Update Log for Sewer		
Rev Date	**Item(s) Changed**	**Page #**
10/1/2007	Update/Format EMWD Guidelines for Sewer Systems Plans	All pages
10/1/2007	Added Authorization Form	16
10/1/2007	Added 4th sentence on section J. Sewer Laterals.	5
8/14/2008	Drawing Revision SB-179	SB-179
4/14/2010	Added "or 811" Section O, item No. 3	6
4/14/2010	Deleted "SB-56" on Section P, item No. 4	7
4/14/2010	Drawing Revision from SB-49-2 to SB-49-3	SB-49
9/2/2010	Deleted "SB-56" & "SB 57"	SB-56&57
11/16/2012	Updated Stagecoach Dr.	11
11/16/2012	Updated GL Profile	12
11/16/2012	Updated Index Map	13
4/24/2013	Drawing Revision SB-157	SB-157
4/24/2013	Drawing Revision SB-159	SB-159
3/27/2018	Drawing Revision SB-70	SB-70
3/27/2018	Drawing Revision SB-75	SB-75
6/29/2015	Drawing Revision SB-177	SB-177

EMWD GUIDELINES FOR SEWER SYSTEM PLAN

This plan check list is a general guide to assist Consulting Engineers in the design and drafting of sewer plans. Contact our Engineering Department concerning any exceptions in order to prevent unnecessary plan revision. Please note that if both water and sewer are required, both are to be delineated on one set of 24" x 36" drawings. Engineer is to provide:

1. Approved plan of service summary spreadsheet.
2. Print of the record map (2 each). Note: If landbase is on a computer system, refer to specification for digital submission of plans.
3. Street improvements plans and grading plans (print 1 set-each).
4. Conditions of approval (1 copy).
5. Sewer improvement plans – prepared by registered engineer (2 sets).
6. Copy of index map sheet with initial submittal.
7. 11" x 17" copy of index map sheet with submittal of final mylars.
8. Cover letter signed with plan check list by registered civil engineers. (See pages 14 & 15).
9. Plan check fee deposits.
10. Authorization for overtime forms if applicable (See page 16).

A. Title or Cover Sheet

1. Index map that shows all sewer system facilities and any water system. (See page 13). Do not show storm drain facilities as part of the index map. Index map can be shown on sheet 2 if it will not fit on title sheet.
    a. Piping system; size and type. (See paragraph B.7, page 3).
    b. Manholes, temporary cleanouts, end plugs and backwater valves.
    c. Existing sewer must be shown dashed with corresponding EMWD drawing number.
    d. Sewer dashed and labeled "proposed per Tract No._____" If planned or constructed by other projects but not yet accepted by EMWD.
    e. Sheet number references to plan-profile drawings.

f. Laterals schematically showing approximate location on lot frontage and to line it are connected.

g. Tie to existing cross street with distance.

2. General Notes and Requirements – County/City required notes only. (Do not include notes that conflict with EMWD required notes).

3. Estimate of Quantities; items such as pipe, pipe laterals, manholes and cleanouts.

4. Notifications – See attached page 5.
5. EMWD Sewer Notes – See attached pages 6, 7 and 8.
6. Sewer Certification (tracts & parcel maps) – See attached page 7.
7. Time Limitation – See attached page 8.
8. Typical Lot – See attached page 9.
9. Sewer Legend – See attached page 9 (on sheet with index map).
10. EMWD Approval Block/Title Block – See attached page 10.
11. Minimum letter heights 0.08" (all sheets).
12. List of Implementing Facilities (on sheet with index map).
13. Project Vicinity Map (on sheet with index map).
14. Manholes, cleanout, etc. should be at a **large enough scale** so as to be clear and obvious.

B. **Sewer Plan and Profile**

1. Plan and Profile Example – See attached pages 11 and 12.
2. Stationing shall correspond with street centerline.
3. Pipe Size – Diameter in inches.
4. M.H. Location – 6' north or east of the centerline of street.
5. Pipe Depth – Minimum 7.5' cover over the top of pipe, drawn to scale in profile.

6. Scale & North Arrow – Pipe slopes and F.L. (flow line) elevations at all manholes to be shown in profile. Minimum slopes are as follows: Laterals: 4" & 6" - .0200; Main Lines: 8" - .0040, 10" - .0032, 12" - .0024, 15" - .0016 18" - .0014, 21" - .0012, 24" - .0010 for minimum accepted velocities of 2 f.p.s. at design flow depths of ½ full of 12" and less diameter, and ¾ full for 15" and larger diameter. Maximum slopes are as follows: 8" - .1200, 10" - .0850, 12" - .0660, 15" - .0500, 18" - .0370, 21" - .0300, 24" - .0250.

Slopes shall be shown in decimal form, not as a percentage. The recommended velocity at design flow is 3 fps. Sewer lines of different sizes connecting to the same manhole shall match soffits (top of pipes) at the center of the manhole. See note 11 sheet 3. Upsizing sewer size to obtain a flatter slope will not be allowed.

7. Pipe Type

   a. Force Main - shall be AWWA C-900, class 150 pipe, unless otherwise stated or approved by the District.

   b. Gravity Sewer - shall be EMWD approved plastic or VCP pipe.

   c. Gravity Sewer – VCP is required when:

      1. Serving industrial development.
      2. On curved alignments (12" and above).
      3. Sizes larger than 15" (unless otherwise approved by the District)
      4. When pipe type is not dictated by above requirements, no pipe type shall be indicated on plan or profile.

   d. Gravity Sewer - When VCP is required, it shall be indicated on plan and profile.

   e. Gravity Sewer – Where existing grade goes cut to fill, use short joints 2.5' max., 10' each side for VCP pipe. Use flex couplings for plastic pipe. Note to be labeled on profile if applicable.

8. Special bedding for sewer pipe: Refer to standard drawings SB-157, SB-158 and SB-159 for specific type of bedding.

9. 10' horizontal clearance required between water and sewer mains (edge to edge; 8' horizontal clearance required between edge of sewer main and curb face).

10. Sewer main pipeline crossing under water pipelines must have 1' of vertical clearance between top of sewer main and bottom of water pipe; otherwise, special conditions will be required per California Department of Health Services requirements. Give crossing elevations (top of sewer, bottom of water).

    When there is no alternative except for sewer to go over water, special conditions will be required per California Department of Health Services requirements.

11. Scale & North Arrow:
All sheets to have same scale: Horizontal @ 1" = 40' to have Vertical @ 1" = 4'; Horizontal @ 1" = 50' to have Vertical @ 1" = 5'; exceptions must have EMWD approval prior to submission of plans for review. Vertical scale 1"= 8' is not acceptable. North arrow pointing down is not acceptable.

C. **Manholes** – The manholes shall be stationed, numbered and shown in the plan and profile. Terminus manholes are required at permanent ends of sewer mains. Number manholes starting with No. 1.

D. **Shallow Manholes**- Required for all manholes of depths less than 5' from finished street grade to sewer pipe shelf.

E. **Manhole Spacing** – The maximum distance between manholes on tangent sections is 500'. Manholes are required at beginning and end of curves.

F. **Horizontal Curves** – The minimum radius is 144' for VCP (4" to 12", 6' length), 200' for 8" PVC and 250' for 10" PVC. For radius equal to or greater than 500', maximum manhole spacing is 450'; for radius less than 500', maximum manhole spacing is 150'. Reverse curves and/or combination curve/tangent are not allowed between manholes.

