



DESIGN AND CONSTRUCTION STANDARD

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DIVISION I --- AUTHORITY

It is the intent of this policy statement to provide guidelines and acceptable practices to be used for the design and/or modification of sewer systems within the SBMWD Service Area. It is intended to clarify and join together the Standard Specifications for Public Works Construction Code and Municipal Code, as well as accepted practices and Design Standards making a general reference guide.

Criteria set forth herein are for the design of City Sewer Systems to be dedicated to the City for operation and maintenance. Guidelines shall also be used for private on-site sewer mains.

Authority for connection or construction of public sewers is contained in the City of San Bernardino Municipal Code in Sections 13.08 “Connection with Public Sewers”, Section 13.32 “Wastewater Facilities”, and Section 18.44 “Improvements”. These code sections (attached at back of policy paper) establish the criteria, fees, policies and discharge limitations for the sewer system. They in turn refer to council resolutions that establish the specific charges for services. As the resolutions setting fees are from time to time changed, please contact the public counter in the Engineering Section for the current fee structure.

In addition to the Municipal Code and its authority, the City has conducted two separate master sewer plan studies and reports. This information is on file in the office of the Director of Water Utility, and contains information on the capacity, size and future needs of the system. It may be used as a guideline for both alignment and size of proposed sewer lines as well as indicating deficiencies in the present system that may require correction prior to development and/or connection to the system.

The Director of Water Utility must review and approve all sewer plans prior to construction and approved plans are required prior to the recordation of Final Maps. Permits for lateral connections to the existing sewer are obtained from the Public Services Section.

All developments must secure sewer capacity rights for disposal at the treatment plant prior to approval of the plans. Information on sewer capacity rights can be obtained from the Water Department.

All development must connect to the SBMWD sewer system. Septic systems must be approved by Building and Safety with concurrence by Regional Water Quality Control Board.

Developments within East Valley Water District shall contact West Valley Water for connection information. On-site mains shall be approved by the City of San Bernardino.

DIVISION II - DESIGN CRITERIA FOR MAIN LINE SEWERS (less than 15' dia.)

1. Pipe shall be designed to flow at 0.5D or less at design flow. Minimum pipe slope shall be 0.4% except cul-de-sac streets where the pipe slope shall not be less than 1.0%
2. Minimum design velocity shall be 2 feet per second
3. Maximum design velocity shall not exceed 10 feet per second
4. $N = 0.013$ for VCP or $N = 0.011$ PVC/ABS unless other values approved in advance.
5. Depth from surface to flow line 8 feet (desirable design depth that may be modified by special field conditions).
6. Recommended depth of lateral at property line is 6 feet (minimum acceptable depth is 4 feet).
7. Minimum pipe diameter is 8 inches.
8. 6-inch diameter sewers are permitted, providing they serve no more than 24 units, extend no more than 500 feet and there is no possibility of further extension beyond the 500 foot limit and normal design criteria for grade and velocity are met.
9. Design flow is calculated as $Q_d = 3.6(Q_a)^{.85}$ where Q_d – Design Q and Q_a = Average flow
10. Average flows are as contained in Table A.
11. Typical manhole spacing 300 to 500 feet with considerations made for the size, alignment and site topography.
12. Clean outs may be permitted at the end of 8-inch and smaller lines as a temporary measure provided the clean out is not more than 150 feet from the downstream manhole, and there are no immediate plans for extension of the sewer line.

13. Drop manholes are not permitted unless no other solution exists and approval is obtained from Director of Water Utility.
14. Preferred location for sewers is 5 feet north or 5 feet east of centerline of streets.
15. All sewers shall be contained in street right-of-way, or, if necessary, in a dedicated easement (minimum width 10 feet).
16. A minimum of 0.10' fall shall be provided across the manhole base unless slope requires greater fall.
17. Curved sewers will be considered that conform to minimum radius of 250'. Manholes will be required at the B.C. and the E.C. of the curved section as well as normal spacing along the curve.
18. For sewers increasing in size, the soffit grades shall match across the manhole.
19. Sewers to extend across full frontage of development if there is the possibility of future extension.
20. All recommendations of the State Department of Health Services relative to crossing and parallel lines with water supply lines shall be compiled with. (See attached Standard Drawings).
21. Laterals and main connections shall be at 90° angle unless approved otherwise. Use standard WYE connection.
22. Supplemental size or capacity may be required based on the City Master Plan or other design considerations.
23. Backflow device required where floor elevation is below rim of upstream manhole. Clean out shall be installed immediately downstream of the backflow device.

