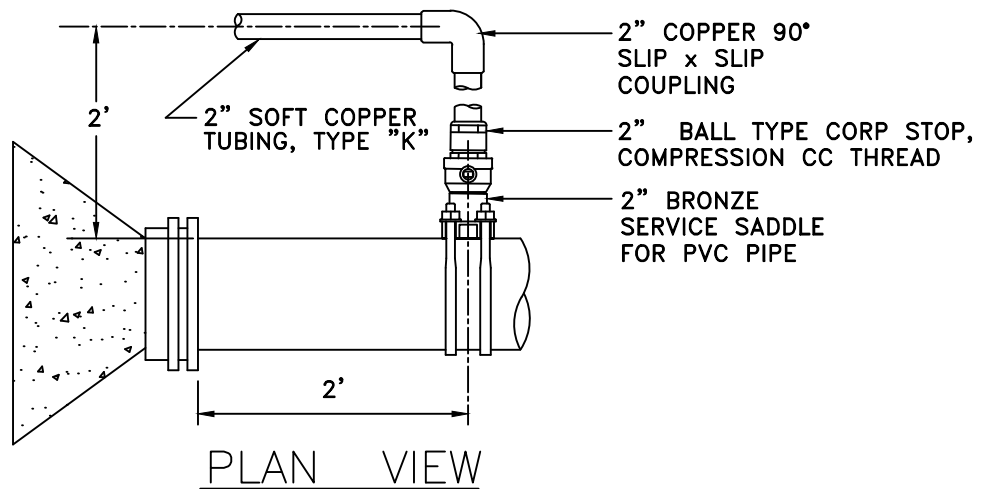
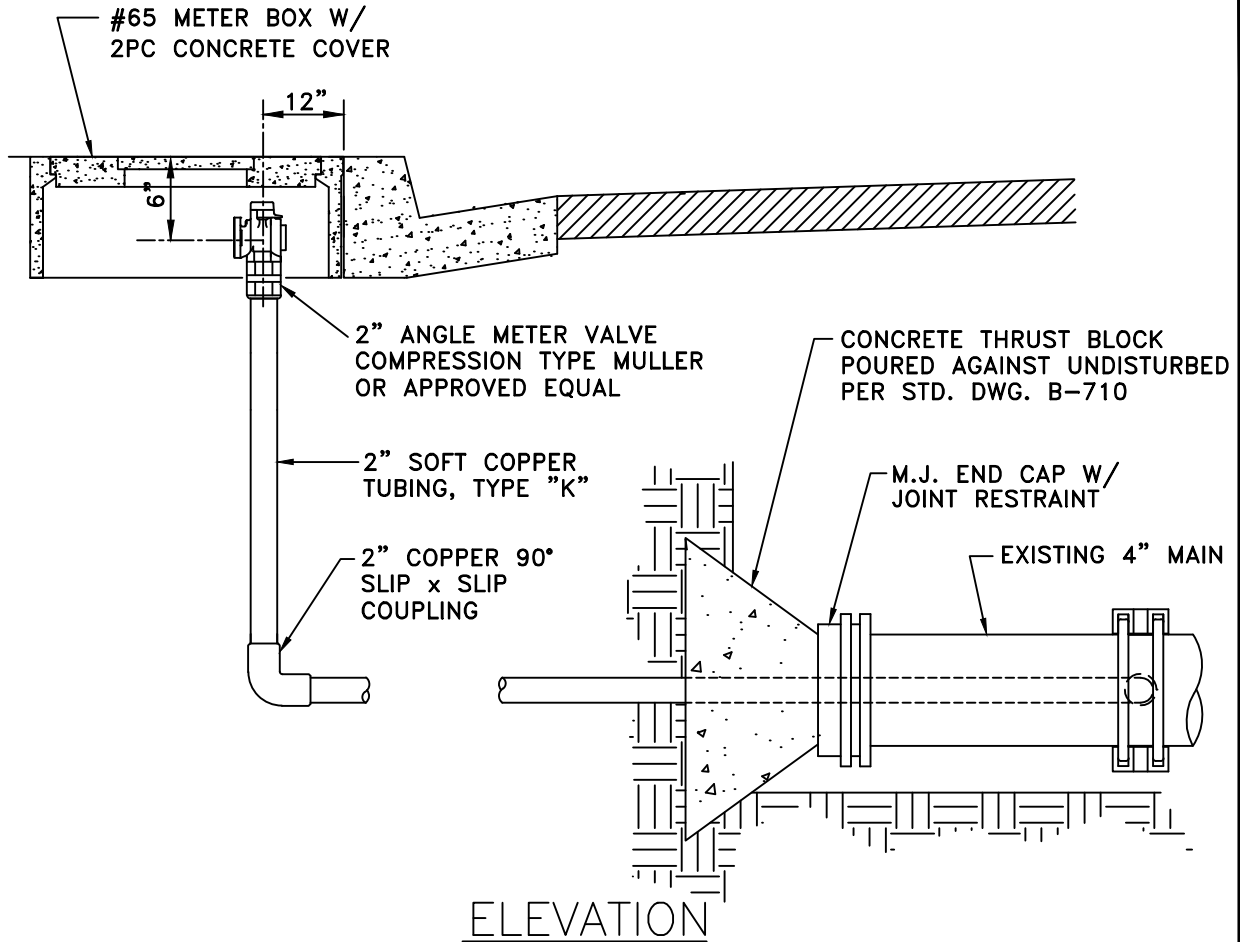
Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-743

SHEET 1 OF 1



City of
Garden Grove
California

2" BLOWOFF INSTALLATION AT END OF 4" WATER MAIN PIPE

Approved

Date 12-8-15

REVISIONS

BY

DATE

STD. PLAN NUMBER

B-744

SHEET 1 OF 1

City Engineer

R.C.E. 52125

Exp. 12-31-16

IN FRONT OF BLOWOFF OR FIRE
HYDRANT ON TOP OF CURB INSTALL
A BLUE ARROW MARKER IN THE
DIRECTION OF VALVE AND ON THE
CURB FACE INSTALL A RED
REFLECTIVE "V" MARKER
(Z-MARKER OR APPROVED EQUAL)

GATE VALVE CAN ASSEMBLY
PER STD. B-752

FINISHED SURFACE

WATER
MAIN

CURB & GUTTER

#65 CONCRETE METER BOX
W/ 2 PC. CONCRETE COVER

4" BLIND FLG W/ 2"
TAP & 2" BRASS PLUG

3" MAX.

4" D.I. FLG x FLG
(CUT TO LENGTH
AS NEEDED)

THRUST BLOCK PER
STD. DWG. B-710

4" MJ x FLG 90° ELL
W/ JOINT RESTRAINT

4" PVC C-900 DR14 CLASS 305

4" FLG x MJ GATE VALVE
W/ JOINT RESTRAINT

MJ x 4" FLG REDUCER
W/ JOINT RESTRAINT

NOTE

THIS DRAWING APPLIES TO PIPES 6" & 8" WATER MAINS.
FOR 10" & 12" WATER MAIN INSTALL A FIRE HYDRANT.



City of
Garden Grove
California

**4" BLOWOFF INSTALLATION
FOR 6" OR LARGER MAINS**

Approved

Date 12-8-15

REVISIONS

BY

DATE

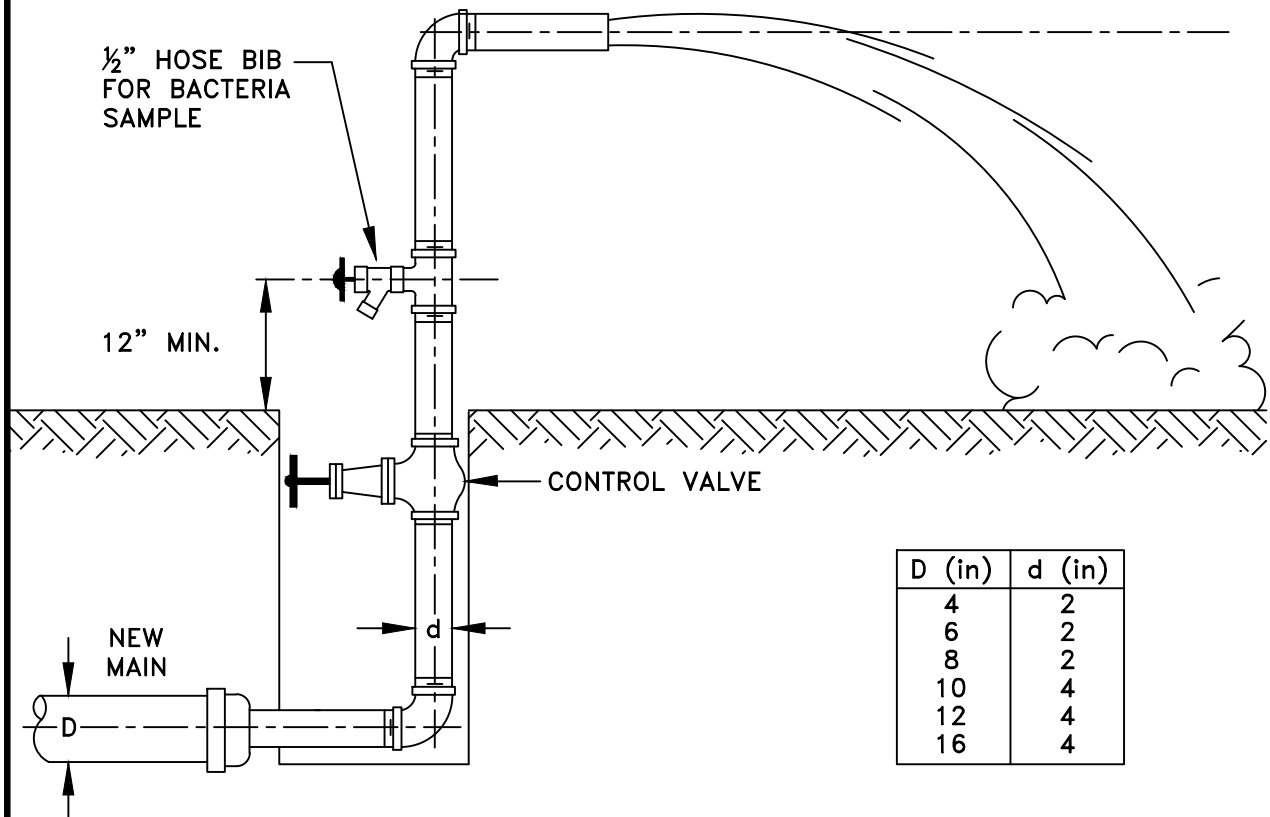
STD. PLAN NUMBER

City Engineer

R.C.E. 52125 Exp.12-31-16

B-745

SHEET 1 OF 1



NOTE: FLUSHING IS NOT REQUIRED FOR SECOND SET OF SAMPLES.



City of
Garden Grove
California

SAMPLE POINT FOR NEW WATER MAIN

Approved

Date 12-8-15

REVISIONS

BY

DATE

STD. PLAN NUMBER

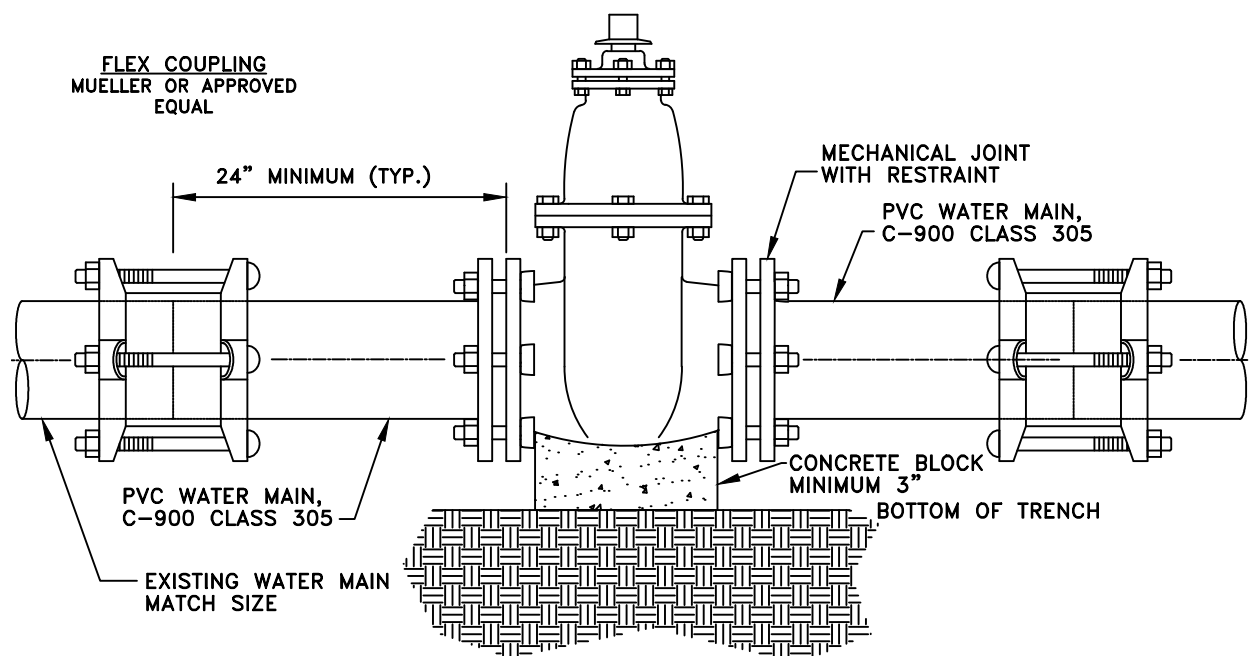
City Engineer

R.C.E. 52125 Exp. 12-31-16

B-746

SHEET 1 OF 1

MJ GATE VALVE
MUELLER A-2362
OR APPROVED EQUAL



CUT-IN VALVE DETAIL



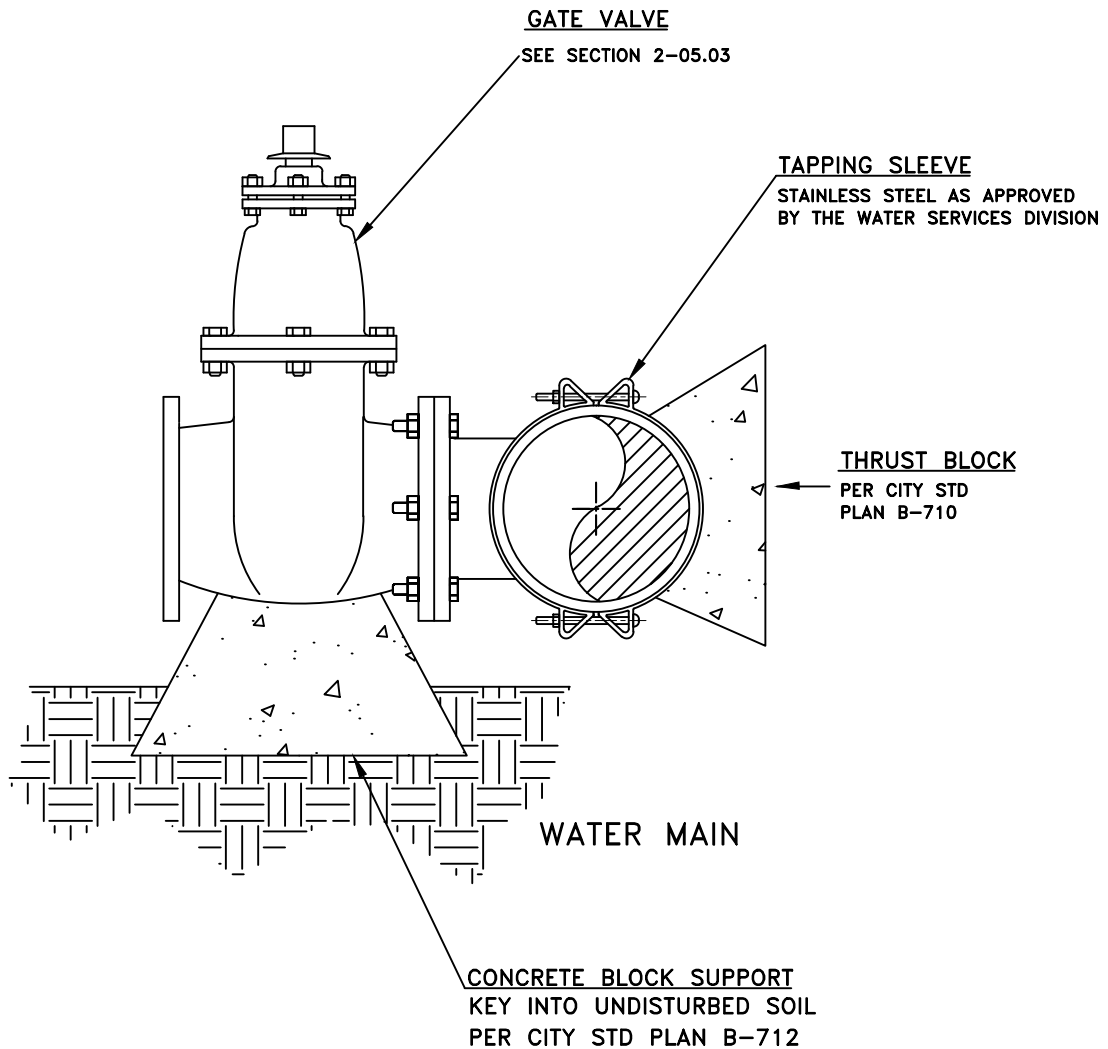
City of
 Garden Grove
 California

CUT-IN VALVE

Approved:  Date: 12-8-15
 City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER
B-749
 SHEET 1 OF 1



NOTES:

1. TAPPING CUTTER SHALL BE MAXIMUM ALLOWABLE DIAMETER CONSISTENT WITH NOMINAL GATE VALVE SIZE. WHEN TAPPING GATE SIZE EQUALS THE DIAMETER OF THE PIPE TO BE TAPPED, INSTALL TEE UNLESS APPROVED BY WATER SERVICES DIVISION.
2. GATE VALVE SHALL BE RESILIENT WEDGE EPOXEY LINED AND COATED TYPE, FLG. x MECH. JOINT OR FLG x FLG.
3. MAKE TAP A MINIMUM OF 3' CLEAR OF PIPE JOINT UNLESS APPROVED BY WATER SERVICES



City of
Garden Grove
California

**TAPPING SLEEVE
AND GATE VALVE**

Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS

BY

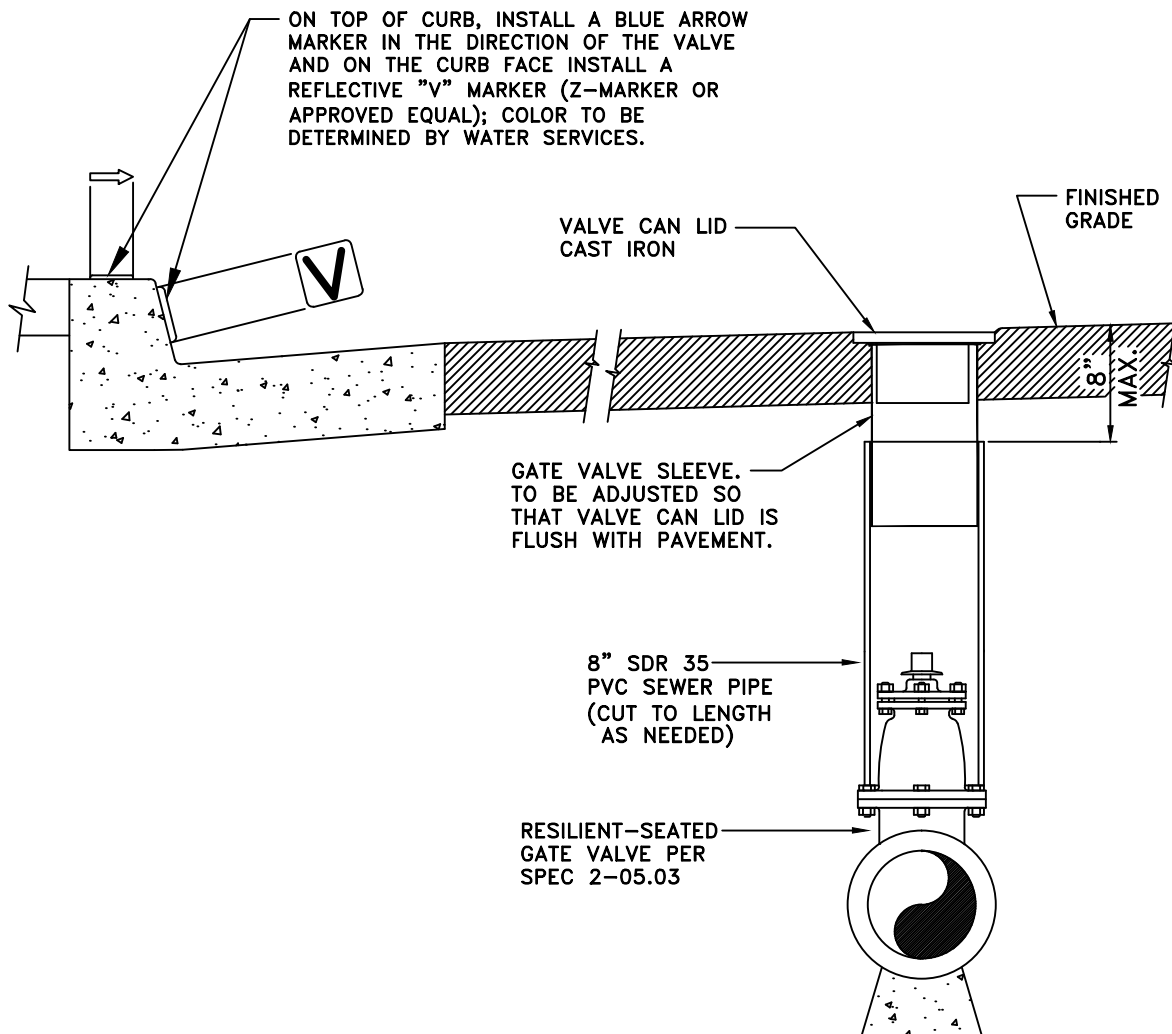
DATE

STD. PLAN NUMBER

B-750

SHEET 1 OF 1

Exp.12-31-16



NOTES:

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR RAISING VALVE CAN TO GRADE AND MAKING SURE THE VALVE CAN IS CLEAR OF DEBRIS AFTER STREET IS PAVED.
2. CONTRACTOR SHALL PURCHASE LID FROM THE PUBLIC WORKS COUNTER IN CITY HALL.



City of
Garden Grove
California

**GATE VALVE
CAN ASSEMBLY**

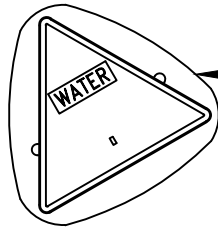
Approved  Date 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

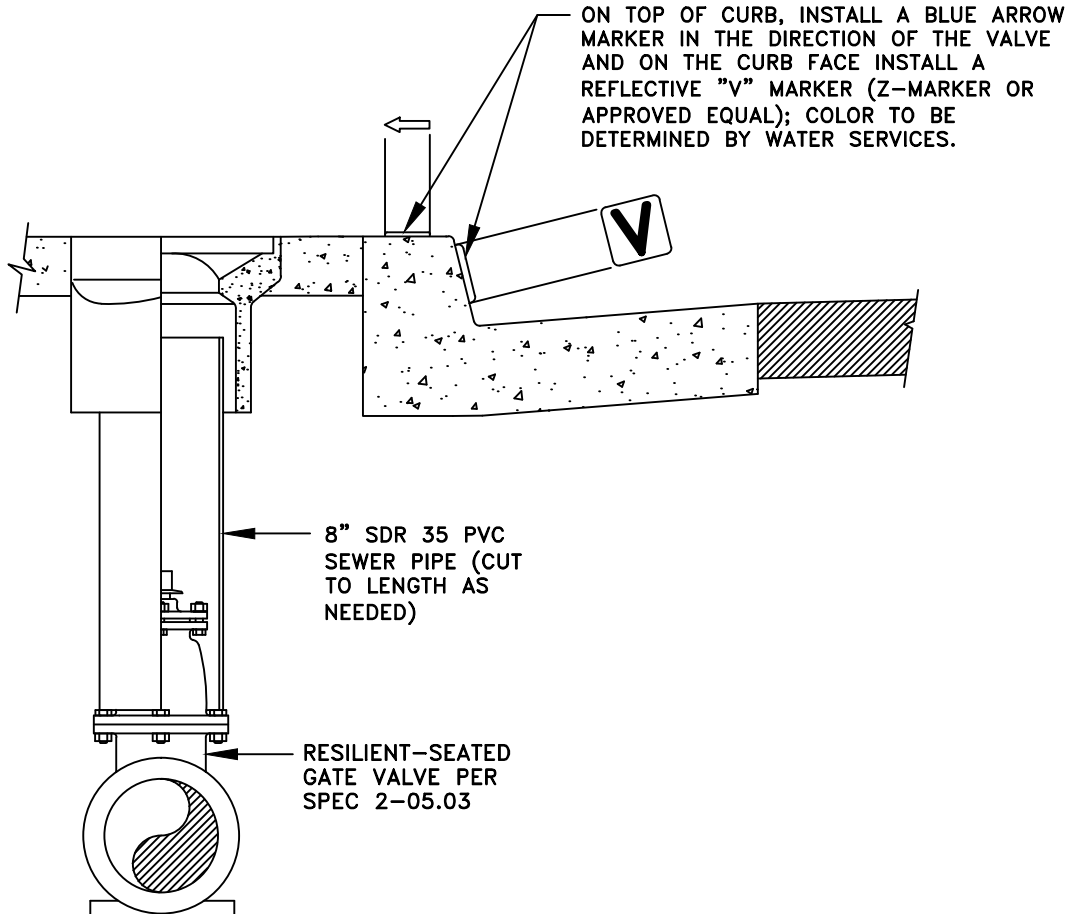
STD. PLAN NUMBER

B-752

SHEET 1 OF 1



BROOKS 4-TT TRAFFIC BOX
WITH TRIANGULAR LID



ON TOP OF CURB, INSTALL A BLUE ARROW
MARKER IN THE DIRECTION OF THE VALVE
AND ON THE CURB FACE INSTALL A
REFLECTIVE "V" MARKER (Z-MARKER OR
APPROVED EQUAL); COLOR TO BE
DETERMINED BY WATER SERVICES.

8" SDR 35 PVC
SEWER PIPE (CUT
TO LENGTH AS
NEEDED)

RESILIENT-SEATED
GATE VALVE PER
SPEC 2-05.03

NOTES:

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR RAISING VALVE CAN TO GRADE
PRIOR TO FORMING AND POURING NEW CONCRETE.



City of
Garden Grove
California

**GATE VALVE CAN ASSEMBLY
FOR CONCRETE AREAS**

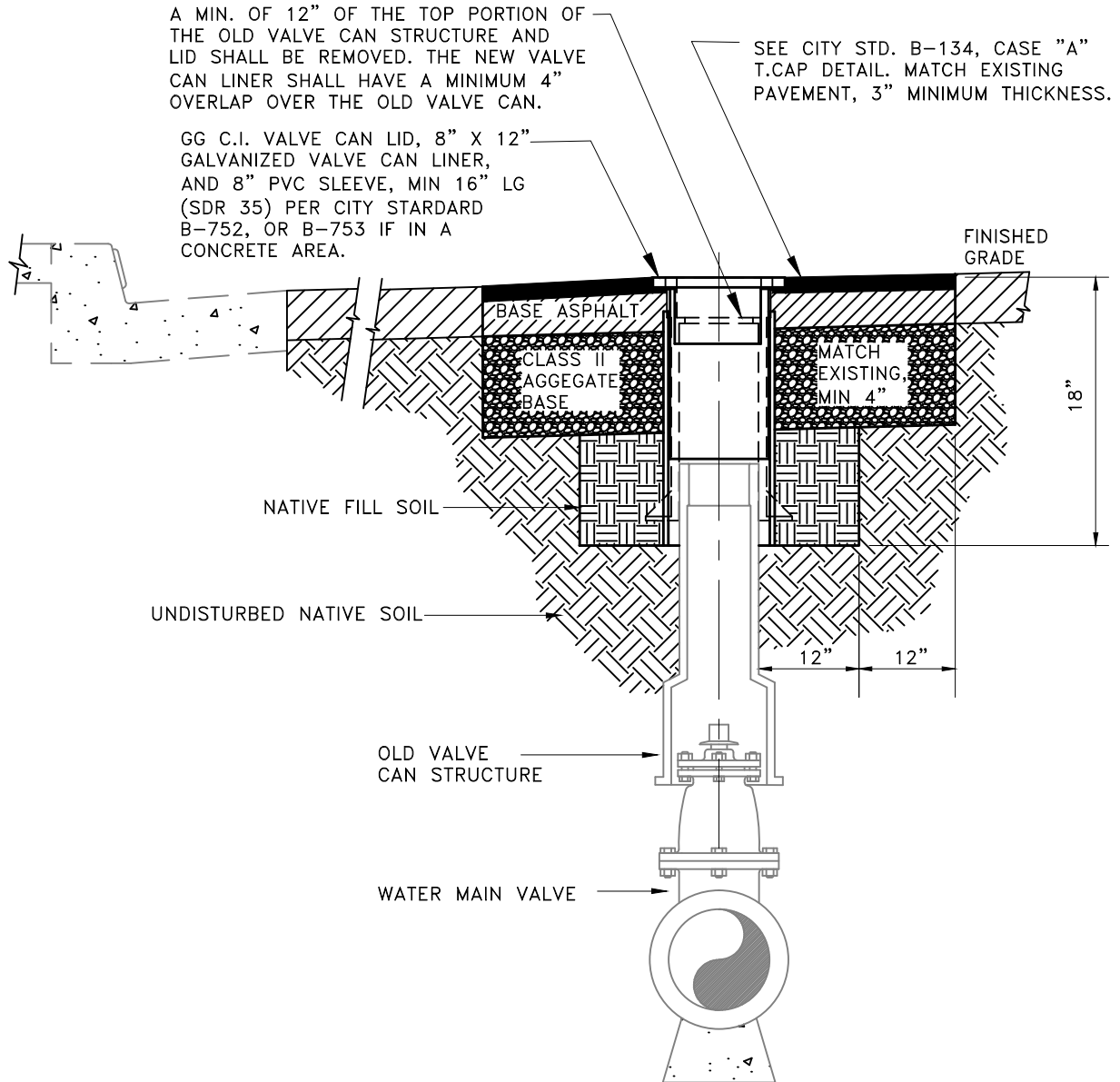
Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-753

SHEET 1 OF 1



NOTES:

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR RAISING VALVE CAN TO GRADE WITHIN 5 DAYS AFTER STREET IS PAVED.
2. COMPACT NATIVE SOIL AND AGGREGATE BASE TO 95% RELATIVE COMPACTION.
3. PURCHASE CI GG WATER LID FROM THE PUBLIC WORKS COUNTER IN CITY HALL.
4. SEE STD. PLAN NO. B-101 THRU B-104 FOR REPLACEMENT STREET SECTION THICKNESS.



City of
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California

OLD GATE VALVE CAN ASSEMBLY REPLACEMENT

Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

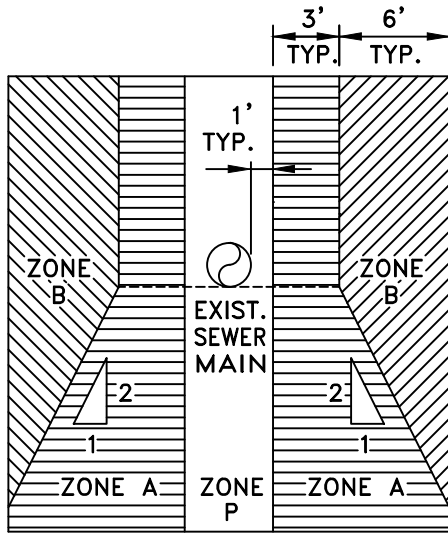
REVISIONS	BY	DATE

STD. PLAN NUMBER

B-754

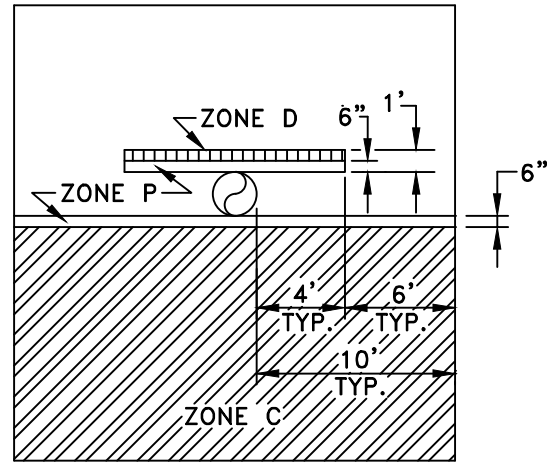
SHEET 1 OF 1

PARALLEL CONSTRUCTION



IF WATER MAIN CANNOT BE LOCATED TEN OR MORE FEET FROM SEWER MAIN AND MUST BE LOCATED WITHIN ANY OF THE ABOVE INDICATED ZONES, SPECIAL CONSTRUCTION SHALL BE REQUIRED AS NOTED BELOW.

PERPENDICULAR CONSTRUCTION



IF WATER MAIN MUST CROSS SEWER MAIN WITHIN ANY OF THE ABOVE INDICATED ZONES, SPECIAL CONSTRUCTION WILL BE REQUIRED AS NOTED BELOW.

ZONES

A,B,C,D WATER MAIN CONSTRUCTION PARALLEL TO SEWER MAIN SHALL NOT BE PERMITTED WITHOUT THE APPROVAL FROM THE CITY WATER ENGINEER AND THE STATE WATER RESOURCES CONTROL BOARD (SWRCB).

B AWWA C-900, DR14, CLASS 305, PVC WATER MAIN PIPE SHALL BE USED.

C & D CENTER A FULL 20' LENGTH OF AWWA C-900, DR14, CLASS 305 PVC WATER MAIN PIPE OVER/UNDER SEWER MAIN PIPE PER DETAIL ON STD PLAN B-763.

P PROHIBITED ZONE

NOTE:

NO WATER MAIN SHALL BE CONSTRUCTED IN ZONES A, B, OR C NEAR FORCE SEWER MAIN. NEW WATER MAIN CROSSING PERPENDICULAR TO A FORCE SEWER MAIN SHALL FOLLOW THE REQUIREMENTS FOR ZONE D WITH A MINIMUM CLEARANCE OF 12 FEET.



City of
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SEPARATION REQUIREMENTS FOR NEW WATER MAIN & EXISTING SEWER MAIN

Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

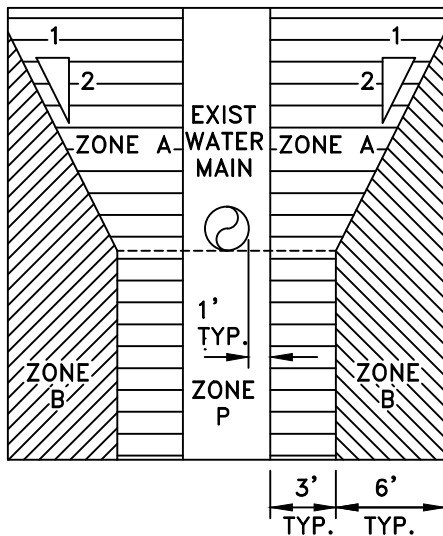
REVISIONS	BY	DATE

STD. PLAN NUMBER

B-760

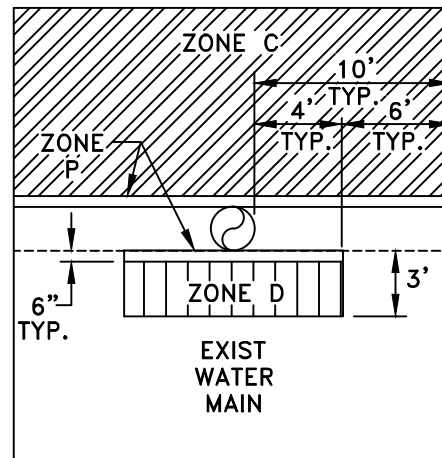
SHEET 1 OF 1

PARALLEL CONSTRUCTION



IF SEWER MAIN CANNOT BE LOCATED TEN OR MORE FEET FROM WATER MAIN AND MUST BE LOCATED WITHIN ANY OF THE ABOVE INDICATED ZONES, SPECIAL CONSTRUCTION SHALL BE REQUIRED AS NOTED BELOW.

PERPENDICULAR CONSTRUCTION



IF SEWER MAIN MUST CROSS WATER MAIN WITHIN ANY OF THE ABOVE INDICATED ZONES, SPECIAL CONSTRUCTION WILL BE REQUIRED AS NOTED BELOW.

ZONES

A,B,C,D SEWER MAIN CONSTRUCTION PARALLEL TO WATER MAIN SHALL NOT BE PERMITTED WITHOUT THE APPROVAL FROM THE CITY WATER ENGINEER AND THE STATE WATER RESOURCES CONTROL BOARD (SWRCB).

B AWWA C-900, DR14, CLASS 305 PVC WATER MAIN PIPE SHALL BE USED WITH STEEL REPAIR COUPLINGS AS APPROVED BY THE CITY WATER ENGINEER. ALL C-900 PIPE TO BE WRAPPED WITH SEWER MARKING TAPE.

C & D CENTER A FULL 20' LENGTH OF AWWA C-900, DR14, CLASS 305 PVC WATER MAIN OVER/UNDER WATER MAIN PIPE PER CITY STD. B-762.

P PROHIBITED ZONE

NOTE:

NO WATER MAIN SHALL BE CONSTRUCTED IN ZONES A, B, OR C NEAR FORCE SEWER MAIN. NEW WATER MAIN CROSSING PERPENDICULAR TO A FORCE SEWER MAIN SHALL FOLLOW THE REQUIREMENTS FOR ZONE D WITH A MINIMUM CLEARANCE OF 12 FEET.



City of
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SEPARATION REQUIREMENTS FOR NEW SEWER MAIN & EXISTING WATER MAIN

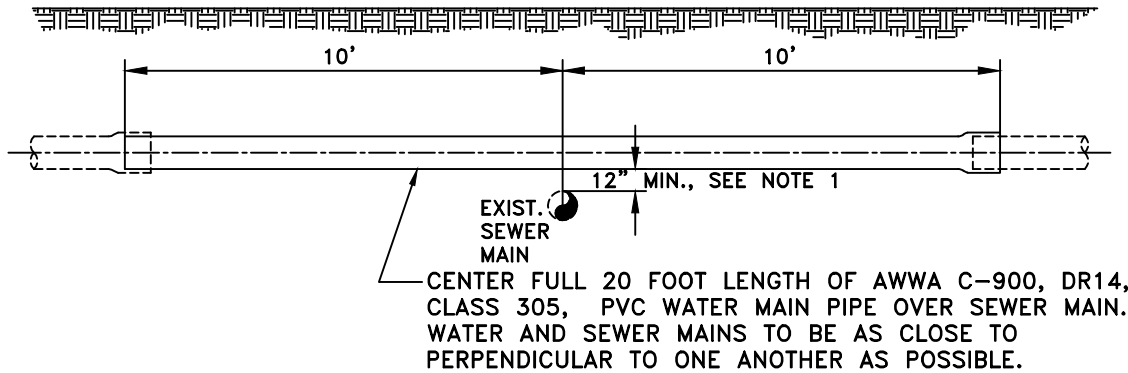
Approved  Date 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

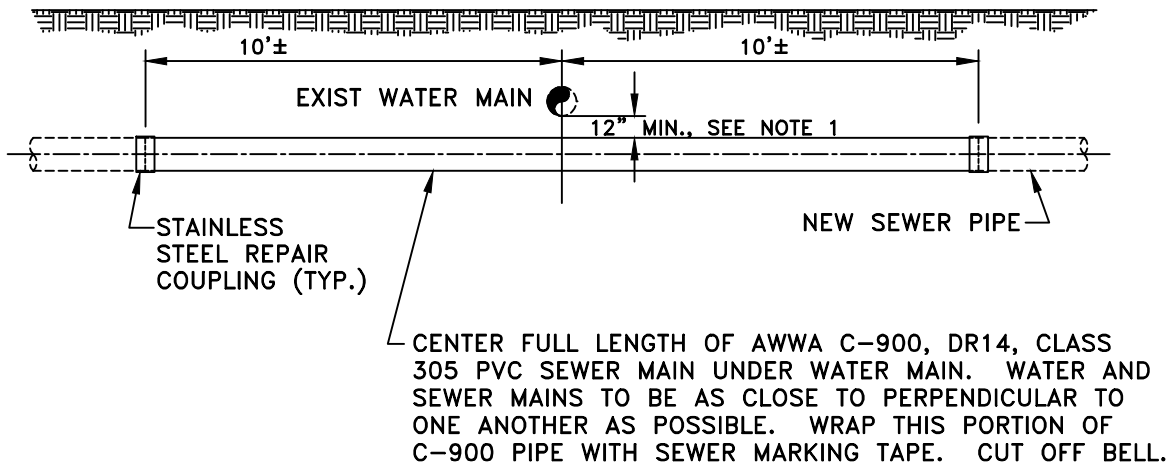
STD. PLAN NUMBER

B-761

SHEET 1 OF 1



NEW WATER MAIN CROSSING OVER EXISTING SEWER MAIN
N.T.S.



NEW SEWER MAIN CROSSING UNDER EXISTING WATER MAIN
N.T.S.

NOTE 1. IF THE SEPARATION REQUIREMENT CANNOT BE MET, APPROVAL FROM THE STATE WATER RESOURCES CONTROL BOARD (SWRCB) AND THE CITY IS REQUIRED.



City of
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California

SEWER MAIN CROSSING UNDER WATER MAIN

Approved

Date 12-8-15

REVISIONS

BY

DATE

STD. PLAN NUMBER

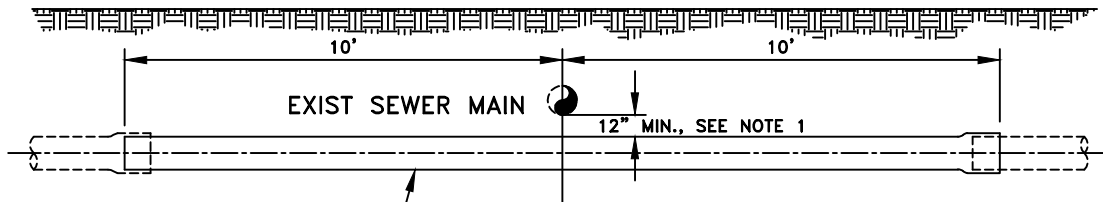
City Engineer

R.C.E. 52125

Exp. 12-31-16

B-762

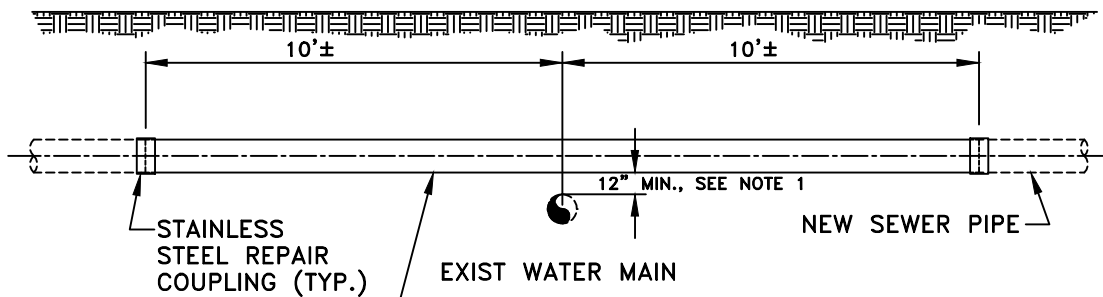
SHEET 1 OF 1



CENTER FULL 20 FOOT LENGTH OF AWWA C-900, DR14, CLASS 305, PVC WATER MAIN PIPE UNDER SEWER MAIN. WATER AND SEWER MAINS TO BE AS CLOSE TO PERPENDICULAR TO ONE ANOTHER AS POSSIBLE.