G. **Mainline Cleanouts** – The use of a temporary cleanout is permitted in lieu of a manhole at the end of a sewer main with a length of 150' or less and is to be extended in the future. Cleanout or stub shall extend 10' or the depth (whichever is greater) past the tract boundary. Temporary end of a sewer line that exceeds 150' will require a manhole.

H. **Lateral Cleanouts** – Cleanouts shall be placed on each lateral just inside of the property line or edge of easement per SB-52.

I. **Utility Crossings** – Show a caution note designating type, size and stationing of the utility line wherever it crosses a sewer main or lateral. In note, also include top or bottom edge elevation of utility line and sewer main/lateral at minimum vertical crossing point. Where a minimum crossing separation is obtained, label on profile between utilities "C.D.F. per EMWD specs."

J. **Sewer Laterals** – Show all sewer laterals on the plan and on the index map. Locate laterals to miss driveways. Design lateral grades, per SB-177, to accommodate water system construction. Maximum number of laterals into terminus manhole not to exceed four. The maximum length of laterals shall be 55 feet from lateral cleanouts (see sub-paragraph H) to centerline of manhole or pipeline connection.

K. **Backwater Valves** – Section 710.1 of the Uniform Plumbing Code states that "...Fixtures which have flood level rims located below the elevation of the next upstream manhole cover...shall be protected...by installing an approved type backwater valve." EMWD will require lots with pad elevation below the elevation of the next upstream manhole cover to have a

backwater valve. Show the backwater valve symbol on each protected lot in the plan view and on index map.

L. **Pad Elevations** – Show the pad elevation of each lot on plan view. Any revisions to the grading plans should be reflected on the sewer plans.

M. **Easements** – Sewers to be located in easements will not be allowed except upon approval by the EMWD Engineering Department. Provide easement description and plats where required, with widths typically twice the depth; rounded up to the nearest 10' increment; 20' minimum. Show and label easements on the index map and plan view of improvement plans. Provide ingress and egress to all manholes or a 75 foot diameter turn around if egress is not provided. Sewers are to be in the center of the easement unless otherwise directed. For commercial and industrial projects, easement **must be recorded** before approval of plans. For residential projects easement documents **must be submitted** before approval of plans.

N. **Index to Commonly Used Sewer Standard Drawings**

SA-47	Paving Detail Around Manholes
SA-79	Connecting Dissimilar Sewer Pipes
SA-87	Sewer Chimney Lateral
SB-8	Locking Manhole Cover & Frame
SB-30	Shallow Manhole
SB-49	Pipe Casing
SB-52	Sewer Cleanout (mainline & on-site)
SB-52A	Sewer Tree Laterals & Cleanouts
SB-53	Manhole (reinforced concrete)
SB-54	Manhole Flat Top
SB-57	Non-Manhole Flat Top
SB-58	Terminus Manhole
SB-61	Manhole Frame and Cover
SB-63	Sewer Connection at Concrete Encasement
SB-70	Grease Interceptor
SB-73	Precast Manhole (reinforced concrete)
SB-75	Oil Interceptor
SB-157	Pipe Zone Bedding for Sewer Pipe
SB-158	Trench Backfill for Sewer Pipe
SB-159	Classification of Pipe Zone Bedding for Sewer Pipe
SB-176	Sewer Lateral Connections
SB-177	Sewer Laterals
SB-179	Manhole Installation for HDPE Sewer Main

O. **Notifications** – Engineering Shall include the following notes:

At least 48 hours prior to commencing construction, contractor shall notify:

1. Eastern Municipal Water District,
   Field Engineering Department, (951) 928-3777, ext 4830

2. Permit Agency (Engineering to select agency).

   a. Riverside County Road Department
      (951) 955-6885

   b. City of Hemet
      (951) 765-2360

   c. City of San Jacinto
      (951) 654-7337

   d. City of Moreno Valley
      (951) 413-3350

   e. City of Temecula
      (951) 694-6400

   f. City of Perris
      (951) 943-5003

   g. City of Murrieta
      (951) 698-1040

3. Underground Service Alert (USA)
   1- (800) 227-2600 or 811

4. All other affected agencies that are not members of USA. (Engineer to provide names and phone numbers of agencies).

P. **EMWD Sewer Notes** – Use only those notes and standards determined appropriate by EMWD. Detailed Requirements: (List on front sheet of construction plans. This may or may not be the Sewer Line Layout for Subdivision Improvements. **List only those notes that are applicable to the project),**

1. Sewer system construction and materials shall be in accordance with EMWD's standards and specifications.

2. Gravity sewer profile elevations are to flow line (conduit invert). Force Main profile elevations are to centigrade (C.G.).

3. Contractor has the option to install plastic or VCP sewers except where specifically designated on plans per EMWD standards and specifications.

4. Manholes shall be constructed in accordance with standard drawings SB-53, SB-58 and SB-61, as applicable. Sewer mains may be laid through the manholes and used as a form for the invert.

5. Manholes of depths less than five feet from finish street grade to sewer pipe shelf are to be constructed in accordance with standard drawing SB-30.

6. All laterals shall have an on-site cleanout in accordance with standard drawings SB-52. In addition, for laterals serving industrial and/or commercial developments, the requirements for sampling and/or pretreatment facilities shall be determined by contacting EMWD's Source Control Division at (951) 928-3777, ext. 6203.

7. Mainline cleanouts, where called for on the plans, shall be constructed in accordance with standard drawing SB-52.

8. Prior to construction of sewer, contractor shall expose existing sewer and verify its existing elevation and location. Where connecting to existing manholes and inlet stub of proper size exists, no alterations shall be made to existing manhole base or stub except as specifically authorized by EMWD.

9. All sewer inlets at the manhole shall be such that its crown shall be level with the crown of the outlet pipe, at their projections to the manhole centerline.

10. Reconstruction of existing manholes shall be scheduled at the convenience of EMWD and shall be completed within five working days following its commencement.

11. Sewer laterals shall be constructed in accordance with SB-177. Locations of wyes and laterals, where not shown on the plans, are to be determined in the field prior to construction to miss driveways. All laterals are to be 4" in diameter unless otherwise shown on plans. Connections of new laterals to existing sewer are to be per standard drawing SB-176.

12. The contractor is advised that the work on this project may involve working in a confined air space. Contractor shall be responsible for "confined air space" Article 108, Title 8, California Administrative Code.

13. Where groundwater is encountered, all VCP pipe shall be treated for absorption resistance per EMWD's specifications.

14. Backwater valves shall be installed per Section 710.1 of the Uniform Plumbing Code.

15. All pipe zone bedding & trench backfill are to be per standard drawing SB-157, SB-158 and SB-159.

List other specific requirements as appropriate.

Q. **Sewer Certification**

I certify that the design of the sewer system in Tract No._____ is in accordance with the Eastern Municipal Water District's Sewer System Master Plan, and the District has programmed adequate capacity to treat wastes from the proposed tract.