24. Private on-site mains are private sewers serving more than one legally defined lot or unit and where the units are accessed by legally defined private roads or streets.
25. Private lateral systems are private sewer systems that fall entirely within a single legally defined lot that is not served by private streets or roads. Private lateral systems shall be constructed in conformance with the Uniform Plumbing Code and must be submitted for review, approval, and permit.

DIVISION III - DESIGN CRITERIA FOR MAIN LINE SEWERS (15 inch dia. and above)

1. Pipe designed to flow at .75D at design flow.
2. Minimum velocity is 2 feet per second
3. Maximum design velocity is 10 feet per second unless abrasive characteristics and pipe materials are established to preclude erosion.
4. Minimum design slope 0.0008 (must meet design velocity requirements).
5. $N = .013$ for VCP. $N = 0.011$ for PVC unless otherwise approved.
6. Minimum depth from surface to top of pipe is 7.5 feet =. Special field conditions may permit adjustments but it must be approved prior to submittal of design drawings.
7. Lateral connections to individual units are not permitted.
8. Design flow is calculated as $Q_d = 3.6(Q_a)^{.85}$ where Q_d – Design Q and Q_a = Average flow
9. Average flows by type of development are contained in Table A.
10. Manhole spacing is 500 to 1000 feet depending on grade, line size, connections and flow rates.
11. Sewers to be in dedicated street right of way or easements. Minimum easement width to be 10 feet wider than pipe diameter.
12. At changes in pipe diameter, soffit grades are to match.
13. All recommendations of the State Department of Health Services relative to crossings and parallel lines with water supply lines shall be complied with.
14. Parallel water and sewer lines shall have a minimum of 10 feet separation (outside of pipe to outside of pipe).

15. Siphons are not permitted without specific approval and only in cases where no other solutions are possible. Criteria for design will be decided on a case by case basis.
16. Lift stations or pump stations are not permitted without approval by the SBMWD and will be evaluated on a case by case basis. They should be avoided if at all possible.
17. Supplemental size or capacity may be required based on the Sewer Master Plan, with approval from SBMWD or other design considerations.
18. Connection to existing systems may be denied if the system is beyond design capacity or connection would pose a threat to the health and safety of the community.
19. Curved sewers will be considered that conform to minimum radius 250 feet and will require manholes at the E.C. and B.C. additionally, curved sections must maintain integrity of the joints and maintain normal manhole spacing.
20. Sewers must be extended across the full frontage of the development if there is a possibility for future extension of the line.

TABLE A				
AVERAGE FLOWS — DU = DWELLING UNIT				
Land Use	Description	DU/Acre	Persons/Ac	CFS/AC
R-1	Residential	1	2.6	.000282
R-2	Residential	2	5.2	.000563
R-3	Residential	3	7.8	.000845
R-4	Residential	4	10.4	.001130
R-6	Residential	6	15.6	.001690
R-8	Residential	8	20.8	.002250
R-11	Residential	11	28.6	.003100
R-14	Residential	14	36.4	.003940
R-15	Residential	15	39.0	.004220
R-20	Residential	20	52.0	.005630
R-30	Residential	30	78.0	.008450
E	Elementary School			.002000
J	Junior High School			.002000
S	Senior High School			.002000
JC	Junior College			.002500
SC	Colleges and Universities			.002500
(E)	Proposed Elementary School			.002000
(J)	Proposed Junior High School			.002000
(S)	Proposed Senior High School			.002000
C	Commercial			.003000
RC	Retail Core (Central City)			.006000
LI	Light Industrial			.003000
GI	General Industrial			.005000
HI	Heavy Industrial			.005000
A	Airport			.001000
H	Hospital			.008000
SH	State Hospital (Patton)			.008000
OS	Open Space			.000000

DIVISION IV - GUIDE FOR PLAN PREPARATION

A. Plan Requirements

1. Sheet size is 22x34 inches. (Plan and Profile)
2. Plan to show the following:
 - a) Vicinity Map
 - b) North arrow
 - c) Scale
 - d) Profile
 - e) Utility crossing
(shown in profile)
 - f) Legend
 - g) General Notes
 - h) Registered Civil Engineer
 - i) Expiration date of license
 - j) Existing/proposed surface over sewer line
 - k) Rights-of-way
 - l) Existing/proposed improvements
 - m) Lot Lines
 - n) Wyes/laterals
 - o) Manhole top/flow elevation
 - p) Rate of grade
 - q) Peak discharge
 - r) Quality estimate
 - s) Details & Standards
3. Submit 2 sets of plans for checking, with calculations.
4. Private on-site sewer mains may be shown in plan view.