NEW WATER MAIN CROSSING UNDER EXISTING SEWER MAIN

N.T.S.



CENTER FULL LENGTH OF AWWA C-900, DR14, CLASS 305 PVC SEWER MAIN OVER WATER MAIN. WATER AND SEWER MAINS TO BE AS CLOSE TO PERPENDICULAR TO ONE ANOTHER AS POSSIBLE. WRAP THIS PORTION OF C-900 PIPE WITH SEWER MARKING TAPE. CUT OFF BELL.

NEW SEWER MAIN CROSSING OVER EXISTING WATER MAIN

N.T.S.

NOTE 1. IF THE SEPARATION REQUIREMENT CANNOT BE MET, APPROVAL FROM THE STATE WATER RESOURCES CONTROL BOARD (SWRCB) AND THE CITY IS REQUIRED.



City of
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California

WATER MAIN CROSSING UNDER SEWER MAIN

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City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-763

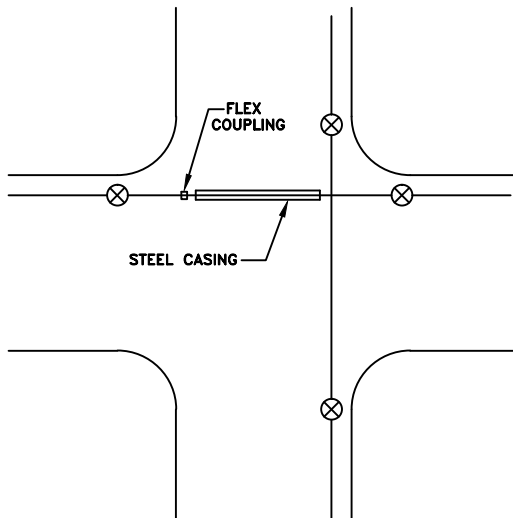
SHEET 1 OF 1

STEEL CASING SCHEDULE

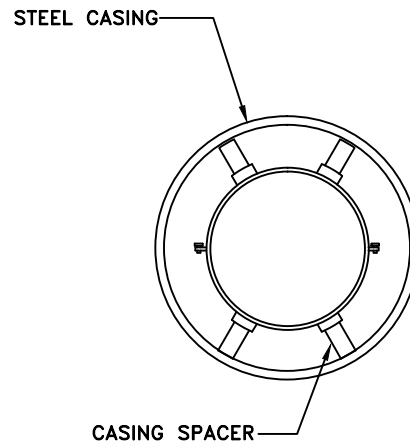
NOMINAL PIPE SIZE	MINIMUM CASING SIZE	MIN. WALL	CASING SPACERS
6"	12" I.D.	1/4"	CASCADE WATERWORKS MFG. OR APPROVED EQUAL
8"	16" I.D.	1/4"	
10"	18" I.D.	1/4"	
12"	20" I.D.	1/4"	
14"	24" I.D.	1/4"	
16"	26" I.D.	1/4"	
18"	28" I.D.	1/4"	

NOTES:

- CASING SHALL BE INSTALLED BY THE BORE JACK AND/OR TUNNEL METHOD.
- USE STAINLESS STEEL CASING SPACERS AT INTERVALS REQUIRED BY MFG.
- SIZE AND THICKNESS OF CASING SHALL BE AS SHOWN IN SCHEDULE AT LEFT.
- WHEN CASING IS OVER 60 FEET LONG, A GATE VALVE AT EACH END WILL BE REQUIRED AND ONE FLEX COUPLING.
- EACH END OF CASING SHALL BE SEALED WITH A STEEL BULKHEAD OR AN APPROVED FLEXIBLE SEAL.
- VOIDS AROUND OUTSIDE OF CASING SHALL BE PRESSURE GROUT (4 TO 1) MIX CEMENT.
- ALL CASING SECTIONS TO BE JOINED BY CONTINUOUS WELD.



TYPICAL STREET CROSSING
(100 FT OR WIDER)



CROSS SECTION



City of
Garden Grove
California

INSTALLATION OF WATER PIPE THROUGH STEEL CASING

Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS

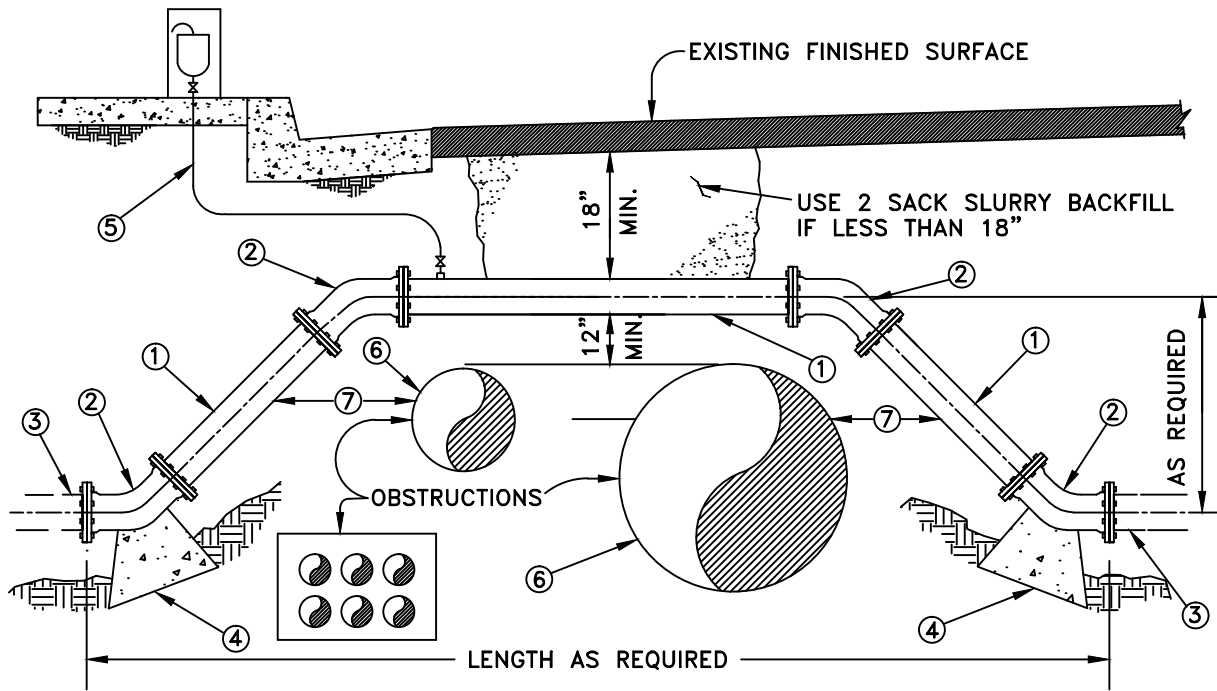
BY

DATE

STD. PLAN NUMBER

B-764

SHEET 1 OF 1



CONSTRUCTION NOTES

1. DUCTILE IRON FLANGED SPOOL (CLASS 150) AS PER AWWA STANDARDS C115-75, C150-76, C151-76, C104-80, & C111-80 (LENGTH AS REQUIRED).
2. 45° CAST IRON FLANGED BEND AS PER AWWA STANDARDS C110-71, C104-80, C111-80.
3. MJ x FLG ADAPTER (IF REQ'D.).
4. ANCHOR BLOCK PER STD. DWG. B-710.
5. 1" AIR RELEASE ASSEMBLY PER STD. DWG. B-740 (INSTALL ON HIGH END).
6. SEE CITY STD PLAN NO. B-762 AND B-763 IF OBSTRUCTIONS ARE SEWER OR STORM DRAIN MAINS.
7. SEPARATION REQUIREMENT PER AWWA AND STATE

NOTE

MJ FITTINGS W/JOINT RESTRAINTS MAY BE USED IN PLACE OF FLANGED FITTINGS WITH THE APPROVAL OF THE CITY WATER ENGINEER.

ALL BOLTS TO COATED WITH NO-OX-ID WATERWORKS OR APPROVED EQUAL.



City of
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DUCTILE IRON VERTICAL OFFSET

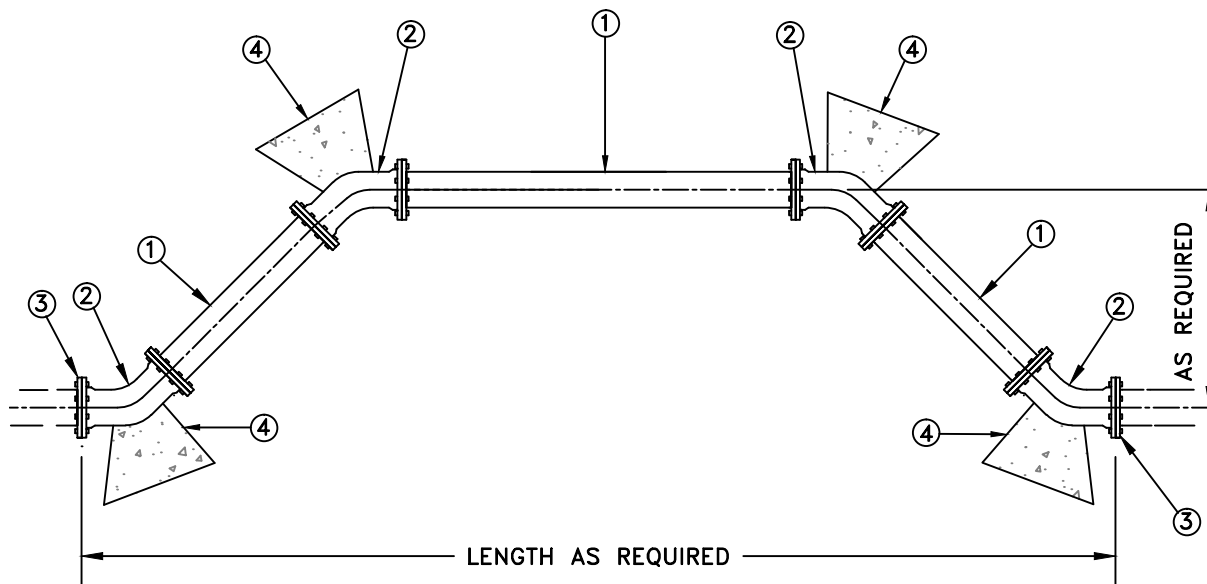
Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-765

SHEET 1 OF 1



CONSTRUCTION NOTES

1. DUCTILE IRON FLANGED SPOOL (CLASS 150) AS PER AWWA STANDARDS C115-75, C150-76, C151-76, C104-80, & C111-80 (LENGTH AS REQUIRED).
2. 45° CAST IRON FLANGED BEND AS PER AWWA STANDARDS C110-71, C104-80, C111-80.
3. MJ x FLG ADAPTER (IF REQ'D.).
4. ANCHOR BLOCK PER STD. DWG. B-710.

NOTE

MJ FITTINGS W/JOINT RESTRAINTS MAY BE USED IN PLACE OF FLANGED FITTINGS WITH THE APPROVAL OF THE CITY WATER ENGINEER.

ALL BOLTS TO COATED WITH NO-OX-ID WATERWORKS OR APPROVED EQUAL.



City of
Garden Grove
California

DUCTILE IRON HORIZONTAL OFFSET

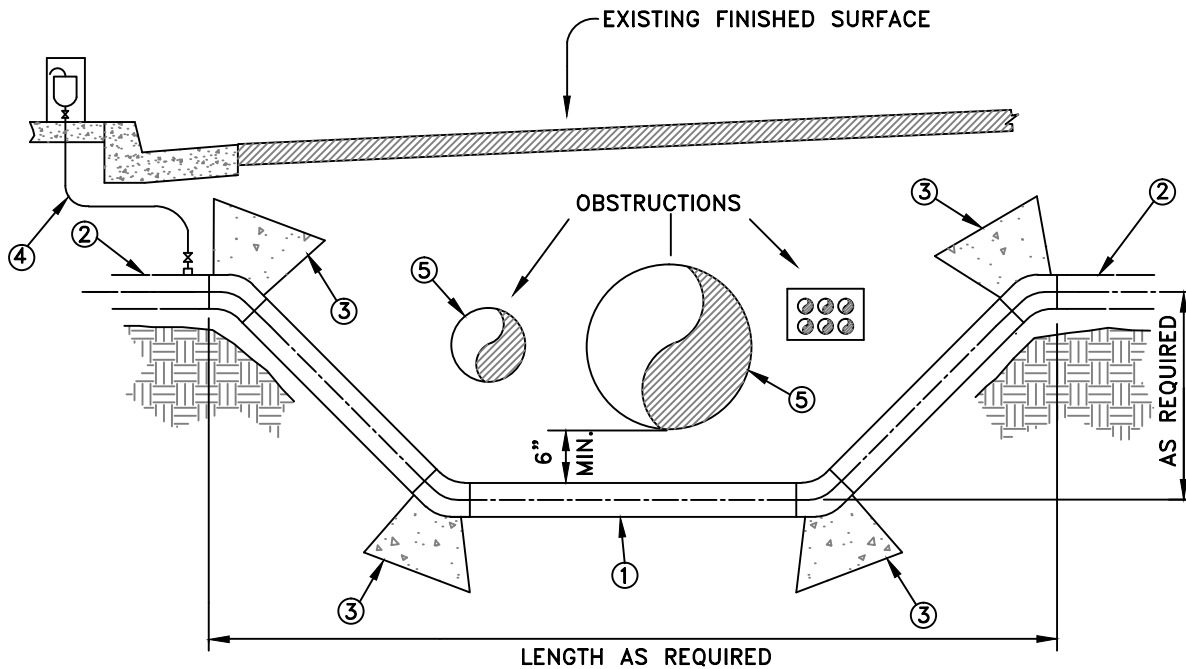
Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-766

SHEET 1 OF 1



CONSTRUCTION NOTES

1. FABRICATE ONE PIECE WELDED STEEL OFFSET PER FOLLOWING SPECIFICATIONS:
 - A. MATERIAL – PIPE (AWWA SPEC. C202-64) ELECTRICALLY WELDED PIPE, GRADE B.
 - B. BENDS – PER AWWA SPEC. C208-59.
 - C. LINING – CEMENT MORTAR LINING PER AWWA SPEC. C205-80.
 - D. PRIMING – PREPARE EXTERIOR OF PIPE TO RECEIVE RUST INHIBITING PRIMER PER AWWA SPEC. C203-73.
 - E. COATING – AFTER PRIMING EXTERIOR OF PIPE, APPLY COAL-TAR ENAMEL (PER AWWA SPEC. C203-73) INTO WHICH A SINGLE LAYER OF FELT WRAP SHALL BE BONDED, FINISH WITH A SINGLE WRAP OF KRAFT PAPER.
2. MJ x FLG ADAPTER (ID REQ'D), WITH JOINT RESTRAINT.
3. ANCHOR BLOCKS PER DETAILS ON STD. DWG. B-710 & 711.
4. 1" AIR RELEASE ASSEMBLY PER STD. DWG. B-740 (IF REQ'D).
5. SEE CITY STD PLAN NO. B-762 AND B-763 IF OBSTRUCTIONS ARE SEWER OR STORM DRAIN MAINS.

ALL BOLTS TO BE COATED WITH NO-OX-1D WATERWORKS OR APPROVED EQUAL



City of
Garden Grove
California

WELDED STEEL OFFSET

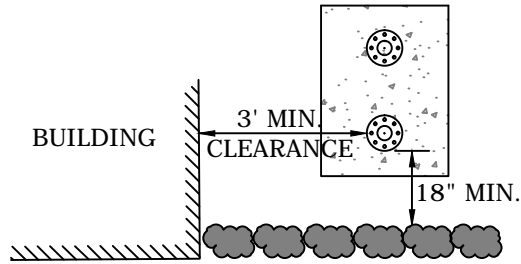
Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-767

SHEET 1 OF 1



PROPERTY LINE

CURB

PUBLIC STREET

STANDARD ORIENTATION

NOTES

1. ABOVE GROUND FIRE LINE AND BACKFLOW ASSEMBLIES MUST BE SHIELDED FROM PUBLIC VIEW FROM STREET WITH LANDSCAPING (IN SOME CASES WALLS MAY BE USED) OR OTHER MEANS IN ACCORDANCE WITH SECTION 4-10 OF THE STANDARD SPECIFICATIONS OR AS DIRECTED BY THE PLANNING SERVICES DIVISION.
2. CLINGING VINES TO BE PLANTED ADJACENT TO WALL (IF WALL IS USED) PER PLANNING DEPARTMENT REQUIREMENTS
3. ALL LANDSCAPING WITH IRRIGATION TO BE INSTALLED AND MAINTAINED BY PROPERTY OWNER.
4. FIRE DEPARTMENT CONNECTIONS CANNOT BE PLACED ON THE ASSEMBLY WITHOUT PRIOR APPROVAL. CONTACT FIRE DEPARTMENT AT 741-5628 FOR ACCEPTABLE LOCATION.
5. THE DISTANCE FROM THE SETBACK LINE TO THE PROPERTY LINE VARIES BY ZONING AND AS APPROVED BY THE CITY.



City of
Garden Grove
California

ABOVE GROUND FIRE LINE AND BACKFLOW DEVICE SCREENING AND SETBACK REQUIREMENTS

Approved  Date 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS

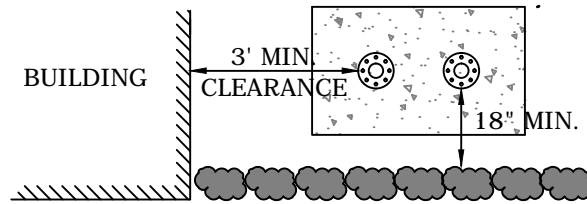
BY

DATE

STD. PLAN NUMBER

B-769

SHEET 1 OF 2



PROPERTY LINE

CURB

PUBLIC STREET

PARALLEL ORIENTATION

NOTES

1. ABOVE GROUND FIRE LINE AND BACKFLOW ASSEMBLIES MUST BE SHIELDED FROM PUBLIC VIEW FROM STREET WITH LANDSCAPING (IN SOME CASES WALLS MAY BE USED) OR OTHER MEANS IN ACCORDANCE WITH SECTION 4-10 OF THE STANDARD SPECIFICATIONS OR AS DIRECTED BY THE PLANNING SERVICES DIVISION.
2. CLINGING VINES TO BE PLANTED ADJACENT TO WALL (IF WALL IS USED) PER PLANNING DEPARTMENT REQUIREMENTS
3. ALL LANDSCAPING WITH IRRIGATION TO BE INSTALLED AND MAINTAINED BY PROPERTY OWNER.
4. FIRE DEPARTMENT CONNECTIONS CANNOT BE PLACED ON THE ASSEMBLY WITHOUT PRIOR APPROVAL. CONTACT FIRE DEPARTMENT AT 741-5628 FOR ACCEPTABLE LOCATION.
5. THE DISTANCE FROM THE SETBACK LINE TO THE PROPERTY LINE VARIES BY ZONING AND AS APPROVED BY THE CITY.



City of
Garden Grove
California

ABOVE GROUND FIRE LINE AND BACKFLOW DEVICE SCREENING AND SETBACK REQUIREMENTS

Approved

Date 12-8-15

REVISIONS

BY

DATE

STD. PLAN NUMBER

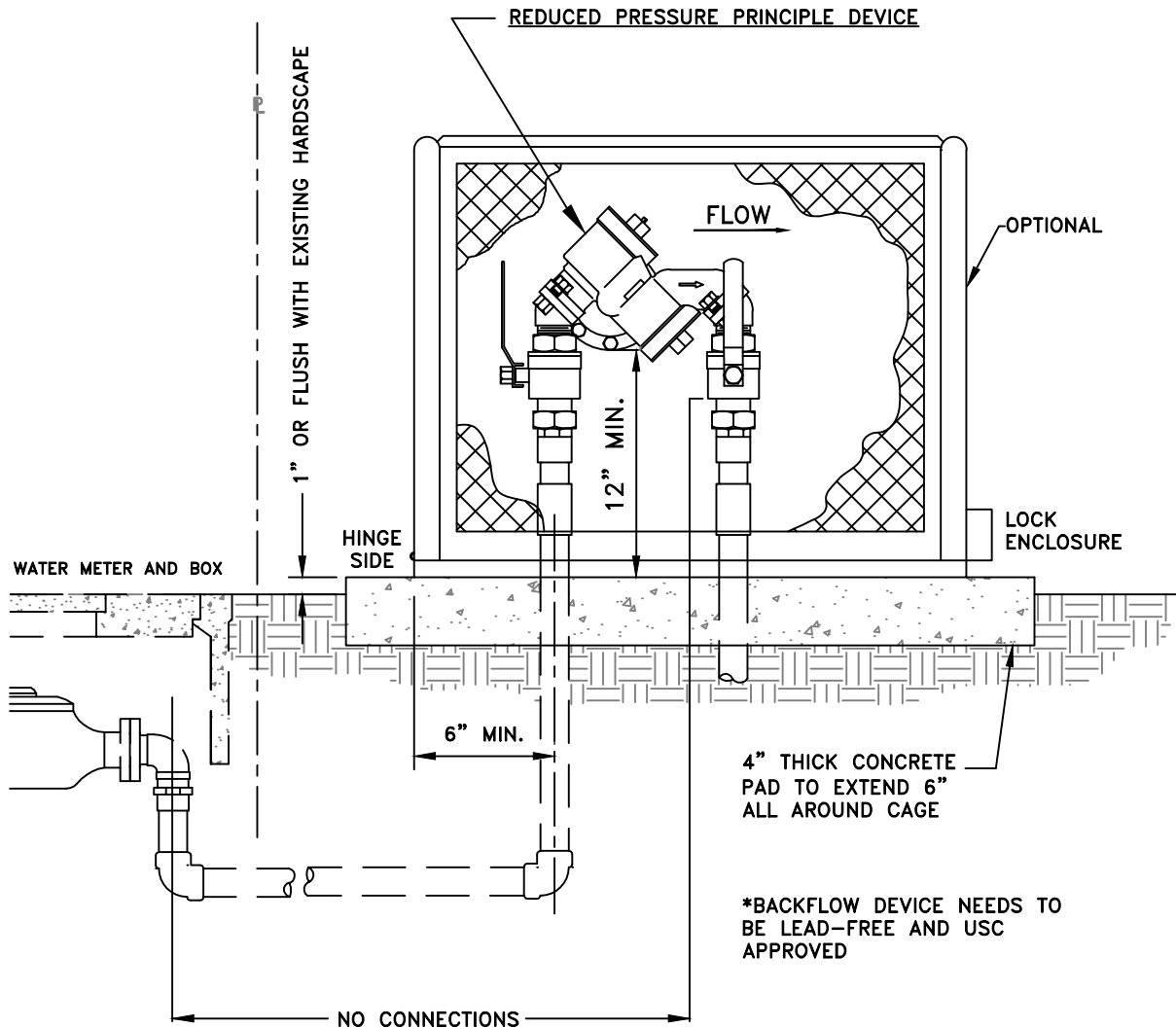
City Engineer

R.C.E. 52125

Exp. 12-31-16

B-769

SHEET 2 OF 2



NOTES:

1. THE BACKFLOW DEVICE MUST BE AS APPROVED BY THE CITY OF GARDEN GROVE WATER SERVICES DIVISION. FOR AN APPROVED LIST CONTACT THE WATER SERVICES DIVISION AT (714) 741-5395.
2. EACH BACKFLOW DEVICE SHALL BE TESTED IMMEDIATELY AFTER INSTALLATION AND ANNUALLY BY A CERTIFIED TESTER AS APPROVED BY THE ORANGE COUNTY HEALTH DEPARTMENT.
3. RELIEF SPOUT OF BACKFLOW DEVICE SHALL BE 12" MIN. ABOVE SURROUNDING GROUND. CLEARANCE AROUND TEST OUTLETS SHALL BE SUCH THAT ANY DEVICE CAN BE CONVENIENTLY TESTED.
4. THERE SHALL BE NO CONNECTIONS BETWEEN THE METER AND THE BACKFLOW DEVICE.
5. KEEP 30" CLEARANCE ON THE HINGE SIDE OF CAGE TO ALLOW FOR CAGE ACCESS PLACEMENT.



City of
Garden Grove
California

TYPICAL 2" OR SMALLER REDUCED PRESSURE PRINCIPAL DEVICE (RPPD)

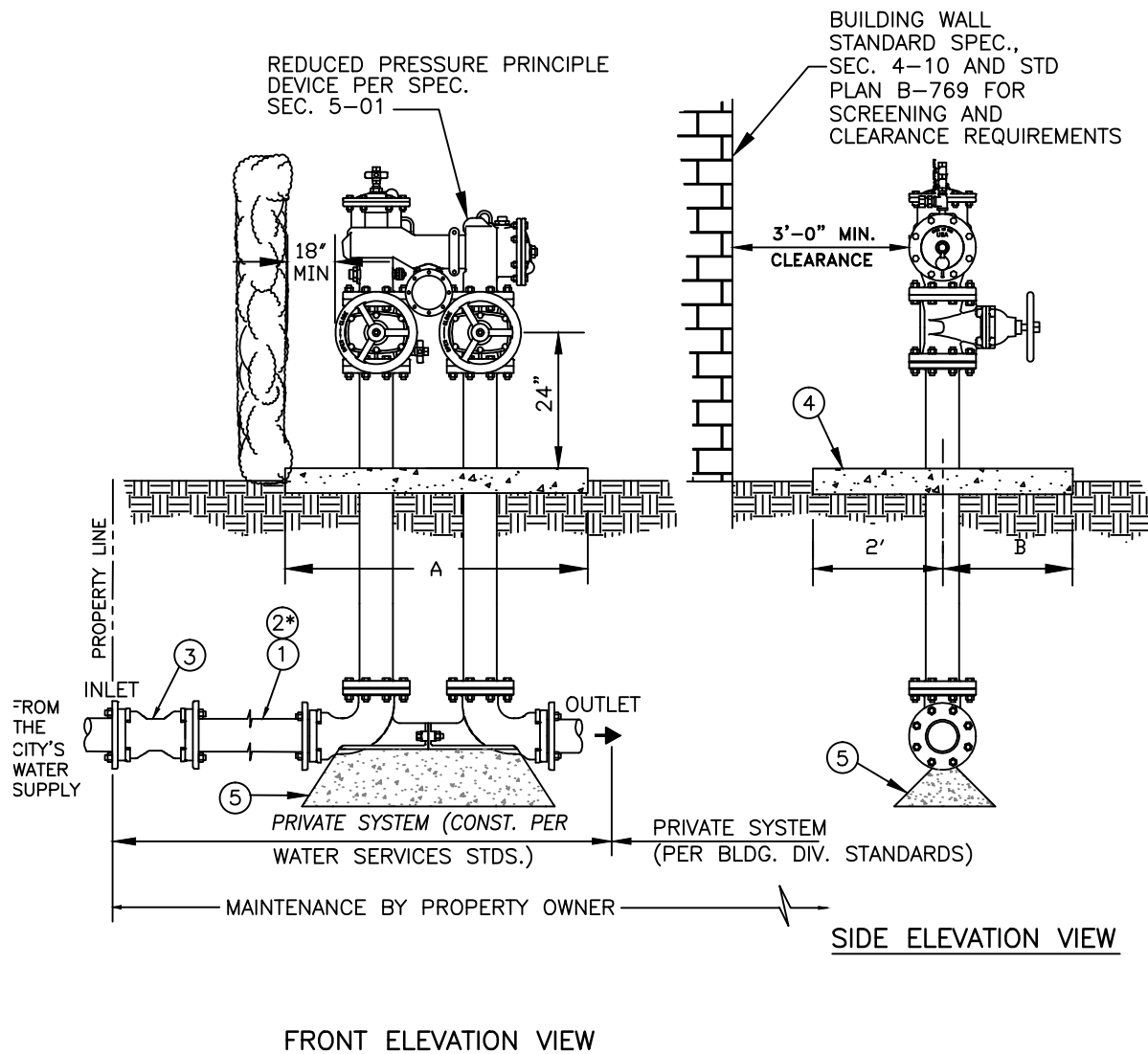
Approved  Date 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-770

SHEET 1 OF 1



* FOR PVC WATER MAIN CONSTRUCTION ONLY - SEE ITEM 2* AND NOTES 9 AND 10 ON SHEET 2.



City of
Garden Grove
California

TYPICAL 2-1/2" OR LARGER REDUCED PRESSURE PRINCIPLE DEVICE (RPPD)

Approved:  Date: 12-8-15

City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-771

SHEET 1 OF 2

LIST OF MATERIAL	
ITEM	DESCRIPTION
1	PIPE SIZE X FIELD LENGTH D.I. SPOOL, P.E.. X P.E. (TYP).
2*	IN LIEU OF ITEM 1, PIPE SHALL BE AWWA C900 PVC, DR14, CLASS 305, P.E.XP.E. (SEE NOTES 9 AND 10)
3	D.I. SOLID SLEEVE M.J. X M.J. (SEE NOTE 8); M.J.'S SHALL BE RESTRAINED PER SECTION 2-12.01
4	CONCRETE PAD 4" THICK, SIZE AS INDICATED HEREIN; CLASS 520-C-2500 CONCRETE
5	ANCHOR BLOCKS SHALL BE 560-C-3250 CONCRETE (GREENBOOK) AND POURED AGAINST UNDISTURBED SOIL.

BACKFLOW DEVICE SIZE	A	B
2 1/2"	6.0'	3.0'
3"	6.5'	3.5'
4"	6.5'	4.0'
6"	7.0'	4.5'
8"	7.5'	5.0'
10"	8.0'	6.0'

NOTES:

1. APPROVED PRESSURE PRINCIPLE DEVICE SHALL BE PER SECTION 5-01.
2. LOCATION AND INSTALLATION SHALL BE PER PLAN AS SUBMITTED TO AND APPROVED BY THE CITY.
3. ALL PIPE SHALL BE DUCTILE IRON PER SECTION 2-01.
4. ALL PIPE FITTINGS AND APPURTENANCES (GASKETS, NUTS, BOLTS, RESTRAINTS) SHALL BE PER SECTION 2-08 AND 2-12.
5. SEE STANDARD DRAWING B-769 FOR ABOVE GROUND ASSEMBLY INSTALLATION REQUIREMENTS.
6. THE COMPLETED ASSEMBLY SHALL BE PAINTED PER SECTION 2-14.
7. NO CONNECTIONS TO BE MADE BETWEEN METER AND BACKFLOW PREVENTER.
8. ITEM 3 ABOVE IS REQUIRED IF THE BACKFLOW DEVICE IS NOT INSTALLED AT THE SAME TIME OF THE LATERAL INSTALLATION.
9. PVC WATER CONSTRUCTION SHALL BE PER SECTION 2-02.
10. MECHANICAL JOINT RESTRAINT FOR PVC PIPE SHALL BE 2000PV RESTRAINT OR EQUAL AS PER SPECIFICATION SECT. 2-12.01 FOR PVC.



City of
Garden Grove
California

**TYPICAL 2-1/2" OR LARGER REDUCED
PRESSURE PRINCIPAL DEVICE (RPPD)**

Approved

Date 12-8-15

REVISIONS

BY

DATE

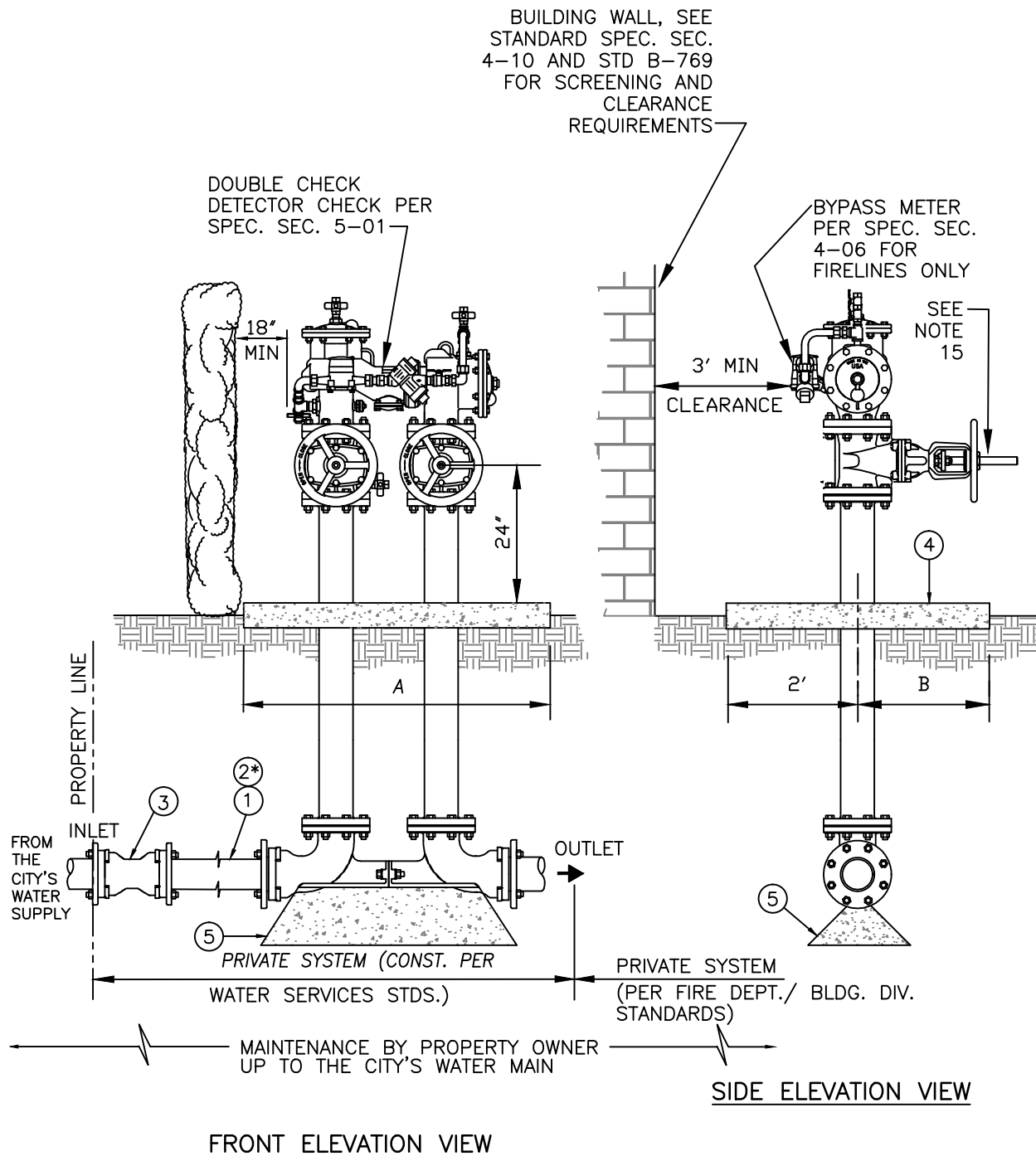
STD. PLAN NUMBER

City Engineer

R.C.E. 52125 Exp.12-31-16

B-771

SHEET 2 OF 2



* FOR PVC WATER MAIN CONSTRUCTION ONLY- SEE ITEM 2* AND NOTES 13 AND 14 ON SHEET 2



City of
Garden Grove
California

TYPICAL 2-1/2" OR LARGER DOUBLE CHECK DETECTOR FIRE LINE ONLY

Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-773

SHEET 1 OF 2

LIST OF MATERIAL	
ITEM	DESCRIPTION
1	PIPE SIZE X FIELD LENGTH D.I. SPOOL, P.E. X P.E. (TYP).
2*	IN LIEU OF ITEM 1, PIPE SHALL BE AWWA C900 PVC, DR14, CLASS 305, P.E.XP.E. (SEE NOTES 12 AND 13)
3	D.I. SOLID SLEEVE M.J. X M.J. (SEE NOTE 11); M.J.'S SHALL BE RESTRAINED PER SECTION 2-12.01
4	CONCRETE PAD 4" THICK, SIZE AS INDICATED HEREIN; CLASS 520-C-2500 CONCRETE
5	ANCHOR BLOCKS SHALL BE 560-C-3250 CONCRETE (GREENBOOK) AND POURED AGAINST UNDISTURBED SOIL.

BACKFLOW DEVICE SIZE	A	B
2 1/2"	6.0'	3.0'
3"	6.5'	3.5'
4"	6.5'	4.0'
6"	7.0'	4.5'
8"	7.5'	5.0'
10"	8.0'	6.0'

NOTES:

1. APPROVED DOUBLE CHECK DETECTOR CHECK SHALL BE PRE SECTION CHECK DETECTOR ASSEMBLY, SEE SECTION 5-01.
2. LOCATION AND INSTALLATION SHALL BE PER PLAN AS SUBMITTED TO AND APPROVED BY THE CITY.
3. FROM THE OUTLET SECTION OF THE DOUBLE CHECK DETECTOR CHECK ASSEMBLY ON THE PRIVATE SYSTEM SIDE, REMOVE THE POST INDICATOR VALVE FROM THE UNDERGROUND, UNLESS PROPERTY IS DONE IN SECTIONS WITH MULTIPLE PIV SHUT OFFS OR WITH FIRE DEPT. APPROVAL.
4. FIRE DEPT. CONNECTIONS CANNOT BE PLACED ON THE ASSEMBLY WITHOUT PRIOR APPROVAL, CONTACT FIRE DEPT. AT 741-5628. WHERE APPROVED BY FIRE DEPT., A FLG X FLG X FLG, D.I., CEMENT MORTAR LINED TEE MAY BE INSTALLED ON FIRELINES.
5. O.S.&Y. VALVES TO BE LOCKED IN OPEN POSITION WITH CHAIN AND OWNER'S PADLOCK(S). PADLOCK(S) SHALL BE BREAKAWAY TYPE.
6. ALL PIPE SHALL BE DUCTILE IRON PER SECTION 2-01.
7. ALL PIPE FITTINGS AND APPURTENANCES (GASKETS, NUTS, BOLTS, RESTRAINTS) SHALL BE PER SECTION 2-08 AND 2-12.
8. SEE STANDARD DRAWING W-769 (SHEET 2) FOR ABOVE GROUND ASSEMBLY INSTALLATION REQUIREMENTS.
9. THE COMPLETED ASSEMBLY SHALL BE PAINTED PER SECTION 2-14.
10. NO CONNECTIONS TO BE MADE BEFORE BACKFLOW PREVENTER.
11. BACKFLOW DEVICE SIZE SHALL BE EQUAL TO OR GREATER THAN PIPE SIZE.
12. ITEM 3 ABOVE IS REQUIRED IF THE BACKFLOW DEVICE ASSEMBLY IS NOT INSTALLED AT THE SAME TIME OF THE LATERAL INSTALLATION.
13. PVC WATER CONSTRUCTION SHALL BE PER SECTION 2-02.
14. MECHANICAL JOINT RESTRAINT FOR PVC PIPE SHALL BE AS PER SECT. 2-12.01 RESTRAINT SHALL BE 2000PV BY EBBA IRON OR APPROVED EQUAL.
15. INSTALLATION OF AN OUTSIDE SCREW AND YOKE (OS&Y) SHALL BE CONNECTED TO A SUPERVISED FIRE ALARM PANEL.



City of
Garden Grove
California

TYPICAL 2-1/2" OR LARGER DOUBLE CHECK DETECTOR FIRE LINE ONLY

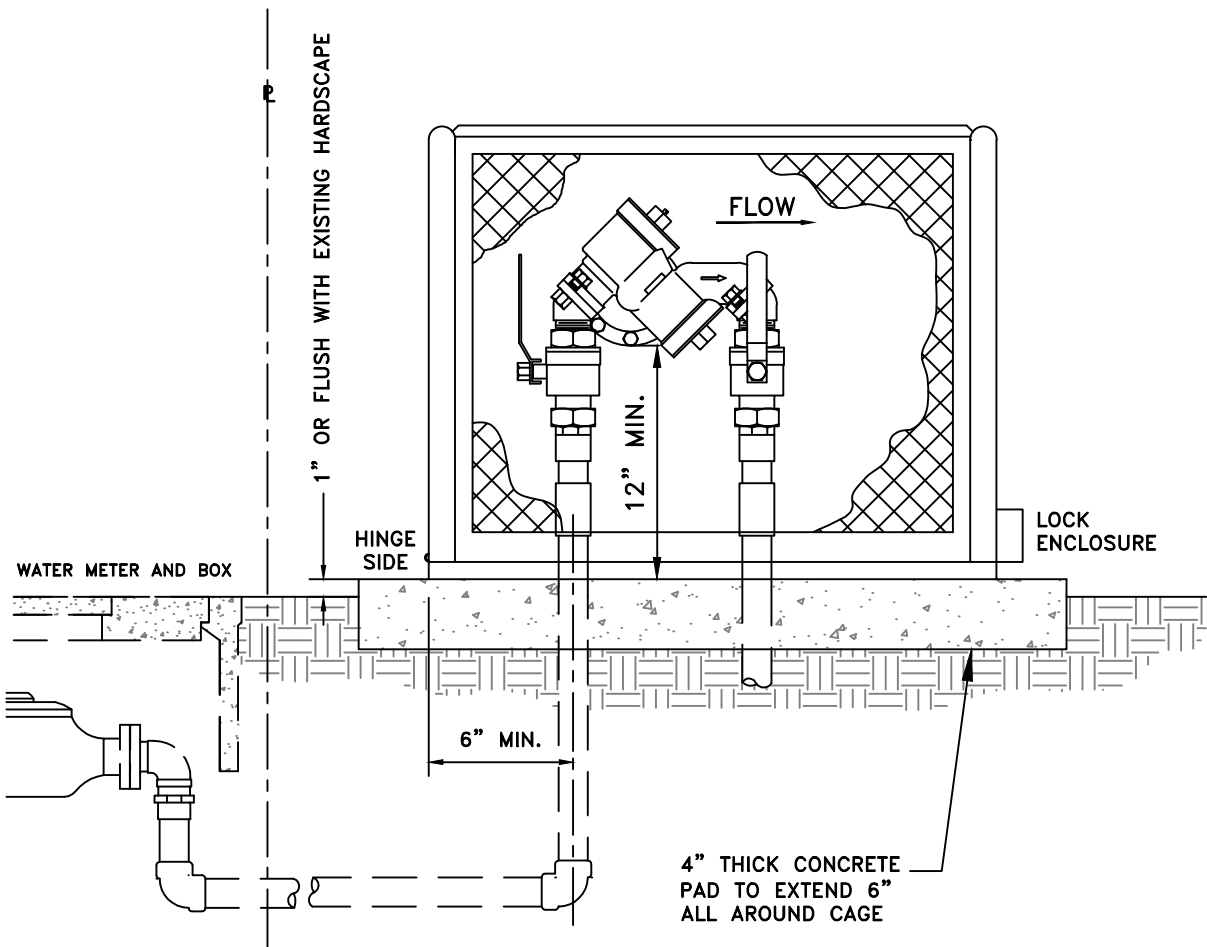
Approved  Date 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-773

SHEET 2 OF 2



NOTES:

1. CAGE TO BE AN ORANGE COUNTY WELDING MODEL 22 BACKFLOW CAGE, HUNTER GREEN POWDER COATED, OR APPROVED EQUAL. OVERALL CAGE DIMENSIONS ARE 14"W x 32"L x 25.50"H
2. KEEP 30" CLEARANCE ON THE HINGE SIDE OF CAGE TO ALLOW FOR CAGE ACCESS PLACEMENT.