EASTERN MUNICIPAL WATER DISTRICT

By:

Civil Engineer of Subdivisions Date

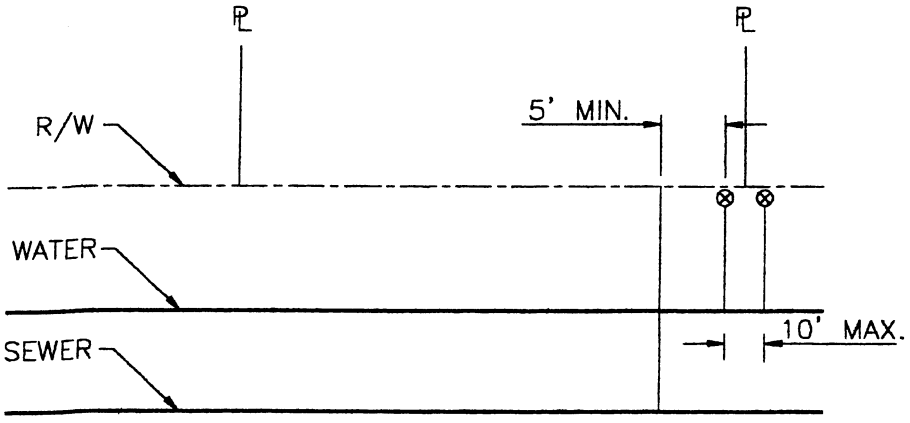
R. **Time Limitation**

The time limit on drawing approval shall be six (6) months from the date on the certification. If construction has not commenced within stated time, EMWD requires drawings to be reviewed by the Developer/Design Engineer and resubmitted to EMWD for possible changes in Master Planned sizing and changes in specifications and standards.

SEWER LEGEND (USE APPROPIATE SYMBOLS)

- EXISTING OR PROPOSED SEWER LINE (BY OTHERS)
- SEWER LINE
- SEWER LINE WITH LATERALS
- MANHOLE
- EXISTING MANHOLE
- CLEANOUT
- BW — BACKWATER VALVE
- SHALLOW MANHOLE
- EXISTING SEWER LINE WITH NEW TAPPING LATERAL

TYPICAL LOT EXAMPLE



TYPICAL LOT

N.T.S.

NOTE: PLEASE MAKE BLOCKS LARGE
ENOUGH THAT THE APPROPRIATE
INFORMATION WILL FIT WHEN FILLED IN

COUNTY (CITY) OF "X"	I.D.
	S.A.
TRACT NO. "X" SEWER, WATER, & RECLAIMED WATER PLAN AND PROFILE	W.O.
	C.O
	COORD.
TITLE SHEET (OR) INDEX MAP (OR) "STREET NAME"	SHT. OF
	D-