B. General Notes (On all Plans)

1. All work shall be in accordance with the SBMWD Specifications, Design Standards and Standard Drawings.
2. Approval of this plan by the SBMWD does not constitute a representation as to the accuracy of the location or of the existence or non-existence of any underground utility pipe or structure within the limits of this project. The Contractor shall assume full responsibility for the protection of all utilities within the limits of the project.
3. Inspection shall be by the SBMWD or its designated inspector. All requests for inspection shall be made at least 48 hours in advance of the proposed construction.
4. During the period of construction, the Contractor shall furnish, erect and maintain such warnings, signs, stop signs, barricades and other safety measures as directed by the Traffic Plan submitted and approved through the City of San Bernardino Permit.
5. Sewer pipe shall comply with the following Sections:
 - a) Section 207-8, "Vitrified Clay Pipe"
 - b) Section 207-15, "ABS Solid Wall Pipe"
 - c) Section 207-16, "ABS Composite Pipe", and
 - d) Section 207-17, "Polyvinyl Chloride Plastic Pipe"

6. All PVC and ABS solid wall pipe shall have a Standard Diameter Ratio (S.D.R.) of 26 or less
7. Use of a pipe deflector or re-rounder shall not be permitted on over-deflected pipe.
8. After backfilling and compaction of ABS or PVC pie, the sewer shall be cleaned and mandrelled. Mandrell shall be rigid type with 9 runners, minimum diameter of 96% of inside pipe diameter and a length equal to or greater than the pipe diameter.
9. Contractor shall not open more trench than can be properly constructed and filled in a day's operation. Any trench unavoidably left open during the hours of darkness or over a weekend shall be fenced with 6 foot chain link fencing and properly lighted.
10. Contractor shall reinstall pavement markings and striping that has been disturbed by his operations.
11. OSHA Permit required for trenches over 5 feet in depth prior to start of trench excavation.
12. Contractor shall contact Underground Service Alert prior to beginning work.

Additional Notes (To be used as required by specific projects)

1. The Contractor shall provide safe and continuous passages for local pedestrian and vehicular traffic at all times.
2. Traffic signal functions shall be the responsibility of the City. However, the Contractor is required to give 48 hour notice prior to construction that will damage or affect any buried traffic detectors.
3. Should any of the existing utilities of any other facilities conflict with the proposed sewer line, the Contractor shall notify the engineer and await the relocation and/or alternate design.
4. The Contractor shall so conduct his operations as to offer the least possible obstruction and inconvenience to the public, and he shall have under construction no greater length or amount of work than he can prosecute properly in one day (8:00 a.m. to 5:00 p.m.).

Convenient access to driveways, houses, and buildings along the line of work shall be maintained, and temporary crossings shall be provided and maintained in good condition. Not more than one crossing or intersecting street or road shall be closed at any one time without the approval of the Engineer.

The Contractor shall provide and maintain such fences, barriers, directional signs, lights, and flagmen as are necessary to give adequate warning to the public at all times of any dangerous conditions to be encountered as a result of the construction work and to give directions to the public.

5. The Contractor shall exercise due care to avoid injury to existing improvements or facilities, utility facilities, adjacent property, and trees and shrubbery that are not to be removed. Contractor shall notify USA prior to entering project site.
6. In accordance with generally accepted construction practices, the Contractor shall be solely and completely responsible for conditions of the job site, including safety of all persons and property during performance of the work, and the Contractor shall fully comply with all state and federal laws, rules, regulations, and orders relating to safety to the public and workmen.
7. Street cut permits must be obtained from the Department of Public Works/City Engineer.
8. All removals in paved areas shall be saw cut on a neat, straight line parallel to the pipe line. The cut edge shall be protected from crushing and all broken edges shall be recut to paving operations.

DIVISION IV - GUIDE FOR PLAN PREPARATION

Testing and inspection shall be per the SBMWD Specifications and the provisions of the SBMWD Specification. Requirements for separation and location of crossings of water supply lines shall be per the standards of the California Department of Health Services Division of Drinking Water.

In addition to the above requirements, the following will apply.