City of
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BACKFLOW CAGE FOR TYPICAL 2" OR SMALLER REDUCED PRESSURE PRINCIPAL DEVICE (RPPD)

Approved  Date 12-8-15

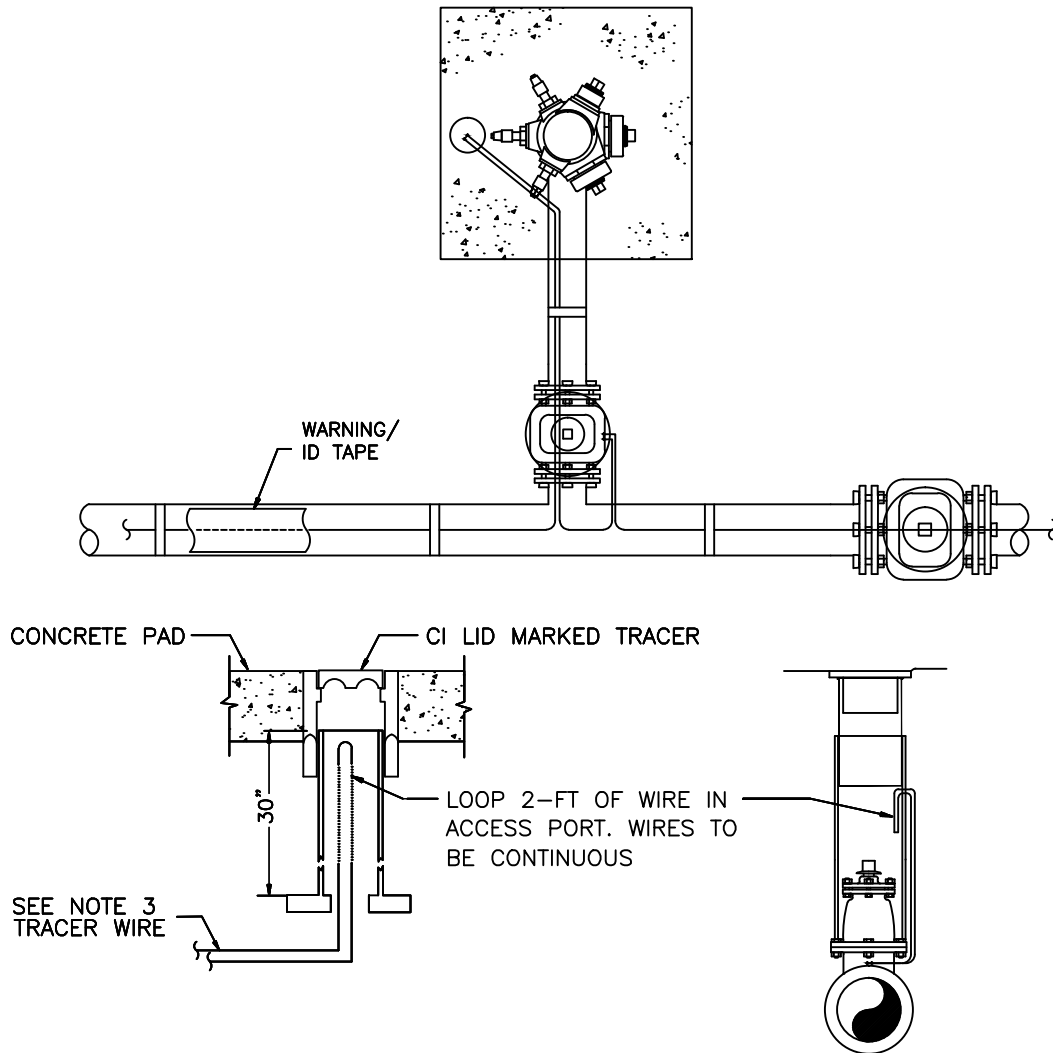
City Engineer R.C.E. 52125 Exp.12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

B-774

SHEET 1 OF 2



TRACER WIRE ACCESS PORT

VALVE CAN W/ TRACER WIRE

NOTES:

1. TRACER WIRE TO BE 14 GAUGE SOLID COPPER WIRE, UF OR THWN.
2. TRACER WIRE SHALL BE SECURED TO THE PIPE AT 10-FOOT INTERVALS WITH PLASTIC ADHESIVE TAPE, DUCT TAPE OR PLASTIC TIE STRAPS. THE WIRE SHALL RUN CONTINUOUSLY ALONG THE TOP OF PIPE FOR THE ENTIRE LENGTH OF PIPE.
3. TRACER WIRE ACCESS PORT (SHOWN ABOVE) SHALL BE INSTALLED WITHIN THE CONCRETE PAD OF ALL NEW FIRE HYDRANTS INSTALLED AND AIR VALVE ENCLOSURES ONLY AS DIRECTED BY THE ENGINEER AT INTERVALS OF NOT MORE THAN 1000-FEET.
4. SUFFICIENT SLACK SHALL BE LEFT IN LEADS NEAR CONNECTIONS TO PIPE TO PREVENT BREAKAGE OF CONNECTION DURING BACKFILLING.
5. WARNING/ IDENTIFICATION TAPE SHALL BE 6-INCH WIDE, BLUE IN COLOR AND MARKED "CAUTION WATER LINE BELOW" BURIED AT A DEPTH OF 1' ABOVE PIPE.
6. A CONTINUITY TEST IS TO BE PERFORMED ON ALL TRACER WIRES.



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WARNING IDENTIFICATION TAPE AND TRACER WIRE INSTALLATION

Approved:  Date: 12-8-15
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REVISIONS	BY	DATE

STD. PLAN NUMBER

B-781

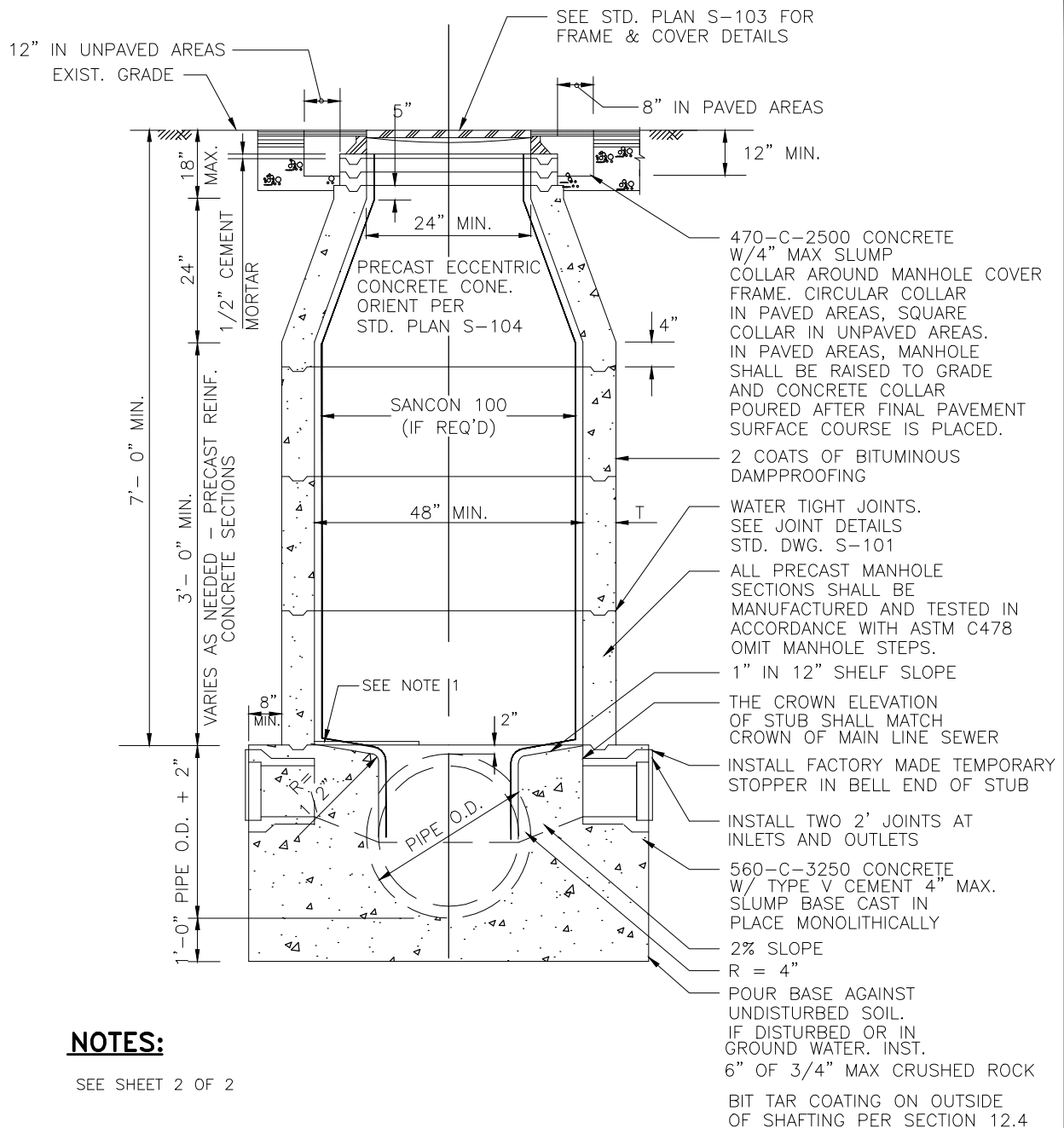
SHEET 1 OF 1



GARDEN GROVE

SERIES S-100

SEWER



Garden Grove
Sanitary District

MANHOLE DETAILS

Approved  Date 12-8-15
City Engineer R.C.E. 52125 Exp.12-31-16

REVISIONS	BY	DATE	STD. PLAN NUMBER
			S-100
			SHEET 1 OF 2

MANHOLE DETAILS NOTES:

1. PLACE TWO HALF MOON SHAPED TEMPORARY PLYWOOD COVERS (5/8" THICK MINIMUM) IN BOTTOM OF MANHOLE AFTER SHAFTS HAVE BEEN SET TO KEEP DEBRIS FROM ENTERING SEWER.
2. FOR DROP MANHOLE SEE STD. PLAN. S-103.
3. FOR MANHOLES LOCATED OUTSIDE PAVED AREAS, THE FRAME AND COVER SHALL BE SET A MINIMUM OF 0.1 FT. ABOVE FINISH GRADE IN SHOULDER AREAS, UNPAVED ROADS OR LANDSCAPING AREAS, AND 18" IN UNFINISHED AREAS.
4. ALL INLETS AND OUTLETS SHALL BE SUPPORTED WITH CONCRETE SUPPORTS PRIOR TO POURING MANHOLE BASE.
5. MANHOLE LOCATIONS SHALL BE MARKED ON CURB FACE.
6. WALL THICKNESS (T) SHALL BE MINIMUM 5" FOR 48" MANHOLES, 6" FOR 60" MANHOLES, 7" FOR 72" MANHOLES.
7. SIDES OF BASE SHALL BE EITHER FORMED OR POURED AGAINST VERTICAL SMOOTH EARTH.
8. WHEN DEPTH OF MANHOLE EXCEEDS 15 FEET FROM TOP OF PIPE TO FINISH GRADE, MANHOLE SHAFT SHALL BE INCREASED TO 60 INCH DIAMETER.
9. A PLASTIC SIGN SHALL BE ATTACHED 12 INCHES BELOW THE TOP OF MANHOLE FRAME WITH INSCRIPTION:

**CAUTION
PERMIT REQUIRED CONFINED SPACE
VENTILATE BEFORE ENTERING**

IN LETTERS NO SMALLER THAN 1/2 INCH IN HEIGHT. ATTACH SIGN TO MANHOLE WALL WITH A MINIMUM OF 4 TYPE 316 STAINLESS STEEL SCREWS AND ANCHORS.

10. DIAMETER OF MANHOLE PER SIZE OF SEWER LINE.

SEWER MAIN (INCHES)	MAXIMUM BRANCH SIZE (INCHES)	MANHOLE SIZE (INCHES)	FRAME AND COVER (INCHES)
8-15	10	48	24
18-21	12	60	30
24-36	15	72	36



Garden Grove
Sanitary District

MANHOLE DETAILS

Approved  Date 12-8-15
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REVISIONS

BY

DATE

STD. PLAN NUMBER

S-100

SHEET 2 OF 2

PIPE SHALL BE LAID WITH END SQUARE INTO M.H. BASE, UNLESS OTHERWISE NOTED. REMOVE TOP PORTION OF PIPE, THEN CONSTRUCT FILLET SHELF OVER PIPE TO DRAIN

FOR LOCATION OF M.H. SHAFT OPENING SEE STD. PLAN S-104

M.H. STATIONING

PROVIDE 0.10' FALL ACROSS M.H. WHERE POSSIBLE

SEE STD. PLAN S-106 FOR PVC PIPE CONNECTION DETAILS

$R = 2 \times D$

STUB (TYP.)

D

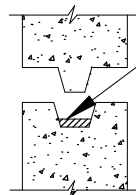
8" MIN. CONC. ENCASEMENT (ENCASE BELL)

2-2' JOINTS AT BOTH INLETS AND OUTLETS FOR VCP ONLY.

8" MIN. BASE

SHAFT
FLOW
CHANNEL

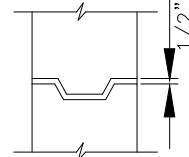
PLAN



JOINT SEALING COMPOUND

PLASTIC JOINT

REQ. IN GROUNDWATER



1/2" MORTAR

MORTAR JOINT

NOTES:

1. MORTAR JOINTS - SUFFICIENT MORTAR SHALL BE APPLIED ACROSS ENTIRE FACE OF JOINT SO THAT WHEN PRECAST UNITS ARE PLACED ON TOP OF ONE ANOTHER, THE MORTAR WILL SQUEEZE OUT BOTH THE INSIDE AND OUTSIDE WALL FACES. JOINTS SHALL BE "POINTED UP" AFTER SETTING PRECAST UNITS EXCLUDING GRADE RINGS.
2. PLASTIC JOINTS - PERFORMED COLD-APPLIED READY-TO-USE PLASTIC JOINT SEALING COMPOUND SHALL BE QUICK-SEAL AS SUPPLIED BY QUIKSET UTILITY VAULTS OR APPROVED EQUAL MUST BE USED WHEN GROUND WATER IS ENCOUNTERED.



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CONCRETE BASE AND JOINT DETAILS

Approved

Date 12-8-15

City Engineer

R.C.E. 52125 Exp.12-31-16

REVISIONS

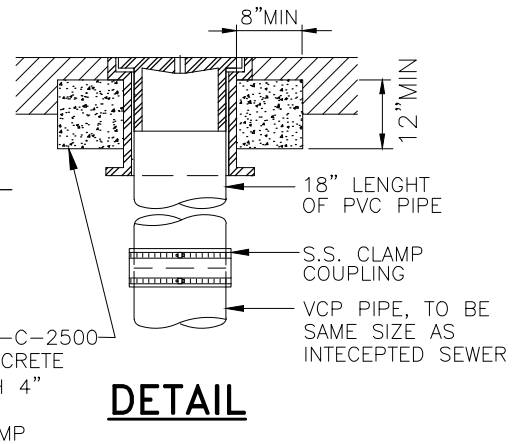
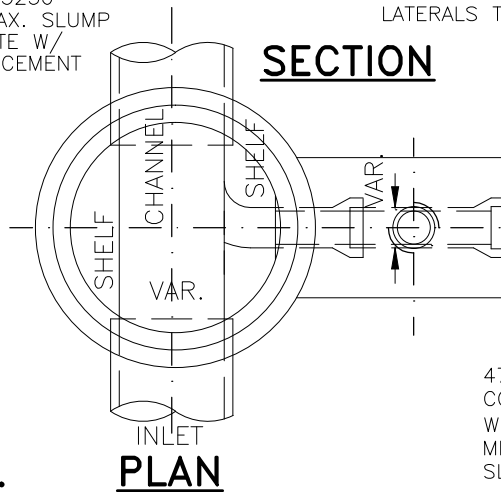
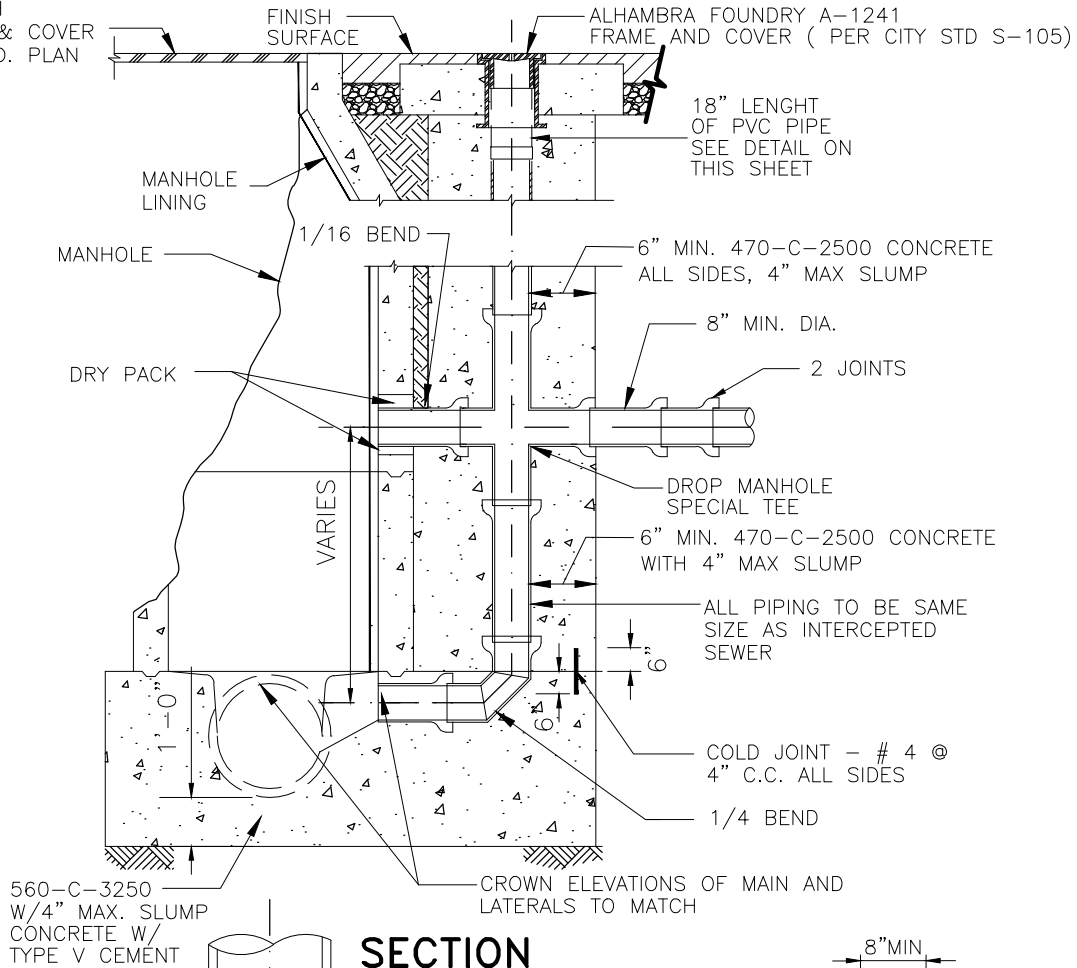
BY

DATE

STD. PLAN NUMBER

S-101

STA. MH
FRAME & COVER
SEE STD. PLAN
S-103



NOTES:

1. DROP MANHOLE TO BE USED FOR SPECIAL SITUATIONS ONLY, AND SHALL NOT BE CONSTRUCTED WITHOUT APPROVAL BY GGSD.
2. ALL NEW OPENINGS CONSTRUCTED INTO MANHOLE SHALL BE DONE BY CORE DRILLING.



Garden Grove
Sanitary District

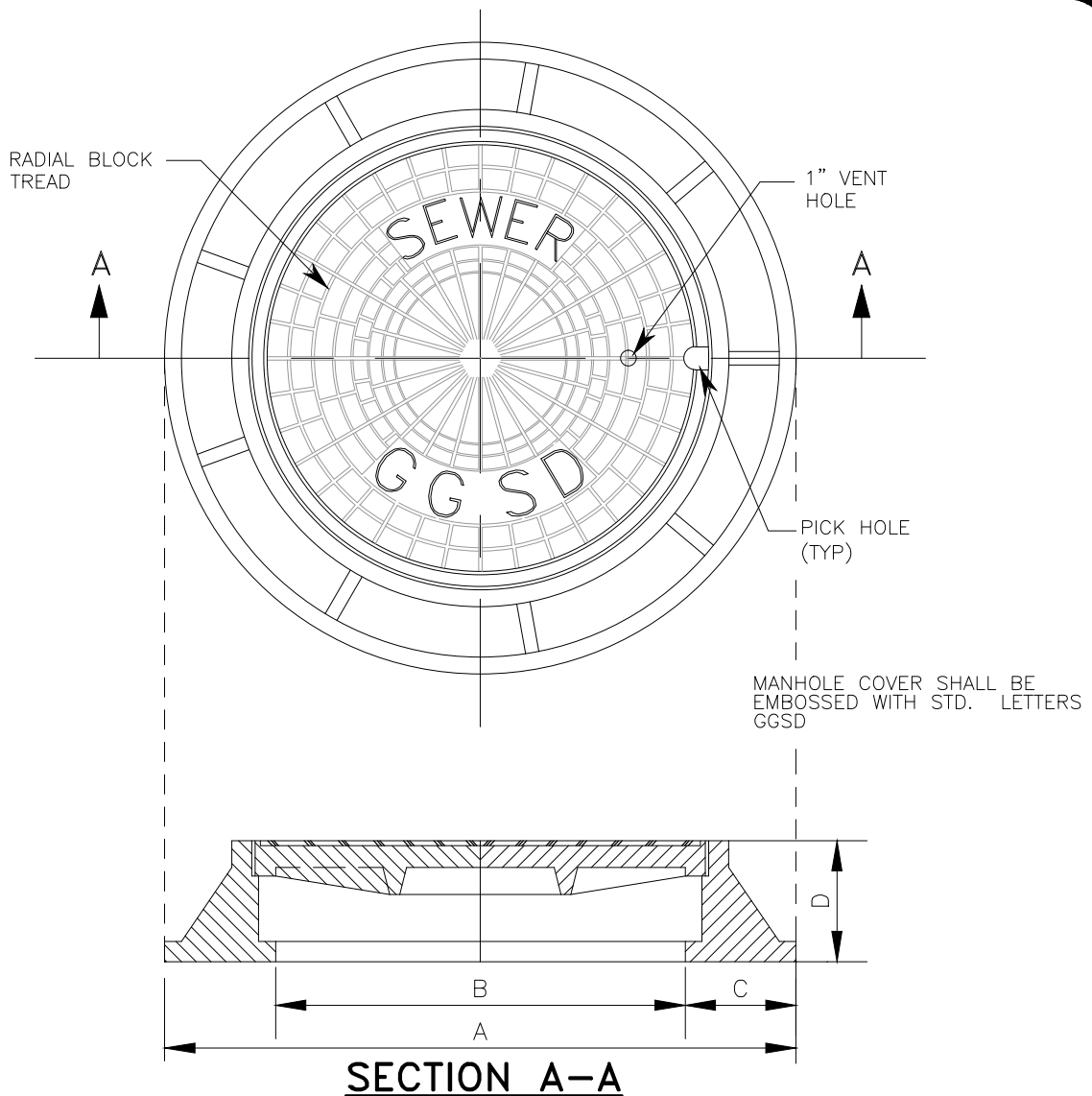
SEWER DROP MANHOLE WITH CLEANOUT

Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

S-102



MANHOLE SIZE	A	B	C	D	PLATE NUMBER
48"	32 1/2"	24	4 1/4	6	A-1495
60"	38 1/2"	30	4 1/4	6	A-1497
72"	44 1/2"	36	4 1/4	6	A-1498

NOTES:

- WHERE FRAME AND COVER ARE SET 18" ABOVE GRADE, FOUR (4) 1/2" DIA. INSERTS FOR ADJUSTABLE STUDS SHALL BE CAST IN TOP GRADE RING, FRAME SHALL BE BOLTED TO GRADE RING.
- MANHOLE COVER AND FRAME SHALL BE AS MANUFACTURED BY ALHAMBRA FOUNDRY. FRAME AND COVER SHALL BE COATED WITH ASPHALT OR COAL TAR.



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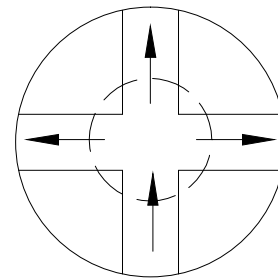
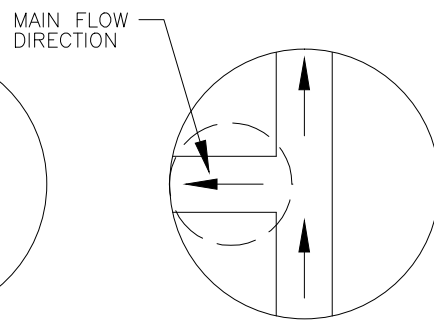
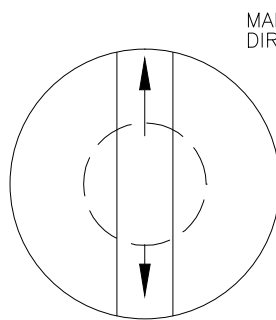
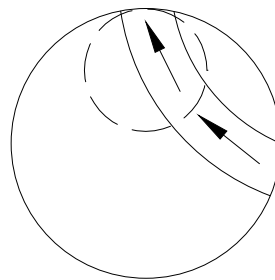
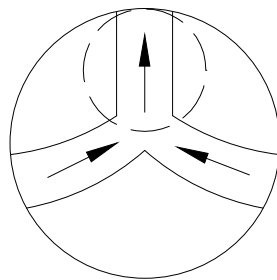
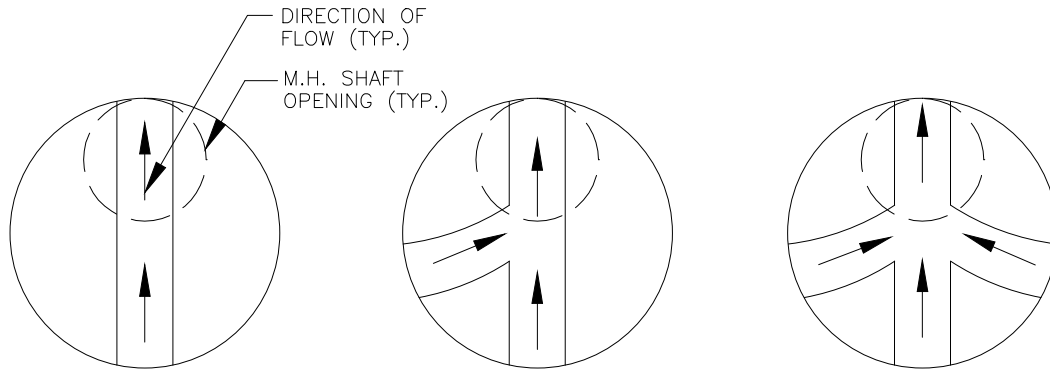
MANHOLE FRAME AND COVER (TRAFFIC LOADING)

Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

S-103



**SUMMIT M.H.
EITHER SIDE**

SUMMIT M.H.

**SUMMIT M.H.
ANY POSITION**



Garden Grove
Sanitary District

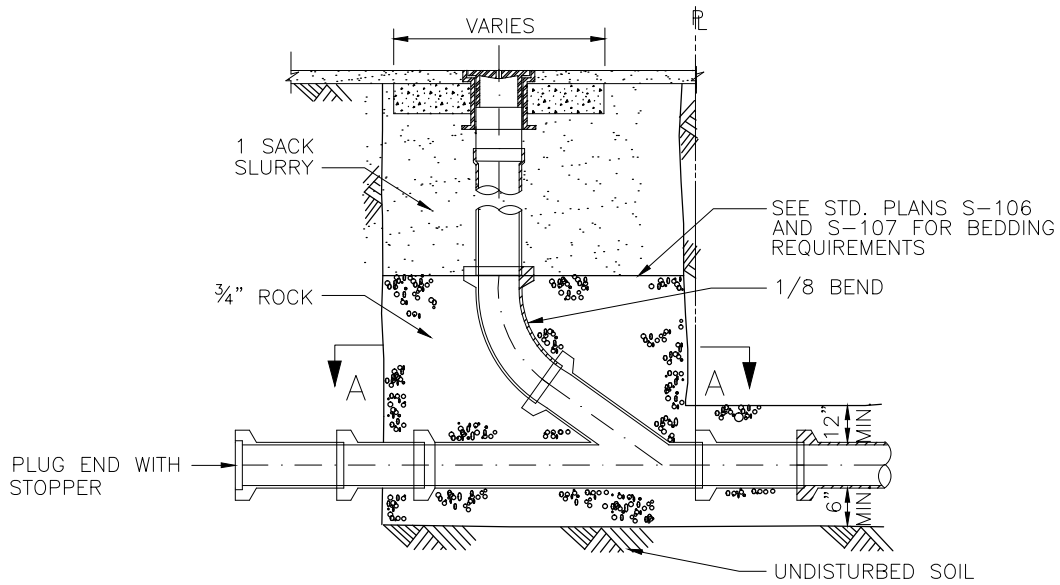
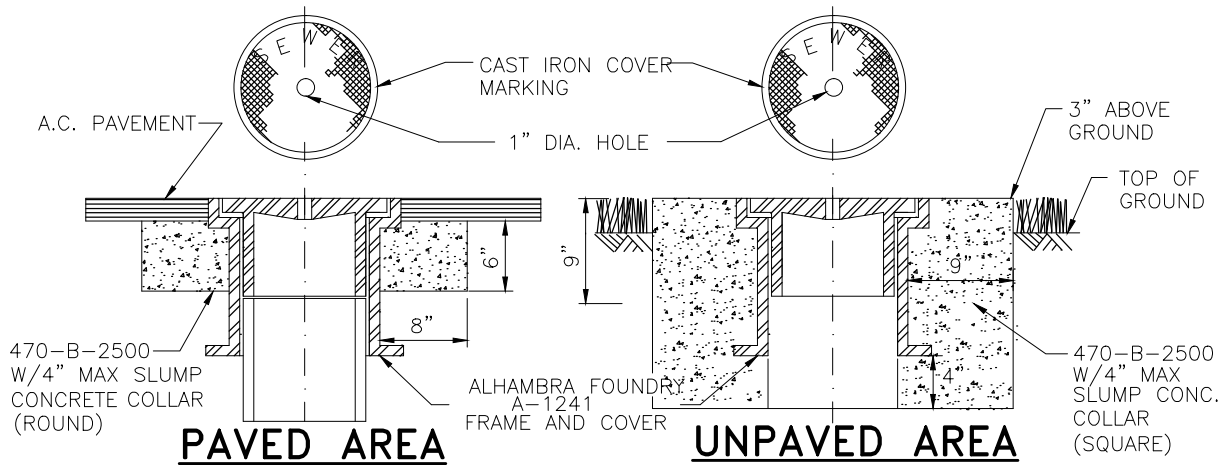
MANHOLE SHAFT OPENING ORIENTATION PLAN

Approved  Date 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

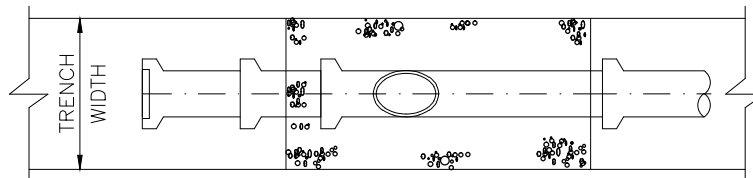
REVISIONS	BY	DATE

STD. PLAN NUMBER

S-104



ELEVATION



NOTES:

SECTION A - A

1. CLEANOUT PIPE TO BE SAME SIZE AND KIND OF MATERIAL AS LATERAL.
2. CLEANOUTS TO BE INSTALLED WITHIN 5' OF BUILDING, DIRECTION CHANGES, MAXIMUM 75' INTERVALS AND AT PROPERTY LINE.



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Sanitary District

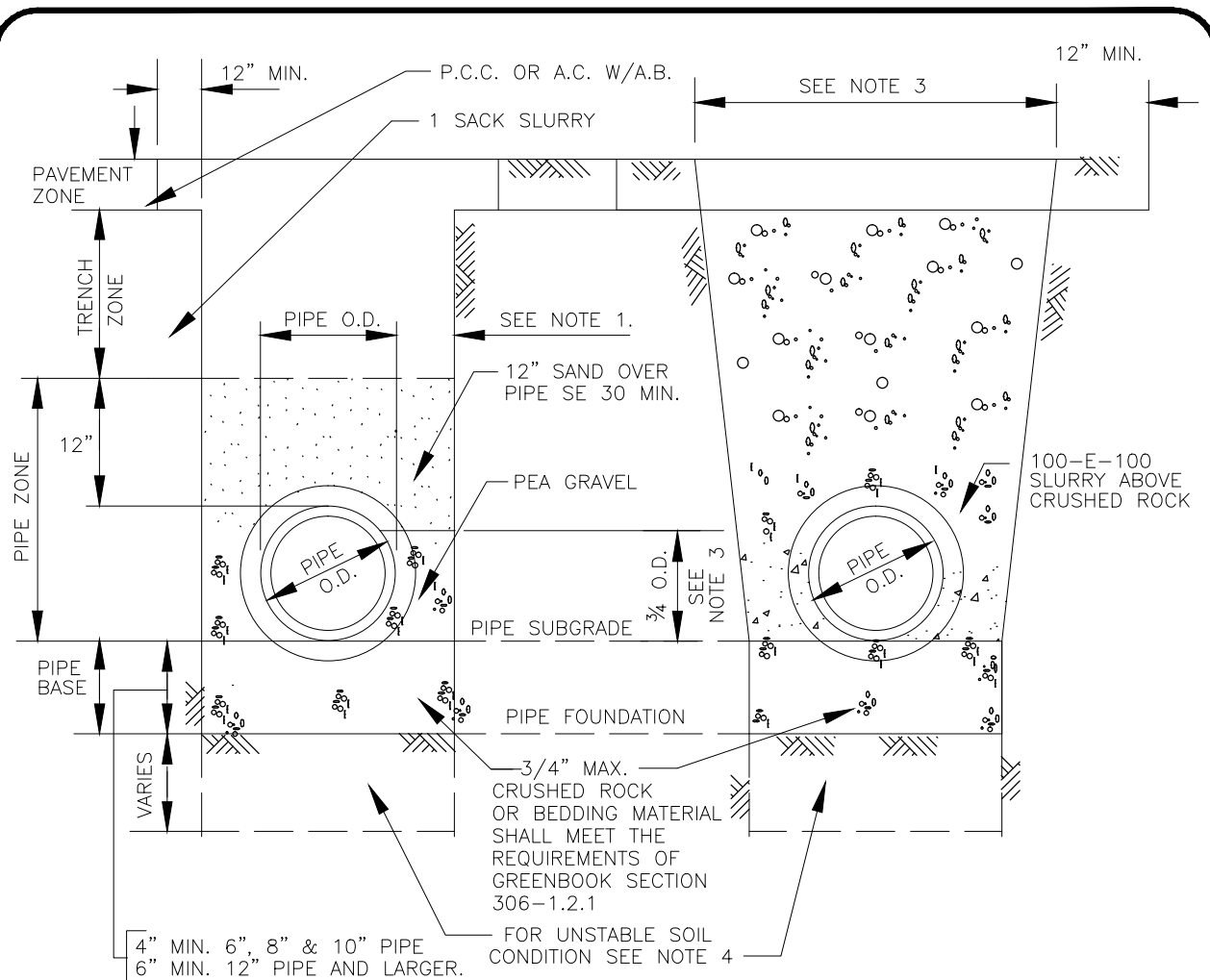
LATERAL CLEANOUT DETAIL

Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

S-105



TYPICAL NORMAL BEDDING

OVERWIDTH BEDDING

SEE NOTE 2

NOTES:

1. TRENCH WIDTH AT THE UPPER LIMIT OF THE PIPE ZONE SHALL BE WITHIN THE FOLLOWING LIMIT FOR TYPICAL NORMAL BEDDING.
(A) MAXIMUM TRENCH WIDTH—O.D. PIPE OR BELL PLUS 8" MAX. EACH SIDE OF PIPE.
(B) MINIMUM TRENCH WIDTH—O.D. PIPE OR BELL PLUS 6" MIN. EACH SIDE OF PIPE.
2. OVERWIDTH BEDDING SHALL BE USED WHERE THE TRENCH WIDTH AT THE UPPER LIMIT OF THE PIPE ZONE EXCEEDS THE MAXIMUM WIDTH SPECIFIED ABOVE.
3. MAXIMUM OVERWIDTH BEDDING TO BE DETERMINED IN FIELD BY THE DISTRICT REPRESENTATIVE ON THE BASIS OF OVERWIDTH EXCAVATED.
4. IF UNSTABLE SOIL IS ENCOUNTERED, DISTRICT REPRESENTATIVE SHALL DETERMINE DEPTH OF REMOVAL AND SIZE OF FOUNDATION ROCK REFILL MATERIAL.



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Sanitary District

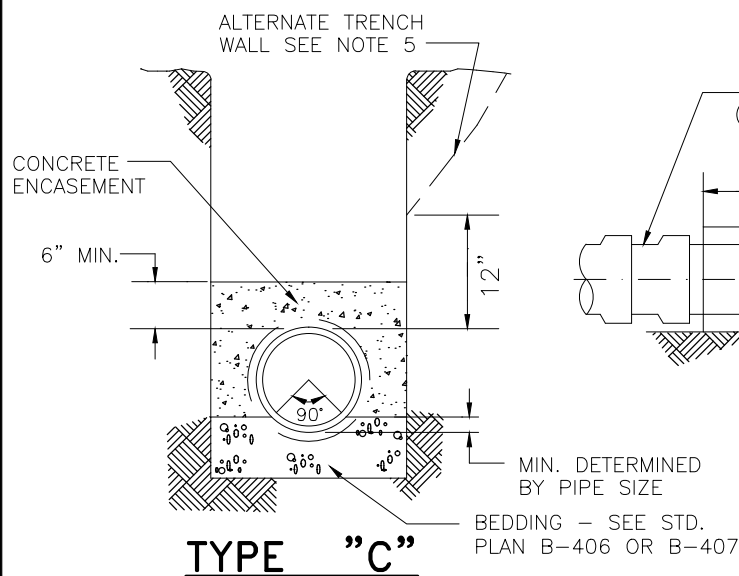
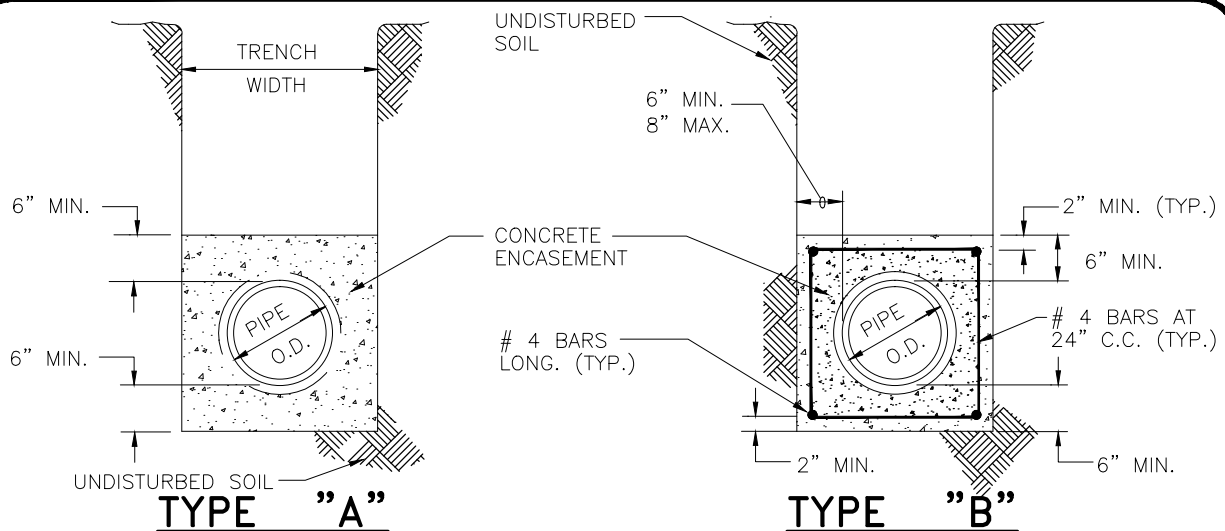
V.C.P. PIPE BEDDING DETAILS

Approved  Date 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

S-107



NOTES:

1. CONCRETE ENCASEMENT SHALL BE USED WHEN COVER IS UNDER 4' OR OVER 20'.
2. ENCASEMENT TO BE PLACED AGAINST UNDISTURBED NATURAL GROUND OR FILL COMPACTED TO 90% RELATIVE DENSITY.
3. NO. 4 GRADE 60 STEEL REINFORCING BARS SHALL BE PLACED AS SHOWN.
4. TYPE OF CONCRETE ENCASEMENT TO BE USED SHALL BE SHOWN ON PLANS OR AS SPECIFIED BY DISTRICT REPRESENTATIVE TO MEET UNFORESEEN FIELD CONDITIONS. UNLESS NOTED OTHERWISE, ENCASEMENT SHALL BE 470-C-2500 WITH 4" MAX. SLUMP.
5. WHERE SLOPED TRENCHES ARE USED, WALLS WILL NOT BEGIN TO SLOPE CLOSER THAN 12" FROM THE TOP OF THE PIPE.