TITLE BLOCK

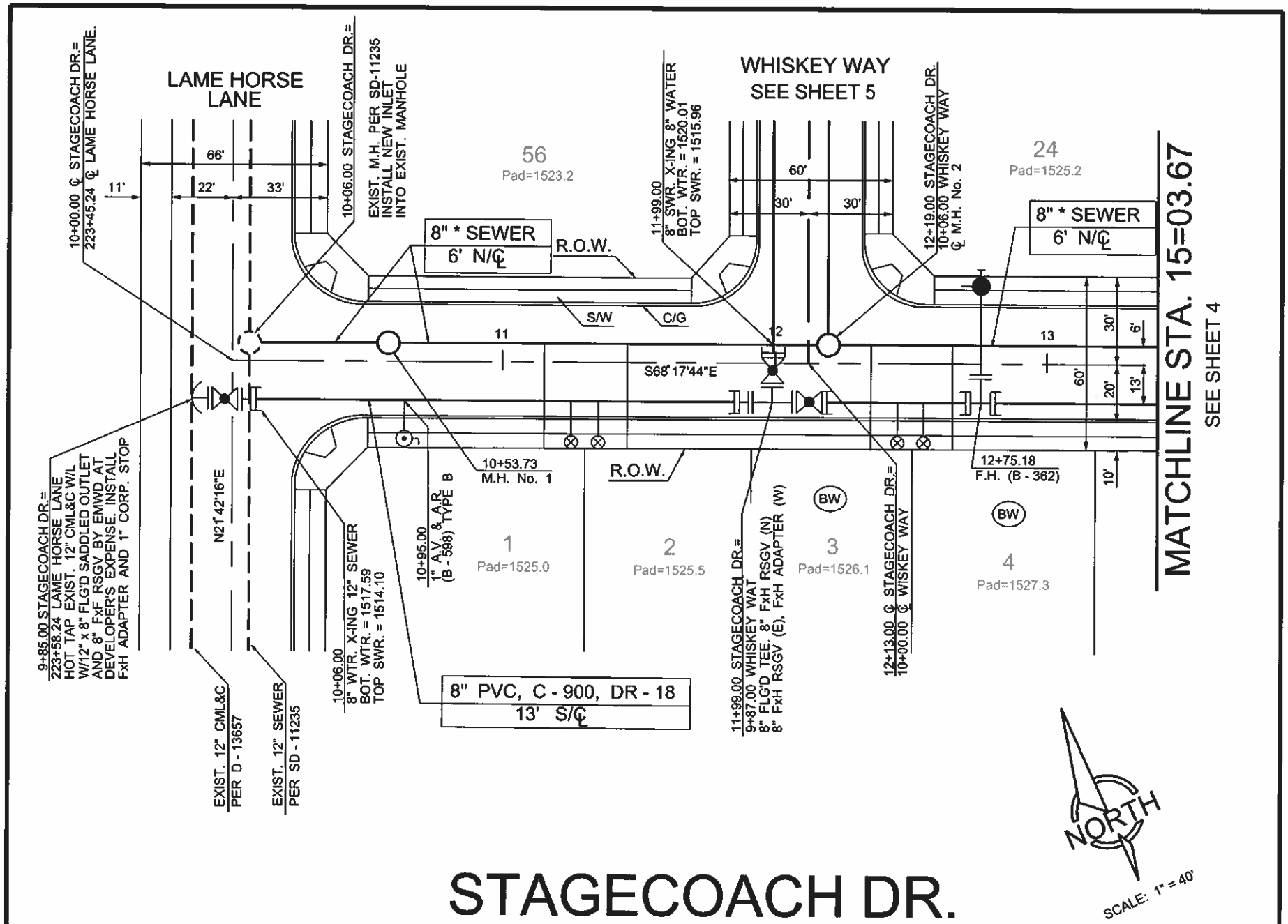
WATER / SEWER / RECLAIMED WATER APPROVED BY:
EASTERN MUNICIPAL WATER DISTRICT

CIVIL ENGINEER OF SUBDIVISIONS DATE

APPROVALS		INITIAL	DATE
	PROJECT ENG.		
	INSPECTION		
	WTR. OPERATIONS		
	SWR. OPERATIONS		

APPROVAL BLOCK

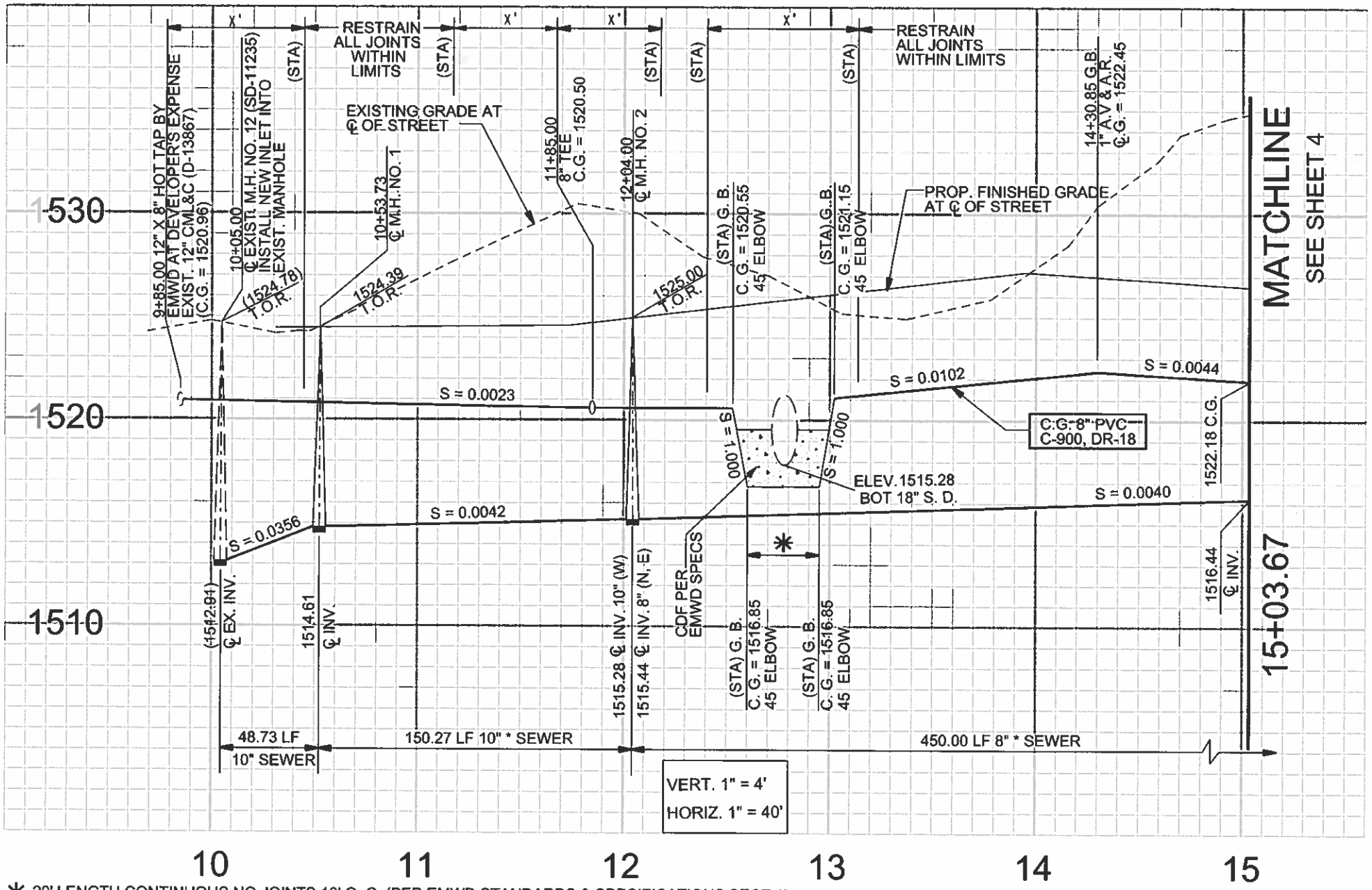
REV 07/09/97
D STANDARDS/TTLBLCK.DGN



STAGECOACH DR.

(EXHIBIT SHOWN IS NOT TO SCALE)

* PROVIDE FIVE (5) SPACES FOR HAND DRAFTING OF PIPE MATERIAL DURING THE AS-BUILT PHASE

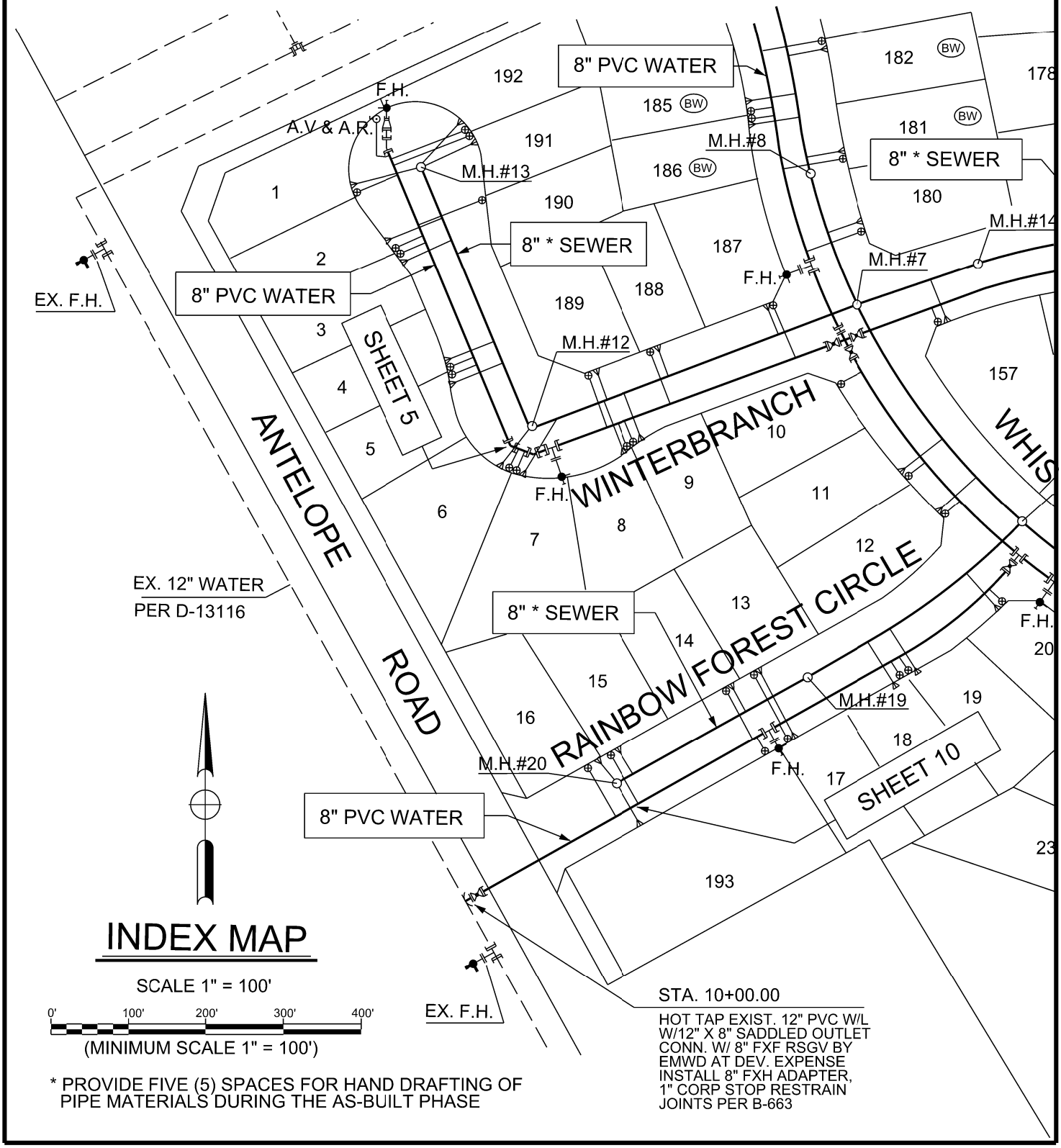


✱ 20' LENGTH CONTINUOUS NO JOINTS 10' O. C. (PER EMWD STANDARDS & SPECIFICATIONS SECT.1)