1. All trench backfills shall be tested and certified by a soils engineer prior to acceptance.
2. Twenty-four hours advance notice is required for inspection. Arrangements for inspection can be made by calling 909-522-3403, between the hours of 7:30 a.m. and 5:30 p.m., Monday through Thursday, and 7:30 a.m. to 4:30 p.m. on Fridays. Please refer to the 9/80 work schedule posted at this site for downloading.
3. Normal inspection hours are 8:00 a.m. to 5:00 p.m., Monday through Thursday, and 8:00 a.m. to 4:00 p.m. on Fridays. Requests for inspection at other times or on other days must be submitted to SBMWD a minimum of 48 hours before the inspection is required. The Contractor must bear the cost of such overtime inspections and will be billed accordingly. Normal overtime rates are 1.5 times the base based on staff availability.
4. Contractors will be required to obtain City business licenses, insurance, and provide evidence of same to inspection staff upon request.
5. Pipe deflection testing may be required as provided for in the Standard Specifications. Air or water tests for pipeline integrity are required.
6. Permits are required for all sewer connections.

DIVISION VI — SEWER PLAN CHECK LIST

_____ 1st submittal
_____ 2nd submittal
_____ 3rd submittal

Project Name: _____

Owner: _____

Checked by Engineer: _____

Phone: _____

_____ OK

_____ Needs Correction

_____ No Requirement

Submittal Completion

_____ 2 sets of plans

_____ 2 copies of design calculations

_____ Engineer's cost data and itemized quantity estimate complete

_____ Permit or clearance needed from

_____ Condition # _____ from Review Committee or Planning Commission
needs to be satisfied.

_____ Street Cuts require a separate permit.

_____ Plans signed by California RCE with expiration date shown

_____Return check prints from previous plan checks

SHOW ON PLANS

_____Vicinity map

_____North arrow

_____Horizontal and vertical scales

_____Profile

_____Utility Crossing (Shown in profile)

_____Legend

_____General notes and additional notes as required

_____California Registered Civil Engineer's Signature and License Expiration Date.

_____Right-of-way

_____Existing and proposed construction

_____Lot Lines

_____Wyes and Laterals

_____Manhole top and flowline elevations

_____Rate of Grade

_____Peak discharge rate

_____Quantity Estimate

_____Details and Standards

_____Bench Mark

_____Backflow prevention device required

_____Separation requirements from existing or proposed water lines per DHS standards

FEES AND PERMITS

_____ Pay plan check fee _____ Receipt No.

_____ Pay permit fee _____ Receipt No.

_____ Reimbursement fee

_____ Inspection fee _____ Receipt No.

_____ Plans signed and approved by Director of Water Utility

_____ Permit issued

_____ Other Departments notified

_____ CAL-OSHA Permit on File

APPENDIX "A"

(Note: These regulations are promulgated by the Department of Health Services and are reproduced herein for the convenience of the user. The City of San Bernardino can offer no guarantee that these regulations are current or complete)

STATE WATER RESOURCES CONTROL BOARD DIVISION OF DRINKING WATER

REQUIRED SEPARATION BETWEEN WATER MAINS AND SANITARY SEWERS

(10 Feet Horizontal and 1 Foot Vertical) I

PUBLIC HEALTH REASONS

Sanitary sewers frequently leak and saturate the surrounding soil with sewage. Water mains cannot always be relied upon to have continuous Positive pressure therein and can be contaminated by a nearby leaking sewer. To install new water mains or to repair breaks in existing mains in sewage contaminated areas is a serious public health hazard. Hazards also can exist if a nearby existing sewer is broken in the course of installing or repairing a water main; this can allow sewage to enter the water main trench or the water main. Water main failures will likely result in failure of any sewer located above or too near the water main.

A community with its buried water mains and sanitary sewers in close proximity is extremely vulnerable to waterborne disease outbreaks in the event of earthquake or man-made disasters that would cause simultaneous fractures to these conduits.

Any case in which both a water main and sewer fail in close proximity is extremely hazardous to the water consumers. There can be no dollar value set on the reduction of such hazards. All practical steps must be taken to avoid them.

II. BASIC SEPARATION REQUIREMENTS

Water Mains and sewer, should be separated as far as is reasonable in both the horizontal and vertical directions with sewers always lower than water mains.

Parallel construction: The horizontal distance between pressure water mains and sewers shall be at least 10 feet.

Perpendicular Construction (crossing): Pressure water mains shall be at least one foot above sanitary sewers where these lines must cross.