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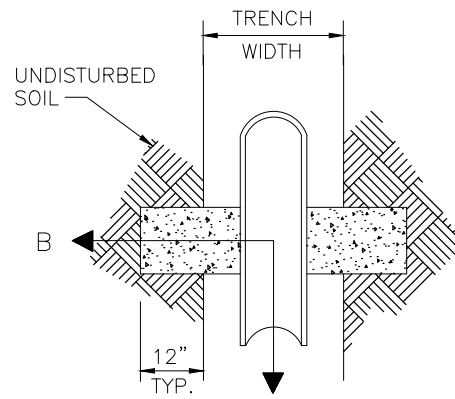
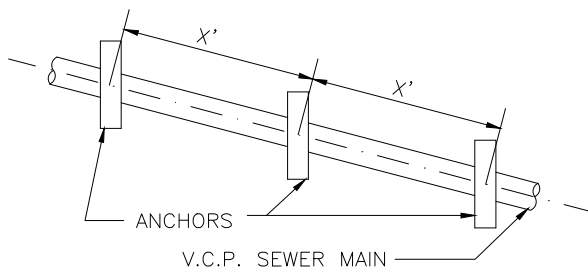
CONCRETE ENCASEMENT TYPE A, B, & C

Approved  Date 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

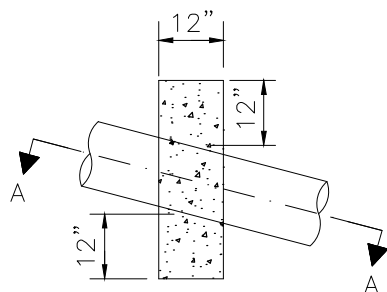
REVISIONS	BY	DATE

STD. PLAN NUMBER

S-108



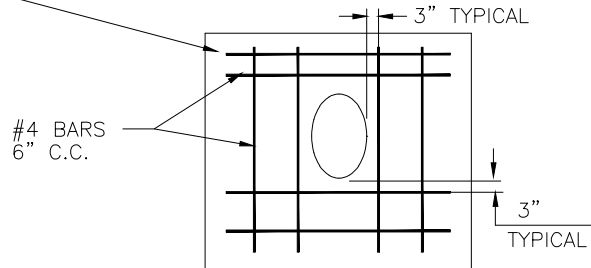
SECTION A-A



SECTION B-B

3" MIN. CLEARANCE BETWEEN REINFORCING STEEL AND EDGE OF CONCRETE

PIPE SLOPE	PIPE SLOPE	X DISTANCE
100%	1:1	12'
66.6%	1-1/2:1	14'
50%	2:1	16'
40%	2-1/2:1	18'
33.3%	3:1	20'



REINFORCING STEEL PATTERN

NOTES:

1. SLOPES GREATER THAN 10% SHALL BE USED BY SPECIAL WRITTEN APPROVAL OF CITY.
2. PIPE ANCHORS REQUIRED ON ALL SLOPES OF 3:1 OR STEEPER.
3. ANCHOR SHALL EXTEND 12" INTO NATURAL UNDISTURBED SOIL.
4. CONCRETE SHALL BE 560-C-3250 W/4" MAX. SLUMP.
5. ANCHORS FOR TRAPAZOIDAL TRENCH SECTIONS WILL CONFORM TO TRENCH CROSS SECTION AND EXTEND 12" INTO UNDISTURBED SOIL.



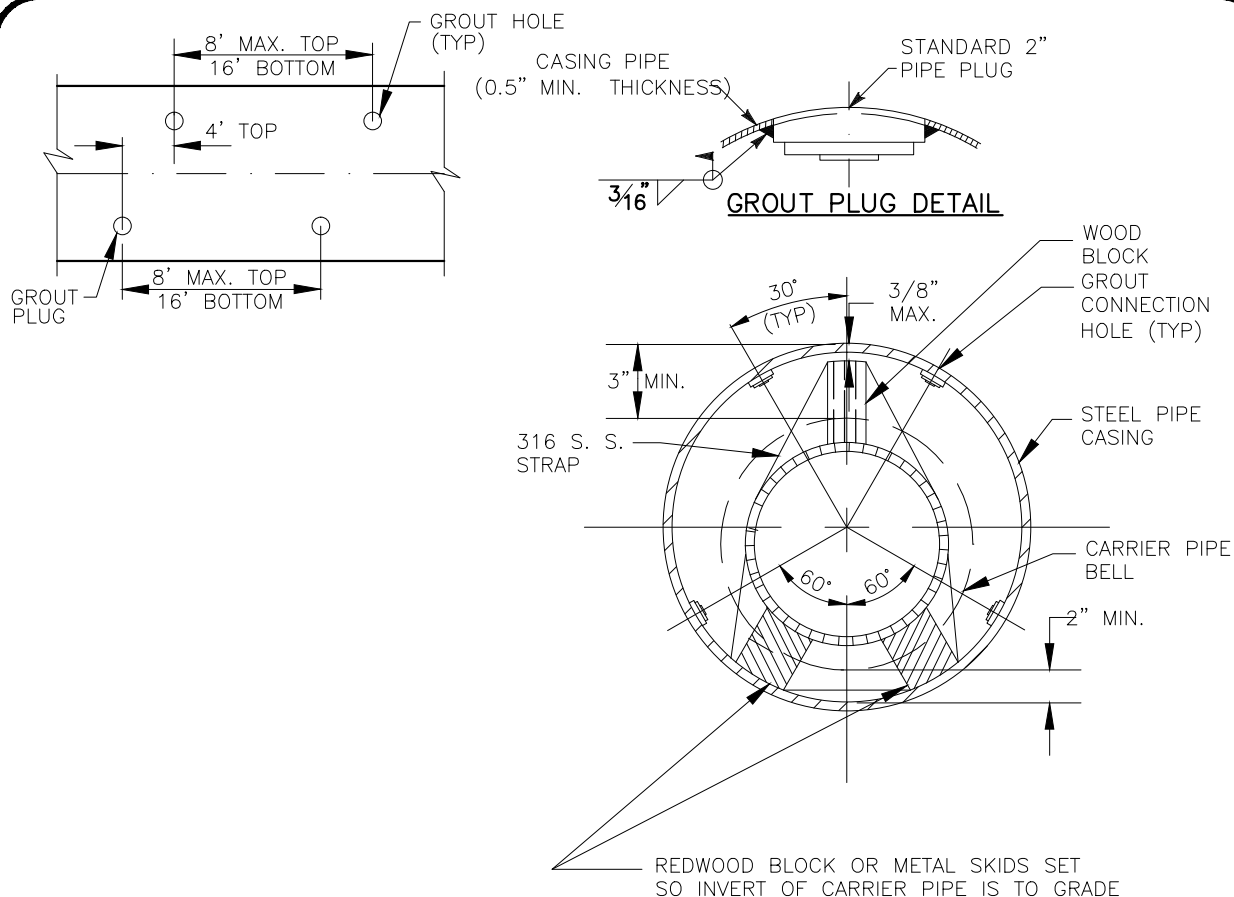
Garden Grove
Sanitary District

CONCRETE SLOPE ANCHORS

Approved  Date 12-8-15
City Engineer R.C.E. 52125 Exp.12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER
S-109



NOTES:

1. UNLESS NOTED OTHERWISE, CASING SHALL BE INSTALLED BY THE JACK AND BORE, AND/OR TUNNEL METHOD. IF OPEN-CUT INSTALLATION OF CASING IS ALLOWED, BACKFILL SHALL BE IN ACCORDANCE WITH STD. PLAN S-106 OR S-107
2. MINIMUM CASING SIZE SHALL BE 24" AND MINIMUM CASING THICKNESS SHALL BE $\frac{5}{16}$ ".
3. ALL STEEL CASING PIPE FIELD JOINTS SHALL BE WELDED FULL-CIRCUMFERENCE.
4. UNFINISHED REDWOOD SKIDS SHALL BE PROVIDED PER DETAIL ABOVE.
5. CARRIER PIPE SHALL BE AIR PRESSURE TESTED PRIOR TO FILLING OF ANNULAR SPACE.
6. UPSTREAM AND DOWNSTREAM ELEVATIONS OF CARRIER PIPE SHALL BE VERIFIED PRIOR TO FILLING OF ANNULAR SPACE.
7. EACH END OF CASING SHALL BE SEALED WITH CONCRETE MORTAR, OR MANUFACTURED CASING END COVER.
8. PERIPHERY OF CASING SHALL BE PRESSURE GROUTED.
9. ANNULAR SPACE SHALL BE FILLED WITH LEAN GROUT.
10. FOR REDWOOD BLOCKS, 3' LONG SKIDS BEVELED AT BOTH ENDS SHALL BE STRAPPED IN PLACE 3" FROM EACH JOINT OF PIPE, NOTCH SKID SET TO SEAT STRAP.

CASING DETAIL



Garden Grove
Sanitary District

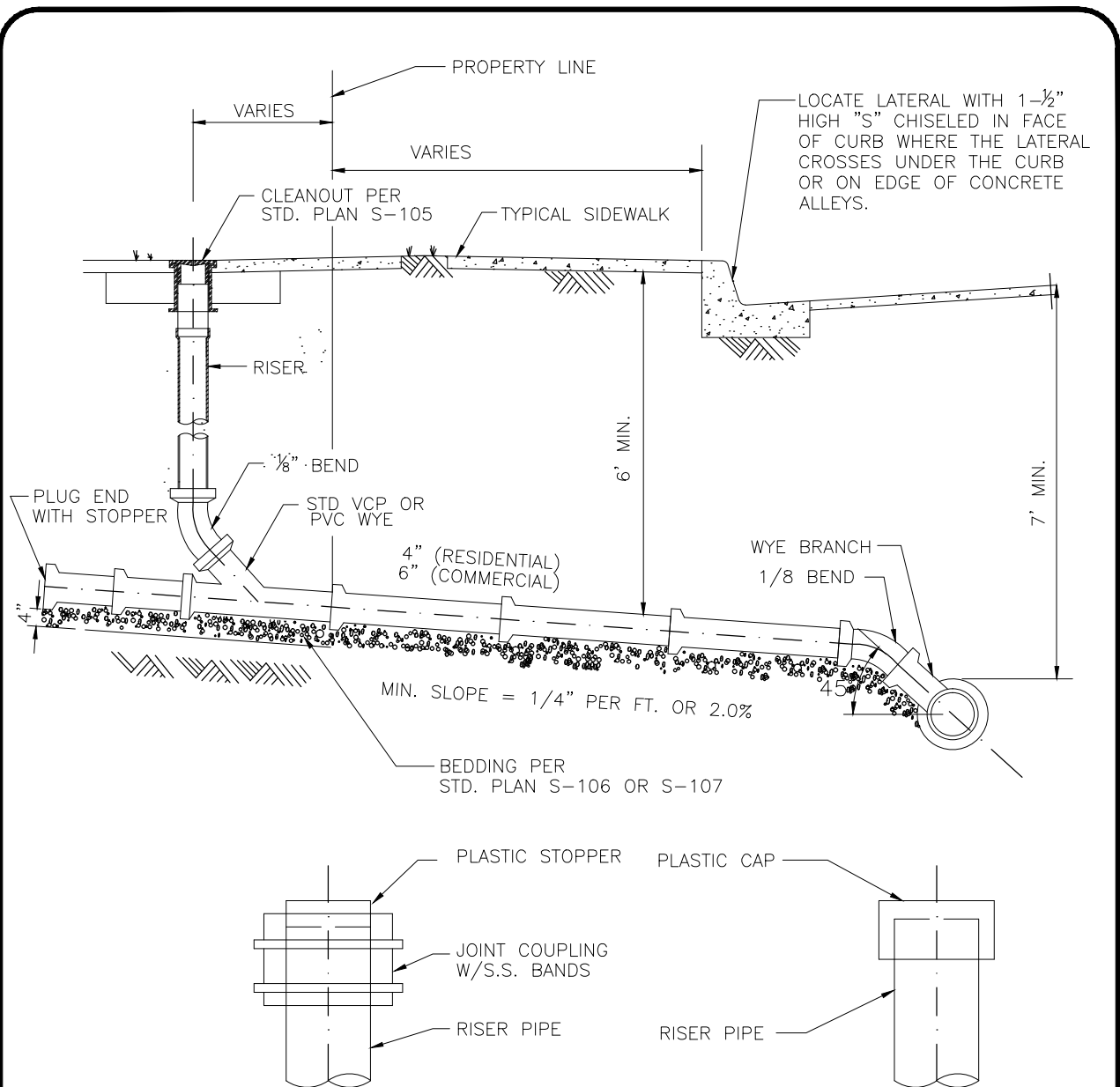
STEEL CASING PIPE

Approved  Date 12-8-15
City Engineer R.C.E. 52125 Exp.12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

S-110



OPTIONAL STOPPER DETAILS

NOTES:

1. LATERAL SIZE TO BE DETERMINED ON THE BASIS OF TOTAL NUMBER OF FIXTURE UNITS DRAINED, BUT IN NO CASE SHALL THE LATERAL DIAMETER BE LESS THAN FOUR INCHES FOR SINGLE OR MULTIPLE FAMILY RESIDENTIAL AND SIX INCHES FOR COMMERCIAL OR INDUSTRIAL LAND USES.
2. LATERAL TO BE INSTALLED TO PROPERTY LINE.
3. IF LATERAL NOT BUILT, PLUG WYE BRANCH WITH STOPPER.
4. IF RISER NOT BUILT, PLUG LATERAL AT \varnothing .



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Sanitary District

V.C.P. OR P.V.C. TYPICAL LATERAL

Approved  Date 12-8-15
City Engineer R.C.E. 52125 Exp.12-31-16

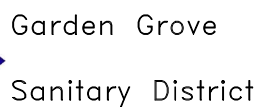
REVISIONS	BY	DATE

STD. PLAN NUMBER

S-111



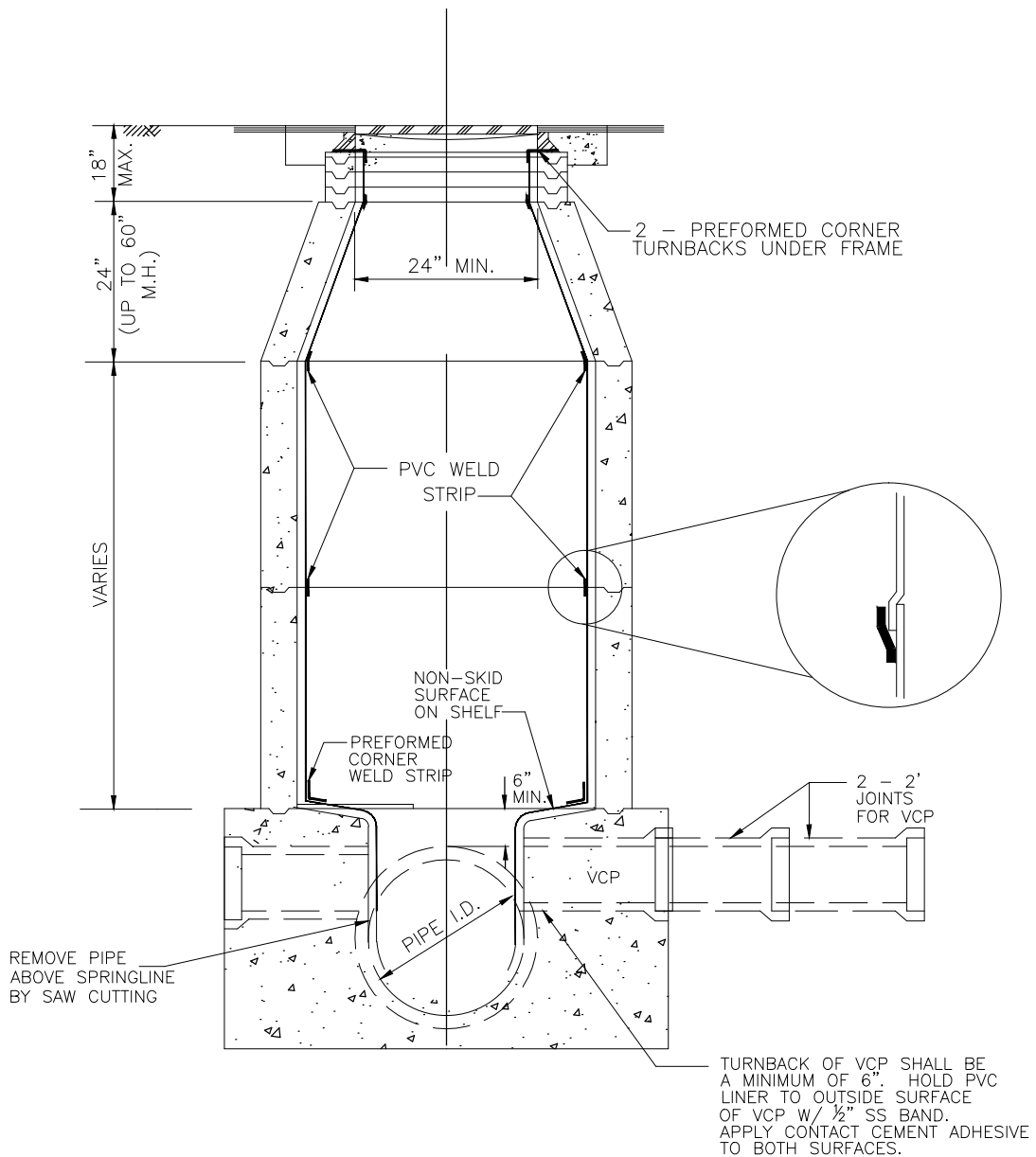
1. THE SADDLE CONNECTION SHALL BE SECURED WITH 470-C-2500 W/4" MAX SLUMP CONCRETE ENCASEMENT AFTER THE CONNECTION IS APPROVED BY THE DISTRICT REPRESENTATIVE.
2. ALL CHIPS, DIRT, EPOXY, MORTAR, AND CONCRETE SHALL BE KEPT OUT OF THE SEWER.
3. DAMAGED PIPE SHALL BE REPLACED.
4. 8" AND LARGER CONNECTIONS SHALL BE BY STANDARD OR DROP MANHOLES.



CUT IN WYE CONNECTION

STD. PLAN NUMBER

S-112



SEE STD. PLANS S-101, S-102, S-103



Garden Grove
Sanitary District

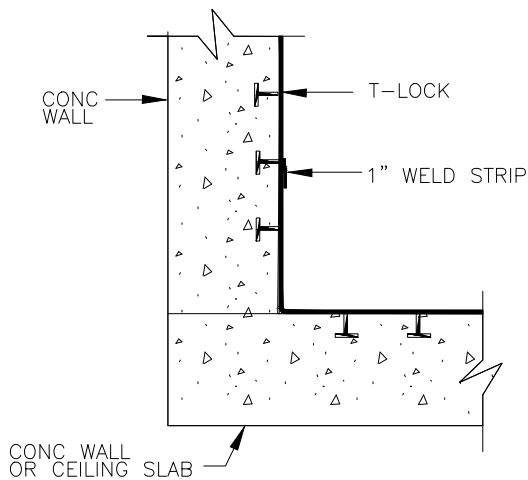
PVC MANHOLE LINER

Approved  Date 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

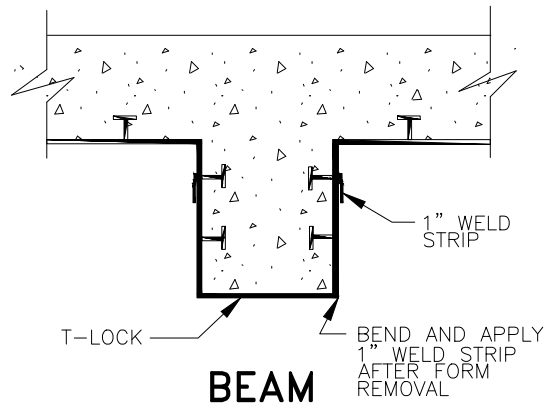
REVISIONS	BY	DATE

STD. PLAN NUMBER

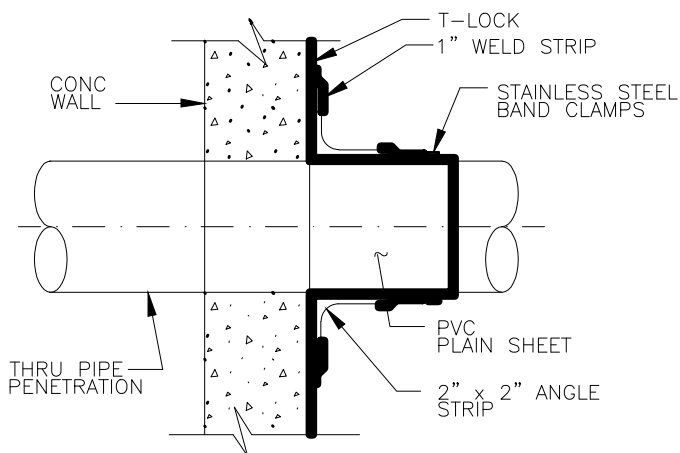
S-113



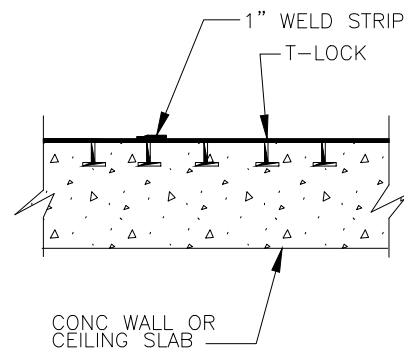
CORNER



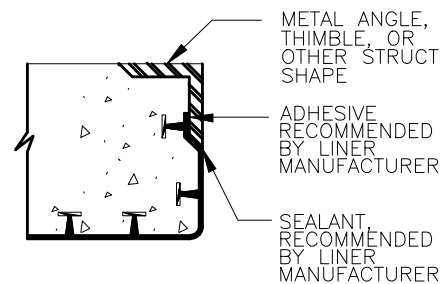
BEAM



PIPE PENETRATION



SPLICE



METAL EMBED

NOTE

1. AT BUTT JOINTS, INSTALL 1" WELD STRIP ON FRONT AND BACK.
2. LINER RIBS SHALL BE ORIENTED VERTICALLY ON VERTICAL SURFACES.



Garden Grove
Sanitary District

**P.V.C. T-LOCK
LINER DETAILS**

Approved  Date 12-8-15
City Engineer R.C.E. 52125 Exp.12-31-16

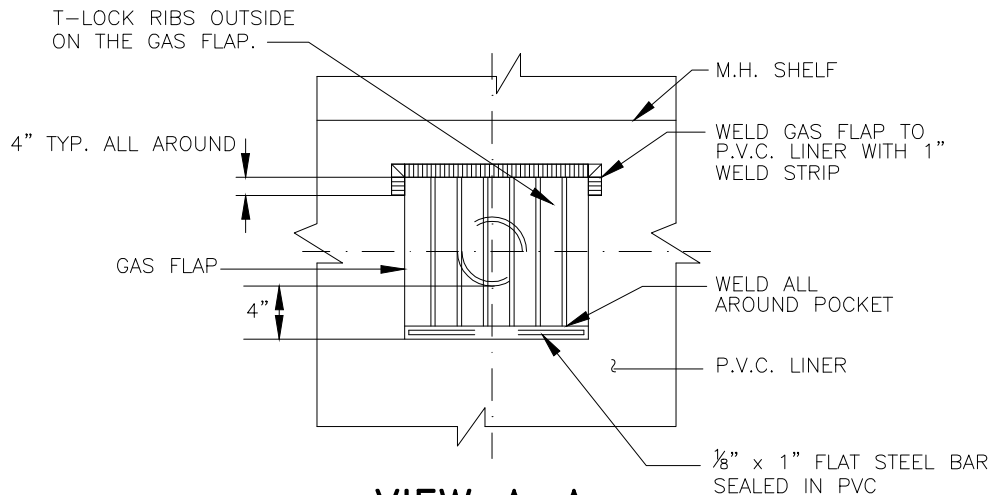
REVISIONS

BY

DATE

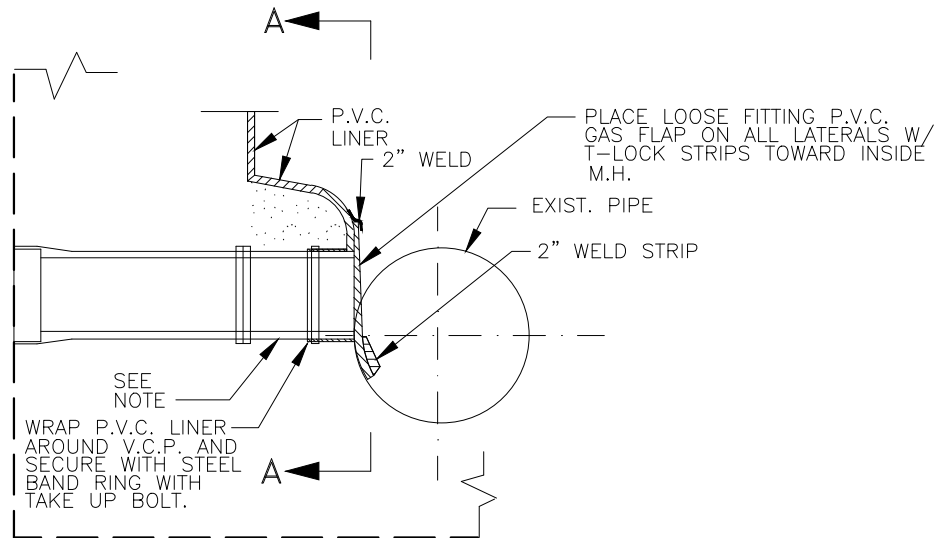
STD. PLAN NUMBER

S-114



VIEW A-A

NOT TO SCALE



PLAN

NOTE

FOR INSTALLATION AT EXISTING M.H., REMOVE INTERFERING CONCRETE AT END OF EACH LATERAL AND EXTEND VCP AS SHOWN. GROUT IN PLACE. EXTEND PVC M.H. LINER OVER GROUT AND INSTALL GAS FLAP AS SHOWN.



Garden Grove
Sanitary District

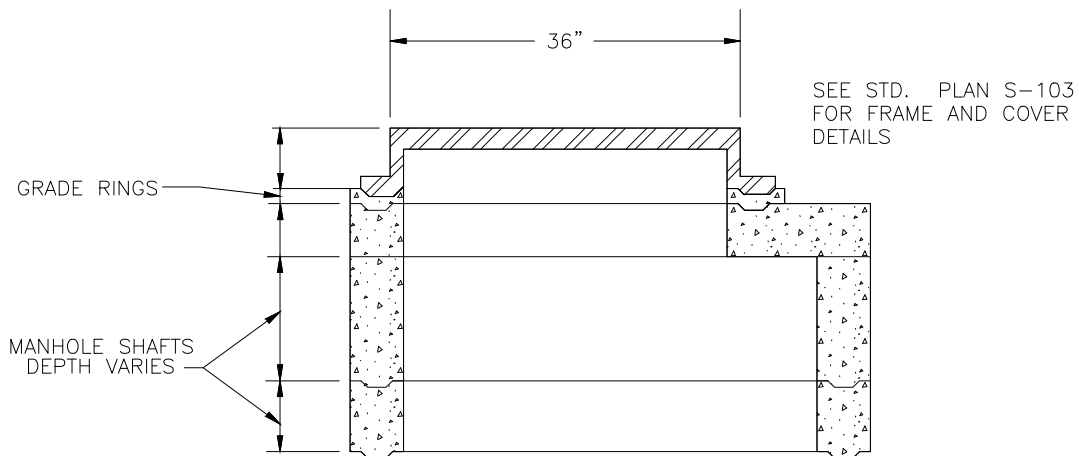
**P.V.C. LINER WITH GAS
FLAP INSTALLATION**

Approved:  Date: 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

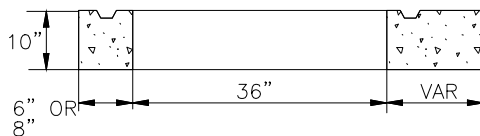
REVISIONS	BY	DATE

STD. PLAN NUMBER

S-115



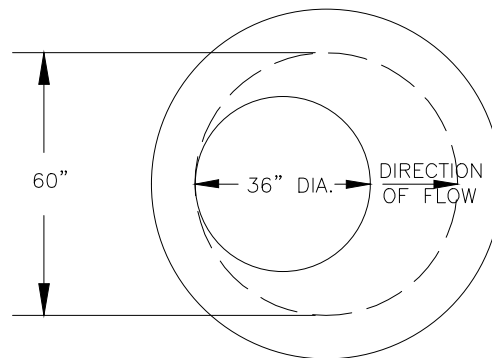
TYPICAL SECTION
FLAT TOP MANHOLE



FLAT TOP COVER

NOTES

1. CONSTRUCTION SHALL BE IN ACCORDANCE WITH STD. PLAN S-101 AND S-103
2. REINFORCED CONCRETE MANHOLE, QUIKSET OR APPROVED EQUAL.
3. USE OF FLAT TOP MANHOLE REQUIRES WRITTEN DISTRICT APPROVAL.



PLAN



Garden Grove
Sanitary District

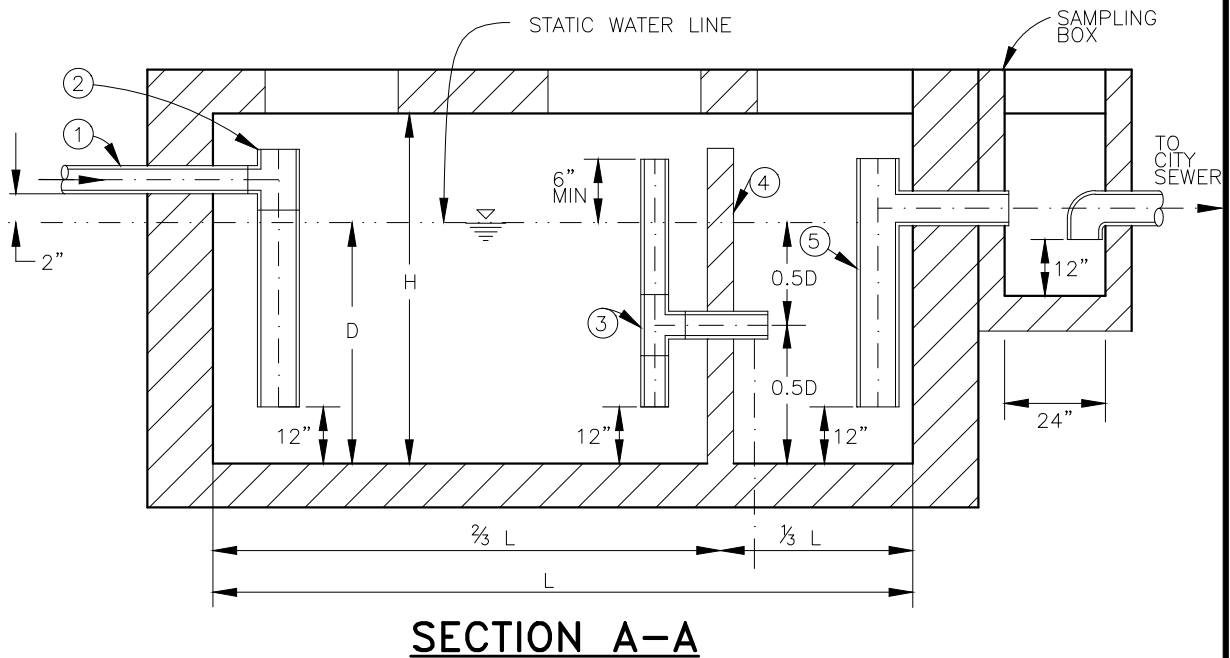
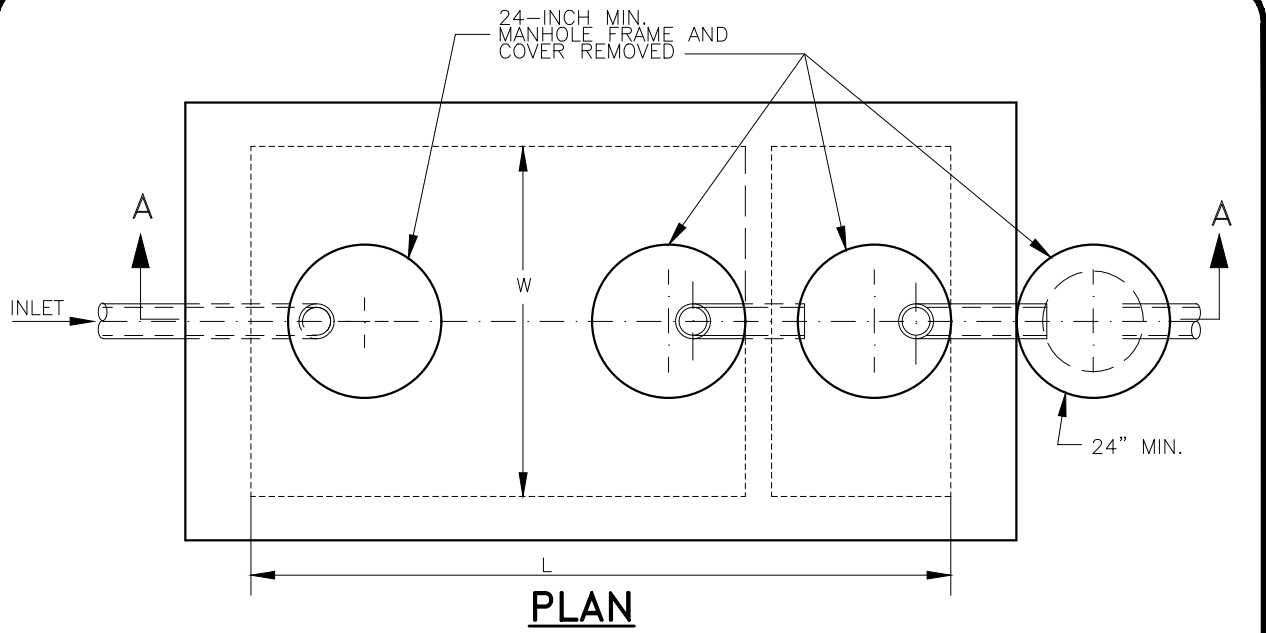
FLAT TOP MANHOLE

Approved  Date 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

S-116



- ① INLET PIPE 4-INCH MINIMUM
- ② INFLOW TEE AND STANDPIPE
- ③ CROSSOVER TEE AND STANDPIPE
- ④ BAFFLE WALL
- ⑤ OUTFLOW TEE AND STANDPIPE

NOTE:

GREASE INTERCEPTOR SHALL BE DESIGNED AND SIZED IN ACCORDANCE WITH THE REQUIREMENTS OF THE CALIFORNIA PLUMBING CODE, APPENDIX H.



Garden Grove
Sanitary District

**TYPICAL GREASE
INTERCEPTOR**

Approved  Date 12-8-15
City Engineer R.C.E. 52125 Exp.12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

S-117

SHEET 1 OF 2

1. GREASE INTERCEPTOR SHALL BE INSTALLED IN CONFORMANCE WITH THE PROVISIONS OF THE CALIFORNIA PLUMBING CODE AS ADOPTED BY THE CITY OF GARDEN GROVE.
2. ALL GREASE INTERCEPTOR SHALL BE OF AN APPROVED TYPE AND INSTALLED IN ACCORDANCE WITH THE MANUFACTURES INSTALLATION INSTRUCTIONS OR AS SUBMITTED BY A DESIGN PROFESSIONAL.
3. INTERCEPTOR SHALL BE ON DRY LEVEL UNDISTURBED SOIL ON A FIRM COMPACTED BASE.
4. MANHOLE GRADE RINGS SHALL BE SEALED WITH MOTAR OR AN APPROVED ALTERNATIVE WATER BARRIER.
5. SAMPLE BOXES SHALL BE REQUIRED UNLESS EXEMPTED BY THE ENVIRONMENTAL SERVICES MANAGER.
6. ON PLUMBING PLAN SUBMITTAL INCORPORATE MANUFACTURE'S INSTALLATION INSTRUCTIONS, TYPE, AND LOCATION OF INTERCEPTOR.



Garden Grove
Sanitary District

TYPICAL GREASE INTERCEPTOR

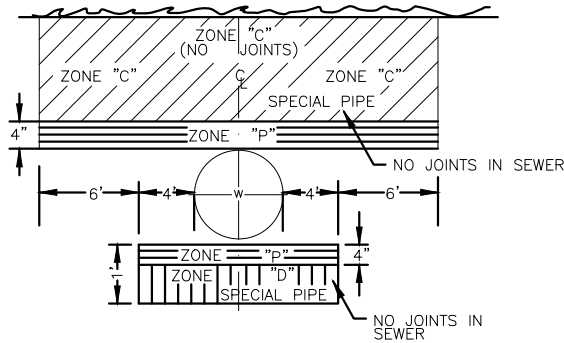
Approved  Date 12-8-15
City Engineer R.C.E. 52125 Exp. 12-31-16

REVISIONS	BY	DATE

STD. PLAN NUMBER

S-117
SHEET 2 OF 2

NEW SEWER

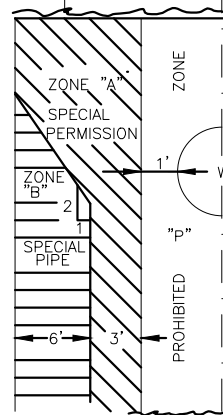


PERPENDICULAR CROSSING

NOTE: "P" IS A PROHIBITED CONSTRUCTION ZONE

NOTES:

ZONES IDENTICAL ON EITHER SIDE OF CENTER LINES. ZONE "P" IS A PROHIBITED ZONE, SECTION 64630 (2) CALIFORNIA ADMINISTRATIVE CODE, TITLE 22



NEW SEWER BEING INSTALLED

- | | |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ZONE | SPECIAL CONSTRUCTION REQUIRED FOR SEWER |
| A,B,C,D | SEWER LINES PARALLEL TO WATER MAINS SHALL NOT BE PERMITTED IN THIS ZONE WITHOUT APPROVAL FROM THE STATE WATER RESOURCES CONTROL BOARD (SWRCB) AND THE CITY. |
| B | A SEWER LINE PLACED PARALLEL TO A WATER LINE SHALL BE CONSTRUCTED OF: |
| | <ol style="list-style-type: none"> 1. EXTRA STRENGTH VITRIFIED CLAY PIPE WITH COMPRESSION JOINTS. 2. PLASTIC SEWER PIPE WITH RUBBER RING JOINTS, DR 26. 3. DUCTILE IRON PIPE WITH COMPRESSION JOINTS. 4. REINFORCED CONCRETE PRESSURE PIPE WITH COMPRESSION JOINTS (PER AWWA C302-74). |
| C | A SEWER LINE CROSSING A WATER MAIN SHALL BE CONSTRUCTED OF: |
| | <ol style="list-style-type: none"> 1. DUCTILE IRON PIPE WITH HOT DIP BITUMINOUS COATING AND MECHANICAL JOINTS. NO JOINTS WITHIN 10' EITHER SIDE OF WATER. 2. A CONTINUOUS SECTION OF CLASS 305 (DR 14 PER AWWA C900) PVC PIPE OR EQUIVALENT, CENTERED OVER THE WATER PIPE BEING CROSSED. 3. A CONTINUOUS SECTION OF REINFORCED CONCRETE PRESSURE PIPE (PER AWWA C302-74) CENTERED OVER THE PIPE BEING CROSSED. 4. ANY SEWER PIPE WITHIN A CONTINUOUS STEEL PIPE SLEEVE. |

PARALLEL INSTALLATION

(CONT.)

- | | |
|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| D | A SEWER LINE CROSSING A WATER MAIN SHALL BE CONSTRUCTED OF |
| | <ol style="list-style-type: none"> 1. A CONTINUOUS SECTION OF DUCTILE IRON PIPE WITH HOT DIP BITUMINOUS COATING AND MECHANICAL JOINTS CENTERED ON THE WATER PIPE BEING CROSSED. 2. A CONTINUOUS SECTION OF CLASS 305 (DR 14 PER AWWA C900) PVC PIPE OR EQUIVALENT, CENTERED ON THE WATER PIPE BEING CROSSED. 3. A CONTINUOUS SECTION OF REINFORCED CONCRETE PRESSURE PIPE (PER AWWA C302-74) CENTERED ON THE WATER PIPE BEING CROSSED. 4. ANY SEWER PIPE WITHIN A CONTINUOUS STEEL PIPE SLEEVE. 5. ANY SEWER PIPE MATERIAL ENCASED IN REINFORCED CONCRETE PER STD. DWG. S-108 TYPE "B". |



Garden Grove

Sanitary District

DESIGN CRITERIA FOR SEPARATION OF WATER AND SEWER MAINS

Approved _____ Date 12-8-15

City Engineer _____ R.C.E. 52125 Exp.12-31-16

REVISIONS

BY

DATE

STD. PLAN NUMBER

S-118

WATER SERVICES DIVISION STANDARD SPECIFICATIONS



**CITY OF GARDEN GROVE
PUBLIC WORKS DEPARTMENT**

2015

13802 NEWHOPE STREET
GARDEN GROVE, CALIFORNIA 92843
(714) 741-5395

CITY OF GARDEN GROVE
PUBLIC WORKS DEPARTMENT
WATER SERVICES DIVISION

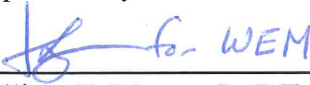
**STANDARD SPECIFICATIONS
FOR
CONSTRUCTION OF DOMESTIC
WATER SYSTEMS**

Approved By:



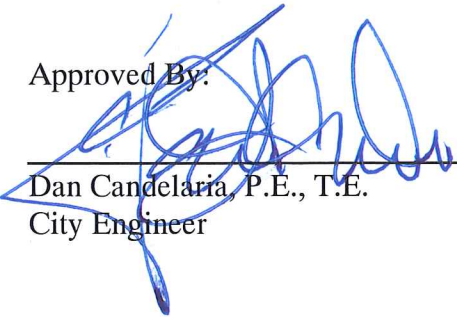
Samuel Kim, P.E. 12-08-15
Project Engineer Date

Approved By:



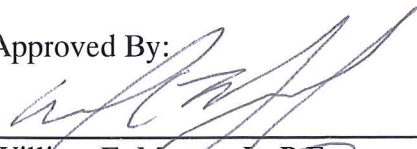
William E. Murray Jr. P.E. 12-08-15
Water Services Manager Date

Approved By:



Dan Candelaria, P.E., T.E. 12-08-15
City Engineer Date

Approved By:



William E. Murray Jr. P.E. 12-08-15
Public Works Director Date

INTRODUCTION

These Standard Specifications are to be used as a guide by Private Engineers and Contractors in the design and installation of all additions or modifications to the City of Garden Grove's Public Water System.

It is the intent that these Standard Specifications will provide uniformity in materials and installation of piping, valves, fire hydrants, service laterals and other appurtenant equipment. The Standard Specifications will also provide for construction methods and controls to be used by Contractors to construct, pressure test, chlorinate and place into service domestic water systems in the City of Garden Grove.

CITY OF GARDEN GROVE
PUBLIC WORKS DEPARTMENT
WATER SERVICES DIVISION
STANDARD SPECIFICATIONS
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SECTION 1 - GENERAL PROVISIONS

1-01 PLANS AND SPECIFICATIONS

Construction of all water system improvements intended to be dedicated to the City will be governed by plans and specifications approved by the Water Services Division. All plans and specifications must be prepared by, or under the supervision of a current registered engineer licensed to practice in the state of California. All work shall be subject to fees as provided for in the City's Water Rates, Rules and Regulations and shall be inspected by the Water Services Division to ensure conformity to these specifications.

In cases of conflict of information, the following documents will have precedence in the order listed:

1. Permits and licenses from affected agencies issued for the improvements.
2. Special provisions for the improvements.
3. Construction plans for the improvements.
4. City of Garden Grove Public Works Department Water Services Division Standard Specifications (WSDSS).
5. Standard Specifications for Public Works Construction (SSPWC), "Green Book".
6. Manufacturer's recommendations of product use and installation.

Conflicts and discrepancies noted by the Contractor shall be brought to the attention of the Director, Public Works Department, or designated representative. The Director, Public Works Department, or designated representative will review the conflicts or discrepancies and determine the appropriate course of action to follow, if any. Unless otherwise determined by the Engineer, the most stringent/restricted condition shall govern over all. Contractor/Developer shall check with zoning code and/or local ordinances for special requirements and color schemes on all above ground facilities.

Provisions of reference specifications noted in these specifications and plans shall have the same effect as if written herein, unless expressly modified by these specifications. Any reference specification in the absence of designation to the contrary, shall be understood to refer to the latest revision at the time of the beginning of work.