* PROVIDE FIVE (5) SPACES FOR HAND DRAFTING OF PIPE MATERIAL DURING THE AS-BUILT PHASE

EXAMPLE OF INDEX MAP
WITH CALL OUTS AND SYMBOLS LEGIBLE

(EXHIBIT SHOWN IS NOT TO SCALE)



INDEX MAP

SCALE 1" = 100'

0' 100' 200' 300' 400'

(MINIMUM SCALE 1" = 100')

* PROVIDE FIVE (5) SPACES FOR HAND DRAFTING OF PIPE MATERIALS DURING THE AS-BUILT PHASE

STA. 10+00.00

HOT TAP EXIST. 12" PVC W/L W/12" X 8" SADDLED OUTLET CONN. W/ 8" FXF RSGV BY EMWD AT DEV. EXPENSE INSTALL 8" FXH ADAPTER, 1" CORP STOP RESTRAIN JOINTS PER B-663

Date: _____

Eastern Municipal Water District
P.O. Box 8300
2270 Trumble Road
Perris, CA 92572-8300

Attention: Engineering Department

Subject: Initial Water and Sewer Plans Submittal

I certify that the water and/or sewer plans prepared on _____ are being submitted for plan check using the Eastern Municipal Water District water and sewer guidelines and the attached checklist. The plans are complete and meet EMWD criteria.

We are providing you with the following:	Yes	N/A
2 sets of the water and/or sewer plans		
1 set of grading plans		
1 set of street plans		
1 print of the record map		
1 set of conditions of approval, including fire flow requirements		

Sincerely,

_____
, Registered Civil Engineer

Plan Check Checklist

Title Sheet

- ☐ Water/Sewer Notes
- ☐ Time Limitation
- ☐ Notifications
- ☐ Certification
- ☐ Engineer's Stamp & Signature
- ☐ Typical Lot

Index Map

- ☐ Scale, North Arrow, Sheet Ref.
- ☐ Vicinity Map
- ☐ Implementing Facilities
- ☐ Quantities
- ☐ Legend
- ☐ Street Names, Lot Numbers
- ☐ Services, Laterals, Appurtenances
- ☐ Backwater Valves/Prs. Regulator Check
- ☐ Distance to Existing Cross Street
- ☐ Water & Sewer Facilities
- ☐ Force Account 'Work'
- ☐ Pressure Zone

Plan & Profile

(Water & Sewer)

- ☐ Scale, North Arrow, Sheet Ref.
  (No 1" = 8' vertical scale allowed.)
- ☐ Utility Crossing Data
- ☐ Curve Data, Bearings, Tables
- ☐ Existing/Future Utility Reference
- ☐ Easements, ROW Info. Offsets
- ☐ Stationing, Matchlines, CL Equations
- ☐ Pipe Slopes
- ☐ Notation, Labeling, Pipe Types
- ☐ Services/Laterals
- ☐ EMWD Symbology
- ☐ Existing Finish Surface
- ☐ Force Account 'Work'

Water

- ☐ Valving
- ☐ Air Valves, Blow-offs, Fire Hydrants
- ☐ Joint Restrained Limits (on profile)
- ☐ Grade Breaks/Deflection Angles
- ☐ Backflow Devices (if required)
- ☐ High Deflection Coupling (if required)

Sewer

- ☐ Manhole Spacing
- ☐ Manhole Inverts (match soffits), Rim El.
- ☐ Manhole Numbering
- ☐ Lateral Clearances
- ☐ Special Bedding
- ☐ Backwater Valves (BW)
- ☐ Cut-to-Fill Note

Project: _____

Date: _____

Engineer: _____

EASTERN MUNICIPAL WATER DISTRICT

OVERTIME AUTHORIZATION FORM
DEVELOPMENT PROJECT

Date:_____

I authorize EMWD's project engineer to work overtime to complete:

☐ Plan of Service ☐ Plan Check

For the following project: _____

I understand that this authorization doesn't mean that my project will be moved ahead of other projects already assigned to the project engineer or that the Plan Check process will be completed in a specific amount of time.

_____
Developer's Representative
Name:
Title:
Company:

cc: Finance Dept

Attachments

EASTERN MUNICIPAL WATER DISTRICT	DATE	01/30/2007	SHEET NO	1 OF 4
	PROJECT	SEWER GUIDELINE FOR MANHOLE SIZING		
	WO/CO ACCT NO			
AFTED BY	FB	REVIEWED BY	SEVERINO MENDOZA	

GENERAL NOTES:

1. THE MINIMUM MANHOLE DIAMETER SHALL BE 48" PER SB-53.

SEWER MAIN (inches)	MAXIMUM BRANCH SIZE (inches)	MH SIZE (inches)	CLEAR OPENING (inches)
8 - 15	10	48	24
18	*NO BRANCH	48	24
18 - 33	12	60	GREATER THAN 24 USE 36
36	*NO BRANCH	60	36
36	15	72	36
42	*NO BRANCH	72	36
* UNLESS OTHERWISE APPROVED BY EMWD ENGINEER			

2. FOR SEWER MAINS GREATER THAN 42" IN DIAMETER OR WITH A DEPTH THAT EXCEED 25 FEET IN DEPTH, SPECIAL DESIGN AND STRUCTURAL DETAILS FOR THE MANHOLES SHALL BE SHOWN ON THE PLANS.

3. STANDARD DRAWINGS:

a. SB-53 - PRECAST REINFORCED CONCRETE STANDARD 48" & 60" I.D. MH

b. SB-54 - PRECAST REINFORCED CONCRETE 60" & 72" ID FLAT TOP MH

4. T-LOCK LINED MANHOLES

a. IF THE SEWER HAS A SLOPE OF 7% OR GREATER, ALL THE MANHOLES WILL BE LINED WITH T-LOCK.

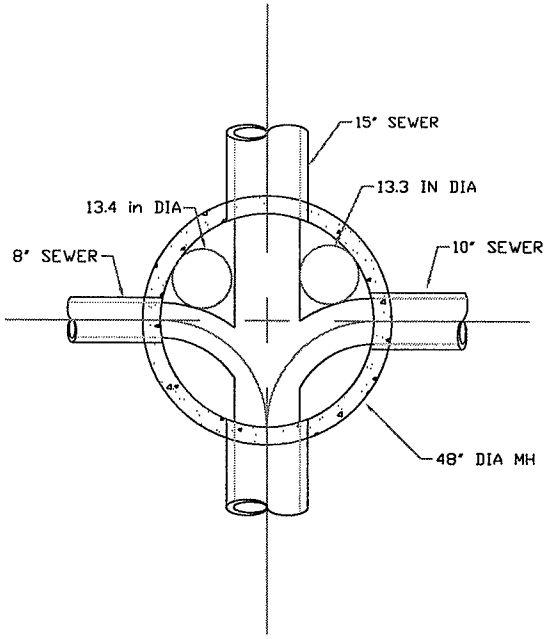
b. WHERE THERE IS A CHANGE IN SLOPE, FROM STEEP TO FLAT IN THE DIRECTION OF FLOW, OF 5% OR GREATER, THE MANHOLE AT THE GRADE CHANGE AND THE NEXT MANHOLE UPSTREAM WILL BE LINED WITH T-LOCK.