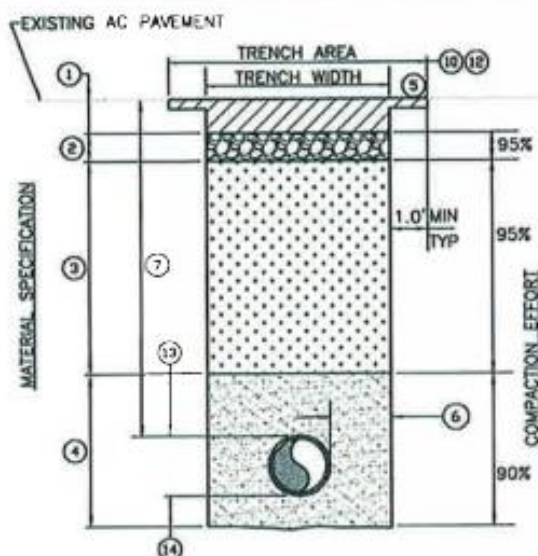
III. EXCEPTIONS TO SEPARATION REQUIREMENTS

Certain local conditions of topography, available space, etc. may create a situation where there is no alternative but to install water mains or sewer lines at less than the required separation. In such cases, more rigid construction requirements must be met as specified in Section IV below.

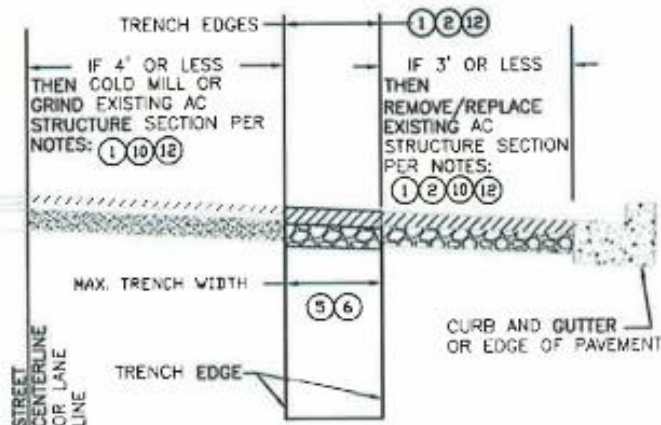
The basic separation requirements apply to sewers of 24 inches in diameter or less. Larger sewers may create special hazards because of flow volumes and type of joints used. Each installation of sewers larger than 24 inches in diameter must be reviewed in advance to determine if the separation and protection provided to nearby water mains is adequate.

IV. SPECIAL CONSTRUCTION REQUIREMENTS

The special construction requirements necessary for sewers or water mains where the minimum required separation cannot be maintained are given in SBMWD Standard Drawing W6.14.