SECTION 1 - GENERAL PROVISIONS

1-02 DEFINITIONS

Whenever the following terms or corresponding pronouns are used in these specifications or plans, the intent and meaning shall be interpreted as follows:

- | | |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| a. City | The City of Garden Grove, California. |
| b. Engineer: | The Project Engineer or his authorized representative. |
| c. Water Services Division | The Director, Public Works Department, Water Services Division, City of Garden Grove or designated representative. |
| d. Planning Services Division | The Director, Community Development Department, Planning Services Division, City of Garden Grove or designated representative. |
| e. Fire Department | The Chief, Fire Department, City of Garden Grove or designated representative. |
| f. Developer: | The person or organization having legal responsibility for construction of water systems in conjunction with development of property. |
| g. Contractor: | The agent of the developer or independent contractor who furnishes labor, material, equipment, method, etc. to perform the requirements of these specifications in the construction of water systems. |
| h. Superintendent: | The field representative of the Contractor, present on the job site at all times during work, who is authorized to receive and fulfill instructions from the City. |
| i. Private Engineer: | The agent of the developer, City of Garden Grove, or independent engineer who has responsibility for the design and drawing of construction documents. |
| j. Or approved equal: | An equivalent product to that specified in these standard specifications, approved by the Water Services Division before beginning of construction. No approved equal product is intended, unless so stated in these standard specifications. |

SECTION 1 - GENERAL PROVISIONS

- k. Drawings: The words “DRAWINGS” or “CONTRACT DRAWINGS” or “PLANS” shall mean those drawings accompanying the specifications which show the location, nature, extent and form of the work, together with applicable details.

1-03 ABBREVIATIONS

Whenever the following abbreviations are used in these specifications, the meaning shall be interpreted as follows:

ASTM:	American Society for Testing and Materials
AWWA:	American Water Works Association
ANSI:	American National Standards Institute
UNI-BELL	Uni-Bell PVC Pipe Association
DIPRA:	Ductile Iron Pipe Research Association
CAL-OSHA:	California Occupational Safety and Health Administration
SSPC:	The Society of Protective Coatings
SSPWC:	Standard Specifications for Public Works Construction. (Green Book)- Latest Edition
CBC:	California Building Code, 2013 Edition
CFC:	California Fire Code, 2013 Edition
UPC:	Uniform Plumbing Code
WSDSS:	Water Services Division Standard Specifications (Garden Grove Public Works Department)
NSF:	National Sanitation Foundation

SECTION 2 - MATERIALS

SECTION 2 - MATERIALS

2-00 GENERAL

All materials and equipment installed in City of Garden Grove's water system shall meet all state and federal standards, as well as standards developed by nationally recognized organizations such as AWWA, ANSI and NSF. In order to protect human health, all materials, chemicals, lubricants, and products in contact with drinking water shall be tested and certified as meeting ANSI/NSF 60-2001/ Addendum 1.0-2001 (Drinking Water Treatment Chemicals- Health Effects) and ANSI/NSF Standard 61-2001/Addendum 1.0-2001 (Drinking Water System Components- Health Effects).

2-01 DUCTILE IRON PIPE

2-01.01 GENERAL

Ductile iron pipe (DIP) shall conform to the requirements of the AWWA Standard C151. Unless otherwise specified, DIP shall only be used for pipe larger than twelve-inch (12) and shall be Special Thickness Class 51.

2-01.02 PIPE JOINTS

Ductile iron pipe shall be furnished in eighteen-foot (18') or twenty-foot (20') nominal laying lengths and shall have a push-on joint employing a single rubber gasket in accordance with AWWA Standard C111, ("TYTON" Joint as manufactured by U.S. Pipe, or approved equal).

Where restrained joints are indicated on the Drawings, push-on joints shall be restrained in accordance with the requirements of Section 2-12.02.

2-01.03 COATING AND LINING

All pipe shall have the interior cement-mortar lined with a seal coat in accordance with AWWA Standard C104, and the outside coated with a bituminous material as specified in AWWA Standard C151.

SECTION 2 - MATERIALS

2-01.04 POLYETHYLENE PROTECTIVE WRAPPING

Polyethylene protective wrapping ("Polywrap") shall conform to the requirements of ANSI/AWWA C105/A21.5 and be eight (8) mil thick tubing of virgin polyethylene (Dupont Alathon, U.S. 1. Petrothene resin, or approved equal) or four (4) mil thick high-density, cross-laminated (HDCL) polyethylene. The color shall be (a) natural (where exposure to sunlight will be less than 48 hours); or (b) black, containing 2.0 to 2.5% well dispersed carbon black with stabilizers (where exposure to sunlight may be up to 10 days). Tubing shall be taped and secured with general purpose polyethylene tape, 2 inches wide and 10 mils thick (Scotchrap No. 50, Plicoflex No. 340, Protecto Wrap No. 200, Polyken No. 900, or approved equal).

2-02 POLYVINYL CHLORIDE PIPE

2-02.01 GENERAL

Polyvinyl chloride (PVC) pipe shall conform to the requirements of the AWWA Standard C 900, DR 14, (PC. 305), and molecularly oriented polyvinyl chloride (PVCO) pipe shall conform to the requirements of the AWWA Standard C 909, (PC 305). Unless otherwise specified, PVC or PVCO shall only be used for pipe sizes, 4 inch through 12 inch. PVC or PVCO Pipe for pipes larger than twelve-inch (12") require special approval from Engineering Services. All PVC Pipe shall and all PVCO pipe shall be colored blue. A number 14-gauge, solid, soft drawn insulated copper tracer wire is required per Standard Drawing B-781 on all PVC and PVCO installations.

2-02.02 PIPE JOINTS

PVC or PVCO pipe shall be furnished in twenty-foot (20') nominal laying lengths and have bell-end push-on joints employing a single elastomeric gasket in accordance with AWWA Standard C900, C905, and/or C909.

2-02.03 PIPE SERVICES AND APPURTENANCES

All service saddles, sleeves, fittings, restraining devices, and other appurtenances used on PVC and PVCO Pipes shall be approved by the Water Services Division prior to use.

2-02.04 RESTRAINED JOINT PVC PIPE

Restrained joint non-metallic couplings for Poly-Vinyl Chloride (PVC) or Molecularly Oriented Poly-Vinyl Chloride (PVCO) pipe shall be CERTALOK™ C900 RJ system, as manufactured by CertainTeed Corporation, or approval

SECTION 2 - MATERIALS

equal.

See sections 2-12 for additional thrust restraint systems for PVC and PVCO pipes.

2-02.05 INSTALLATION CURVATURE

Where the pipeline is a non-restrained joint and to be installed in a curved alignment, the radius of curvature and specific alignment shall be as shown on the plans and shall be accomplished by means of deflecting the pipeline at the joints with couplings. Couplings in any of the curved alignment for this project where required deflection is between 1 and 5 degrees shall be High Deflection Couplings, Class 200 manufactured by CertainTeed or approved equal.

Contractor shall not exceed the manufacturer's recommendation for deflection for the couplings. Bending of the PVC and PVCO is not allowed.

The cost of providing pipe material and specialized tools to achieve the required curvature shall be included in the unit cost for the pipeline and no additional compensation will be allowed.

2-02.06 MARKINGS

Pipe shall be legible and permanently marked in ink with the following information.

- Manufacturer and Trade Name
- Nominal Size and DR Rating/Pressure Class
- Hydrostatic Proof Test Pressure
- [NSF-61]
- Manufacturing Date Code

2-02.07 WORKMANSHIP

The beveled end of any PVC or PVCO pipe shall be cut off before the pipe is inserted into a mechanical joint fitting.

2-02.08 FITTINGS FOR PVC MAIN LINE

Main line PVC or PVCO pipe fittings shall be as called for on the construction plans. All fittings shall be ductile iron fittings per Section 2-08.

SECTION 2 - MATERIALS

2-03 COPPER TUBING

2-03.01 GENERAL

This specification shall cover the requirements for 1-inch and 2-inch seamless, annealed, Type “K”, copper water tube. Copper tubing shall meet the requirements of ASTM B-88, “Specifications for Seamless Copper Water Tube”. The 2-inch copper water tube shall be of the rigid type.

2-03.02 DIMENSIONS

Copper tubing shall be furnished in coils or straight lengths, as follows:

<u>SIZE</u>	<u>FORM</u>	<u>LENGTH</u>
1"	Coils	60' to 100'
2"	Straight Lengths (rigid)	20'

Coils shall be wound in a single layer flat with a minimum 24-inch inside diameter.

2-03.03 TEMPER

Copper tubing shall be furnished in the annealed condition in accordance with the technical property requirements of ASTM B-88. Straight lengths shall be annealed after being drawn.

2-04 RED BRASS PIPE

Brass pipe shall conform to the requirements of the “Specifications for Seamless Red Brass Pipe, Standard Sizes” ASTM Specification B-43 and referenced in the appendix to AWWA Standard C800.

Fittings shall be of bronze conforming to the requirements of ASTM B-62, “Specifications for Composition Bronze or Ounce Metal Castings”.

2-05 MAIN LINE VALVES

2-05.01 GENERAL

Valves shall be iron-body fusion bonded epoxy lined, non-rising stem, butterfly or fully encapsulated resilient wedge disk type and shall not have more than two internal moving parts. All valves shall open by turning the wrench nut counter-clockwise. Operating nut for butterfly valves shall be placed at the north or east

SECTION 2 - MATERIALS

side of the water line.

When required, above ground installations shall be resilient seat/wedge disk type valves with outside screw and yoke.

All bronze parts shall contain not more than 7% zinc, nor more than 2% aluminum.

Stems shall be low zinc bronze, and equipped with a 2-inch operating nut conforming to AWWA C509. The valve manufacturer shall employ a positive physical means of indicating the specified stem material to insure ready recognition during inspection.

The bolts and nuts on the bonnet shall be stainless steel type 304 or 316 with an anti-seize lubricant.

The ductile iron interior and exterior of all valves shall be protected with 10 mils (nominal) fusion bonded epoxy. Coating shall conform to AWWA Standard C-213 and C550, and shall be certified to NSF 61.

For above ground or vault installation, exterior coating to valves shall be as per Section 2-14 for coating on above ground or vault installation.

Resilient wedge type valves with a flanged end may be used as “tapping valves”.

All valves shall be provided with a stem extension if depth of valve nut exceeds 4 feet. All valve extensions shall be centered in the valve well by use of a guide and shall operate freely without binding after installation.

2-05.02 GATE VALVES

Gate valves shall conform to the requirements of AWWA Standard C509 “Resilient-Seated Gate Valves for Water Supply Service” with fully encapsulated disk and guide lugs and as supplemented herein.

All gate valves shall be full wall ductile iron body, resilient wedge gate valves equipped with double O-ring stem seals. If the resilient seats are bonded to the gates, the gates shall be totally encapsulated with the material, with the exception of any guide tabs or slots. All valves shall have non-rising stems.

The design of the non-rising stems shall be such that if excessive input torque is applied, stem failure shall occur above the stuffing box at such a point as to enable the operation of the valve with a pipe wrench or other readily available tool.

Valves shall be suitable for frequent operation as well as service involving long period of inactivity, and capable of operating satisfactorily with flows in either

SECTION 2 - MATERIALS

direction.

Guide caps of an Acetal bearing material shall be placed over solid guild lugs to prevent abrasion and to reduce the operating torque.

All exterior fasteners, including all bonnet and seal plate bolts and nuts shall be 300 series 18-8 stainless steel or approved equal corrosion resistant material.

Valve stem seals shall be O-rings in conformance with AWWA C509 and shall be designed so that the O-ring above the stem collar can be replaced while the valve is under pressure and in the fully open or fully closed position. Valves shall be supplied with stems having a minimum yield strength of 38,000 psi and a minimum elongation in 2 inches of 12%. Valve stem, stem nuts and stem collar shall be made of low zinc bronze or approved equal material.

Valves 3" and 4" in diameter shall be designed for an input torque of 300 foot pounds at the fully opened or fully closed positions, without any distortion of any kind to the valve or its components.

Valves 6" through 12" in diameter shall be designed for an input torque of 450 foot pounds at the fully opened or fully closed positions, without any distortion of any kind to the valve or its components.

Each valve shall be tested in accordance with AWWA C509 and certified to NSF 61 after shop assembly.

2-05.03 APPROVED GATE VALVE MANUFACTURERS

Mueller A-2362
US PIPE
Or approved equal

2-05.04 BUTTERFLY VALVES

Butterfly valves shall conform to the requirements of AWWA Standard C504. Valves shall have a minimum working differential pressure across the valve disc of a 150-psi for class 150B valves and 250 psi for class 250B valves. Valves shall be flanged short-body or restrained mechanical joint as indicated per the Construction Drawings. Flanges shall be drilled per ANSI/B16.1, 125-pound standard bolt template. Valves shall be designed for buried installation.

SECTION 2 - MATERIALS

Component	Material	Specification
Body	Ductile Iron	ASTM A-536, Grade 65-45-12
Valve Shaft	Stainless Steel	Type 304 or Type 316
Exposed body, cap screws, bolts and nuts including squeeze-pins	Stainless Steel	ASTM A-276, Type 316
Disc	Cast Iron or Ductile Iron	ASTM A-48, Class 40 or ASTM A-536, Grade 65-45-12
Valve Seat	EPDM rubber	ASTM D-412
O-Rings	Synthetic Rubber	ASTM D-2000

Valve seat material shall be peroxide cured EPDM rubber seat and shall be fastened integrally with the valve body. The valve disc shall be furnished with a stainless steel seating edge to mate with the rubber seat in the valve body. Valves with the seat located on the disc shall not be accepted.

The ductile iron interior shall be shop coated with NSF 61 approved fusion bonded epoxy or coated with NSF 61 approved 12 mils DFT high solids 2 part epoxy of not less than 65% conforming to AWWA standard C550. Interior shall be holiday free. External surfaces shall be shop coated with two coats of asphalt varnish per Federal Specification TT-C-494A.

Valve operators shall be the manual type. All valves and actuators shall be supplied by the valve manufacturer. Gear actuators shall be for buried service applications and shall come furnished with a standard 2" AWWA operating nut. The operators shall be of a worm gear or traveling nut type with adjustable stops to limit the disc travel and shall be totally enclosed and self locking. The actuator shall be capable of withstanding 300 ft-lb (worm gear) and 450 ft-lb (travel nut gear) at the stops. The actuator shall be sized for bi-directional maximum pressures and flow rate per AWWA valve classification 150B (250B when specified). All external bolts on the actuator shall be furnished with 316 stainless steel. The operator shall be of the size required for opening and closing the valve in accordance with AWWA C-504. All valve operators shall be factory packed with grease, fully gasketed and sealed for permanent installation and operation.

Factory signed and dated affidavit of compliance shall accompany all submittals. Affidavits shall include "holiday free" paint, actuator stops compliance of 450 foot pounds, proof of design per AWWA C504 latest version for valves and actuator, and bi-directional seat leak test. Signatures of agents or distributors of the factory will not be accepted.

SECTION 2 - MATERIALS

2-05.05 APPROVED BUTTERFLY VALVE MANUFACTURERS

Mueller	B-3211 (Linesal XP)
Pratt	Ground hog
DeZurik	BAW

2-05.06 END CONNECTIONS & GASKET MATERIAL

Valves shall have mechanical joints or flanged ends, or a combination of both. Gaskets shall conform to the requirements of Section 2-08.03 of these specifications.

Unless otherwise shown on plans, all valves installed at fittings shall be flanged by mechanical ends, with the flange abutting the fitting.

2-05.07 VALVE BOXES & CAN ASSEMBLY

Valve boxes and can assembly shall be provided per Standard Drawings B-752 and B-753.

2-06 AIR AND VACUUM, AIR RELEASE, AND COMBINATION AIR VALVES

Air and Vacuum, Air Release and Combination Air Valves shall conform to AWWA C512 and be designed for a working pressure of 150 psi, unless otherwise specified. Float, linkage and all internal parts shall be 8-18 stainless steel. Interior coating for cast iron body shall be NSF 61 approved fusion bonded epoxy. Valves shall be APCO as manufactured by Valve and Primer Corporation, Crispin by Multiplex Manufacturing Co., Cla-Val, or approved equal.

	<u>APCO</u>	<u>CRISPIN</u>	<u>CLA-VAL</u>	<u>BERMAD</u>
Air/Vacuum	Series 140	Series AL	Series 35	1/2"-ARV
Air Release	50/200A	Series AR/PL	Series 34	2"-ARK, 1"-ARA
Combination Air	Series 140C	Series UL	Series 36	2"-ARC

SECTION 2 - MATERIALS

2-07 FIRE HYDRANTS

2-07.01 GENERAL

Fire hydrants shall be of the wet-barrel type, conforming to AWWA C503, and as supplemented herein. The Engineer may require a break-off check valve with the wet-barrel type due to location, terrain, available drainage area, and/or system pressure.

2-07.02 MATERIALS AND PARTS

Fire hydrants shall have two 2 1/2-inch hose outlets and one 4-inch pumper outlet, or have one 2 1/2-inch hose outlet and two 4-inch pumper outlets. Outlet threads shall conform to ANSI-B26 "National Standard Fire-Hose Coupling Screw Threads".

Fire hydrants shall be furnished with a pentagon shaped operating nut 1-1/2 inch per side, and opening shall be counterclockwise. Fire hydrants shall be furnished with hollow break off bolts.

Fire hydrants shall be equipped with cast iron or bronze outlet nozzle caps attached to the body of the fire hydrant with non-kinking electro-galvanized steel chains and fitted with appropriate neoprene rubber gaskets.

All fire hydrant burys shall be cast iron, asphalt coated and cement lined. Fire hydrant burys shall be provided with a Mechanical Joint-end at the shoe.

Wet barrel type fire hydrants shall have a nominal six-inch (6") base flange with a six-hole bolt pattern. All internal working parts, including stem, shall be in compliance with NSF/ANSI 61 & NSF/ANSI 372 drinking water system components.

2-07.03 APPROVED FIRE HYDRANT MANUFACTURERS

Clow	F – 860 and F-865
Or approved equal	

SECTION 2 - MATERIALS

2-08 MAIN LINE PIPE FITTINGS

2-08.01 GENERAL

Main line pipe fittings shall conform to the requirements of AWWA Standard C110, "Ductile Iron and Gray-Iron Fittings, 3-inch Through 48-inch, for Water and Other Liquids".

Short body type fittings conforming to AWWA Standard C153 may be used for sizes 4-inch through 24-inch.

All fittings shall be made of ductile iron. Fittings up to 24-inch size shall be 350 psi pressure ratings and over 24-inch size shall be 250 psi pressure rating. Fittings shall be cement mortar lined in accordance with AWWA Standard C104, "Cement Mortar Lining for Ductile-Iron Pipe and Fittings for Water".

2-08.02 END CONNECTIONS

2-08.02.1 MECHANICAL JOINTS

Mechanical Joints shall conform to the requirements of AWWA Standard C111 "Rubber-Gasket Joint for Ductile Iron Pressure Pipe and Fittings". Glands shall be made of ductile iron.

2-08.02.2 FLANGED FITTINGS

Flanged fittings shall conform to the requirements of AWWA Standard C110 or C153. Flanges shall be drilled to ANSI B16.1, 125 lb. standard bolt template. The 250 lb. flanges, when required, shall be drilled to ANSI B16.1, 250 lb. standard bolt template.

SECTION 2 - MATERIALS

2-08.03 GASKETS

Gaskets for flanged fittings shall be 1/8-inch thick ring type Non-Asbestos, vulcanized styrene butadiene rubber (SBR), or Neoprene rubber gaskets. Non-Asbestos type gaskets shall be manufactured from a non-asbestos material that meets the pressure ratings, drilling, and dimensional requirements as per section 2-08.02.2. The synthetic fiber content shall be aramid, bound by Nitrile (Buna-N) Rubber (NBR) and have a non-stick coating. Color shall be Green.

2-08.04 BOLTS AND NUTS FOR MECHANICAL JOINTS AND FLANGED FITTINGS

Tee-head bolts and hexagonal nuts for all mechanical joints shall be high strength, low alloy steel, meeting the current provisions of American National Standard ANSI/AWWA C111/A21.11, "Rubber-Gasket Joints for Ductile Iron Pressure Pipe and Fittings", and must be Cor-Ten as manufactured by NSS Industries, or approved equal.

Hexagonal bolts, nuts and washers for flanged fittings shall be zinc plated, high strength, low-carbon steel conforming to the chemical and mechanical requirements of ASTM A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength, Grade A.

Stainless Steel nuts and bolts are required for above ground installations, for steel pipe installations, for stainless steel tapping sleeves and for all other construction as required. The Contractor shall strictly follow the torque limitations and shall use Anti-Seize as manufactured by Permatex Part# 80078 or approved equal with the stainless steel nuts and bolts.

All exposed nuts and bolts shall be coated after assembly with an approved mastic as described in Section 2-09.01, with the exception of stainless steel nuts and bolts.

2-08.05 TAPPING SLEEVES

All Tapping Sleeves for tapping a water main under pressure shall conform to the following requirements:

2-08.05.1 DUCTILE IRON, GRAY IRON AND ASBESTOS-CEMENT PIPE

Tapping sleeves shall be the full circle stainless steel type with a pressure testing port. All tapping sleeves specified in this Section must withstand a 150 psi minimum working pressure and shall provide a positive seal around the pipe at each end of the sleeve. Tapping sleeves that seal only around the opening in the pipe may not be used. For working pressures above 150 psi, special approval must be obtained

SECTION 2 - MATERIALS

from the Water Services Division.

Stainless steel type tapping sleeves shall be made of 18-8 stainless steel, with a flange piece conforming to the requirements of AWWA Standard C207 "Steel Pipe Flanges for Waterworks Service, Sizes 4-inches through 144-inches". Approved stainless steel type tapping sleeves are listed in Section 2-08.05.3. Size on size stainless steel type tapping sleeves is not permitted unless approved otherwise by the Engineer.

2-08.05.2 APPROVED STAINLESS STEEL TAPPING SLEEVE MANUFACTURERS

JCM	Model 432
Ford	Style FAST or FTSS
Romac	Style SST or SST III with Stainless Steel Flange
Mueller	Model H-304 SS
Power Seal	Model 3490 AS
Smith -Blair	Model 663
Or approved equal	

2-08.05.3 APPROVED STAINLESS STEEL TAPPING SLEEVE MANUFACTURERS FOR PVC PIPE

JCM	Model 432
Ford	Style FAST or FTSS
Romac	Style SST or SST III with stainless steel flange
Mueller	Model H-304 SS
Power Seal	Model 3490 AS
Smith -Blair	Model 663
Or approved equal	

2-08.05.4 SPECIAL APPLICATIONS AND PIPE LARGER THAN 12-INCHES IN DIAMETER

Tapping sleeves for special applications, including Belgium cast iron pipe, and pipe larger than 12-inches in diameter shall be of the full circle split body, fabricated steel type or all stainless steel type. The body shall be fabricated steel conforming to ASTM A36 and fusion bonded epoxy coated after fabrication, or shall be all 18-8 type 304 stainless steel for total corrosion control. Nuts, bolts and washers shall be stainless steel, type 18-8. Tapping sleeves shall be rated for a

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working pressure of 150 psi. For working pressure above 150 psi, special approval must be obtained from the Water Services Division.

2-08.05.5 APPROVED TAPPING SLEEVE MANUFACTURERS - SPECIAL APPLICATIONS AND PIPE LARGER THAN 12-INCHES IN DIAMETER.

Fabricated Steel Type

JCM	Model 412
APAC	Model 500 Series
Or approved equal	

Stainless Steel Type

JCM	Model 432
Ford	Style FAST or FTSS
Romac	Style SST or SST III with Stainless Steel Flange
Smith Blair	Model 663
Mueller	Model H-304 SS
Power Seal	Model 3480 or 3490
Or approved equal	

2-08.05.6 CONCRETE CYLINDER PIPE

At the sole discretion of the Water Services Division, tapping sleeves for concrete cylinder pipe may be required to be of the weld-on type, provided that welding is performed by a State certified pipe welder. For concrete cylinder pipe with a steel cylinder wall thickness of 13 gauge or thinner, the Water Services Division may require a full circle, split body, fabricated steel type tapping sleeve, conforming to the provisions of Section 2-08.05.5 of these specifications.

2-08.05.7 APPROVED TAPPING SLEEVES MANUFACTURERS FOR CONCRETE CYLINDER PIPE

Full Circle Two-Piece Type:

Koppl	Model AS-150
Or approved equal	

Weld-On Type:

Koppl	Model CN-100
Or approved equal	

2-09 MAIN LINE COUPLINGS

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2-09.01 SLEEVE TYPE COUPLINGS

Sleeve type couplings shall provide a flexible, watertight connection between two plain ends as described on the construction drawings. For ductile iron and gray iron pipe, all couplings shall be ductile iron solid sleeve type couplings conforming to AWWA C 110, with mechanical joint ends and body not less than 12 inches long. For PVC, steel, or asbestos cement pipe, all couplings shall be ductile iron type with sleeve not less than 7 inches long. Bolts and nuts for exposed ductile iron couplings shall be of type 316 stainless steel and use anti-seize as described in section 2-08.04. Bolts and nuts for buried couplings shall be of low alloy per ASTM A242, AWWA C111 and shall be coated with a mastic or NO-OX-ID water works rust preventative protective coating after they are assembled. Coal-tar mastics shall be Protecto-Wrap JS 160H coating as manufactured by Protecto-Wrap Company, Denver, Colorado or an approved equal.

2-09.01.1 APPROVED SLEEVE TYPE COUPLINGS MANUFACTURERS FOR DUCTILE IRON, GRAY IRON PIPE AND PVC PIPE

Clow - MJ Solid Long Sleeves
Tyler Corporation - MJ Solid Long Sleeves
Or approved equal

2-09.01.2 APPROVED FLEXIBLE COUPLING MANUFACTURERS FOR STEEL

Ford Meter Box Company, Inc. - FC2W Wide Range Coupling
Smith Blair, Inc. - 411 Cast D.I. Couplings
Romac Industries, Inc. – Model XR501
Or approved equal

2-09.01.3 APPROVED FLEXIBLE COUPLING MANUFACTURERS FOR TRANSITION TO ASBESTOS CEMENT PIPE AND BELGIUM CAST IRON PIPE

Ford Meter Box Company, Inc. - FC2W Wide Range Coupling
Smith Blair, Inc. – OMNI 441 Cast D.I. Couplings
Or approved equal

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2-09.02 MECHANICAL GROOVED-TYPE COUPLINGS

Mechanical grooved-type couplings shall provide a positive thrust restraint by locking two grooved or shouldered ends of pipe together. The couplings shall be Style 77 for steel pipe and Style 31 for ductile iron pipe as manufactured by Victaulic Company, or approved equal. These couplings shall have Grade H rubber gaskets and the interior shall be lined with fusion bonded epoxy. Mechanical grooved-type couplings shall be used in above ground or vault installation only.

2-09.03 DISMANTLING JOINTS

Dismantling joints shall be a self-contained flanged restrained joint fitting, including both flanged components and sufficient harness bars to withstand the imposed thrust. The dismantling joint shall be designed to provide no less than 5 inches of longitudinal adjustment and shall be installed with 4 inches of inward adjustment and 1 inch of expansion. The pressure rating will be determined by the flange configuration, and all commonly used flanges shall be available. As standard, flanges conforming to AWWA C207 class D shall be used.

The dismantling joint shall be furnished as a complete assembly consisting of spigot piece, flange adapter, tie bars and gasket.

The spigot piece and the flange adapter shall be steel per AISI C1010-C1015. All exterior fasteners including tie bars shall be 304 or 316 stainless steel. Stainless steel fasteners and tie bars shall use anti-seize as described in Section 2-08.04 and not be painted. Gasket material shall be EPDM or Buna-S. The dismantling joint shall be coated inside and out with a fusion bonded Epoxy coating applied to a thickness of 5 -10 mils. The epoxy shall comply with the requirements of NSF 61 and AWWA C550.

The dismantling joint shall comply with AWWA C219 where applicable, and the manufacturer shall operate an accredited Quality Management System to ISO 9001. The design pressure rating shall be equal to or greater than the mating flanges. The gasket seal and compression stud and nut arrangement shall be separate and independent of the tie bar restraint system. Seals between companion flanges and dismantling joint flanges shall be made by full faced or drop in ring-style non-asbestos gaskets. Tie bar diameter shall be equal to the corresponding bolt diameter of the mating flange and shall not extend outside the diameter of the flange diameter.

The dismantling joint shall be Dresser Industries, Style 131, Romac Industries, Inc. Style DJ400, Smith Blair 900 Series or approved equal.

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2-09.04 FLANGE ADAPTERS

Flange Adapters shall be manufactured from ductile iron per ASTM A536 and shall have bolt circles and bolt holes to meet ANSI B16.1 - Class 125 or Class 250 if required and shown on the plans.

Flange adapters are approved only for above ground ductile iron pipe installations.

APPROVED FLGANGE ADAPTERS MANUFACTURERS

EBAA IRON, INC - Series 2100 Megaflange
Smith Blair - Model 912
Romac Industries, Inc. – Model FC400 or FCA501
Ford Meter Box Company, Inc. - UNI-Flange
Tyler Union - Adpater Flange
or Approved Equal

2-10 SERVICE LATERAL INSTALLATION

2-10.01 GENERAL

All valves and fittings for use in the buried service line from the main to the meter setting appurtenance shall conform to the requirement of AWWA standard C800 “Underground Service Line Valves and Fitting” and meet the California Health and Safety Code section 116875. Materials in contact with potable water shall be made from copper alloy No. C83600, in accordance with ASTM B-62. This alloy contains nominally 85 percent copper and 5 percent each tin, lead and zinc. All corporation stops and angle meter valves used for copper installations shall have compression connection of copper tubing. Approved manufacturers are James Jones, Ford, and Mueller, or approved equal.

2-10.02 FITTINGS

2-10.02.1 CORPORATION STOPS

Corporation stops shall have inlet threads per AWWA tapered threads as specified by AWWA Standard C800 “Underground Service Line Valves and Fittings”. Outlet shall be compression connection for copper tube.

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2-10.02.2 ANGLE METER VALVES

All angle meter valves shall have a locking wing on the key operator. All valves for 5/8 x 3/4 inch and 1-inch meters shall have a compression connection inlet and a meter swivel nut outlet. All 2-inch valves shall have a compression connection inlet for 2-inch copper tubing and a meter flange outlet slotted to accommodate 1½-inch and 2-inch meters. Slot should not extend to the outside edge – open slot will not be accepted.

2-10.02.3 COUPLINGS AND SOLDER

Couplings required in 2-inch service laterals shall be made with copper tube fittings in accordance with ANSI B16.22. The diametrical clearance between the tube and fitting shall be .004 to .010 inches. Solder shall be 95/5 (tin-antimony) or an approved equal. Solder with a lead content of 0.2% or greater will not be accepted.

2-10.02.4 BOLTS AND NUTS FOR METER FLANGE CONNECTIONS

All bolts, nuts and washers for flanged fittings shall be Type 316 stainless steel per ASTM A 276-88A, or of an approved similar metal as the flanges, to resist corrosion and for easy removal after lengthy service. Use anti-seize as described in section 2-08.04.

2-10.03 SERVICE SADDLES

All service saddles shall be bronze conforming to ASTM B-62, double strap, and tapped for AWWA taper thread as specified by AWWA Standard C800 “Underground Service Line Valves and Fittings”.

2-10.03.1 SERVICE TAPPING TO CONCRETE CYLINDER PIPES

Service tapping to concrete cylinder pipes shall only be made under special approval by the Water Services Division. Unless specified otherwise, tapping shall be a minimum of 2-inch NPT with bushing, as needed. Service saddles shall be Smith Blair 362, or approved equal.

2-10.03.2 SERVICE TAPPING TO PVC PIPE

For dry tapping 1” and 2” services on PVC pipe, the hole shall be bored into the pipe with a hole saw that retains the coupon and allows the shavings to fall clear of the hole. A Ford 202 BS or approved equal service saddle shall be centered over the hole, seated, and tightened

SECTION 2 - MATERIALS

then the corporation stop installed using pipe thread sealant.

2-10.04 METER BOXES

Meter boxes shall be precast concrete or polymer concrete having a compressive strength of 4000 psi. Meter boxes shall have a polymer 2- piece concrete cover. Body of the meter box shall be constructed with a “ring” at the top to prevent settlement.

Where required, meter boxes shall have traffic load rating covers. Meter boxes shall be manufactured by J&R Concrete Products, Inc., Eisel Enterprises, or approved equal, as indicated below.

<u>Meter Size</u>	<u>Armorcast Box/Cover</u>	<u>J&R. Box/Cover</u>	<u>Eisel Box / Cover</u>
5/8" X 3/4" and 1"	P6000485 A6000484DS A6000499-GG	W4 ½	437 437
1 ½" and 2"	A6001419/ A6001420TDW		655½ 655½

2-11 SMALL METERS

POSITIVE DISPLACEMENT TYPE

Meters 2-inch or less in size are classified as small meters and shall conform to AWWA C700-09, Standard Specifications for “Cold Water Meters – Displacement Type, Bronze Main Case”. All meters shall consist of a bronze main case with serial numbers stamped on the main case. All meters shall be read in cubic feet.

APPROVED POSITIVE DISPLACEMENT TYPE METER MANUFACTURERS

Sensus Metering Systems:

5/8" x 3/4"	Model SR II
1"	Model SR II
1 ½" and 2"	Model SR OMNI R-2 C-2

2-12 THRUST RESTRAINING MATERIALS

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All mechanical thrust restraining devices shall be ductile iron. All devices shall withstand a working pressure of at least 250 psi with minimum safety factor of two.

2-12.01 MECHANICAL JOINT RESTRAINT

2-12.01.1 FOLLOWER GLAND TYPE

Restraining devices for mechanical joint fittings shall be incorporated with design of the follower gland and shall include a restraining mechanism which when activated, imparts multiple wedging action against the pipe, increasing its resistance as the pressure increases. The joint shall maintain flexibility after burial. Glands shall be manufactured of ductile iron conforming to ASTM A536.

APPROVED POSITIVE DISPLACEMENT TYPE METER MANUFACTURERS

Ductile Iron Pipe

EBAA Iron Inc.- Megalug® Series 1100
Ford Meter Box, Inc. - Uni Flange® Series 1400
or Approved Equal

PVC or PVCO Pipe

EBAA Iron Inc., - Megalug® Series 2000 PV
Ford Meter Box, Inc. - Uni-Flange® Series 1500
or Approved Equal

2-12.01.2 GASKET TYPE

Where gasket type restraints are indicated on the Construction Plans, mechanical joint pipe and fittings shall be restrained with the MJ FIELD LOK® Gasket as manufactured by US PIPE or approved equal. The restraint system shall be completely integral to the gasket, requiring only standard mechanical joint assembly techniques. The gasket type restraint shall fit mechanical joints conforming to ANSI/AWWA C111/A21.11 "Rubber Gasket Joints for Ductile-Iron Pressure Pipe and Fittings".

For mechanical joint restraints on PVC C900 and PVCO C909 pipes, the Series PV MJ FIELD LOK® Gasket restraint as manufactured by US PIPE or approved equal, shall be used.

2-12.02 PUSH-ON PIPE BELLS FOR DUCTILE IRON PIPE

SECTION 2 - MATERIALS

Where restrained joints are indicated on the Construction Drawings, push-on joints shall be restrained with FIELD LOK® 350 or TR FLEX® as manufactured by U.S. Pipe or approved equal.

2-12.03 CONCRETE

Concrete for thrust blocks shall conform to Concrete Class 420-C-2000. If thrust block is to be disturbed or backfill is to be placed prior to developing its required strength, additional mechanical thrust restraining devices approved by the Water Services Division shall be installed. Concrete for anchor and Gravity Anchor Blocks shall conform to Class 560-C-3250.

2-13 SHOP DRAWING AND MATERIAL SUBMITTALS

The Contractor shall furnish to the Water Services Division such working drawings, data on materials, certifications of materials, and equipment and samples as are required for the proper control of the work, including, but not limited to, those working drawings, data and samples specifically required in Subsection 2-5.3 of the SSPWC and on the Drawings. All working drawings, data and samples shall be subject to review by the Water Services Division for conformity with the drawings and specifications. The shop drawings shall be submitted at least ten (10) working days before such drawings will be required for commencing the work. Cut sheet submittals having more than one size, type, or model shall be clearly highlighted with a yellow marker to indicate specific items to be reviewed. Shop drawings having multiple sizes or items without highlighting will be rejected.

2-14 PAINTING - ABOVE GROUND INSTALLATIONS

After ALL Testing and Disinfection has passed, but prior to Final Acceptance by the Water Services Division, all above ground installations shall be painted in accordance with the following:

Remove ALL dirt, oil, grease, rust, bituminous coating, and other contaminants from surfaces to be painted by sand-blasting, pickling, or wire brushing as required. Clean all surfaces with a SCAQMD compliant, biodegradable surface cleaner as may be necessary. Allow surfaces to dry completely, then apply primer to all surfaces to be painted. Allow primer to dry, then apply intermediate coat to all surfaces; allow intermediate coat to dry, then apply finish coat.

The underlined generic terms in the above paragraph shall be considered together as a painting system and shall be supplied by a single manufacturer selected from the list of Approved Painting Systems at the end of this section.

The above specified work shall be accomplished per the appropriate sections of Steel Structures Painting Manual, Volumes 1 and 2, published by the SSPC of Pittsburgh, Pennsylvania AND strict adherence to the manufacturer's recommendations.

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Approved Painting Systems by Manufacturer:

Manufacturer	<u>Carboline</u>	<u>Tnemec</u>
Primer	Carboguard 890 VOC @ 4-6 mils DFT	Series 69 @ 3-5 mils DFT
Intermediate Coat	Carboguard 890 VOC @ 4-6 mils DFT	Series 69 @ 4-6 mils DFT
Finish Coat	Carbonthane 134MC @ 2-3 mils DFT	Series 73 @ 2-3 mils DFT

(DFT = Dry film thickness)

From the following approved list, use the semi-gloss top coat color that corresponds with the application or as directed by the City.

Approved Finish Coat Colors:

	<u>Carboline</u>	<u>Tnemec</u>	<u>Frazer Paint</u>
Backflow Prevention Devices > 2-inches	Hunter 4372	Hunter Green 08SF	-
*Fire Line Assemblies	Offshore Green D337	Hunter Green 08SF	-
Fire Hydrant	Safety Yellow 6666	Bright Yellow 03SF	143 Mirro - Glide
Guard Post	Safety Yellow 6666	Bright Yellow 03SF	143 Mirro - Glide
Air Vents Type I	Lt. Gray C705	Lt. Gray 32GR	-

* Where the assembly can be placed close to the building the color shall compliment the building. Alternate colors for unique situations shall be reviewed and approved by the Planning Services Division. **Top of FDC shall be painted Safety Red** per the Fire Department.

2-15 ACCESS TO MANUFACTURING AND TEST FACILITIES

The Water Services Division shall at all times have access to the manufacturing and test facilities, and the right to inspect the work, and materials. The manufacturer shall furnish the Water Services Division with reasonable facility access for obtaining such information as necessary to assess the progress of the work, and the character and quality of materials used. When requested by the Water Services Division, the manufacturer shall submit a certificate of compliance that the product meets the requirements of these specifications.

SECTION 3 - CONSTRUCTION METHODS AND CONTROL

3-01 INSPECTION

The construction of any water system improvement intended for dedication to the City and used by the Water Services Division for public water service shall be subject to inspection by the Water Services Division. Such inspection will assure the Water Services Division that all phases of the work are in compliance with these specifications. The Inspector will be the representative of the Director, Public Works Department and shall coordinate the various responsibilities of the Water Services Division throughout the work. Inspection costs will be paid by the Developer or Contractor at a rate prescribed by City Council resolution.

The Water Services Division shall have access to the work and shall be furnished with every reasonable facility for ascertaining full knowledge of the progress, material, and workmanship used to complete the work. The Water Services Division shall be given 48-hours advance notice of major phases of construction for purposes of inspection unless noted otherwise on the construction drawings. All material shall be inspected prior to placement and all workmanship shall be visually inspected prior to backfilling. Reasonable aid shall be given to ascertain the exact location of all work.

The inspection of the work shall not relieve the Contractor of any obligation to complete the work as prescribed by these specifications. Defective work shall be made good, and unsuitable materials may be rejected notwithstanding the fact that such defective work and unsuitable materials have been previously accepted by the Water Services Division.

The Water Services Division shall have the authority to suspend the work wholly, or in part, for such time as it may deem necessary due to the failure of the Contractor to perform any provisions of the plans or specifications. The work can only be continued when the defective material or method is recognized as corrected by the Water Services Division.

3-02 PRE-CONSTRUCTION DETAILS

3-02.01 PERMITS AND LICENSES

The Contractor shall have a Class "C-34" or Engineering "A" Contractor's License valid in the State of California and shall meet all the applicable requirements of the Garden Grove Municipal Code. The Contractor shall have a current, valid City of Garden Grove business license. The Contractor shall obtain all necessary permits, licenses, or agreements required by any legally constituted agency. An excavation permit from the City shall be required for excavation in the public right-of-way within the City. A copy of all licenses and permits required for the project shall be provided to the City prior to starting work. The Contractor shall observe all safety

SECTION 3 - CONSTRUCTION METHODS AND CONTROL

procedures as required by CAL-OSHA. All provisions of these permits, licenses, or agreements shall be binding upon the Contractor as though stated herein. Water Services Division will not be responsible for actions involving the agencies controlling such permits, licenses, or agreements.

3-02.02 TRAFFIC CONTROL

The Contractor shall furnish all materials, labor and traffic controls necessary to safeguard the work and the public safety.

Traffic and pedestrian control shall comply with the applicable provisions as contained in the latest edition of the California Manual of Uniform Traffic Control Devices (CaMUTCD). All traffic control plans shall be reviewed and approved by the City.

3-02.03 SURVEYING

The Contractor shall provide equipment, method, and labor to locate accurately all proposed water facilities. The Contractor shall further guarantee the accurate location of all water facilities by constructing curb and gutter prior to the beginning of any water improvements. If, in the opinion of the Water Services Division, this sequence of construction cannot be followed, the Contractor will sign a "Waiver of Curb and Gutter Requirements" and assume all responsibility and costs for correcting any resulting errors or omissions.

3-02.04 POLLUTION PREVENTION & BEST MANAGEMENT PRACTICES

Storm water and non-storm water discharges resulting from municipal construction activities (less than 1 acre) are currently governed by the Santa Ana Regional Water Quality Board NPDES Permit No. CAS618030. The permit applies to municipal activities within the County of Orange. A Municipal Activities Procedures Manual has been developed by the County of Orange to assist with permit implementation. A copy of the permit, the Municipal Activities Procedures Manual, and the Local Implementation Plan are available from the City of Garden Grove, Department of Public Works Records Office, located in the City Hall, 11222 Acacia Parkway, Garden Grove, CA 92842. These documents provide guidance and requirements regarding proper pollution control practices at construction sites. They include a list of Best Management Practices (BMPs) to be implemented where applicable. For more information on BMPs and compliance with the Construction General Permit (CGP), refer to California Storm Water Quality Association website at <http://www.cabmphandbooks.com>.

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3-03 REMOVALS AND TRENCH EXCAVATION

3-03.01 REMOVAL OF PAVEMENT

Asphalt and concrete paving shall be removed after saw cutting. All edges shall be as straight as possible. Contractor shall dispose the pavement off the work site to a permitted facility.