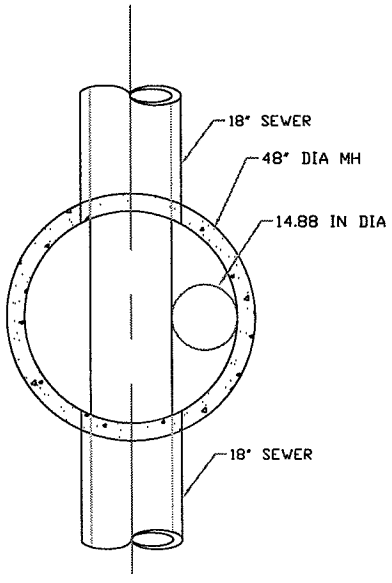
c. AS REQUIRED, FORCE MAIN TERMINAL MANHOLES WILL BE LINED WITH T-LOCK.

d. PREMOLDED PLASTIC SHEET LININGS SHALL BE AMER-PLATE "T-LOCK", NOT LESS THAN 0.065 INCH THICK, AS MANUFACTURED BY AMERON, CORROSION CONTROL DIVISION, BREA, CALIFORNIA, OR APPROVED EQUAL. WELDING STRIP SHALL BE AMER-PLATE "T-LOCK" WELDING STRIP OR APPROVED EQUAL PER SECTION 06400 PLASTIC LINING FOR CONCRETE STRUCTURES.

e. TYPICAL BASE CHANNELIZATION DETAILS (SEE DETAIL DRAWING)

EASTERN MUNICIPAL WATER DISTRICT	DATE	01/30/2007	SHEET NO	2 OF 4
	PROJECT	SEWER GUIDELINE FOR MANHOLE SIZING		
	WO/CO ACCT NO			
AFTED BY	FB		REVIEWED BY	SEVERINO MENDOZA

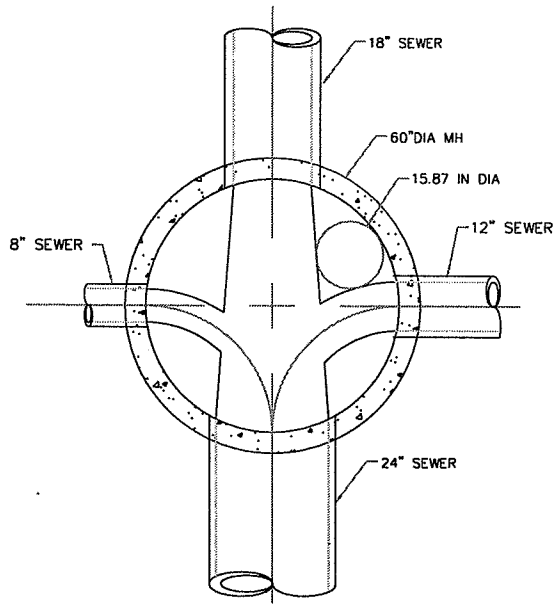


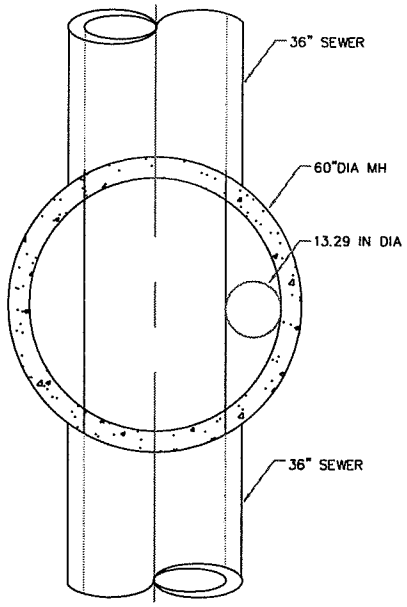


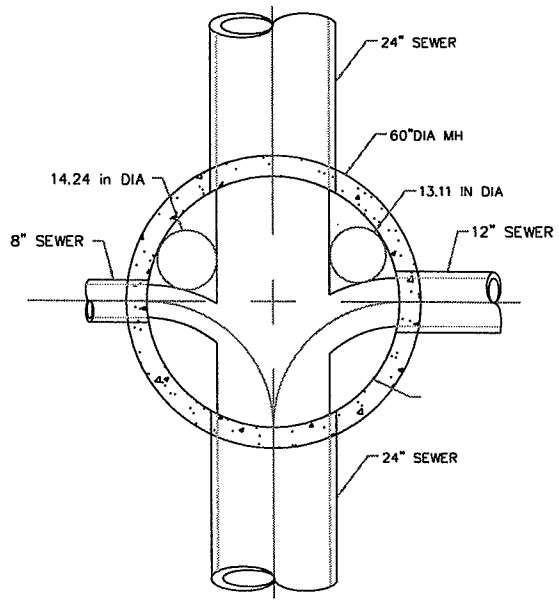
2 OF 4

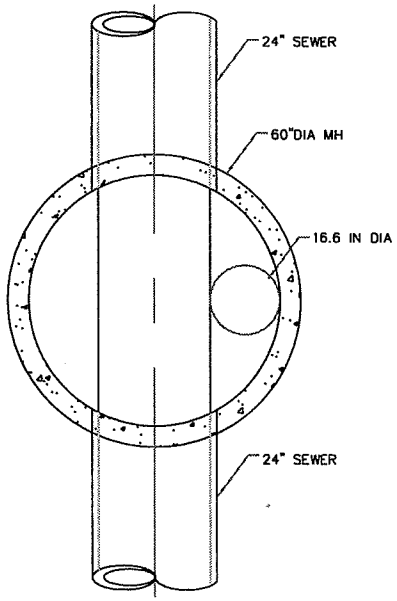
48-IN DIA MH

EASTERN MUNICIPAL WATER DISTRICT	DATE	01/30/2007	SHEET NO	3 OF 4
	PROJECT	SEWER GUIDELINE FOR MANHOLE SIZING		
	WO/CO ACCT NO			
DRAFTED BY	FB	REVIEWED BY	SEVERINO MENDOZA	