TYPICAL SECTION



PAVEMENT REPLACEMENT LIMITS

GENERAL RIGHT-OF-WAY TRENCH NOTES: OR AS DIRECTED BY THE ENGINEER

- ① ASPHALT PATCH THICKNESS SHALL BE 3 INCHES MINIMUM OR 1" GREATER THAN EXISTING AC, WHICHEVER IS GREATER. TRENCH WIDTH SHALL BE BY SAW CUT ONLY. ASPHALT PATCH MAY BE ELIMINATED OUTSIDE THE ROADWAY PRISM. COLD MILL OR GRIND EXISTING ASPHALT CONCRETE PAVEMENT TO A DEPTH OF 0.15' WITHIN THE TRENCH AREA AND TO AT LEAST 1.0' BEYOND THE EDGES OF THE TRENCH, OR REMOVE FULL DEPTH OF ASPHALT CONCRETE SECTION WITHIN THE SAME LIMITS. MORATORIUM STREETS: WHEN TRENCH CUTS HAVE BEEN AUTHORIZED FOR NEW STREETS OR FULL REHABILITATED STREETS WITHIN THE LAST 5 YEARS, GRINDING SHALL BE EXTENDED TO THE FULL TRAFFIC LANE. FOR STREETS THAT HAVE BEEN SEAL COATED WITHIN THE LAST 3 YEARS, THE TRENCH AREA SURFACE SHALL BE SEAL COATED WITH SIMILAR MATERIAL TO THE REST OF THE STREET. ANY TRENCH CUTS WITHIN THE SAME AREA LESS THAN ONE (1) YEAR OLD ARE CONSIDERED MULTIPLE CUTS. MULTIPLE CUTS WITHIN 100' OF EACH OTHER MADE BY THE SAME ENTITY SHALL BE REQUIRED TO GRIND AND OVERLAY 0.15' FOR THE FULL LANE WIDTH BETWEEN CUTS AND INCLUDING THE CUTS. EXISTING CONCRETE ROADWAYS SHALL BE REPLACED WITH CLASS 520-C-2500 CONCRETE OF EQUAL THICKNESS COLD JOINT TO COLD JOINT IN ACCORDANCE WITH GREENBOOK SECTION 201-1.1.2 AND INSTALLED IN ACCORDANCE WITH STANDARD PLAN 132-1 OF THE AMERICAN PUBLIC WORKS ASSOCIATION STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION, LATEST EDITION. FOR "IN-HOUSE" WATER UTILITY INSTALLATION, MAINTENANCE, AND REPAIR SEE W5.1A.
- ② ROAD BASE: CRUSHED AGGREGATE BASE (GREENBOOK SECTION 200-2.2) 4 INCHES OR MATCH EXISTING SECTION, WHICHEVER IS GREATER, 95% DENSITY, PLACED IN MAXIMUM 4 INCH LIFTS. EXISTING CONCRETE ENCOUNTERED BENEATH THE ASPHALT PAVEMENT ROADWAY SHALL BE COMPLETELY REMOVED AND REPLACED WITH CRUSHED AGGREGATE BASE (GREENBOOK SECTION 200-2.2) TO A THICKNESS EQUAL TO THAT OF THE CONCRETE REMOVED.
- ③ TRENCH BACKFILL: SELECT BACKFILL, 95% DENSITY, PLACED IN 18 INCH LIFTS. IF TRENCH IS LOCATED OUTSIDE THE ROADWAY PRISM, SELECT BACKFILL MAY BE PLACED TO FINISH GRADE AT 90% DENSITY.
- ④ PIPE ZONE: SAND (SE 30) OR GREATER, JETTED, PER SECTION 306-1.3 (GREEN BOOK), OR PLACED MECHANICALLY TO 90% DENSITY. LOCATIONS SHALL BE CLEARLY SHOWN ON THE PLANS.
- ⑤ MINIMUM TRENCH WIDTH SHALL BE THE PIPE DIAMETER PLUS 18 INCHES FOR ALL PIPE DIAMETERS. PIPE SHALL BE CENTERED IN THE TRENCH. TRENCH WIDTHS SHALL ALLOW PLACEMENT AND COMPACTION OF BACKFILL MATERIAL.
- ⑥ MAXIMUM DISTANCE BETWEEN PIPE WALL AND TRENCH WALL SHALL BE 18".
- ⑦ MINIMUM COVER IS REFERENCED TO FUTURE FINISHED FINAL GRADES UNLESS OTHERWISE SHOWN ON PROFILE DRAWINGS (36" MIN).
- ⑧ SUPPORT PIPE WITH SANDBAGS AND SPOT LOAD PIPE AS REQUIRED DURING INSTALLATION OF CLSM IN PIPE ZONE AND PIPE BEDDING AREAS.
- ⑨ DIAGONAL PAVEMENT REPLACEMENT IS NOT PERMITTED.
- ⑩ ANY TRENCH CUTS WITHIN 4' FROM THE EDGE OF PAVEMENT, LANE LINE, CURB OR GUTTER SHALL HAVE THE PAVEMENT PATCH EXTENDED TO THE EDGE OF PAVEMENT, LANE LINE, CURB OR GUTTER.
- ⑪ NO FLOATER LESS THEN 3'-0" ALLOWED.
- ⑫ PATCH MATERIAL SHALL BE LIKE IN KIND.
- ⑬ 12 INCH MINIMUM.
- ⑭ FOUNDATION FILL: THE FILL MATERIAL SHALL BE THE SAME AS THE PIPE ZONE MATERIAL AROUND THE PIPE. A MINIMUM OF 6 INCHES OF FOUNDATION FILL IS REQUIRED, 90% DENSITY, JETTED PER SECTION 306-1.3 (GREENBOOK) OR PLACED MECHANICALLY.

Approved By:

Matthew H. Litchfield
Principal Civil Engineer

4/17/13
Date

REVISION DATE: 4/8/2013

F.D.L.	APR. 13	SAN BERNARDINO MUNICIPAL WATER DEPARTMENT		DRAWING NUMBER
F.D.L.	DEC. 11	TRENCH, BACKFILL AND PAVEMENT REPLACEMENT DETAIL		SBMWD
F.D.L.	OCT. 11			W5.1
R.L.L.	JAN. 11			
REVISION	DATE	APPROVED	DATE	
SCALE:	NONE	MATTHEW H. LITCHFIELD, P.E.	4/10/13	