3-03.02 REMOVAL OF UTILITIES

Utilities shall be removed only as stated on the construction plans. Structures or piping not shown on the construction plan shall be brought to the attention of the Water Services Division. Disposition of these structures shall be determined by the Water Services Division prior to proceeding with the work.

The Contractor shall notify and coordinate with representatives of any utility which must be removed or relocated.

3-03.03 TRENCH EXCAVATION

Trench excavation shall include any excavation in which the depth is greater than the width at the bottom of the excavation. Such excavations as required for pipe lines, vaults, thrust blocks, boring pits and service laterals shall be considered as trench excavations. All earthen material and water that will interfere with the placement of the pipe shall be removed. Contractor shall use sufficient means to protect any existing utilities from damage during trench excavation. Contractor shall also use Best Management Practices (BMP) to prevent silt, mud, or other pollutants from entering storm drains or catch basins as a result of trenching or excavating activities.

The maximum length of open trench shall be 500 feet or the length of pipe installed in one day, whichever is less. An open trench of up to 1,000 feet is permissible only in areas not subject to public traffic. The width of the trench at the bottom of the excavation shall be a minimum of 6 inches and not to exceed 10 inches on either side of the pipe. Bell and coupling holes shall be used as required to complete a satisfactory pipe joint.

Water main installation will not be permitted until subgrade is established and the storm drain and sewer installation have been completed. Pipe shall be placed to the grade and depth specified on the construction drawings. When not specified, pipe shall be placed as follows:

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- a. 42-inch standard cover to finished surface of primary and secondary streets, (64 feet right-of-way and greater).
- b. 36-inch standard cover to finished surface of collector and interior streets (less than 64 feet right-of-way).
- c. 12-inch standard vertical clearance from any crossing utility or structure.

In all cases pipe shall be installed so that there is a minimum of 24" cover between top of pipe and bottom of pavement structural section.

The minimum cover and clearance herein stated applies to construction where there are existing underground facilities. These minimums are not intended as "design minimums" where all new underground facilities or two or more conflicting facilities are installed at the same relative time. The design shall attempt to maximize clearance between conflicting facilities and provide standard cover as the minimum.

The trench bottom shall be graded to provide a smooth, firm, and stable foundation which is free of rocks and other obstructions. All soft, spongy, and unstable material shall be overexcavated to a depth of two feet, replaced with backfill material per Section 3-09 of these specifications, and compacted to provide a firm and stable foundation. All rocks or cobbles two inches or greater in any dimension shall be removed to a depth of six inches below pipe grade and replaced with compacted backfill material.

3-04 CONNECTION TO EXISTING FACILITIES

3-04.01 GENERAL

The Contractor shall make connection to the existing public facilities as shown on the construction drawings. All connections must be made under inspection of the Water Services Division's representative. The Inspector shall consider the means of chlorinating those sections of main, fittings, or valves in contact with the public system. When such connection provides a direct closure between the existing public system and that under construction, such valves shall become the property of the Water Services Division and shall be operated only by the Water Services Division.

3-04.02 PRESSURE TAPPING

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Cast iron, ductile iron, PVC, or asbestos cement pipe can be tapped under pressure by the Contractor. The exterior surface of the pipe shall be cleaned to provide a smooth surface for the tapping sleeve. The tapping sleeve shall be secured to the pipe to prevent movement during the tapping process. Prior to tapping, the tapping sleeve shall be tested for leaks. It shall be tested to 1.5 times the static pressure or 150 psi, whichever is greater. Concrete cylinder pipes shall be tapped under pressure by the Koppl Company, Montebello, California, International Flow Technologies, Inc., Murrieta, California, or approved contractor by the Engineer. Tapping nozzles shall be bolted or welded on as determined by the Water Services Division based on steel cylinder thickness.

3-04.03 SHUTDOWN OF MAIN

All work necessary to shut down an existing public water main for the benefit of a Contractor shall be by Water Services Division personnel and shall require prior approval by the Water Services Division. Unless at the direct supervision of the Water Services Division Inspector, under no circumstances shall the Contractor operate valves, hydrants, and other appurtenant equipment on the existing public system. It shall be the Contractor's responsibility to coordinate the necessary shutdown schedules through the Water Services Division Inspector. Scheduled shutdowns shall require sufficient time to allow operations personnel to review, approve, and develop an appropriate Operation Program. The Contractor shall be responsible for maintaining all schedules current and coordinating all deviations which may occur from time to time with the Water Services Division Inspector.

The City will make a concerted effort to isolate the system as planned with the Contractor. However, the Contractor shall be prepared to employ pumping equipment if a water tight seal cannot be achieved. City will not be responsible for any delays due to system shutdown and isolation.

All emergency situations shall be reported immediately to the Water Services Division (714-741-5395 during business hours and 714-741-5704 after business hours). When extensive main shutdown is required, the Water Services Division will determine what temporary service connections may be required. The Contractor shall furnish all necessary hose, piping, valves, water trucks and associated labor required to provide such temporary service. All piping, hoses and associated equipment used in temporary service connections shall be flushed and disinfected in accordance with Section 3-11, TESTING, DISINFECTION, AND FLUSHING.

3-05 LAYING OF DUCTILE IRON PIPE WATER MAIN

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3-05.01 GENERAL

Installations of pipe and fittings shall be in accordance with AWWA Standard C600, "Installation of Ductile-Iron Water Mains and Their Appurtenances" and the pipe manufacturer's installation manual. The DIPRA Publication "Guide for the Installation of Ductile Iron Water Mains" shall be used for details of pipe installation practice except as follows and where noted otherwise on plans. Maximum deflection per joint for greater than 12-inch pipe shall conform to allowable values shown in "Installation Guide for Ductile Iron Pipe" by DIPRA.

Water Main Separation Criteria shall be as follow:

- (a) New water mains and new supply lines shall not be installed in the same trench as, and shall be at least 10 feet horizontally from and one foot vertically above, any parallel pipeline conveying:
 - (1) Untreated sewage,
 - (2) Primary or secondary treated sewage,
 - (3) Hazardous fluids such as fuels, industrial wastes, and wastewater sludge.
- (b) New water mains and new supply lines shall be installed at least 4 feet horizontally from, and one foot vertically above, any parallel pipeline conveying:
 - (1) Disinfected tertiary recycled, and
 - (2) Storm drainage..
- c) If crossing a pipeline conveying a fluid listed in subsection (a) or (b), a new water main shall be constructed no less than 45-degrees to and at least one foot above that pipeline. No connection joints shall be made in the water main within eight horizontal feet of the fluid pipeline.
- (d) The vertical separation specified in subsections (a) and (b) is required only when the horizontal distance between a water main and pipeline is less than ten feet.
- (e) New water mains shall not be installed within 100 horizontal feet of the nearest edge of any sanitary landfill, wastewater disposal pond, or hazardous waste disposal site, or within 25 horizontal feet of the nearest edge of any cesspool, septic tank, sewage leach field, seepage pit, underground hazardous material storage tank, or groundwater recharge project site.

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- (f) The minimum separation distances set forth in this section shall be measured from the nearest outside edge of each pipe barrel.
- (g) With the State Water Resources Control Board and City Engineer written approval, newly installed water mains may be exempt from the separation distances in this section, except subsection (e)

In addition, installation shall comply with Standard Drawings B-760 and B-761.

Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the trench. If the pipe-laying crew cannot put the pipe into the trench and in place without getting soil into it, the Engineer may require that before lowering the pipe into the trench, a temporary plug be placed over each end and left there until the connection is to be made to the adjacent pipe. During laying operations, no debris, tools, clothing or other materials shall be left in the pipe.

At times when pipe laying is not in progress, the open ends of pipe shall be closed by watertight plug or other means approved by the Engineer. This provision shall apply during the lunch-hour breaks as well as overnight. If water is in the trench, the seal shall remain in place until the trench is pumped completely dry.

The cutting of pipe for inserting tees, fittings or closure pieces shall be done in a neat workmanlike manner without damage to the pipe or cement lining and so as to leave a smooth end at right angles to the axis of the pipe. No pipe shall be laid in water or when, in the option of the Engineer trench conditions are unsuitable. Field welding of Ductile Iron Pipe for repair or for joining is prohibited. Service saddles are required for all corporation stops 2-inch diameter and less.

3-05.02 THRUST RESTRAINT

The Contractor shall be responsible for anchoring the pipe and fittings against movement due to water pressure. The materials specified in Section 2-12 will be used for restraining any movement of underground piping systems. Concrete thrust blocks shall be poured in place against an undisturbed earth bearing surface.

Concrete shall be placed so as not to interfere with the fitting joint. Concrete shall be per Section 2-12.03. Thrust block locations and dimensions shall be per Standard Drawings B-710 through B-713, Section 6 of these specifications.

3-05.03 STANDARD ASSEMBLIES

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Fire hydrants shall be constructed per Standard Drawings B-701 and B-702, Section 6 of these specifications. Fire Hydrants shall be placed at a location shown on the construction drawing or as directed by the Inspector. The determination will be based on specific locations which, in the opinion of the Inspector, could result in potential hazard from the fire hydrant being hit and broken, such as closeness to overhead power lines or water damage to property.

Water valves shall be installed at locations shown on the construction drawing, or as directed by the Water Services Division. Valves shall be set plumb, and shall be stabilized and supported separately from the pipeline. Information regarding size, type, make, and number of turns to close shall be supplied to the Water Services Division by the Contractor in accordance with Section 2-13. All valves shall be covered with a valve box assembly. Valve boxes shall be plumb, centered over the valve nut, and supported separately from the valve body per Standard Drawing B-752, B-753, and B-754. Valve boxes shall be lowered to below paving grade level prior to street paving, and after final grade has been established by the final grade. In any event, Contractor shall ensure that all valve boxes will provide access to the operation of the valve by the Water Services Division's personnel.

Valve boxes shall be flagged or barricaded during construction to divert traffic around their location.

3-05.04 PROTECTION AND CLEANING OF PIPE AND FITTINGS

The Contractor shall take extreme care to insure cleanliness and protection of the inside coatings of all piping and fittings. The interior surfaces of all pipe, fittings and other appurtenances shall be kept free of dirt or foreign matter at all times. All lumps, blisters, excess lining and coating materials shall be removed from the flanged end or bell and spigot end of each pipe or fittings. The outside of the spigot and the inside of the bell shall be wire brushed and wiped clean, and free from oil and grease before the pipe is laid.

3-05.05 HANDLING PIPE AND OTHER MATERIALS

Proper implements, tools and facilities satisfactory to the Engineer shall be provided and used by the Contractor for the safe and convenient prosecution of the work. All pipes, fittings and valves shall be carefully lowered into the trench in such a manner as to prevent damage to water main materials and protective coatings and linings. Under no circumstances shall water main materials be dropped or dumped into the trench.

3-05.06 PROTECTION OF METAL SURFACES

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All exposed surfaces of the valves, flanges, bolts, nuts, tie-rods, turn buckles, etc. in contact with the earth and backfill materials shall be coated with a minimum of 30 mils of bitumastic coating, NO-OX-ID water works rust preventative protective coating or approved equal prior to backfilling. In addition to this coating, all iron or steel surfaces such as valves, flanges, bolts, nuts, couplings, shall be encased in 8 mil polyethylene wrapping in accordance with AWWA C-105. Stainless Steel shall use anti-seize as described in Section 2-08.04.

3-06 LAYING OF PVC PIPE WATER MAIN

Installations of pipe, bends, and fittings shall be in accordance with Section 2-08 for ductile iron bends and fittings, and AWWA C605 "Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water" and the pipe manufacturer's installation manual.

PVC bends and fittings are not allowed. The Uni-Bell Handbook of PVC Pipe-Design and Construction shall be used for details of pipe installation practice except as follows and where noted otherwise on plans. Longitudinal bending of pipe sections is prohibited. Any directional change shall be accomplished through manufacturer approved 1° deflection of push on joints, 5° deflection with CertainTeed - couplings, or ductile iron bends capable of withstanding 250 psi loads. A number 14-gauge, solid, soft drawn insulated copper tracer wire is required for PVC pipe installation. The tracer wire and warning identification tape shall be installed per Standard Drawing B-781.

Service saddles are required for all corporation stops 2-inch diameter and less.

Point load set screws in retainer glands and flanges are prohibited, whereas those devices with pads or full circle are acceptable.

Water Main Separation Criteria shall be as follow:

(a) New water mains and new supply lines shall not be installed in the same trench as, and shall be at least 10 feet horizontally from and one foot vertically above, any parallel pipeline conveying:

- (1) Untreated sewage,
- (2) Primary or secondary treated sewage,
- (3) Hazardous fluids such as fuels, industrial wastes, and wastewater sludge.

(b) New water mains and new supply lines shall be installed at least 4 feet horizontally from, and one foot vertically above, any parallel pipeline conveying:

- (1) Disinfected tertiary recycled, and

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(2) Storm drainage.

- c) If crossing a pipeline conveying a fluid listed in subsection (a) or (b), a new water main shall be constructed no less than 45-degrees to and at least one foot above that pipeline. No connection joints shall be made in the water main within eight horizontal feet of the fluid pipeline.
- (d) The vertical separation specified in subsections (a) and (b) is required only when the horizontal distance between a water main and pipeline is less than ten feet.
- (e) New water mains shall not be installed within 100 horizontal feet of the nearest edge of any sanitary landfill, wastewater disposal pond, or hazardous waste disposal site, or within 25 horizontal feet of the nearest edge of any cesspool, septic tank, sewage leach field, seepage pit, underground hazardous material storage tank, or groundwater recharge project site.
- (f) The minimum separation distances set forth in this section shall be measured from the nearest outside edge of each pipe barrel.
- (g) With the State Water Resources Control Board and City Engineer written approval, newly installed water mains may be exempt from the separation distances in this section, except subsection (e)

In addition, installation shall comply with Standard Drawings B-760, B-761, and B-763.

Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the trench. If the pipe-laying crew cannot put the pipe into the trench and in place without getting soil into it, the Engineer may require that before lowering the pipe into the trench, a temporary plug be placed over each end and left there until the connection is to be made to the adjacent pipe. During laying operations, no debris, tools, clothing or other materials shall be left in the pipe.

At times when pipe laying is not in progress, the open ends of pipe shall be closed by watertight plug or other means approved by the Engineer. This provision shall apply during the lunch-hour breaks as well as overnight. If water is in the trench, the seal shall remain in place until the trench is pumped completely dry.

The cutting of pipe for inserting tees, fittings or closure pieces shall be done in a neat workmanlike manner without damage to the pipe and so as to leave a smooth end at right angles to the axis of the pipe. The beveled end of any PVC pipe shall be cut off before the pipe is inserted into a mechanical joint bend or fitting. No pipe shall be laid in water or when, in the opinion of the Engineer, trench conditions are unsuitable.

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3-07 REPAIR, REMOVAL AND DISPOSAL OF ASBESTOS CEMENT PIPE (ACP)

Contractor shall be responsible to remove and dispose Asbestos Cement Pipe indicated on the project plans.

Asbestos Cement Pipe (ACP) is a mixture of cement and asbestos fibers. ACP is no longer manufactured or allowed for new installations due to health and safety hazard. ACP is defined under the National Emission Standard for Hazardous Air Pollutants (NESHAP) as a Category II, non-friable, non-regulated material in its intact state but which may become friable upon removal, demolition and/or disposal. ACP repair and removal due to the damage of the existing pipe is defined as Class II asbestos work. Any repair, removal, disposal and handling of ACP shall comply with NESHAP, CAL-OSHA and all other applicable regulations and procedures.

Only the personnel who are trained/qualified for Class II asbestos work shall be allowed for any repair, removal, disposal and handling of ACP.

Contractor shall provide the Water Services Division a manifest of properly disposed ACP material.

3-08 SERVICE LATERALS

3-08.01 GENERAL

One-inch and two-inch diameter service laterals shall be installed per Standard Drawings B-719, B-721 and B-722. The service lateral shall consist of the double strap service saddle, polywrap per Section 3-12.03 if ductile iron main, insulated corporation stop, angle meter valve, meter, meter box and lid, and copper tubing. Service laterals shall be installed perpendicular to the centerline of the street.

Meters and meter boxes shall be supplied and installed by the Contractor at such time and place as directed by the Water Services Division. Meter boxes located in areas subject to traffic loading, or located behind a rolled curb, shall be installed with an approved Traffic bearing lid.

Special consideration shall be given to backfill and compaction in the area adjacent to the copper tubing that is "snaked" in the trench. The area adjacent to the tubing shall be considered to extend not less than 4-inches below and 4-inches above the copper tubing and shall include the entire width of the trench. Bedding and backfill shall conform to Section 3-09 of these specifications. Backfill material shall be

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compacted under the service lateral so as to create a firm laying bed prior to placing and compacting any material over the top of the lateral. Compaction of backfill material by mechanical means directly over the exposed service tubing shall not be allowed.

The Contractor, under the direction of the Water Services Division, shall be responsible for proper abandonment, including cut and cap at the main, of all existing active and inactive services and laterals not intended for reuse.

Prior to any modification of service laterals 4-inches or larger and within 20-feet from the existing valve, the Contractor shall expose the valve on the service lateral to ensure the lateral including the valve is adequately restrained to the main pipeline. The exposed valve is to be witnessed by the Water Services Division for verification of restraint. Inadequately restrained valve shall be properly restrained by the Contractor.

All water service connections may require the installation of a backflow device in accordance with Section 5 of these specifications.

3-08.02 IRRIGATION SERVICES

Services installed for the primary purpose of providing irrigation of landscapes or commercial crops, and which may have booster pumps downstream of the meter, shall conform to the following requirements:

1. A hydraulically actuated, slow open/close valve shall be provided immediately downstream of the pump or a surge tank, properly sized and approved by the Water Services Division.
2. A Reduced Pressure Principle Device (RPPD) type backflow preventer will be required immediately downstream of the flow meter.

3-09 PIPE BEDDING AND BACKFILLING OF TRENCH

The Contractor shall backfill the pipe trench as soon after placement of pipe as practical with due regard of the requirements in this Section. All fittings, valves, utility crossings, and assemblies shall be visually inspected by the Water Services Division prior to backfilling. Pipe bedding shall be defined as that material supporting, surrounding and extending to a minimum of 12 inches above the top of pipe and shall consist of imported or native free draining material having a sand equivalent (SE) of not less than 30 or other material approved by the engineer. Bedding and backfill shall be placed in accordance with the Sections 306-1.2.1 and 306-1.3 of the "Standard Specifications for Public Works

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Construction" and as supplemented herein. All backfill for pipe or conduit shall be densified to a minimum relative compaction of 90% by water densification, mechanical tampers, rollers or other mechanical means.

All buried valves and fittings shall be backfilled with clean sand. The sand shall be installed in such a manner that after compaction no earth or other backfill will be less than 6-inches from any part of the valve, fitting, flanges, bolts, or nuts. The sand shall be compacted as specified for other backfill.

3-10 REPAVING AND FINISHING

The Contractor shall replace all removed or damaged pavement with a section equal to that removed, but not less than four inches of asphalt concrete (A.C.) over the subgrade. All pavement replacement with the exception of temporary shall be hot-mix A.C. as specified in the Plans or Specifications. Cold-mix A.C. shall only be allowed for temporary pavement replacement. The Contractor shall place pavement following final compaction of the backfill.

The Contractor shall not wait for completion of the full length of pipeline installation to begin resurfacing; the pavement shall be repaired and/or replaced, flush with existing road surface, within five working days of damage or removal of the pavement. Valve boxes shall be located after final paving and adjusted to finished grade. The Contractor shall remove the paving section down to the valve box, raise the valve box top section to finished surface, install the gate valve can assembly per Standard Drawing B-752 or B-754, and patch the annular space with hot-mix A.C. The top six(6) inches of backfill below the street structural section shall be compacted to 95% relative compaction.

3-11 TESTING, DISINFECTION, AND FLUSHING

3-11.01 GENERAL

All required testing shall be performed and certified by a third party agency hired by the Contractor and approved by the City. All tests shall be made in the presence of the Inspector, except that bacteriological tests shall be performed at laboratories certified by the State Water Resources Control Board. All constructed facilities shall be isolated from the existing public system while being tested.

3-11.02 HYDROSTATIC PRESSURE TESTING

After all thrust blocks have been placed for at least two days in the particular portion to be tested, a pressure test shall be conducted by a hydrostatic testing agency hired by the Contractor unless otherwise approved by the City. Each

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section of main, up to but not exceeding 1,200 feet in length unless otherwise approved, and all fire hydrants and fittings connected thereto, shall be subjected to a hydrostatic pressure in accordance with AWWA Standard C600 and C605 and as modified herein, while all pipe, fittings and joints are inspected for leakage. Test pressure shall not exceed rated working pressure of the gate or butterfly valves. The section of pipe under test shall be allowed to stand at 40 psi minimum pressure for one (1) hour prior to the beginning of the test. The pressure shall then be increased to 1.5 times the local static pressure, or 150 psi, whichever is greater, to a maximum of 300 psi. Pressure shall be measured at, or corrected to, the lowest point in the portion of the line being tested. After the entire section under test has been inspected and no leaks have been found, or if found, have been repaired and re-subjected to the test pressure, the pressure shall be maintained for four hours, during which time the amount of leakage shall be determined by measuring the quantity of water which must be added to maintain the test pressure. The following table lists the maximum allowable leakage per 1,000 feet of pipe, in gallons per hour, in conformance with the latest AWWA Standard C600 and C605:

Maximum Allowable Leakage per 1,000 feet of Pipe, Gallons per Hour								
Static Pressure, psi	Test Pressure	Nominal Pipe Diameter, in.						
		4	6	8	10	12	16	18
100 or less	150	0.33	0.50	0.66	0.83	0.99	1.32	1.49
110	165	0.35	0.52	0.69	0.87	1.04	1.39	1.56
120	180	0.36	0.54	0.73	0.91	1.09	1.45	1.63
130	195	0.38	0.57	0.75	0.94	1.13	1.51	1.70
140	210	0.39	0.59	0.78	0.98	1.17	1.57	1.76
150	225	0.41	0.61	0.81	1.01	1.22	1.62	1.82
160	240	0.42	0.63	0.84	1.05	1.26	1.67	1.88
170	255	0.43	0.65	0.86	1.08	1.29	1.73	1.94
180	270	0.44	0.67	0.89	1.11	1.33	1.78	2.00
190	285	0.46	0.68	0.91	1.14	1.37	1.83	2.05
200	300	0.47	0.70	0.94	1.17	1.40	1.87	2.11

If the pipeline under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.

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3-11.03 DISINFECTION

3-11.03.1 GENERAL

All water mains, water services, attached appurtenances and connections shall be disinfected in accordance with AWWA Standard C651-05 "Disinfecting Water Mains", State Water Resources Control Board, and as specified herein. Disinfection requirements shall include preventive and corrective measures during construction, final flushing, and bacteriological testing, and shall include the form of chlorine and methods of application

The Contractor shall be solely responsible for the methods and techniques used to successfully disinfect the water mains and appurtenances and for disposing of the highly chlorinated water during flushing operations.

Contractor shall furnish all equipment, labor, materials, safety requirements, and water necessary for chlorinating and flushing the pipeline. Disinfection of new mains, including all chlorination, chlorine residual measurements, collection of samples, and certification shall be conducted by a third party testing agency approved by the City.

Gauges and apparatus used for chlorine injection shall bear the current State Certification. An independent State Certified Laboratory or authorized agent shall collect the samples and a State Certified Laboratory shall perform the bacteriological tests. All costs for disinfection, including laboratory fees, shall be paid by the Contractor.

At no time shall personnel other than the authorized third party testing agency be in charge of injecting chlorine into the water pipeline, the residual testing of the chlorine, or obtaining bacteriological samples.

Contractor shall ensure that all pipe, fittings, and appurtenances are kept free from dirt and foreign matter at all times. During construction all open pipe ends and fittings shall be fitted with a water tight plug. At the end of the work day the open pipe in the trench shall be plugged in an equally suitable manner.

The Contractor shall swab the interior surfaces of the new valves, pipes and appurtenances as well as interior surfaces of existing main, both upstream and downstream of the new pipe section, with a minimum

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five percent concentration of NSF approved hypochlorite disinfection solution before installation. During the chlorination or chlorinating process, all valves shall be operated, and the chlorine solution shall be drawn through all laterals and appurtenances. Disinfection of mains and appurtenances, hydrostatic testing, and chlorine retention may run concurrently for the required minimum 24-hour period only if prior approval is obtained from the Water Services Division and Water Quality Services Division.

In the event of leakage or where repairs are necessary, added disinfection shall be made only by injecting chlorine into the line whereby adequate mixing is assured. If the test results are not satisfactory, the Contractor shall provide additional disinfection, as required. Such additional disinfection shall be at the Contractor's expense.

Disinfection of pipelines 4-inch or larger and in excess of 20-feet in length shall be accomplished by direct liquid chlorine as specified herein, unless otherwise approved by the Water Quality Services Division.

3-11.03.2 CHLORINE LIQUID FEED

The new system which is being disinfected shall be thoroughly pre-flushed, utilizing a minimum velocity of 2.5 feet per second throughout the entire system. The chlorinating agent shall be applied at a point not more than ten feet from the beginning of the section 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. All required corporation stops and other plumbing materials necessary for chlorination or flushing of all parts of the main being disinfected shall be installed by and at the expense of the Contractor.

Chlorine liquid shall be fed directly from the chlorine cylinder equipped with a suitable device capable of regulating the rate of flow and diffusion of liquid within the pipe. Water shall be concurrently fed into the pipe at a rate which produces a residual of not less than 50 (parts per million) PPM and not to exceed 100 PPM of chlorine in all sections of the pipeline and appurtenances being disinfected. Chlorinated water shall be retained in the system for a minimum duration of 24 hours, and shall produce at the end of the retention

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period not less than 25 PPM of chlorine in all sections of the pipeline being disinfected.

3-11.03.3 FINAL FLUSHING

Following the chlorination period of 24 hours, the newly laid line shall be thoroughly flushed to remove any foreign material. A suitable connection shall be provided by the Contractor at the end of each new line at the invert large enough to achieve a flushing velocity in the line of at least 2.5 feet per second.

Water shall be flushed from the line at its extremities and at all outlets until the chlorine residual of the water system being flushed is equal to or less than the distribution system level.

3-11.03.4 DISINFECTION PROCEDURES WHEN CUTTING INTO OR REPAIRING EXISTING MAINS

The following procedures apply primarily when existing mains are wholly or partially dewatered. After the appropriate procedures have been completed, the existing main may be returned to service prior to completion of bacteriological testing in order to minimize the time customers are without water. Leaks or breaks that are repaired with clamping devices while the mains remain full of pressurized water may present little danger of contamination and therefore may not require disinfection.

1. Trench treatment. When an existing main is opened, either by accident or by design, the excavation will likely be wet and may be badly contaminated. Minimum of 12 inches of space shall be maintained between pipe and nearby soil. Plastic covering (6 mil minimum) shall be used under the pipe with gravel on top of it. Chlorine tablets shall be placed at the lowest point of the trench to lessen the danger from this contamination.

2. Swabbing with hypochlorite solution. The interior of pipe and fittings (particularly couplings and sleeves) used in making the repair shall be swabbed or sprayed with a 1 percent hypochlorite solution before they are installed.

3. Flushing. Thorough flushing is the most practical means of removing contamination introduced during repairs. If valve and hydrant locations

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permit, flushing toward the work location from both directions is recommended. Flushing shall be started as soon as the repairs are completed and shall be continued until discolored water is eliminated.

4. Slug chlorination. Where practical, in addition to the procedures previously described, the section of the main in which the break is located shall be isolated, all service connections shut off, and the section flushed and chlorinated. The dose may be increased to as much as 300 mg/L and the contact time reduced to as little as 15 min. After chlorination, flushing shall be resumed and continued until discolored water is eliminated and the chlorine concentration in the water exiting the main is no higher than the prevailing water in the distribution system or that which is acceptable for domestic use.

5. Bacteriological samples. Bacteriological samples shall be taken after repairs are completed to provide a record for determining the procedure's effectiveness. If the direction of flow is unknown, then samples shall be taken on each side of the main break. If positive bacteriological samples are recorded, then the situation shall be evaluated to determine corrective action. Daily sampling shall be continued until two consecutive negative samples are recorded.

3-11.03.5 SPECIAL PROCEDURE FOR CAULKED TAPPING SLEEVES

Before a tapping sleeve is installed, the exterior of the main to be tapped shall be thoroughly cleaned, and the interior surface of the sleeve shall be lightly dusted with calcium hypochlorite powder.

Tapping sleeves are used to avoid shutting down the main. After the tap is made, it is impossible to disinfect the annulus without shutting down the main and removing the sleeve. The space between the tapping sleeve and the tapped pipe is approximately 1/2 in. (13 mm), so that as little as 100 mg/ft² of calcium hypochlorite powder will provide a chlorine concentration of more than 50 mg/L.

3-11.03.4 BACTERIOLOGICAL TESTS

After the system has been flushed, the Contractor shall have tests conducted for chlorine residual by a State Certified Laboratory approved by the City. Should the chlorine residual in any part of the disinfected system be higher than the distribution system level, the Contractor shall repeat the flushing procedure. If the chlorine residual

SECTION 3 - CONSTRUCTION METHODS AND CONTROL

after flushing is equivalent to or less than the distribution system level, the Contractor may proceed with the bacteriological sampling. Samples shall be taken at the direction of the Water Quality Services Division with at least one set of samples collected at 1,200-foot intervals along the new water main, plus one set at each dead-end main section, and at least one set from each branch (i.e., laterals 4-inch and larger). Two consecutive bacteriological samples are required for water quality evaluation. The first bacteriological sample shall be taken immediately after final flushing and the second sample shall be taken at least 24 hours later. All samples shall be collected by Certified Laboratory Personnel and tested for bacteriological quality in accordance with *Standard Methods for the Examination of Water and Wastewater*, and shall show the absence of coliform organisms.

The following tests are required to provide information for water quality evaluation:

- 1.) Presence/Absence of Total Coliform
- 2.) Heterotrophic Plate Count.

Report shall include:

- a. Presence/Absence of Coliform Bacteria Count per 100 ml.
- b. Heterotrophic Plate Count per ml.
- c. Total and Free Chlorine Residual, taken at time of sample collection by certified laboratory personnel.

All coliform test results must be negative. The heterotrophic plate count shall be 500 cfu / ml or less.

The results of these tests must be approved by the Water Quality prior to activating any new water facilities. Should the test results from the State Certified Laboratory disclose that the water from the new line does not meet the above standards, the disinfection process shall be repeated until it meets the required standards.

3-11.05 DISPOSAL OF TEST WATER

All water used in testing and disinfecting the portions of pipeline or water system component, including that used for retesting, shall be disposed of following such testing, retesting, and disinfecting by the Contractor at his sole expense. The disposal of water shall, in all cases, be carried out in compliance with the water

SECTION 3 - CONSTRUCTION METHODS AND CONTROL

quality objectives and discharge permit restrictions established by the California Regional Water Quality Control Board - Santa Ana Region.

For contracts administered by the City, the Contractor will be authorized to discharge test water to the storm drain under the National Pollution Discharge Elimination System (NPDES) permit issued to the City if all requirements and procedures per such permit are followed. For all other projects, including Developer projects, Contractor or Developer shall obtain an NPDES permit and comply with that permit.

Disposal of test water or chlorinated water used for disinfection will require the Contractor to apply a reducing agent (i.e. sodium thiosulfate, or ascorbic acid, etc.) to the test water in order to neutralize residual chlorine or chloramine to meet the discharge limitation. Additionally, the flow of water from the portions of pipeline shall be controlled to prevent erosion of surrounding soil, damage to vegetation, and altering of ecological conditions in the area and shall not contribute to silt, mud, debris, or other contaminants entering storm drains or surface waters.

The Contractor's attention is directed to the portion of the pipe with a low elevation. All water used in testing and disinfecting in that portion of the pipe shall be pumped out by the Contractor, at his expense, as specified in the paragraph hereinbefore. The Contractor shall furnish and operate all necessary pumps, pipelines, valves, hoses and all other appurtenances needed for pumping out water from the said low portion.

3-12 SPECIAL CONDITIONS

3-12.01 SHEETING AND SHORING

All trench excavation shall be adequately protected to provide a safe working condition, and protection to adjacent facilities and structures. The Contractor shall work in such a manner and install such protective devices, shoring, and bracing to comply with all rules, regulations, and orders of CAL-OSHA, Division of Industrial Safety.

Prior to any trench excavation where the depth is more than five feet, the Contractor shall submit a detailed plan to the Water Services Division showing the design of shoring, bracing, sloping, or other provisions to protect the workers from the hazard of caving ground during the excavation of such trench. If the plan varies from the shoring system standards, the plan shall be prepared by a Civil or Structural Engineer registered in the State of California. No excavation shall start

SECTION 3 - CONSTRUCTION METHODS AND CONTROL

until the Engineer has accepted the plan and the Contractor has obtained a permit from CAL-OSHA, Division of Industrial Safety. A copy of the permit shall be submitted to the Engineer and available at the job site at all times.

Sheeting and shoring shall not place any undue strain on existing utilities or structures, nor on completed sections of construction. Sheeting and shoring may be removed during backfilling, provided adequate protection is provided at all times. The Contractor shall be responsible for any damage to existing utilities or structures due to placement, removal, or failure of any sheeting and/or shoring system. The Contractor shall repair or have repaired any damage as soon as practical.

3-12.02 JACKING OF STEEL CASING

Steel casing shall be placed at the location, elevations, and limits shown on the construction drawings. Known existing utilities shall be shown on the construction drawings. Any utilities or structures encountered which will interfere with construction shall be brought to the attention of the Water Services Division. Only new steel casing shall be used for jacking. Jacking shall be at a rate that will not over stress the casing, causing failure. Any damage to the casing during placement of the pipe shall be brought to the attention of the Water Services Division. The jacking and receiving pit shall be sheeted and shored as required by CAL-OSHA and as provided in Section 3-12.01 of these specifications. The excavated area ahead of the casing shall not be larger than 0.1 foot greater than the outside diameter of the casing. Over excavation beyond the above described limits shall be sanded or pressure grouted as directed by the Water Services Division. Sluicing or jetting ahead of the jacking casing shall not be permitted.

3-12.03 POLYETHYLENE PROTECTIVE WRAPPING

Unless otherwise noted on the plans, polyethylene protective wrapping (Polywrap) for ductile iron pipe shall be furnished and installed on all buried water lines, except where water lines are within a steel casing pipe, in accordance with the requirements of AWWA C105, Section 2-01.04 of these specifications, and as specified herein. Polywrap shall be installed so as to prevent any section of the pipe, fittings, valves, services, or appurtenances from contacting the soil.

The 'polywrap' shall be taped to provide a snug fit along the pipe. Minimum tubing size shall allow for an overlap of 12 inches; i.e., flat tube width in inches = $(3.14 \times \text{Diameter}) + 12$ inches. An additional 3 layer wrap of polyethylene shall be made at all tapping locations a minimum of 12 inches in width. Openings for service taps, blowoffs, or similar appurtenances shall be cut in the 'polywrap' during

SECTION 3 - CONSTRUCTION METHODS AND CONTROL

backfilling of the trench. Corporation stops and copper service lines shall be wrapped with polyethylene protective wrapping for a minimum clear distance of 3 feet from the water main.

Any punctures, tears or other damage shall be patched with polyethylene wrap and tape in accordance with the requirements of AWWA C105 and manufacturer's instructions. Rocks or other material that could damage the wrapping shall not be included in the backfill.

3-13 DEDICATION OF IMPROVEMENTS TO THE CITY

The Water Services Division may serve temporary construction water through facilities installed by the Contractor. This use shall be permitted following written confirmations from the laboratory conducting bacteriological tests that all samples meet the requirements of the Water Services Division. This use does not constitute acceptance of these facilities by the Water Services Division.

The Water Quality Services Division will serve domestic water through facilities installed by the Contractor after the following items are received.

1. Written confirmation from the laboratory conducting bacteriological tests that all samples meet the requirements of the Water Quality Services Division.
2. Confirmation by the Water Services Division that all water improvements have been constructed per applicable specifications and plans. Contractor shall be responsible to maintain accurate records of any changes made during the course of construction and shall submit such information to the Water Services Division.
3. Public Utility Easements dedicated to the City, as required to gain access to public water facilities located on private property.
4. Such agreements, fees, or other items as required by the Water Services Division.

Prior to serving domestic water through the installed facilities, the Developer shall present all deeds or instruments of conveyance to the Water Services Division and shall dedicate all water system improvements intended for public use to the City.

The Contractor shall warrant the quality of all material and workmanship for a period of one year from the date of acceptance of these facilities by the City. The Contractor shall make all repairs to facilities due to defect in material or construction method. Such repair shall not be the responsibility of the Water Services Division. If the Water Services Division's

SECTION 3 - CONSTRUCTION METHODS AND CONTROL

representative should deem the repair of such defective work an emergency situation, the Contractor shall be held liable for all costs required to correct such defective work.

3-14 AS-BUILT DRAWINGS

The Contractor shall provide and maintain a complete, legible, and accurate As-Built record set of prints. Such prints shall be kept up to date as work progresses and shall be maintained at the job site during construction. Progress payments for City of Garden Grove projects will not be processed until the As-Built drawings are reviewed and approved by the City.

As-Built drawings shall be prepared and shall show all changes in the work constituting deviations from the original contract drawings. All conceptual or major design changes shall be approved by the City before implementing the change in the construction contract.

Upon completion of the work, all required information, dimensions and adjustments to the original contract drawings shall be submitted to the City to be transferred to the record drawings. Facilities and items to be located and verified on the record drawings shall include the following:

- a. Point of connections.
- b. Utility locations.
- c. Water mains: where deviations along installed water mains are more than ½ foot vertically and more than 1 foot horizontally, actual location (line and grade) shall be noted on the plans at intervals of 100 feet.
- d. Services: where service tie-in differs from the plan station by more than 2 feet or when meter box is not perpendicular from the main, corporation stops shall be stationed. For all service lines that have directional changes, such as in the case of cul-de-sacs, the actual installation shall be noted regardless of field changes, and shall be adequately referenced to the satisfaction of the City Inspector.
- e. Any material changes, including additions, deletions and substitutions.
- f. Other related facilities, as required by the City Inspector
- g. Contractor shall write on all sheets where the water improvements were built per plan that the construction was made “Per Plan”.

The City’s receipt and acceptance of As-Built drawings shall be a condition precedent to the release of the Contractor’s retention/final payment. For projects constructed by Developers, the Water Services Division will not give final acceptance until approved “as-built” plans have been received.

SECTION 4 - LARGE SERVICES AND FIRE LINES

SECTION 4 - LARGE SERVICES AND FIRE LINES

4-01 GENERAL

All services larger than 2 inches in diameter installed for the purpose of obtaining water from the public system for domestic, irrigation, commercial or industrial consumption, or for fire protection shall be defined as large services. Large services installed for the purpose of providing fire protection only shall be further defined as Fire Lines.

Unless otherwise specified on the plans approved by the Water Services Division, all materials, construction methods and controls shall conform to the applicable sections of the Water Services Division Standard Specifications (WSDSS), which this section is a part thereof, including, but not limited to, Testing, Disinfection and Flushing.

4-02 DESIGN

The Developer or his Private Engineer or Contractor shall be responsible for preparation of the necessary design drawing showing the proposed large service installation together with meter and appurtenances. The drawing shall be prepared by a Registered Professional Civil Engineer licensed by the State of California, shall be submitted to the Water Services Division for review and must be approved prior to beginning construction.

The drawing shall be prepared on an 8 ½" X 11" Standard Plan sheet furnished by the Water Services Division. The drawing shall show, but not be limited to, the following major items:

Street Name and Cross Street Name
Station from C/L of Street Intersection
Size, Type and Location of Street Main
Public and Private Utilities
Above and Below Ground Improvements and Cultures
Scale and North Arrow
Width of Street, Location of Curb, Sidewalk and Property Line
Location and Size of Proposed Assembly
For Vault installations identify Type of Vault and Cover Required (Traffic Bearing or Pedestrian)
Easement, if required
Size of Service Lateral and Meter
Reference to Standard Detail Drawings

SECTION 4 - LARGE SERVICES AND FIRE LINES

4-03 FEEES

The Water Services Division will require the payment of plan check and inspection fees concurrently with filing the application and submission of the drawing for review. A fee for checking, preparing and recording of easement documents, when applicable, will also be required prior to drawing approval. Fees shall conform to the latest revision of the User Fee Schedule prescribed by City Council resolution.

4-04 CONSTRUCTION AND INSPECTION

Upon approval by Water Services Division of the Service Application and Drawing for Large Service Installation, the Developer may proceed to award the work to a contractor of his choice.

The Contractor shall have a Class "C-34" or Engineering "A" Contractor's License valid in the State of California and shall meet all the applicable requirements of the City of Garden Grove Municipal Code. The Contractor shall be responsible for obtaining all construction permits and licenses as may be required by those agencies having jurisdiction over the work area.

The Contractor shall notify the Water Services Division of his intent to commence work at least five (5) working days prior to starting construction. Inspection shall be provided by Water Services Division in accordance with Section 3-01 of these specifications.

4-05 EASEMENTS

The Water Services Division will advise the Developer at the time the application and drawings are first reviewed, if an easement for water utilities is required. Should an easement be required, the Developer or his Private Engineer shall be responsible for preparing a drawing and legal description on the appropriate form. The easement drawing and description shall be prepared by a Professional Land Surveyor licensed by the State of California and shall be submitted along with a copy of the property owner's last deed of record to the Water Services Division for checking and preparation of the Easement Deed. Execution of the Easement Deed, by the property owner, shall be required prior to drawing approval. A written waiver may be requested by the owner of the property on which the easement is required. In which case, the Execution of the Easement Deed, by the property owner, shall be required prior to final inspection and rendering of service by the Water Services Division.

SECTION 4 - LARGE SERVICES AND FIRE LINES

4-06 METERS

All Large Service installations shall include a meter and shall be located outside of the public right of way on private property, unless otherwise approved by the Water Services Division. Meters shall conform to size, type and manufacturer as shown on the Standard Drawings. Meters shall be compound type unless otherwise approved by the Water Services Division. The Water Services Division reserves the right to specify the type of meter if, in its sole opinion, a specific type of meter is best suited for the proposed application. Meters shall be provided with digital or direct reading registers with a full circle sweep hand, a leak indication dial, and shall read in cubic feet.

Minimum registration shall be as follows for the meter sizes stated:

2-3 inch meters	CF X 10
4-8 inch meters	CF X 100
10 inch and greater	CF X 1,000

All Large Service installations, except Fire Lines, shall include provisions for a temporary bypass line per Standard Drawing B-724. All valves and fittings on the bypass line shall conform to Sections 2-05 and 2-08 of these specifications, respectively.

The Water Services Division, at its sole discretion, may require the bypass line to have OS&Y valves with handwheel operators and a permanent bypass spool. When OS&Y gate valves and spools are required by the Water Services Division on the bypass line, the hand wheel operators shall be secured in the closed position by a lock and chain.

4-07 VAULT INSTALLATIONS

All Large Services installed underground shall be installed in a concrete vault with an aluminum cover or as otherwise specified on the construction drawings. The dimensions of the vault, location of knock-out sections and the cover details shall be in strict conformance with this section and the application Detail Drawings contained in Section 6 of these specifications or as otherwise specified on the construction drawings.