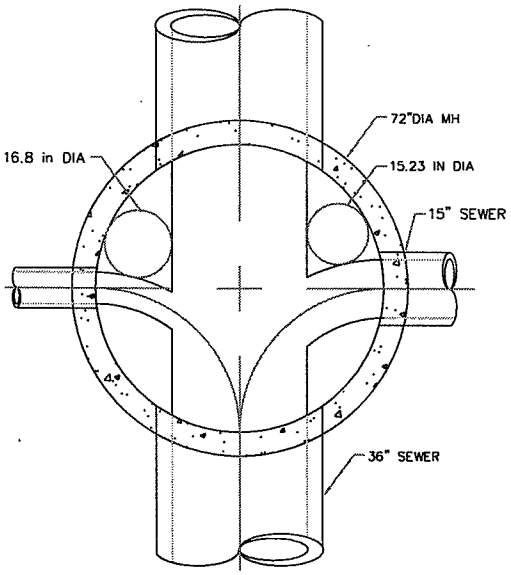


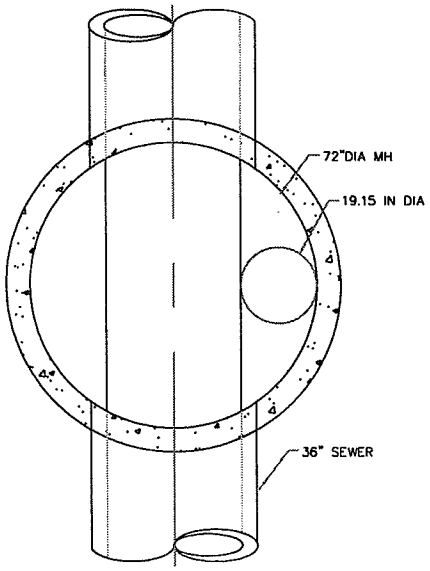


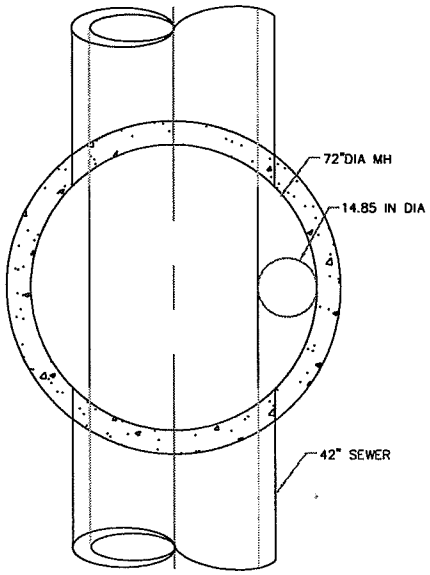
3 OF 4

60–IN DIA MH

EASTERN MUNICIPAL WATER DISTRICT	DATE	01/30/2007	SHEET NO	4 OF 4
	PROJECT	SEWER GUIDELINE FOR MANHOLE SIZING		
	WO/CO ACCT NO			
AFTED BY	FB		REVIEWED BY	SEVERINO MENDOZA







4 OF 4

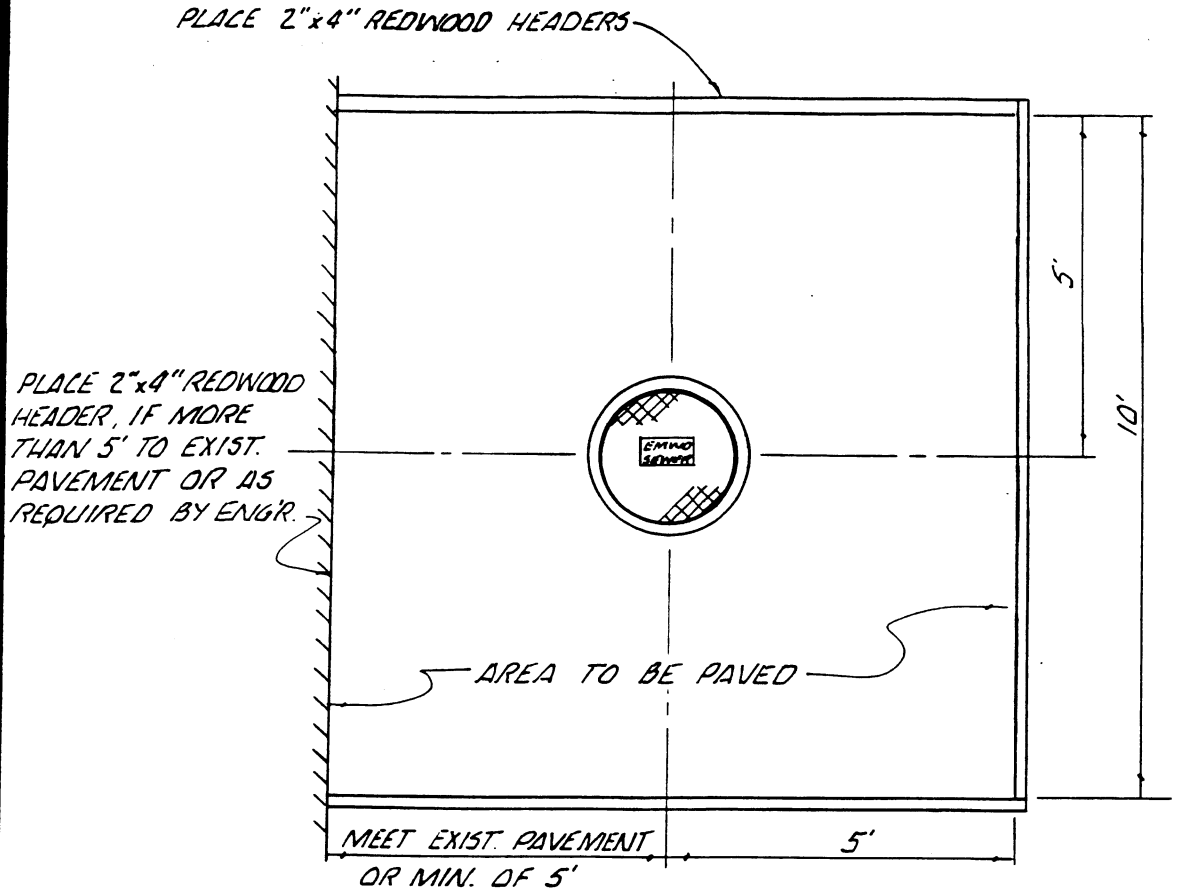
72–IN DIA MH

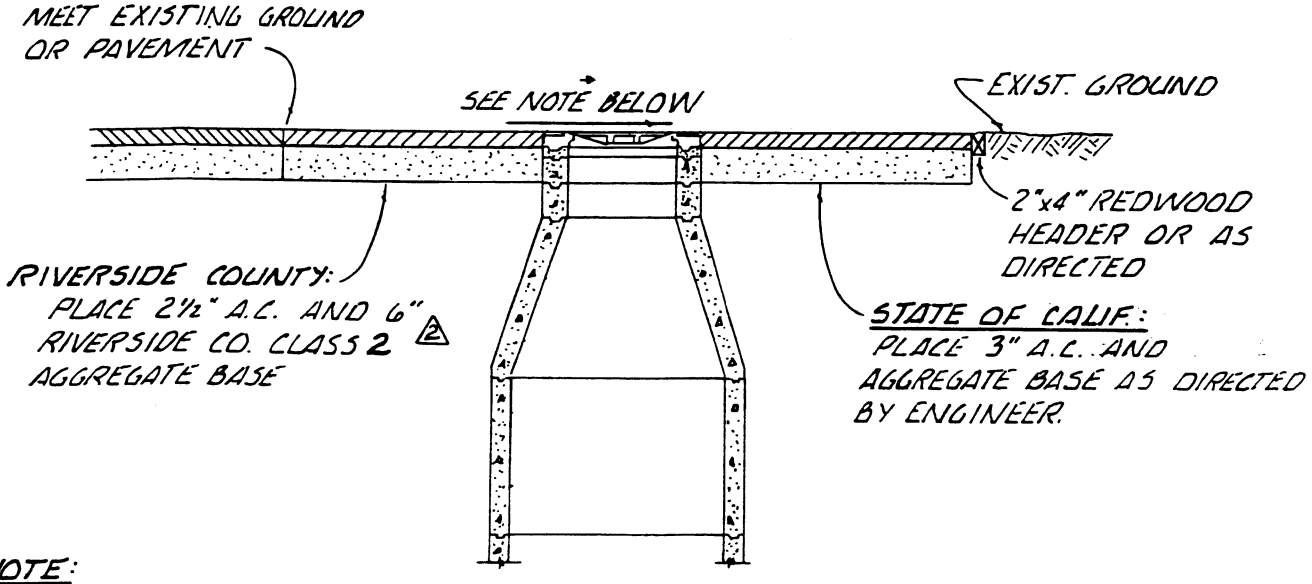
Eastern Municipal Water District
Sewer System Construction