The vault cover shall consist of one or two doors in one channel frame and shall open over the entire length and width of the vault. Door leaf shall be 1/4-inch aluminum diamond pattern plate to withstand a live load of 300 pounds per square foot. Channel frame shall be 1/4-inch aluminum. Door shall be equipped with heavy forged brass hinges, stainless steel pins, spring operators for easy operation, and an automatic hold open arm with release handle. A snap lock with removable handle shall be provided. Unless noted otherwise on the plans, hardware shall be mill finish with bituminous coating applied to the exterior of the frame. Stainless steel hardware may be required for installations in a highly corrosive environment. Manufacturer shall guarantee against defects in material and workmanship for a period of at least five years.

SECTION 4 - LARGE SERVICES AND FIRE LINES

An access ladder shall be provided for safe access in and out of vaults. An access ladder shall be constructed of Fiberglass Reinforced Plastic (FRP). The construction and installation of an FRP ladder shall meet all applicable requirements of CAL-OSHA .

All vaults installed in areas subject to incidental vehicular traffic shall be steel reinforced concrete with an aluminum cover designed to meet a minimum traffic bridge loading of H-20, as defined by the American Association of State Highway Officials. As to type, materials, and hardware, traffic covers shall conform to the requirements specified in the preceding paragraph. In certain situations, guard posts may be required to prevent vehicular traffic from passing over the vault.

When vaults are installed in areas subject to pedestrian traffic, the cover shall consist of non-skid materials as approved by the City Engineer.

4-08 THRUST RESTRAINT - VAULT INSTALLATION

A positive means of thrust restraint shall be provided on the inlet line to a vault installation so that the pipe at the last joint, prior to entering the vault, is physically restrained from movement in the direction of the vault. See Standard Plan B-713.

4-09 PAINTING - ABOVE GROUND INSTALLATIONS

After ALL Testing and Disinfection has passed, but prior to Final Acceptance by the Water Services Division, all above ground Large Service installations shall be painted in accordance with Section 2-14.

4-10 AESTHETICS - ABOVE GROUND INSTALLATIONS

Above ground Large Services shall be screened from public view by landscape plants and/ or walls as per *Utility Equipment Screening Standards and Specifications for Above-ground Equipment on Private Property* or other appropriate means as directed by the Planning Services Division. Landscape plants shall be a minimum of 15-gallon each in size, and the same type as the existing landscape plants in surrounding area to blend with the local environment. If a screen wall is proposed, landscaping including clinging vines shall be planted to soften the wall and discourage graffiti. If such wall is adjacent to a structure, the wall may also be required to be painted to match the exterior of the structure, if determined necessary by the Planning Services Division. The above ground service shall be located and shielded from view per Standard Plan B-769. Whichever method of concealment is used, it shall not obscure or hinder access to the Fire Department's pumper connection.

Within the confines established by the Fire Department, Planning Services Division and Water Services Division, the owner/developer shall locate all above ground large services in a manner that is aesthetically pleasing. Additional conditions may be required for specific projects in order to comply with local ordinances and zoning codes. The owner/developer

SECTION 4 - LARGE SERVICES AND FIRE LINES

shall submit the location and method of screening of the above ground services to the Fire Department, Planning Services Division, and Water Services Division for review and approval.

It shall be the owner's responsibility to irrigate and maintain planted landscape screening in a healthy state and to trim and prune them such that access to the device is not impaired. If owner fails to maintain landscape plants and paint in the desired state, the City will cause such work to be performed and owner will be billed for the actual cost of performing the work plus ten percent for overhead and administration. Failure to pay for said work, when due, shall be cause for termination of service.

SECTION 5 – BACKFLOW PREVENTION

5-01 BACKFLOW PROTECTION

All water services connected to the public water system may be required to include an approved backflow prevention device of the type designated by the Water Quality Services Division. The type of device approved shall be based on the existing or potential degree or hazard which exists, in the opinion of the Water Quality Services Division. All devices shall be approved by the Foundation for Cross-Connection Control and Hydraulic Research, University of Southern California, Los Angeles, CA 90089-2531.

The Developer or his Contractor shall be responsible for the installation, initial test and certification of all new or relocated backflow prevention devices. Thereafter, backflow prevention devices will be maintained and tested annually by the owner or water user.

The backflow prevention device installation shall be above ground, screened from view as approved by the Planning Services Division and Water Services Division, and shall conform to Sections 4-09, 4-10, and Section 6 of these Specifications.

When an existing backflow prevention device that is located in public right-of-way needs to be replaced, a new device shall be required to be installed above ground on private property. Unless otherwise approved by the Water Services Division, the entire section of piping between the water main and the new device shall be replaced with new pipe. In addition, design plans for the new device, and accompanying plan check and inspection fees shall be submitted to the Water Services Division for review and approval in accordance with Section 4 of these specifications.

Backflow prevention devices shall be located above ground and as close as practical to the meter or to the street right-of-way line, and subject to approval by the Water Quality Services Division. The entire length of underground piping from the meter or the street right-of-way line to the Backflow Prevention Device shall be backfilled with one-sack slurry 12 inches minimum thickness over the top of the pipe zone (bedding), unless other means/methods are approved by the Water Services Division.

SECTION 5 - BACKFLOW PREVENTION

5-01.01 APPROVED MANUFACTURERS

Any backflow prevention devices approved by the Foundation for Cross-Connection Control and Hydraulic Research, University of Southern California, Los Angeles, CA 90089-2531, as shown on the latest edition of "List of Approved Backflow Prevention Assemblies".

5-02 FIRE LINE ASSEMBLY

All fire line assemblies shall require a detector meter and backflow protection as may be determined by the Water Quality Services Division. All fire lines shall be installed in conformance with Section 6 of these Specifications and/or as directed by the Fire Department and Water Services Division. Vault installation of fire line assemblies is prohibited.

For assemblies that require a detector meter, the meter shall be 5/8 or 3/4 inch nominal size with bronze case and shall have a straight read magnetic drive register capable of detecting increments of consumptive use in one cubic foot increments.

GARDEN GROVE SANITARY DISTRICT

Design Criteria for Sewer Facilities



GARDEN GROVE SANITARY DISTRICT
Garden Grove, California

2015

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1. STANDARD REQUIREMENTS

The design and construction of all sanitary sewer system facilities to be operated and maintained by the Garden Grove Sanitary District (GGSD or District) shall be in accordance with these Design Criteria, and the latest edition of the following:

- The Garden Grove Sanitary District Standard Plans, latest edition (GGSDSP)
- The City of Garden Grove Public Works Department Standard Plans, latest edition (GGPWSP)
- Standard Specifications for Public Works Construction (Greenbook),
- Garden Grove Sanitary District's Sewer System Management Plan,
- Statewide General Waste Discharge Requirements issued by the State Water Resources Control Board (Order No. 2006-0003)
- Requirements of the jurisdictional agencies where the work shall be performed
- Cal-OSHA requirements

2. CALCULATIONS REQUIRED

Substantiating engineering calculations for design flows; pipe size; pump, motor, generator, wet well size and appurtenant equipment selection; structural design, and bedding/backfill designs shall accompany plan submittals to the District. All calculations shall be sealed and signed by a California registered professional engineer.

Where flow from a new development or redevelopment is added to an existing sewer, and where the new development or redevelopment is in an area of questionable sewer capacity, the existing sewer shall be flow monitored by a qualified company acceptable to GGSD at the owner's cost for a minimum period of two weeks to verify the existing minimum, average, and peak dry weather flows. Two copies of the report shall be submitted to GGSD in the District's required format. The District will determine the adequacy of capacity in all the facilities that will convey the subject flow.

3. SIZE

Gravity Sewers

The minimum size gravity sewer shall be 8-inches in diameter. The Garden Grove Sanitary District may accept 6-inch diameter sewer lines if they must be used to provide adequate velocity. Sewer pipes shall not be constructed in a common trench with another utility. Adequate horizontal and vertical clearance shall be maintained in accordance with the State of California Department of Health Services "Criteria for the Separation of Water Mains and Sanitary Sewers", summarized on GGPWSP B-760, B-761, B-762, and B-763.

Force Mains

The size of sewer force mains shall be determined during the design phase of the project based upon a comparative study of the construction cost and pumping costs for several alternative sizes. In no case shall a force main be less than 4 inches in diameter. The capacity of the force main shall be the design peak flow from the pump station. The minimum design velocity for a force main shall be 3.0 fps, and maximum allowed 5.0 fps.

The discharge shall be into a manhole with a smooth flow transition to a gravity sewer. The force main terminal manhole shall be PVC lined.

All force mains shall have a tape attached to the pipe, identifying it as a sewer pipe.

4. MINIMUM AND MAXIMUM SLOPE

All sewers shall be designed and constructed to provide a mean velocity of not less than two (2) feet per second (fps) when flowing at the estimated average dry weather flow as calculated using Manning's formula with an "n" value of 0.013. Subject to the velocity limitations contained in this subsection, the slope shall be the maximum possible. Drop manholes shall not be used to reduce slopes to the minimum allowed.

The maximum allowable slope shall be the slope which generates a maximum flow velocity of 6 fps at the peak dry weather flow rate in vitrified clay pipe (VCP), and 5 fps in polyvinyl chloride pipe (PVC) as calculated using Manning's equation with an "n" value of 0.013.

The minimum slope on 6-inch sewer shall be 1% where the tributary area consists of less than 20 dwelling units (d.u.) or its flow equivalent.

Sewer pipes shall have a constant slope between the upstream and downstream manhole of each reach. Any reach of sewer containing sags of any amount shall be removed and reconstructed at the design slope at no cost to the Garden Grove Sanitary District. The total cost of inspection, administration, and retesting of improperly installed sewers shall be borne by the contractor. The Garden Grove Sanitary District shall not accept any sewer that does not meet these requirements. There shall be no exception to the proper slope requirement.

5. DESIGN FLOW CRITERIA

The average dry weather flow (Q_{adw}) rates for sewers shall be calculated using the unit flow factors contained in Table 1 and the tributary land uses. Where appropriate, and when required by the Garden Grove Sanitary District, the unit flow factors shall be evaluated by the design engineer based upon the specific land uses and densities proposed for new development or redevelopment.

Table 1
Unit Flow Factors

Land Use Designation	Land Uses	Unit Flow Factor	Units
R-1	Low Density Residential	1,450	GPD/AC
R-2	Medium Density Residential	2,750	GPD/AC
R-3	High Density Residential	3,000	GPD/AC
C-1	Neighborhood Commercial	1,500	GPD/AC
C-2	Community Commercial	1,500	GPD/AC
M-1	Light Industrial	2,000	GPD/AC
O-P	Office/Professional	1,500	GPD/AC
O-S	Open Space	10	GPD/AC
PUD	Planned Unit Development	1,000	GPD/AC
BCSP, CCSP, HCSP	Specific Plans	1,000	GPD/AC

The peak dry weather flow (Q_{pdw}) in cubic feet per second (cfs) shall be determined from Q_{adw} in cfs based upon the following equation:

$$Q_{pdw} = a Q_{adw}^b$$

Coefficients a and b shall be based upon a minimum of two weeks of flow monitoring where the tributary flow from a new development or redevelopment is added to an existing sewer. Where such information is not available, the following equation shall be used to determine the peak dry weather flow:

$$Q_{pdw} = 2.0 Q_{adw}^{0.92}$$

The determination of the peak dry weather flow shall also consider other factors such as pumped flows and large sewer flow generators.

The peak wet weather flow (Q_{pww}) shall be based upon recorded historical information where available and applicable. Otherwise, the peak wet weather flow shall be calculated utilizing the following formula:

$$Q_{pww} = 1.4 Q_{pdw}$$

The peak dry weather flow rate in pipes 15-inches and smaller will be limited by the calculated depth to pipe diameter ratio of $d/D = 0.5$; and 18-inches and larger $d/D = 0.62$.

The pipe shall flow at a calculated depth to pipe diameter ratio of no more than 0.80 with the peak wet weather flow.

6. STANDARD LOCATION AND ALIGNMENT

In local residential and industrial streets, sewer pipes shall be located six (6) feet from the centerline of the street in the center of the driving lane. In major, primary, and secondary highways, the sewer pipes shall be located in the center of the driving lane nearest to the center of the street, but will **not** be located in the median strip or parking lanes. Any deviation from the standard location and alignment shall only be done with prior written approval of GGSD.

All-weather access roads capable of accommodating all required construction and maintenance equipment shall be provided for all sewers not located within a paved street.

In curved streets, gravity sewer mains shall be constructed in straight reaches between manholes. In no case shall the outside of the sewer main be closer than four feet to the closest curb face.

A maximum horizontal separation between sewer and domestic water mains shall be achieved by aligning the sewer on the opposite side of the street centerline from the domestic water main.

7. EASEMENTS

Permanent easements, where absolutely necessary, shall be a minimum of 30 feet in width and shall be shown on the plans. Temporary easements for construction only shall be shown on the plans including date of termination.

Where applicable, permanent public utility easements shall be recorded on the tract map, and granted to the Garden Grove Sanitary District. When applicable, separate easement documents for both permanent and temporary easements shall be prepared (on standard title company forms) and presented to the Garden Grove Sanitary District for acceptance and recording.

The District will accept sewers on private streets upon granting of a public utility easement to the District.

The District will not accept any easement for sewers if said easement cannot be accessed with a flush truck through its entire length.

Sewer easement shall be located entirely on one lot. Building set backs shall be minimum 20 feet from easement edges.

8. HORIZONTAL CURVES

Gravity sewer mains shall **not** be designed with horizontal curves.

9. STATIONING PROCEDURE

Centerline stations for sewers shall be shown on the plans. Sewer centerline stations shall be independent of street stationing. All manholes shall be numbered and the numbers noted on the plans (example: MH #1). Sewer stations shall start at 10+00.00 at the downstream point of connection and increase upstream to the last manhole on a sewer line. Intersecting sewer lines will be independently stationed from their downstream point of connection and increase upstream to the last manhole. Each line shall be independently labeled for identification as "Sewer Line A", "Sewer Line B", etc.

10. MINIMUM DEPTH

Minimum depth of cover from finish street grade to the top of sewer main pipe shall be seven (7) feet unless otherwise approved by the District Engineer.

Unless dictated otherwise by the elevation of an existing mainline sewer, house connections shall be installed so that there is a minimum of six (6) feet of cover from the top of the curb to the top of the pipe at the curb line. At the time of construction, stakes shall be provided for location and grade of each house connection.

11. SEWER PIPE MATERIAL

All gravity sewers shall be either extra strength VCP or SDR-26 PVC. Imperfections **shall not be allowed** in either type of pipe. Sewer service laterals shall be of the same material as the main line sewer-either extra strength VCP or SDR-26 PVC pipe.

All sewer force mains carrying domestic sewage and operating at pressures of less than 40 psi shall be PVC pipe meeting AWWA C-900 Class 200 pipe standards. All other force mains shall be 40 mil ceramic epoxy lined and properly coated ductile iron pipe.

All gravity sewers in industrially zoned areas or major commercial areas shall be extra strength VCP.

12. MANHOLES

12.1 Manhole Requirements

A manhole will be required at:

- A. The upstream end of each line, change in grade or size, change in alignment, or intersection of two (2) or more sewers
- B. At a lateral when it is the same size as the main line sewer
- C. Along the sewer main at maximum distances of 300 feet for 6-inch sewers, 400 feet for 8-inch and larger sewers.

12.2 Manhole Type and Size

Manholes shall be precast reinforced concrete with eccentric cone in accordance with Garden Grove Sanitary District Standard Drawings S-100 through S-104. The summit manholes shall be precast reinforced concrete with concentric cone. Minimum diameter shall be 48 inches and larger sizes shall be required as shown in the following table:

Manhole Sizes

Sewer Main (inches)	Maximum Branch Size (inches)	Manhole Size (inches)	Frame and Cover (inches)
8-15	10	48	24
18-21	12	60	30
24-36	15	72	36

Extra Depth Requirements

Depth of Cover (feet)	Manhole Size (inches)
6 or less	48
6.5-12	48
12.5-16	60
16.5 and greater	72

All manholes shall be provided with at least all-weather vehicular access.

12.3 Manhole Covers

Manhole covers shall be cast iron in accordance with Garden Grove Sanitary District Standard Drawing S-103. The size shall be determined from the table in Section 12.2. Manhole covers shall have one (1) vent hole and one (1) pick hole.

Temporary covers may be necessary in new streets. In these cases, the manhole shaft shall be left six (6) inches, minimum, below subgrade. A heavy metal plate acceptable to the District Engineer shall be provided to cover the manhole opening. Cleats shall be provided in at least four (4) points for the underside of the temporary cover to prevent the temporary cover from moving. These cleats shall extend a minimum of 3 inches from the cover plate and shall be welded to the plate.

Plywood shall be cut to the shape and size of the manhole base and placed in the base before the temporary cover is placed on the shaft. At the completion of final paving, each manhole shall be raised to final grade by the installation of grade rings, as necessary, and the installation of the permanent frame and cover assembly. Plywood shall be removed from the manhole when the permanent frame and cover assembly is installed.

12.4 Manhole Linings and Coatings

The following manholes will be lined with PVC:

- A. If the sewer has a slope of 5% or greater, all the manholes on the sewer
- B. Where there is a change in slope, from steep to flat, of 3% or greater, the manhole at the grade change and the next manhole upstream
- C. All force main terminal manholes
- E. As required by the District Engineer

The approved PVC liners are Ameron T-Lock liner and Koroseal Lok-Rib by B. F. Goodrich. Refer to Orange County Sanitation District Standard Drawing S-065 for PVC liner details.

All other manholes shall be lined with Sancon 100 or approved equal.

Outer surfaces of precast and cast-in-place manholes and structures shall be given two coats of bituminous dampproofing applied at a rate in accordance with manufacturer's instructions. In no case shall the total bituminous coating be less than 16 mil dry film thickness.

12.5 Manhole Warning Signs

The entrance to every new manhole shall be fitted with a plastic warning sign, located 12 inches below the top of the manhole frame, with the inscription "CAUTION – VENTILATE BEFORE ENTERING" in letters no smaller than ½-inch in height. The sign shall be attached to the concrete with four Type 316 stainless steel screws and anchors. Signs shall be manufactured by W.H. Brady Company; Seton Nameplate Corporation, or approved equal.

13. CLEAN-OUTS

Use of clean-outs as shown in the Garden Grove Sanitary District Drawing S-105 shall be limited to the following instances unless approved otherwise by the District Engineer.

- A. At the upstream end of short sections of sewer, less than 250 feet which will be extended within three months.
- B. All sewer laterals at the property owner's side of the property line.
- C. Special instances such as on a sewer lateral to a single family residential lot where the dwelling unit is set back more than 100 feet from the property line, where there is a large slope up to the building pad from the property line and a grade change in the

lateral is necessary, or where the sewer lateral enters the rear of the lot from a public right-of-way.

- D. On a lateral where the overflow level of the lowest wastewater fixture in the building is below the rim elevation of the uphill sewer manhole on the main line. In this situation the rim elevation of the clean-out installed at the property line shall be at least 6-inches below the overflow elevation of the lowest wastewater fixture on the lateral. A backflow prevention device is required on the lateral.

14. SEPARATION BETWEEN SEWER AND WATER AND RECYCLED WATER LINES

Horizontal and vertical separation between sewer mains and water and reclaimed water lines will be provided in accordance with the State Water Resources Control Board "Criteria for Separation of Water mains and Sanitary Sewers" and GGSD Standard Drawing No. S-118.

15. HOUSE LATERALS

Sewer laterals shall be constructed to the property line from the main line and there shall be a separate lateral for each individually owned building.

Sewer laterals shall have a minimum 4-inch diameter. Apartment and condominium developments shall have at least one (1) 6-inch, or one (1) 8-inch lateral to serve each building in the development which contains more than one dwelling unit.

Laterals shall have a minimum slope of 2%.

Laterals shall be located at the center of each lot and shall be constructed perpendicular or radial to the property line. If the developer must install a sewer lateral at a location other than in the center of a lot due to unavoidable interference, the improvement plans shall indicate the centerline station of the lateral on the sewer and show the distance from a property corner. In no case shall a sewer lateral be located within 12 feet of a property corner. Refer to Section 13 and Standard Plan S-105 for cleanouts on laterals.

Permanent visible monuments shall be set to indicate the locations of all sewer laterals. A 1½-inch high "S" shall be chiseled in face of curb where the lateral crosses under the curb or on the edge of alleys without curbs. The method used shall be indicated on the plans. A licensed Civil Engineer or Land Surveyor shall verify locations of set monuments.

The sewer laterals from the main to the building, and inside the buildings are governed by the Uniform Plumbing Code and enforced by the City of Garden Grove Building Official.

The sewer house laterals between the main sewer line and the property line are owned by the property owner, and **NOT** by the Garden Grove Sanitary District.

16. PRIVATE SEWER SYSTEMS

All plans submitted for review and approval for commercial/industrial developments and residential developments with private sewer systems shall show the plans, profiles, and details of private onsite sewer systems. The private sewer systems shall be planned,

designed, and constructed to the same standards as the Garden Grove Sanitary District's public sewer system.

Sewer pump stations on private property shall be designed, administered, and inspected by the Garden Grove Sanitary District or its designated representative. The private property owner shall be responsible for all costs associated with such design, administration, and inspection.

Each site shall be reviewed on an individual basis at the time plans are submitted. As a condition of service, the Garden Grove Sanitary District shall require the property owner to enter into an agreement with the District acknowledging that the onsite facilities are private and shall be properly maintained according to industry standards and the State Water Resources Control Board's General Waste Discharge Requirements 2006-0003. The property owner shall further agree to hold the District and the City of Garden Grove harmless from any claims on the design, maintenance and operation of the private onsite systems. The property owner shall prepare an Overflow Emergency Response Plan and a Preventative Maintenance Plan as required by Order No. 2006-0003.

All onsite sewer collection systems for commercial/industrial developments shall be private and shall be owned, operated and maintained by the property owner up to the District's sewer line in a public street. A cleanout or manhole shall be installed at the owner's side of the property line in accordance with District Standard Plans S-105 or S-100 through S-104. Each building onsite shall have an individual sewer lateral with a monitoring manhole. Monitoring manholes shall be installed in accordance with District criteria. All laterals from a building shall be connected to the main lateral upstream of the monitoring manhole for that building. No lateral connections are to be made downstream of the monitoring manhole.

17. SEWER PUMP STATIONS

17.1 General

All sewer pump stations conveying wastewater flows to the Garden Grove Sanitary District's collection system, including those from private systems, shall be designed, administered, and inspected by the Garden Grove Sanitary District, or its authorized representative.

The general criteria outlined herein shall apply to all sewer pump stations. The detailed design criteria for each sewer pump station will be established based upon the specific conditions of each installation on a case-by-case basis and documented in a preliminary design report. Sewer pump stations shall be designed according to the following criteria:

Small sewer pump stations, where the peak wet weather flow can be pumped with a maximum of two duty pumps of 1,500 gpm capacity, shall be the stainless steel slide-rail submersible type with a minimum of two recessed impeller or enclosed screw impeller centrifugal pumps, permanent standby generator/automatic transfer switch, and peak flow storage.

Larger sewer pump stations shall be wet well-dry well type with permanent standby generator/automatic transfer switch, and peak flow storage. The District Engineer may allow slide rail submersible pump stations if project conditions warrant it. Pumps shall be either the recessed impeller, or enclosed screw impeller type, as determined by the District Engineer.

17.2 Standards and Codes

Sewer pump station designs shall be based upon current codes and standards, including but not limited to:

- Statewide General Waste Discharge Requirements covered under Order No. 2006-0003 issued by the State Water Resources Control Board on May 2, 2006
- Hydraulic Institute Standards
- California Administrative Code, Title 8, Article 59-Electrical Safety Orders
- National Electrical Code
- NFPA 820 Fire Protection in Wastewater Treatment Plant and Collection System Facilities
- Uniform Building Code
- Uniform Plumbing Code
- Uniform Mechanical Code
- California Fire Code
- National Electrical Manufacturers Association (NEMA)
- American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE)
- Standard Specifications for Public Works Construction
- Standard Plans for Public Works Construction
- OSHA Construction Safety Orders
- American Water Works Association
- American Society for Testing Materials

17.3 Design Flows and Heads

The pump stations shall be designed with a firm pumping capacity equaling the greater of:

- Tributary peak wet weather flow
- Flow that will provide a minimum velocity of 3 fps in the force main.

The standby pump will have the same capacity as the largest pump in the pump station.

In selecting the number, capacity, and operating characteristics of the pumps, the minimum, average, peak dry weather and peak wet weather flows, as well as wet well size and operating band shall be considered. The selected design shall minimize pump cycling and odors.

The total dynamic head (the sum of static lift, velocity head, and frictional losses in the station piping/ valving and force main) shall be determined for all operating conditions, wet

well and discharge point water surface elevations, and a range of frictional coefficients (Hazen Williams C factor of 80 to 150).

Calculations documenting the determination of flows and head calculations shall be submitted along with pump curves and catalog information for the recommended pumps. Prior to final acceptance, the design engineer shall obtain written verification from the recommended pump manufacturers that the selected pumps shall perform throughout their operating range as designed at the published efficiencies free from cavitation, vibration, and premature failure.

17.4 Drivers

The pumps shall be driven by submersible or vertical dry pit immersible motors. All motors shall be Factory Mutual (FM) or Underwriters Laboratories, Inc. (UL) listed explosion proof type. Motors operated by variable frequency drives shall be inverter duty motors. Nameplate horsepower shall be at least 20 percent greater than the maximum brake horsepower needed within the operating range of the pump.

Variable frequency drives shall be provided with bypass contactors to operate the pumps at full speed.

Small pump stations may be designed with constant speed pumps. Larger pump stations may require the use of variable speed drives. The decision of the District Engineer of the Garden Grove Sanitary District shall be final as to the type of driver to be used.

17.5 Wet Well

The wet well shall be sized to

- Provide adequate submergence
- Provide adequate net positive suction head available (NPSHA)
- Prevent frequent pump cycling
- Provide emergency storage

Submergence provided shall prevent formation of vortices and air being drawn into the pump. It shall also prevent cavitation. The minimum submergence shall be at least one foot greater than that required by the pump manufacturer.

The net positive suction head available shall be calculated as:

$$NPSHA = 2.24 (P_a - P_v) - H_f \pm Z$$

Where

P_a = Atmospheric pressure (psia)

P_v = Vapor Pressure of liquid at the maximum expected temperature (use 0.59 psia)

H_f = Friction and minor losses between the wet well and the pump suction flange in feet of liquid

Z= Difference in elevation between the minimum wet well water level and pump datum, in feet. Use – when the pump datum is higher than the minimum wet well water level.

The minimum NPSHA shall be at least eight feet greater than the net positive suction head required (NPSHR) by the selected pump for the maximum expected flow through the pump.

The wet well shall be sized to provide the storage capacity which will preclude exceeding the following number of pump starts per hour:

Motor Horsepower	Maximum Starts per Hour	Minimum Cycling Time (Minutes)
Up to 20	6	10
25 to 50	4	15
60 to 75	3	20
100 and larger	2	30

Wet well bottom corners shall be sloped at 1:1 and slope to the suction pipe inlet to prevent the accumulation of debris on the wet well floor.

Influent pipe(s) shall not enter the wet well in a position which may cause pre-rotation of the flow into the pump suction, and turbulence in the wet well. The influent velocity into the wet well shall be no greater than three (3) feet per second.

For large pump stations, a partition wall(s) with sluice gates may be required to isolate a portion of the wet well for cleaning.

17.6 Emergency Storage

Emergency storage volume needed shall be evaluated for each pump station based upon the tributary area and expected ultimate wastewater flows. The minimum volume of emergency storage shall be 30 minutes of ultimate peak wet weather flow without surcharging the tributary collection system. The emergency storage volume may be provided in the wet well or in a separate adjacent PVC lined overflow structure.

Where possible, the invert of the overflow structure shall be higher than the low water elevation of the pump station wet well to allow gravity drainage of the stored sewage to the wet well. There shall be a minimum of two connecting pipes between the overflow structure and the wet well. The connecting pipes shall be equipped with flap gates on the wet well side. The floor of the overflow structure shall slope to the connecting pipes.

All overflow structures shall be equipped with an access hatch, and three 30-inch diameter maintenance access holes. A 2-1/2 inch hydrant water connection shall be provided near the overflow structure for use in periodic cleaning. The water supply to the hydrant water connection shall have a reduced pressure backflow preventer.

The higher of the maximum storage level and overflow level shall be set at least one foot (1-ft) lower than the top of the lowest manhole in the system, basement or p-trap of the plumbing fixture connected to the system.

17.7 Dry Well

The dry well shall meet the following criteria:

- A. Pumps shall be placed to provide minimum clear space of 3'-6"
- B. The lowest level of the pump station dry well shall have a sump pit with duplex explosion proof submersible pumps controlled by float switches. The sump pumps shall discharge to the wet well above the maximum water level.
- C. Discharge piping and the force main shall be placed in the dry well along the common wall with the wet well. The flow meter shall be placed inside the dry well sufficiently downstream of the last pump discharge pipe. If there is not sufficient room, the flow meter shall be placed in a below grade vault adjacent to the pump station structure.
- D. Catwalks or mezzanine levels shall be provided to access the flow meters, valves, and other portions of the equipment

17.8 Standby Equipment

All pump stations shall have standby equipment capable of handling the ultimate peak wet weather flow during a commercial power outage and/or with the largest unit out of service. This criterion shall apply to all essential electrical and mechanical equipment including pumps/motors, fans, air compressors and sump pumps.

There shall be a minimum of one **standby main sewage pump** equal in size to the largest duty main sewage pump in the station.

All pump stations shall have a **permanent standby generator** and an **automatic transfer switch** sized to start and operate all the sewage pumps needed for ultimate peak wet weather flow, sump pump, ventilation fans, lighting, instrumentation, controls, and telemetry, with voltage dip not to exceed 16% when starting any motor.

Generators shall be skid mounted, permanently anchored to the foundation, and housed in an acoustically insulated enclosure. Exhaust mufflers shall be super critical grade designed for noise level not to exceed the noise level allowed within each particular area.

Load banks sized for 80% of the generator capacity shall be provided. Load banks shall be mounted in the vicinity of the generator and protected with adequate enclosure suitable for the location as required by NEMA Standards.

Portable trailer mounted generators are acceptable only for locations where installation of a permanent skid-mounted generator is not feasible. When a portable trailer mounted generator is furnished, a power receptacle shall be permanently installed for quick connection.

Standby generators shall be furnished with battery chargers and block heaters.

The standby generator shall be a diesel or natural gas powered generator. The diesel fuel powered generators shall be equipped with a sub-base fuel tank sized for a minimum of 12

hours of continuous full load operation. Standby generators shall be units pre-approved by the South Coast Air Quality Management District.

17.9 **Pumps**

Pumps shall be the enclosed screw-centrifugal or recessed impeller type. Wet well-dry well pumps shall be suitable for operation when the dry well is flooded. Pumping capacity and head shall be considered in the selection of the type of pump for the wet well-dry well pump stations.

RECESSED IMPELLER CENTRIFUGAL PUMPS

Recessed impeller centrifugal pumps are designed to handle stringy materials and up to 25 times the amount of solids of conventional non-clog pumps. Some recessed impellers are labeled by pump manufacturers as torque-flow, bladeless and sphere flow. However, all of these pump models follow the general design of placing the impeller away from the fluid stream in order to pass stringy material without clogging the hydraulic passages.

The recommended minimum design criteria in the selection of recessed impeller centrifugal pumps are as follows:

- a. Pump impeller shall be selected with the best possible efficiency at design point or at the operating range of the pump.
- b. Maximum Speed
1750 rpm or shall not exceed the limitation as recommended by the Hydraulic Institute Standards for Centrifugal Pump application
- c. Materials of Construction
 - NiHard (minimum of 550 Brinnell hardness) or stainless steel Type 316 impeller with a removable wear plate of the same material as the impeller
 - NiHard (minimum of 550 Brinnell hardness) or cast iron casing, as determined by the District Engineer.
 - Stainless steel Type 316 shaft.
 - Tandem mechanical shaft seal system for the motor with two totally independent seal assemblies and Tungsten-Carbide seal faces
- d. Upper and Lower Bearings
Radial and thrust bearings, grease lubricated with minimum B-10 bearing life of 60,000 hours for the operating range of the pump.
- e. Slide Away Coupling
Foot mounted discharge elbow and adaptor, base plate, upper and lower rail supports, lifting yoke, and cable. All metal to metal interfaces where movement may occur shall be non-sparking.
- f. Electric Motor
 - For wet well installation, motors shall be FM or UL listed, and be designed for Class I, Group D, Division 1 explosion proof.
 - NEMA Design B, heavy duty, high efficiency, non-overloading, with a nameplate horsepower at least 20% greater than the maximum horsepower required over the entire operating range.
 - Thermal overload protectors imbedded in the motor windings.
 - Dual moisture or leak sensors on the sealing chamber.

- Motors shall be immersible capable of operating continuously in air without the use of sewage pumped for cooling if installed in a dry well.
- Motors in damp locations and dry pits shall have two cycles of solid baked epoxy vacuum impregnation.
- Motors shall be inverter duty if operated by variable frequency drives.

g. Painting and Coating

All non-stainless steel wetted surfaces in contact with wastewater shall be coated with coal tar epoxy enamel. Surface preparation shall be in accordance with SSPC-SP5, white metal blast cleaning. Prime coat to DFT=1.5 mils, Amercoat 71, Engard 422 or approved equal. Two or more coats, DFT=16 mils, Amercoat 78HB, Engard 464 or approved equal. Total system DFT=17.5 mils.

All non-stainless steel external surfaces exposed to corrosive environment shall be coated and painted by amine-cured epoxy. Surface preparation shall be in accordance with alkaline cleaned, SSPC-SP1. Prime coat and finish coat shall be three or more, DFT=16 mils. Amercoat 395, Engard 480 or approved equal.

SCREW-CENTRIFUGAL PUMPS

The recommended minimum design criteria in the selection of the screw-centrifugal pumps are as follows:

- a. Pump impeller shall be selected with the best possible efficiency at design point or at the operating range of the pump.
- b. Maximum Speed
 - 1750 rpm for pumps with discharge nozzle diameter up to 12-inch,
 - 1175 rpm for pumps with discharge nozzle diameter from 14 to 16-inch,
 - Shall not exceed the speed limitation recommended by the Hydraulic Institute Standards for Centrifugal Pumps.
- c. Materials of Construction
 - Cast iron with Hi Chrome suction liner or 316 Stainless steel where available
 - Stainless steel Type 316 impeller and shaft.
 - Tandem mechanical shaft seal system for the motor with two totally independent seal assemblies and Tungsten-Carbide seal faces and silicone carbide lower seal
 - Minimum B-10 bearing life of 60,000 hours for the operating range of the pump.
- d. Electric Motor
 - For wet well installation, motors shall be FM or UL listed, and be designed for Class I, Group D, Division 1 explosion proof.
 - Thermal overload protectors imbedded in the motor windings.
 - Dual moisture or leak sensors on the sealing chamber.
 - Motors shall be NEMA Design B, heavy-duty, high efficiency with Class B or F insulation. Motors shall be non-overloading over the entire operating range, with a nameplate horsepower rating a minimum of 20

percent greater than the maximum horsepower required over the operating range.

- Motors located in a damp environment and in a dry pit shall have 2 cycles of solid baked epoxy vacuum impregnation.
- Motors shall be inverter duty if operated by variable frequency drives.
- Motors shall be immersible, capable of operating continuously in air without the use of sewage pumped for cooling if installed in a dry well.

e. Painting and Coating

All non-stainless steel wetted surfaces in contact with wastewater shall be coated with coal tar epoxy enamel. Surface preparation shall be in accordance with SSPC-SP5, white metal blast cleaning. Prime coat to DFT=1.5 mils, Amercoat 71, Engard 422 or approved equal. Two or more coats, DFT=16 mils, Amercoat 78HB, Engard 464 or approved equal. Total system DFT=17.5 mils.

Non-stainless steel external surface exposed to corrosive environment shall be coated and painted by amine cured epoxy. Surface preparation shall be in accordance with alkaline cleaned, SSPC-SP1. Prime coat and finish coat shall be three or more, DFT=16 mils. Amercoat 395, Engard 480 or approved equal.

17.10 Valves and Gates

Pump stations are equipped with various types of valves to prevent backflow, to isolate the equipment from the system, to control hydraulic surges and to drain the piping system during scheduled repair and maintenance. Each valve type differs in construction, materials, and operation depending on the service and application. All valves shall be suitable for wastewater service.

All interior surfaces of valves in contact with wastewater shall be epoxy coated. All valves 10-inch diameter and larger shall be provided with motor operators. Manually operated valves located more than six feet above the operating floor shall be equipped with chain wheel operators, with the chain extended 36 inches above finish floor. Motor operated valves shall be provided with a manual hand wheel and manual push button station conveniently located below the valve, 5 feet above finished floor.

SLUICE GATES

Sluice gates shall be furnished with stainless steel frames and slides with embedded bronze seats, Type 316 stainless steel stem, and adjustable bronze bushed stem guides. Sluice gate manual operator shall have AWWA square nut; manual crank operator with floor stand and 2-speed gear reducer designed for opening time of not to exceed six minutes. Motor operator shall be provided when required by the District Engineer. Motor operated gates shall be designed for opening and closing times of one foot per minute.

Sluice gates shall be specified to be furnished with pattern wall thimbles to match the concrete thickness where the gate is to be installed.

Sluice gates shall be Rodney Hunt or approved equal.

ECCENTRIC PLUG VALVES

Non-lubricated eccentric plug valves shall be used as isolation valves. Valves shall have hard rubber (suitable for sewage service) resilient faced plugs and flanged ends. Valve seats and discs shall be stainless steel, Type 316. Bodies shall be semi-steel with raised seats. Valves shall be of the bolted bonnet design. Valve design shall allow repacking without removing the bonnet, and the packing shall be adjustable. All exposed nuts, bolts, springs, and washers shall be stainless steel, Type 316. Valves shall have permanently lubricated stainless steel bearings in the upper and lower plugstem journals.

Manual valves shall have a 2-inch square nut and lever actuator. Levers shall be field cut as required to be operable in their installed locations.

Eccentric plug valves may be used as pump control valve to alleviate hydraulic surges during normal starting and stopping of the pumps and as surge anticipators when required. These valves shall have hydraulic cylinder type operators with adjustable opening and closing times. Where the valve is used as a surge relief valve, emergency (upon failure of power supply) opening and closing times shall be specified.

Where space permits, all eccentric plug valves shall be installed with the shaft in the horizontal position. The orientation of the plug with respect to the fluid flow direction shall be as recommended by the manufacturer. The valve manufacturer's recommended installation instructions to prevent clogging of the valves during extended shutdown periods shall be strictly followed.

Valves shall have unobstructed port area of not less than 80-percent of total pipe area.

Eccentric plug valves shall be as manufactured by DeZurik Corporation, Keystone, Drum-Owens (Homestead), Milliken, or approved equal.

BALL VALVES

When required by the District Engineer, ball valves shall be used as pump control valves or for surge relief where flow characteristics require the valve trim that would match that of the ball valves.

Small diameter ball valves (3/4 inch to 2-1/2 inch diameter) shall be used as isolation shut off valves for potable or pump station water system.

All ball valves shall be in accordance with ANSI/AWWA C 507, with cast iron, ductile iron, cast steel, or stainless steel bodies, support legs or pads, flange ends, suitable for velocities up to 35 fps, temperatures up to 125 degrees F, and design pressures to 150, or 250 psi depending on the pressure range required by the system. The balls shall be cast iron, ductile iron, cast steel or stainless steel, shaft or trunion-mounted, with tight shut-off, single or double seat, and full bore. The valves shall be rubber, with stainless steel or monel shafts, and at least one thrust bearing. Except for stainless steel, ferrous surfaces of valves in contact with wastewater shall be minimum 16 mil epoxy-coated.

Ball valves shall be as manufactured by Jamesbury Corporation, Wm. Powell Company, or approved equal.

CHECK VALVES

Check valves shall be installed at each pump discharge piping to prevent backflow of wastewater which can cause severe damage to the pump impeller and shaft, and recirculation of flows back to the wet well in stations with multiple pumps. Valves shall comply with the requirements of AWWA C508.

Check valves shall be the outside lever and weight type swing check valves. They shall be installed in the horizontal position to prevent accumulation of solids downstream of the valve which can cause clogging of the valves.

Swing check valves shall have a flanged cover piece to provide access to the disc. The valve body, cover, and disk shall be cast iron conforming to ASTM A 126 Grade B. Disc facing shall be rubber conforming to ASTM D2000 2BG715. Seat ring and clapper arm shall be cast bronze conforming to ASTM B584 Alloy C 84400. Clapper arm shall be clamped to the hinge pin with stainless steel screws and jam nuts.

Ferrous surfaces of valves in contact with wastewater shall be minimum 16 mil epoxy coated.

Swing check valves shall be as manufactured by APCO (Valve and Primer Corp.), Kennedy, Crane Company, or approved equal.

SEWAGE SURGE RELIEF VALVES

The necessity for surge control devices shall be determined through a complete surge analysis of the pumping system. Although surge tanks are the most reliable means to alleviate damaging surges in the force mains, sewage surge relief valves may be required by the system. Where surge relief valves are required, the valve shall be installed in the discharge piping manifold and connected to the wet well. The valve shall be designed to open immediately when the system pressure exceeds the load setting of the counterweights and shall close slowly at an adjustable speed upon return of system pressure to normal.

The surge relief valve body shall be constructed of a heavy cast-iron or cast steel disc having rubber seating face; and corrosion resistant shaft and cushion chamber.

Sewage surge relief valves shall be as manufactured by APCO (Valve and Primer Corporation), Empire Specialty Co., Inc, or approved equal.

SEWAGE AIR RELEASE VALVES

Sewage air release valves shall **not** be used unless **absolutely necessary**. The design engineer shall endeavor to provide a system which rises continuously from the pump station to the discharge point. Where absolutely necessary, sewage air release valves shall be provided to vent accumulating air or gas during pumping operation or entrapped during initial operation. Air release valves shall be installed at high points of the piping systems. Entrapped air or gases can reduce pumping capacity of the pumping system or cause

corrosion of the piping system with gases containing hydrogen sulfide. The air or gas vent located at the pump station plant shall be discharged to the wet well.

The valves shall have long float stems and bodies to minimize clogging. Each valve shall be furnished with backwashing accessories to remove solids accumulated inside the valve. Water supply and connection shall be provided with appropriate reduced pressure backflow preventer near the valve for backwashing.

Sewage air release valves shall be as manufactured by APCO (Valve and Primer Corporation), Val-Matic (Valve Manufacturing Corporation), or approved equal.

REDUCED PRESSURE BACKFLOW PREVENTERS

Backflow preventers shall be installed where utility water or plant water is connected to the potable water supply to prevent contamination of the potable water system. The valves shall be designed to operate on the reduced pressure principle. The valve assembly shall consist of two spring loaded check valves, automatic differential pressure relief valve, drain valves and shut-off valves. The body materials shall be bronze for working pressure of not less than 150 psi, with bronze and stainless steel trim. Drain lines and air gaps shall be provided. All backflow preventers shall be registered with County Health Department and must be approved for use in the Garden Grove Sanitary District.

Backflow prevention valves shall be as manufactured by Cla-Val Company or Febco.

PUMP CONTROL VALVES

The pump control valves shall be installed in the pump discharge pipe to minimize hydraulic surges during normal starting, stopping and emergency stopping of the pump during power failure or emergency stopping caused by system failures.

The pump control valve shall be operated by hydraulic (oil) or pneumatic operator with a reserve accumulator system as back-up energy source to operate the valve during power failure. The pump control system shall be designed to start the pump against a closed valve. Once the pump has developed pressure, the pump control valve shall start to open until it reaches the maximum open position. Stopping sequence shall cause the pump control valve to close. Complete closure of the valve shall signal the pump to stop. Emergency power failure shall cause the pump control valve to close.

The normal opening, closing, and emergency closing times of the pump control valve shall be independently adjustable. Range of adjustment shall be determined based upon the results of surge analysis. Final settings of closing and opening times shall be verified during pump station start-up. Settings shall be included in the Operation and Maintenance Manual.

17.11 Magnetic Flow Meters

Each pump station shall be equipped with metering equipment to measure outlet flow and provide flow signal for recording, totalizing and control of other equipment. In addition, the flow meter shall be used for pump field performance test to measure capacity and efficiency. The meter shall be magnetic type suitable for wastewater service.

Magnetic flow meters shall be provided at the pump station discharge manifold capable of metering the full range of flow with an accuracy of ± 1 percent of flow rate from 10 to 100 percent of scale. At a velocity below 1 foot per second, the accuracy shall be ± 0.1 percent of the full scale. The meter shall be installed in the piping manifold with minimum straight approach of 4 and 2 diameters upstream and downstream respectively.

The size of the flow meter shall be selected to cover the entire velocity range expected.

The magnetic flow meter shall utilize characterized electromagnetic induction to produce a voltage linearly proportional to the average flow rate. The metering system shall consist of a sensor with field coils, transmitter and interconnecting cables to make a complete operating flow metering system. The meter shall be bipolar pulsed dc type with continuous automatic zeroing.

The sensor shall be flange tube with non-conductive liner. The tube shall be constructed of Type 316 stainless steel with carbon steel flanges AWWA Class D if the coils are external to the tube. The sensor rating shall be NEMA 4, and capable of withstanding accidental submergence in water to a depth of 30 feet for 48 hours. The meter shall include a positive zero feature for periods when the metering portion of the process pipe is not full.

Liner material shall be neoprene, except for liquids which may deposit non-conductive coatings, which shall have Teflon linings. The specific conductivity of the liquid shall not preclude meter operation.

Grounding electrodes shall be of the same material as the sensing electrodes and shall be furnished mounted on each end of all flanges.

Transmitters shall be provided for either local or remote indication as required for each particular project. Remote transmitters shall be NEMA-4X enclosures suitable for wall mounting. Transmitters shall produce a 4-20 ma-dc output signal into a minimum load of 800 ohms linear flow, and a scaled pulse for totalization. All electrical equipment furnished with the magnetic flow meter shall carry a UL label.

Magnetic flow meters shall be Tigermag manufactured by Sparling Instrument Co., Inc. or approved equal.

17.12 Piping and Support System

The pump station piping and supports system consists of the gravity sewer, pump suction and discharge piping, station water or utility water piping, potable water piping, air piping, sanitary drainage piping, fire protection, and sprinkler piping systems. Most of these piping systems are adequately specified by the applicable sections of the Uniform Plumbing Code, Fire Codes and the Standard Specifications for Public Works Construction.

This Section includes special requirements and recommended practices involving the design of piping and the support system.

A. Piping

1. Materials

Ductile iron pipe shall be used in pump station main piping, consisting of suction and discharge piping, discharge manifolds, force mains as specified in Section 11, and water piping 2-1/2 inch and larger. Ductile iron pipe shall be in accordance with SSPWC, and ANSI A21.51 (AWWA C151). All internal surfaces of ductile iron pipe and fittings for water service shall be cement mortar lined and sealed with bituminous coating in conformance with AWWA C104. Internal surfaces of ductile iron pipe for sewer service shall be lined with polyurethane or glass.

Unless otherwise specified, all joints of ductile iron pipe shall be 125-lb flange in conformance with ANSI B16.1, B16.2 and A21.10 (AWWA C110). Sleeve or mechanical grooved type couplings shall be provided at the suction and discharge piping of the pump, and between the magnetic flow meter and the isolation valves to allow removal of the equipment for maintenance.

All bolts shall be of Type 316 stainless steel with bronze nuts or cap screws of copper—copper silicon alloy, conforming to ASTM B 98, Alloy C 65100, designation H04, or alloy C 65500, designation H04. Where anaerobic conditions are anticipated, Type 304 stainless steel shall be used.

Mechanical-type couplings (grooved) shall be used between the valves, pumps, meters and the piping system for the above ground installation. Groove type couplings shall not be used for underground installation. Mechanical-type couplings shall be cast as manufactured by Victaulic, Gustin Bacon or approved equal.

Sleeve-type couplings shall be of fabricated steel with steel bolts and with sizes to fit outside diameter of the ductile iron pipe. The middle ring shall not be less than 1/4-inch in thickness and minimum of 5 to 7-inches long. The follower shall be single piece contoured mill section welded and cold-expanded as required for the middle rings. The coupling shall be equipped with a gasket to make the joint water-tight. The coupling shall be factory epoxy coated suitable for sewer service.

Sleeve couplings shall be installed in the piping systems subject to differential settlement as in the force main that connects the piping inside the pump station building to the yard piping. Two sets of sleeve couplings shall be installed with spacing as recommended by the coupling manufacturer.

Where sleeve couplings are installed in the piping system subject to thrust loads, the coupling shall be provided with restraining bolts. The bolts shall be designed in conformance with AWWA Design Manual M-11.

Sleeve-type couplings shall be as manufactured by Rockwell (Smith-Blair), or Dresser.

2. Suction Pipe

The suction pipe shall meet the following requirements:

- a. The suction pipe shall be sized to provide a minimum velocity of 3 feet per second, and a maximum velocity of 6 feet per second throughout the operational range of the pump.
- b. The inlet velocity to the eye of the impeller shall meet the pump manufacturer's requirements. The largest suction inlet available shall be selected.
- c. The suction pipe shall be flat, or slope up to the pump to eliminate the formation of air pockets. Reducers shall be the eccentric type, with flat top, matching the crown of the suction pipe.
- d. There shall be a straight length of pipe of minimum 5 diameters before the suction elbow to provide uniform flow to the pump.
- e. The inlet of the suction pipe shall be a long radius elbow with a flared bell. The inlet location shall be in accordance with the hydraulic institute standards. The velocity at the inlet to the suction bell shall be less than 2.5 feet per second.
- f. The suction line isolation valve shall be full port eccentric plug valve located close to the wet well wall, allowing sufficient room for removal of the bolts and servicing of the valve.
- g. A pressure gauge capable of measuring the entire range of pressures expected at the entrance to the pump shall be provided as close to the pump as possible. The gauge shall be installed on a ½ inch NPT pipe tap with a ball isolation valve and chem seal with snubber.

3. Discharge Pipe

The discharge pipe shall meet the following requirements:

- a. Discharge pipes shall be sized for a minimum velocity of 3 feet per second and a maximum velocity of 6 feet per second.
- b. The discharge nozzle for dry well installed pumps shall be directed towards the wet well and rotated 45 degrees from the suction line.
- c. The discharge pipe shall be connected to the discharge header at an angle of 45 degrees.
- d. A pressure gauge shall be installed on the discharge nozzle or as close to the pump as possible. The gauge shall be installed on a ½ inch NPT diameter pipe tap with a ball isolation valve and chem seal with snubber.
- e. A 1-1/2 inch diameter pipe with a ball isolation valve shall be installed between the top of the pump casing and the wet well.

B. Pipe Support Systems

All piping systems, including connections to equipment, shall be designed with proper support to prevent undue deflection, vibration, and stresses on piping, equipment, and structures resulting from normal operation and seismic events. All supports and parts thereof shall conform to the requirements of ANSI/ASME B 31.1 except as specified herein.

Ductile iron pipe of any size shall have a minimum of 2 supports per straight length not to exceed 10 feet of unsupported span. One of the supports shall be located at the joint.

Where the piping system is subject to thrust as a result of hydraulic surge or actuation of a surge relief valve, a thrust support or a hydraulic shock suppressor shall be provided.

All pipe supports shall be galvanized after fabrication. Pipe supports shall have a minimum of 1-1/2 inch thick dry pack between the floor and the support base.

17.13 Ancillary Equipment

Each pump station shall be designed to provide the necessary ancillary equipment to support the operation and maintenance of the facility. This equipment is essential to the operation and maintenance of the system. Ancillary equipment or systems that are discussed herein are commonly required equipment or systems in a wet well-dry well pump station.

A. Hoisting Equipment

Most pump stations are located underground to provide adequate submergence for the pumps. Therefore, the substructure and superstructure need to be designed to allow for installation and removal of equipment. The provisions for access hatches, lifting hooks, hoisting systems, roll-up doors and other means to provide ease of maintenance shall be carefully investigated and designed as required.

For wet well-dry well type pump stations equipped with either vertical non-clog dry well pumps or submersible pumps mounted in the dry well, a traveling bridge crane shall be provided. The bridge crane shall be designed to have a travel and span capable of reaching the pumps, meters and valves. Where the valves are located in areas which are inaccessible to the crane, lifting eyes attached to the ceiling shall be provided directly above the valve or equipment. A floor access hatch shall be provided when required.

Bridge cranes shall have a manually or electrically operated hoist, trolley and end trucks, all designed to conform to all applicable codes, and OSHA safety requirements. Where possible, monorail hoists may be used in lieu of the traveling bridge cranes.

Where space permits, a hoisting system shall be designed to allow direct transfer of equipment from the dry well to a flat bed truck. Traffic into the pump station building shall be given special consideration and necessary turning radius shall be provided.

B. HVAC and Odor Control Systems

A typical pump station consists of the wet well, dry well or the pump room, motor room, electrical and control room, and ancillary equipment rooms. Each of these rooms requires different methods and degrees of heating, air conditioning and ventilation to provide the following conditions:

1. A safe and comfortable working environment for personnel;
2. To facilitate proper operation of equipment;
3. To minimize corrosion of equipment and building materials; and
4. To prevent accumulation of explosive and hazardous gases.

The heating, ventilating and air conditioning (HVAC) system and odor control systems shall be designed and controlled as one integrated system. Air distribution, building enclosures, wall penetrations, wind directions, building occupancies, and area classifications shall be carefully investigated. HVAC systems shall be designed in accordance with the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE), State of California Energy Conservation Standards Title 24 and the NFPA 820 Fire Protection in Wastewater Treatment Plants.

Equipment conveying corrosives shall be of material that is corrosion resistant, such as fiberglass reinforced plastic (FRP) or stainless steel. If FRP ductwork is used, it shall have flame spread of less than 25, and a smoke propagation of less than 400, and be of fire resistant rating. Air containing flammable and explosive vapors or toxic gases shall not be recirculated.

Air conditioning may be required for pump stations with VFD's.

Depending upon classification, motors for supply and exhaust fans shall be explosion proof, totally enclosed fan cooled (TEFC) units.

C. Wet Well Ventilation

The pump station wet well receives and stores wastewater before it is pumped to the force main. Corrosive and hazardous gases are normally present in the wet well. These gases can become a safety hazard to operating personnel or can cause corrosion of building materials and equipment in the wet well. In order to minimize accumulation of gases inside the wet well, the wet well shall be flushed with fresh air by an adequately sized ventilation system.

Ventilation rates shall be in accordance with:

1. NFPA 820 Fire Protection in Wastewater Treatment Plants
2. Occupational Health and Safety Act (OSHA)

Pump station wet wells are classified into two types depending on their use;

1. Accessible Wet Well.
2. Sealed Wet Well.

ACCESSIBLE WET WELLS

Wet wells which require routine access for maintenance shall be provided with adequate fresh air ventilation in order to provide a safe environment for maintenance personnel, to prevent accumulation of explosive gases, and to minimize corrosion of equipment installed in the wet well. The internal surfaces of the wet well shall be lined with PVC for corrosion protection.

The following minimum ventilation criteria shall be used:

1. All accessible wet wells shall be provided with continuous ventilation of a minimum of 15 air changes per hour.
2. Where intermittent ventilation is required, the ventilation rate shall be at least 30 air changes per hour.

All electrical equipment and fans inside the accessible wet well shall be explosion-proof designed and manufactured for Class I, Division I, Group D. All other design criteria shall be in accordance with NFPA 820 Fire Protection in Wastewater Treatment Plants.

SEALED WET WELLS

Sealed wet wells shall be designed to be low maintenance. The internal surfaces of the wet well shall be lined with PVC for corrosion protection.

Sealed wet wells shall be provided with static vents to accommodate air displacement due to the rise and fall of the water level in the wet well. The vent shall have a minimum diameter of one-half the diameter of the incoming sewer. The vent pipe shall be connected to the nearest sewer maintenance hole where possible. Where the pump station is located away from any sensitive area, vent pipe could be extended above the roof line with a minimum of 15 feet from any window or fresh air inlet.

All electrical equipment inside the sealed wet well shall be classified in accordance with NFPA 820, Fire Protection in Wastewater Treatment and Collection System Facilities.

C. Odor Control

The need for odor control systems shall be evaluated for each project. Such evaluation shall be based on a life cycle cost of 20 years with major consideration of the power and chemical consumption, first cost, maintenance cost, reliability and efficiency of the system.

Wet well odor control shall consist of a water misting system. Activated carbon scrubbers, chemical scrubbers utilizing a chemical absorption process for removal of odors, or chemical or air injection systems may be necessary for odor control in other parts of a pump station.

For the chemical scrubbing systems, foul air from the plant process facility is introduced into the scrubber vessel with an atomized mist chemical solution containing sodium hypochlorite. Oxidation of odorous compounds occurs upon contact with the scrubbing mist, and is removed in the condensate. The scrubber shall be designed to remove a minimum of 99 percent of hydrogen sulfide in the foul stream. Acceptable chemical scrubber manufacturers are Calvert Environmental Co., San Diego, CA, and Quad Environmental Technologies, Corp., Highland Park, IL.

All odor control and ventilation equipment shall be suitable for continuous exposure to saturated hydrogen sulfide gas, sodium hypochlorite mist, sodium hydroxide mist and sulfuric acid. Electrical equipment shall have explosion proof enclosure designed for hazardous condition for Class 1, Division 1, locations.

For air pollution permits, consult South Coast Air Quality Management District.

D. Dry Well Ventilation

The pump station dry well is normally located adjacent to the wet well to house the pumps, valves, meters and other ancillary equipment.

The dry well and equipment rooms shall be designed for a ventilation rate of at least 15 air changes per hour or ventilation rate equivalent to cool internal heat load from the equipment whichever is greater or not greater than 60 air changes per hour. The sensible cooling ventilation rate shall be calculated as follows:

$$H = \text{cfm} \times 1.09 \times t$$

where:

H - Internal heat gain from equipment, Btu per hour

cfm - Air flow, cu ft per minute

t - Change in internal temperature, degree F. Use 10 degrees F for change in internal temperature as adequate for sensible cooling.

Where a pump station is equipped with variable frequency drives (VFD), the VFD shall be installed in an air conditioned room with 90 percent efficient outside air filters. VFD units are inherently sensitive to temperature, dust, moisture and other corrosive elements in the air. For constant speed pump stations, the motor control center (MCC) and control rooms shall be equipped with a ventilation fan and 90 percent efficient outside air filters. Pump and equipment room air inlets shall be provided with 30 percent efficient outside air filters. All air filters shall be provided with differential pressure gages to indicate when the filters are clogged, and flow detection devices connected to alarm signaling systems to indicate ventilation system failure.

E. Fire Protection System

Where required by NFPA or by the Fire Department, necessary fire protection systems shall be provided in required areas. For areas housing electrical equipment such as the motor control centers, computer rooms and control rooms, an approved type fire protection systems shall be provided.

F. Gas Detection System

Combustible gas detection equipment shall be provided in the wet well and dry well, and other areas where hazardous gas may be present, to record, activate alarms and/or to operate the ventilation system. The stationary gas detection system shall be capable of measuring concentrations of hydrogen sulfide, methane gas and/or petroleum vapor in the air.

The combustible gas sensor shall be DET-TRONICS Point Watch Infrared Hydrocarbon Gas Detector Model PIR9400 or approved equal. The sensor shall be mounted in the wet well such that it can be removable externally for maintenance and calibration. It shall be connected to the programmable logic controller (PLC). The PLC shall monitor the combustible gas sensor through the 4-20 mA signal which shall be proportional to combustible gas concentrations of zero to 100%. Two (2) PLC adjustable alarms shall be provided. 6% lower explosion level (LEL) shall indicate a warning, and 10% LEL shall indicate an alarm. Alarm beacons shall be installed in the dry well and the electrical room.

An entry control station shall be provided in a NEMA 4X stainless steel enclosure with vandal resistant hardware, and amber and green NEMA 4 vandal resistant pilot lights at or near each entry. They shall indicate a potentially dangerous condition in the pump station based on the loss of the ventilation system, combustible gas, loss of positive pressure in the electrical room, or loss of negative pressure in the dry well. Both lights shall be dark if there is a component or power failure. A lamp test switch shall be provided, which will activate all entry control system lights for ten seconds for testing.

G. Compressed Air System

For pump stations using surge tanks, air operated valves; pneumatic tools for maintenance purposes, and instrument air, a compressed air system shall be provided. The air system for pneumatic tools shall consist of a lubricated type air compressor, receivers, air dryers and necessary piping system. For an instrument air system, a dedicated non-lubricated type air compressor, receiver, dryer and necessary piping system shall be provided. Where the valve operators are designed as pump control valves with the option to have controlled closing during power failure, the air receivers shall be sized to store compressed air capable of stroking the air cylinders three (3) complete cycles between the specified operating pressures during power outages.

H. Hydraulic System

Pump stations equipped with hydraulic operated valves shall be provided with hydraulic systems. The hydraulic system shall be either a package system supplied

with each valve, or one complete package to operate multiple valves. The system shall consist of an oil reservoir, hydraulic pumps, control valves, hydraulic cylinders, limit switches and nitrogen gas-filled accumulators where the valves are required to operate during power outages. The valve opening and closing ranges shall be specified. Final field adjustments shall be made during pump station start-up.

I. Noise Control

The pump station shall be designed to meet the minimum noise level requirement of the Municipal Code of the local jurisdictional agency and the Occupational Safety and Health Administration (CAL/OSHA). All mechanical equipment and enclosures shall be acoustically treated to bring the noise level down to an acceptable limit. These attenuation devices may consist of exhaust mufflers, sound isolators or acoustical panels.

The pump stations shall be designed with noise levels not more than 5 dBA above the ambient noise level as measured at the property line of the nearest recipient (neighbor). A 24 hour noise level reading shall be measured at the pump station site as basis of the design.

In the absence of actual field measurements, the presumed ambient noise level shall be deemed to be the minimum ambient noise level for each zone as follows:

Sound Level "A" Decibels
(In this chart, daytime levels are to be used from 7:00 A.M. to 10:00 P.M. and nighttime levels from 10:00 P.M. to 7:00 A.M.)

Presumed Ambient Noise Level (dBA)		
<u>Zone</u>	<u>Day</u>	<u>Night</u>
Residential	50	40
Public Facility, Commercial, Recreational	60	55
Industrial	65	65

At the boundary line between two zones, the presumed ambient noise level of the quieter zone shall be used.

J. Sump Pumps

A sump pit shall be provided in all underground structures such as dry wells, valve and electrical vaults. The sump pit shall be equipped with an adequately sized plus a standby unit, each having a minimum capacity of 50 gpm. Submersible sump pumps shall be used and controlled by a duplex type control, an automatic alternator and a float switch level control. The control system shall be designed to start the standby pump when the lead pump fails to start or when the water level continues to rise while the lead pump is operating. Both pumps are to stop at low water level.

Sump pump discharge pipe, fittings and valves shall be Schedule 80 PVC pipe, with minimum diameter of 2-inches. Each sump pump discharge pipe shall be provided with a swing check valve and isolation gate valve mounted above, both in the vertical

position. A common discharge manifold shall terminate inside the wet well with the wall penetration above the highest surcharge elevation of the wet well.

K. Spare Parts

Pump station electro-mechanical equipment shall be provided with spare parts necessary to ensure continuous operation. The recommended spare parts shall be determined by the project design engineer with assistance from the District Engineer. The following shall be the minimum list of spare parts:

1. One set of pump and motor bearings for each size and model of pump unit.
2. One set of pump seals for each size and model of pump unit.
3. One set of pump and casing wear rings for each size and model of pump unit.
4. One set of pump and motor for each size and model of pumping unit.
5. One dozen fuses for each size of fuse.
6. A printed circuit board for each size and model of the variable frequency drives.

The spare parts shall be delivered to the project site no later than two (2) months prior to pump station start up. Spare parts required during testing and start-up shall be provided by the contractor.

17.14 Electrical Equipment

Electrical systems in the pump station consist of the power supply, power transformers, motor control centers, electric motors, electric variable speed drives, electrical wires and conduits, lighting fixtures, and other associated interface with the instrumentation and control systems.

A. Power Supply

The standard power supply to the pump station shall be 480 volts.

B. Motor Control Centers (MCC)

All motor starters and disconnect switches shall be installed in NEMA 3R Motor Control Centers (MCC). MCC rooms shall be located away from hazardous gas or other corrosive environments. Mechanical ventilation equipment shall be provided to maintain air circulation. All fresh air inlets to the MCC rooms shall be provided with 90 percent efficient inlet filters.

Where environmental problems exist in the pump station location, such as the presence of dust, moisture from sea water, or corrosive gas, the MCC room shall be designed to have adequate ventilation and provided with air cleaning equipment such as de-humidifiers, filters or carbon absorbers.

The MCC circuit breaker handles must be provided with safety interlocks.

C. Electrical Cables and Conduits

All electrical cables and conduits shall be designed in accordance with the NEMA Area Classification as required by the service area. All electrical conduits shall be PVC coated galvanized rigid metallic conduits or Schedule 80 PVC. All conduits shall be sized for 100 year service. Spare conduits may be required. The minimum size conduit shall be 1-inch.

17.15 Instrumentation and Controls

The instrumentation and control system shall be designed to operate the pump station to match the flow characteristics of the service area. The control system shall consist of the wet well level control, flow metering equipment, pressure gages and switches, fire alarms and gas detection instruments.

A. **Pump Control System**

1. General

The pump control panel (PCP) provides manual or automatic control of the pumps, as well as visual indication of the pump station status and alarm conditions. The following status and alarm indicators are to be provided as a minimum:

Status

Power ON Light
Running Time Meter
Pump RUN
HAND-OFF-AUTO selector switch
Lights Test Pushbutton
Seal Test Pushbutton (for submersible pumps)
Flow Rate Indicator
Wet Well Level Indicator

Alarms

Wet Well HIGH LEVEL Alarm Light (from Ultrasonic)
Wet Well High High Level Alarm Light
Pump FAIL Alarm Light
Motor winding HIGH TEMP Alarm Light
Seal FAIL Alarm Light (for submersible pumps)
FAIL RESET pushbutton

Discharge Pressure Indicators

The pump(s) may be controlled either manually, or automatically, depending upon the position of the pump hand-off-auto selector switch. In the MANUAL mode, a pump is started by placing its hand-off-auto selector switch in the HAND position. In this mode, the pump will run continuously unless shut down by the "fail" interlocks.

In the AUTO mode, the pump is started and stopped by the wet well level, as measured by an ultrasonic level sensor. In the "Auto" mode, the pump will run until called to stop by wet well level, unless shut down by the "fail" interlocks.

In the AUTO mode, the pumps will alternate operation automatically after each pump down cycle. If the operating pump should fail, the next pump in the call sequence will start and operate each time the wet well level calls for a pump operation until the failed condition is cleared.

The pump controller shall be a solid state device, which provides operational set points, high level alarm, outputs to start and stop the pumps, and perform pump alternation. The controller shall be a U.S. Filter D153U triplex controller/alternator or approved equal.

A float switch is to be installed in the wet well to provide an emergency high level alarm and a back up pump control system for the station. The emergency high level is to be indicated on the pump control panel and through the dialer. In this condition, the pump will operate for an adjustable time (0-5 minutes after emergency high level initiation), as set by the operator, and then will shut down. If the wet well level again rises to the emergency high level, the cycle will be repeated. The station can run indefinitely in this mode if necessary.

A “pump fail” alarm (for each pump) will be indicated at the pump control panel and transmitted to the automatic dialer system should any of the following conditions occur:

- Pump motor winding high temperature detected by sensors in the motor winding.
- Motor overload detected by the overload relay.

Each of the above “fail” conditions will lock-out the pump from operation. To reset a pump, the operator must visit the station, determine the cause of failure, correct the condition, and depress the “fail reset” pushbutton on the pump control panel.

For submersible pumps, a motor seal failure will also be detected and alarmed but will not stop pump operation.

2. Constant Speed Pump Control System

The operating sequence is applicable for multiple pump units installed in a smaller wet well. The pump station will start in sequence, pumps start and stop in the reverse order.

This sequence is recommended for the following reasons:

- a. To maintain uniform flow into the receiving system
- b. To provide smaller wet well storage volume and less number of motor starts per hour;
- c. To reduce sewer gas emission to the atmosphere by maintaining a constant water level in the wet well.

3. Variable Speed Drives.

Variable speed (matched-flow) pumps shall be used for the following conditions;

- a. Where more uniform discharge to the receiving system is required;
- b. Where there is not enough space in the pump station to accommodate installation of multiple smaller unit constant speed pumps;
- c. Where the wet well volume is limited to satisfy maximum starts per hour;
- d. Where sewer gas emissions to the atmosphere should be limited;

The variable speed drive pumps shall be controlled as follows:

- a. When the wet well level reaches the first set level, the lead pump will start and ramp to a minimum preset speed. As the flow increases, the pump speed will increase in proportion to the increase in flow in order to maintain the level in the wet well until the pump has reached its maximum speed.
- b. When the inflow to the wet well exceeds the maximum capacity of the lead pump, the control system will then start the lag pump. The lag pump will increase its speed while the lead pump will decrease its speed up to the point where the two pumps share the flow, both at the same speed. As the inflow increases, the two pumps will increase their speeds in proportion to the inflow until the pumps have reached the maximum pump design flow, in the case of two pump combination.
- c. A drop in wet well level equivalent to a decrease in pump station inflow will signal the pumps to slow down until a preset speed is reached. Then the lag pump will stop, and the lead pump will increase its speed in proportion to the inflow.
- d. Further drop in wet well level will signal the lead pump to slow down until the minimum level is reached, at which level, the lead pump will stop.
- e. In the event that either the lead pump or the lag pump fails, the wet well level will rise and the standby pump will be started at the same time the failure alarm is activated. The standby pump will be provided with a variable speed drive.

For pump stations equipped with more than two variable speed pumps, the same operating sequence will be followed.

Under no conditions will a force main velocity of less than 3 feet per second shall be allowed.

The variable speed drives shall be provided with bypass contactors to operate the pump at full speed when the VFD is not available.

4. Float Level Switch

The float level switches shall be used to detect the low-low level cut-off and the high-high water level alarm, and as an auxiliary system in the event of failure of the ultrasonic level control systems. When the water level in the wet well reaches the high-high level, the control system (US Filter CBIT B300 single stage controller or approved equal) shall initiate a timed pump down using all pumps. The pump station shall be capable of operating indefinitely in this mode. The float switch shall be direct acting with a single pole mercury switch which activates when the longitudinal axis of the float is horizontal and de-actuates when the liquid level falls 1-inch below the actuation level. The switch shall be encapsulated in a chemical resistant polypropylene casing with a firmly bonded electrical cable protruding. The entire assembly shall be watertight and impact resistant designed and manufactured for Class 1 Division 1, Hazardous Conditions. Float switches shall be Roto-Float as manufactured by Anchor Scientific or approved equal.

Submersible dewatering sump pumps located in dry wells and valve structures shall be controlled by float switches. Float switches shall be designed and manufactured suitable for the area classification of the sump pit.

5. Ultrasonic Level Control

The pump station's primary level controller shall be the ultrasonic level sensor. The transducers shall be hermetically sealed, self cleaning with built-in temperature compensation 6° beam angle, suitable for installation in a sewage pump station wet well.

Ultrasonic measuring systems shall be the Hydorranger with XPS-15 transducer as manufactured by Milltronics, or approved equal.

17.16 Supervisory Control and Data Acquisition (SCADA) System

To monitor and control the operation of the pump station remotely at a central station, SCADA system equipment shall be provided. The system shall consist of the Remote Telemetry Unit (RTU) located in the pump station connected to a computer at a designated central station. The signal to the central station shall be transmitted over spread spectrum radio.

The pump operation is initiated by a motor starter mounted in the Motor Control Center (MCC). The starter is controlled by a signal from the level sensor or push buttons or by local control automation, such as the remote telemetry unit.

The Central Computer System displays information such as graphics and tables; gathers historical data such as trends of pumping cycles, measurement of flows and pressures, equipment running time, number of pump starts per hour; and can remotely control the operation of the pump stations.

17.17 Pressure Gauges

In a wet well-dry well type pump station, pressure gauges shall be installed at the suction and discharge sides of each pump to measure the pump total dynamic head. The pressure gauges shall be at least 4-1/2 inches in diameter. Where seal flushing water is required, a pressure gauge and low pressure switch shall be provided to activate an alarm in case of loss of flushing water. A low flow alarm switch may be used in lieu of the pressure switch.

A pressure switch shall be provided between the pump and the check valve or pump control valve to activate an alarm in the event of failure of the valve to open or accidental closure of any isolation valve located at the pump discharge piping. A micro-switch attached to the valve shaft may be provided in lieu of the pressure switch.

All, pressure gauges and switches installed in a piping system carrying solids bearing fluids such as wastewater, sump pump discharge or chemical lines shall be provided with diaphragm seals and snubbers where pulsating flow is expected. The assembly shall be provided with an isolation ball valve for maintenance. Diaphragm seal material shall be compatible with the pressure and fluid being handled.

In a submersible pump station, a pressure gauge/switch shall be installed in the discharge pipe of each pump in the valve vault upstream of the check valve. The discharge pressures shall be indicated in the pump control panel.

17.18 Pump Station Facility

The pump station facility includes the pump station structure, buildings, electrical substation or transformer, access roads and other appurtenant equipment inside the property. The facility design shall incorporate access road and security. The architectural treatment shall blend with the surrounding area.

A. Building Design and Materials of Construction

The pump station usually consists of an underground concrete structure to house the wet well and the dry well. Where the pump station requires an above ground structure to house the electrical room, generator room, office area and maintenance shop, the above ground building shall be designed in accordance with the requirements of the Uniform Building Code and California Fire Code. In general, all buildings shall be cast-in-place concrete or masonry block wall construction.

Wet Well and Dry Well. The wet well and dry well shall be reinforced cast-in-place concrete with wall thickness to withstand the earth and seismic loads, and shall be heavy enough to resist floatation without earth skin friction resisting the outside surfaces when the wet well is empty.

The size and configuration of the wet well shall be designed in accordance with Section 17.5. The bottom of the wet well shall be sloped to at least 15 degrees and corners grouted to prevent accumulation of solids during operation.

The dry well shall be designed to provide the following:

1. Minimum of 42-inch clear working clearance between pumps and piping;
2. Access doors, stairways and landing;
3. Access opening for equipment installation, maintenance and removal;
4. Hoisting equipment or lifting hooks;
5. Adequate ventilation
6. Fire protection equipment where required.

17.19 Force Mains

The minimum diameter for a force main shall be 4 inches. The capacity of the force main shall be the design peak flow from the pump station. The minimum design velocity for a force main shall be 3.0 fps, and maximum allowed 5.0 fps for PVC and 6.0 fps for DIP.

Force mains shall continuously rise from the pump station to the terminal manhole to eliminate the need for air and vacuum release valves.

For new pump stations with phased development of the tributary area, dual force mains may be required. The District Engineer shall select the number of force mains that will be installed at each pump station.

17.20 Access Roads

Pump stations shall be designed with access roads for construction, operation and maintenance of the equipment. The roads shall have turning radii suitable for the size of vehicle, or heavy hoisting equipment necessary for installation, removal or delivery of equipment or supplies into the station. Pavement sections shall be able to support the load of the heaviest anticipated equipment to be used in the station. Where monorail hoists or traveling cranes are required, adequate headroom clearance shall be provided or loading docks can be used to limit the height of the building.

17.21 Flood Control

The pump stations shall be designed with pad elevation one foot above the expected value 100-year flood elevation or the elevations indicated on the Flood Insurance Rate Maps in areas where detailed studies have been conducted, whichever is higher. Where available and current, information contained in the Orange County Public Facilities and Resources Department documents can be used to determine the expected value 100-year flood elevation.

All hydrologic and hydraulic calculations and design shall be in accordance with the standards of the jurisdictional flood control agency standards.

17.22 Grading and Area Drainage

The site drainage shall be designed to prevent standing water or the erosive effects of storm runoff. Pavement areas shall have a positive drain of up to 3%. Flow lines shall have a minimum of 1% slope. Underground structures shall not be constructed in partially cut and partially fill. Where this condition exists, the site shall be over-excavated and re-stabilized. The pump station shall be designed not to float where high groundwater exists.

17.23 Soils Report

A geotechnical investigation shall be conducted to determine the underground soils conditions. The Soils report shall show the foundation design criteria, corrosiveness of soils and ground water, groundwater elevations if it exists, and possible hazardous materials underground. Cleaning of such materials shall be addressed in the construction contract, or can be awarded to a separate hazardous materials contractor as determined by the District Engineer.

17.24 Surveying

The control bench marks shall be referenced from the County of Orange records. Where existing survey and reference plans are available, field check existing data with the current datum and adjust all elevations to current datum where required.. The location of the pump station shall be tied to a nearby street and to an existing property line. Basis of survey bearings and control shall be given if the local coordinate are established.

17.25 Security

The pump station site shall be provided with an 8 foot high chain link fence or masonry block wall fence, as directed by the District Engineer. The fence or wall shall be designed in accordance with applicable American Public Works Association Standards. The entrance gate shall be secured with a padlock. Where the pump station has a superstructure housing the motor control center and the generator, the building shall be equipped with intrusion alarms. Where there is no superstructure, the NEMA 3R enclosure housing the motor control center shall be equipped with an intrusion alarm. The alarms shall be connected to a horn mounted in the building, a red beacon light mounted outside the building or above the NEMA 3R enclosure, and remoted via telemetry to the main control system.

17.26 Water Supply System

The pump station water supply system shall be provided for pump seal water system, irrigation system, rest rooms and housekeeping hose downs. A backflow preventer shall be installed in the pipeline connecting the hose bibs, seal water and irrigation system. Seal water systems shall utilize air gap tanks, and not be directly connected to the water supply system. All piping shall be designed in conformance with the Uniform Plumbing Code.

17.27 Landscaping and Irrigation System

Plants selected shall be drought resistant and approved by the District Engineer. Irrigation system equipment shall utilize water saving kits that are controlled by automatic timers.

17.28 Construction

The pump station shall be constructed in conformance with the specifications and drawings. The pump station construction shall be administered and inspected by the Garden Grove Sanitary District, or its designated representative.

A. Shop Drawing Submittal and Shop Drawing Review

The Technical Specifications shall specify the requirements for shop drawing submittal and review process.

Once the project is awarded, shop drawing submittals shall be reviewed and accepted. The shop drawing review is one way to check compliance with the specifications. It also serves as a mechanism to get from the contractor the equipment as specified. Where a substitution to specified equipment is proposed to the construction project Design Engineer for review, the design project engineer shall be consulted.

B. Equipment Installation and Testing

The equipment installation and testing shall be specified in each equipment specification. Normally, the equipment shall be specified to be installed by the Contractor under the supervision of a certified factory representative. After installation, the Contractor shall conduct trial operation of the equipment, and make the necessary adjustments as required. When the equipment becomes operational, the Contractor shall test the equipment in the presence of the District's representative. The test shall include a performance test, simulating the manual and automatic operation, and checking of other components in compliance with the specifications. The test shall also include verification of all alarm functions. A continuous test using the actual process material shall be conducted without any breakdown prior to final acceptance.

C. Operation and Maintenance Manuals

The Operation and Maintenance Manual shall be prepared by the construction contractor based upon the plans and specifications, and assistance from equipment manufacturers, to clearly describe how the pump station shall operate under normal and emergency conditions, and how it should be maintained.

Final payment shall not be made to the Contractor until the Operation and Maintenance Manual is approved by the District Engineer.

D. Operator Training

Each pump station has unique operational requirements and some have equipment that requires familiarization by the station operators. The Contractor shall provide

training, through respective authorized equipment representatives, to the station operators as specified in the Contract Documents.

18. INSPECTION AND TESTING OF GRAVITY SEWERS

18.01 CCTV Inspection

The Contractor shall perform Closed Circuit Television inspection (CCTV) of all gravity sewers to determine alignment, grade and damaged or defective pipe in place; after the pipe has been installed, backfilled and compacted to grade, tested for leakage, manholes raised to grade, but prior to final resurfacing, from manhole to manhole. CCTV inspection shall be recorded on DVD, and recording procedures shall conform to the requirements of Standard Specifications for Public Works Construction Section 500-1.1.5, Television Inspection, except that the maximum speed shall be 15 feet per minute. The recording shall continuously display the following on-screen data: contract number, project name, date, time, distance (in feet) from the insertion manhole, and manhole identification codes.

Two copies of the recording shall be submitted to the District for approval within two days of the CCTV inspection. CCTV recording shall be performed first with the pipe dry, and then immediately following clean water flowing in the pipe to clearly indicate vertical misalignments, sags or other defects. Should CCTV inspection indicate any faulty installation of the pipe, repairs or replacement shall be made at the Contractor's expense by a method approved by the District. Repaired and or replaced pipe and/or segments shall be retested and reinspected through CCTV at no additional cost to the District, until final acceptance is granted. Any sag greater than 0.25 inch in 100 feet of pipe reach shall be considered excessive, and the pipe shall be removed and reinstalled to proper grade.

18.02 Gravity Pipe Leakage Tests

All gravity sewer pipes and service laterals shall be tested for exfiltration and/or infiltration and deflection. All leakage tests shall be in conformance with Standard Specifications for Public Works Construction (SSPWC), "GREENBOOK" Section 306-1.4.1. Water exfiltration test shall be in conformance with SSPWC Section 306-1.4.2. Air pressure test shall be in conformance with SSPWC 306-1.4.4. All testing shall be performed in the presence of the District Inspector.

18.03 Manhole Leakage Tests

1. Leakage tests shall be made and observed by the District Inspector on each manhole. The test shall be the exfiltration test made as described below:
2. After the manhole has been assembled in place, all lifting holes and those exterior joints within 6 feet of the ground surface shall be filled and pointed with an approved non-shrinking mortar and the lining joints completed. The test shall be made prior to placing the shelf and invert. If the groundwater table has been allowed to rise above the bottom of the manhole, it shall be lowered for the duration of the test. All pipes and other openings into the manhole shall be suitably plugged and the plugs braced to prevent blow out.

3. The manhole shall then be filled with water to the top of the cone section. If the excavation has not been backfilled and observation indicates no visible leakage, that is, no water visibly moving down the surface of the manhole, the manhole may be considered to be satisfactorily water-tight. If the test, as described above is unsatisfactory as determined by the District Inspector, or if the manhole excavation has been backfilled, the test shall be continued. A period of time may be permitted if the Contractor so wishes, to allow for absorption. At the end of this period, the manhole shall be refilled at the top of the cone, if necessary and the measuring time of at least 8 hours begun. At the end of the test period, the manhole shall be refilled to the top of the cone, measuring the volume of water added. This amount shall be extrapolated to a 24-hour rate and the leakage determined on the basis of depth. The leakage for each manhole shall not exceed 1 gallon per vertical foot for a 24-hour period. If the manhole fails this requirement, but the leakage does not exceed 3 gallons per vertical foot per day, repairs by approved methods may be made as directed by the District to bring the leakage within the allowable rate of 1 gallon per foot per day. Leakage due to a defective section or joint or exceeding the 3 gallon per vertical foot per day shall be the cause for the rejection of the manhole. It shall be the Contractor's responsibility to uncover the manhole as necessary and to disassemble, reconstruct or replace it as directed by the District Engineer. The manhole shall then be retested and, if satisfactory, interior joints shall be filled and pointed.
4. No adjustment in the leakage allowance will be made for unknown causes such as leaking plugs, absorptions, etc., i.e., it will be assumed that all loss of water during the test is a result of leaks through the joints or through the concrete. Furthermore, the Contractor shall take all steps necessary to assure the District Inspector that the water table is below the bottom of the manhole throughout the test.
5. If the groundwater table is above the highest joint in the manhole, and if there is no leakage into the manhole as determined by the Engineer, such a test can be used to evaluate the water-tightness of the manhole. However, if the District Engineer is not satisfied, the Contractor shall lower the water table and carry out the test as described herein before.

18.04 Pipe Slope

All gravity sewer pipe shall be laid to the line and grade shown on the plans and per Section 306.1.2 of "GREENBOOK," with a maximum allowable tolerance of 0.125 inch at the invert. The Contractor shall continuously check the grade of the pipe being installed through the use of laser line.

19. STANDARD SEWER NOTES

The following notes must appear on the plans under Standard Sewer Notes.

- A. The sewer Contractor shall have a copy of the Project Plans and Specifications, as well as the Garden Grove Sanitary District Design Criteria for Sewer Facilities on the job site.

- B. The Contractor shall obtain a City and/or County permit for work done on public right-of-way.
 - C. The Garden Grove Sanitary District Office shall be called for inspection five (5) working days before start of work at (714) 741-5566.
 - D. A pre-construction conference shall be held 48 hours before starting construction work.
 - E. The Contractor shall expose all join points to the existing sewer system for verification of location and elevation before construction.
 - F. Stations shown as 1+00.00 are sewer stations and are independent of all other stations.
 - G. All laterals shall be staked by a surveyor before trenching and a complete set of cut sheets shall be supplied to the Contractor and the District Inspector.
 - H. The District will inspect and test the sewer collection system and lateral sewers to the property clean-out. Privately owned sewer laterals from the property line clean-out will be inspected and tested by an approved contractor subject to the City of Garden Grove Building Department approval.
 - J. All sewer lines shall be balled in the presence of the District Inspector before completion of all leakage tests.
 - K. Pipeline leakage tests shall be made in the presence of the District Inspector, only after backfill has been completed, compaction tests on backfill have been made, and the backfill has been accepted by the District Inspector.
 - L. All sewer main lines shall be inspected using a closed circuit television system. Two recordings shall be made of the inspection on a DVD disk in accordance with the Garden Grove Sanitary District Specifications for Video Inspection of Sewer Lines. One recording shall inspect the system constructed with no flow, and one shall conduct the inspection 15 minutes after flowing water in the sewer.
 - M. The Contractor shall provide the Garden Grove Sanitary District with an as-built set of job prints with tie-down measurements for all laterals and manholes.
 - N. Before final acceptance, the developer's engineer signing the plans shall furnish the Garden Grove Sanitary District with a set of as-built mylars of the sewer plan.
 - O. Curbs, or pavement surfaces in alleys where sewer laterals exist shall be inscribed with an "S" indicating locations of all sewer laterals.
 - P. Curbs shall be inscribed with ties for all manhole locations.
- Add the following notes to plans having on-site work which will be dedicated to the District:
- Q. Trench backfill, on all sewer lines to be dedicated to the District, shall be compacted to a minimum of 90% relative density as determined by the five-layer test method (California 216G). Tests will be required every 300-feet of trench or as determined

by the District Inspector. The developer shall submit written results of compaction testing to the District before acceptance. If in dedicated street or future street, compaction will be as required by governmental agency having jurisdiction, but no less than 90 percent relative compaction.