Revision 3/28/18

Sewer Standard Drawings:

Dwg No.	Description	Rev. No.	Rev.Date
SA-47	Paving Detail Around Manholes	2	06/07/96
SA-79	Connecting Dissimilar Sewer Pipes	2	08/04/70
SA-87	Sewer Chimney Lateral	1	11/01/86
SB-8	Locking Type Manhole Cover & Frame	3	03/21/85
SB-30	Reinforced Precast Shallow Manhole	4	07/21/97
SB-49	Pipe Casing (Sewer Main)	3	04/14/10
SB-52	Sewer Cleanouts	1	02/10/97
SB-52A	Sewer Tree Laterals & Cleanout	1	01/25/99
SB-53	Precast Reinforced Concrete, 48" & 60" ID Manhole	4	01/09/03
SB-54	Precast Reinforced Concrete, 60" & 72" ID Flat top	4	02/02/07
SB-58	Terminus Manhole	2	09/22/06
SB-61	Manhole Cover & Frame Standard & Watertight Manholes	4	01/09/03
SB-63	Sewer Connection at Concrete Encasement	5	02/02/93
SB-70	Grease Interceptor with 24" Sampling Box	3	03/27/18
SB-73	36" ID Sampling Manhole Precast Reinforced Concrete	1	02/16/99
SB-75	Sand / Oil Interceptor with 24" Sampling Box	3	03/27/18
SB-157	Pipe Zone Bedding for Sewer Pipe	6	04/23/13
SB-158	Trench Backfill for Sewer Pipe	5	10/15/03
SB-159	Classification of Pipe Zone Bedding for Sewer Pipe	7	04/23/13
SB-176	Sewer Lateral Connections		
SB-177	Sewer Laterals	3	06/29/15
SB-179	48" and 60" Diameter Manhole Installation for HDPE Sewer Main	2	08/14/08





NOTE:
SLOPE WILL CONFORM WITH RIVERSIDE CO. ROAD OR STATE HIGHWAY IMPROVEMENT STANDARDS AND SPECIFICATIONS, AS APPLICABLE, OR MEET EXIST. CONDITIONS AS DIRECTED BY ENGINEER.

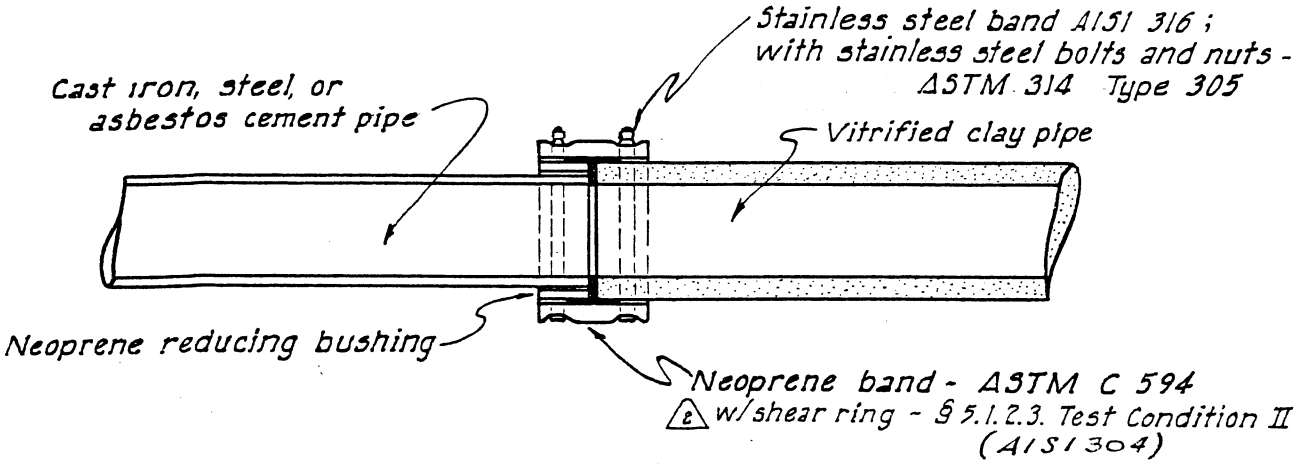
2

REVISIONS	SCALE NONE	INITIAL	DATE
1 REMOVE STEPS	DESIGNED		
	DRAWN	DRK	2-2-76
3/12/91	CHECKED	RS	2-2-76
2 CHG'D BASE 6/7/96	RECOMMENDED		8-9-76
	APPROVED		
	DATE	GEN. MGR. & CHIEF ENG.	

EASTERN MUNICIPAL WATER DISTRICT
RIVERSIDE COUNTY, CALIFORNIA

STANDARD DRAWING
PAVING DETAIL AROUND MANHOLES

SA-47



FLEXIBLE COUPLING
(NON-PRESSURE)

NOTE:

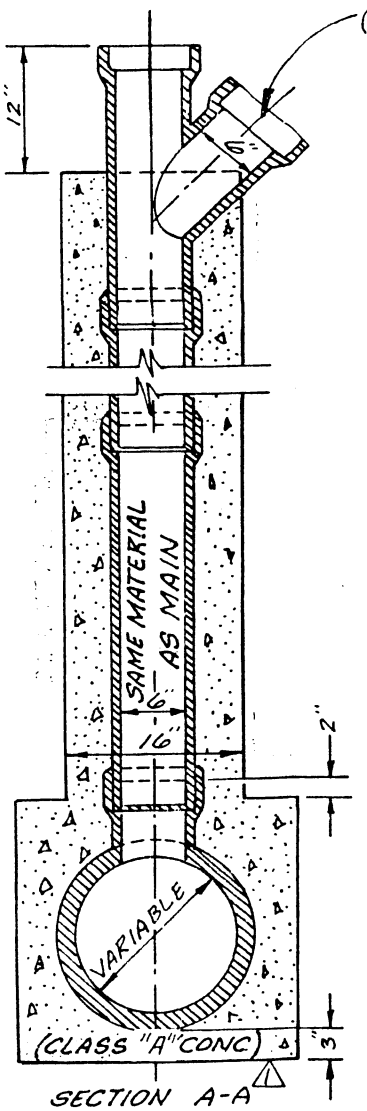
No connection allowable at bell end of V.C.P. ...
Cut bell end off V.C.P. prior to making connection.

REVISIONS	SCALE	None	DATE
1 Redrawn - LAH	DESIGNED	J.H.B.	
2 Revsd band note LAH	DRAWN	McM	8-3-70
	CHECKED	J.V.S	8-4-70
	RECOMMENDED		
	APPROVED		
	GEN MGR. & CHIEF ENG.		

EASTERN MUNICIPAL WATER DISTRICT
RIVERSIDE COUNTY, CALIFORNIA

STANDARD DRAWING
CONNECTING DISSIMILAR
SEWER PIPES

SA - 70



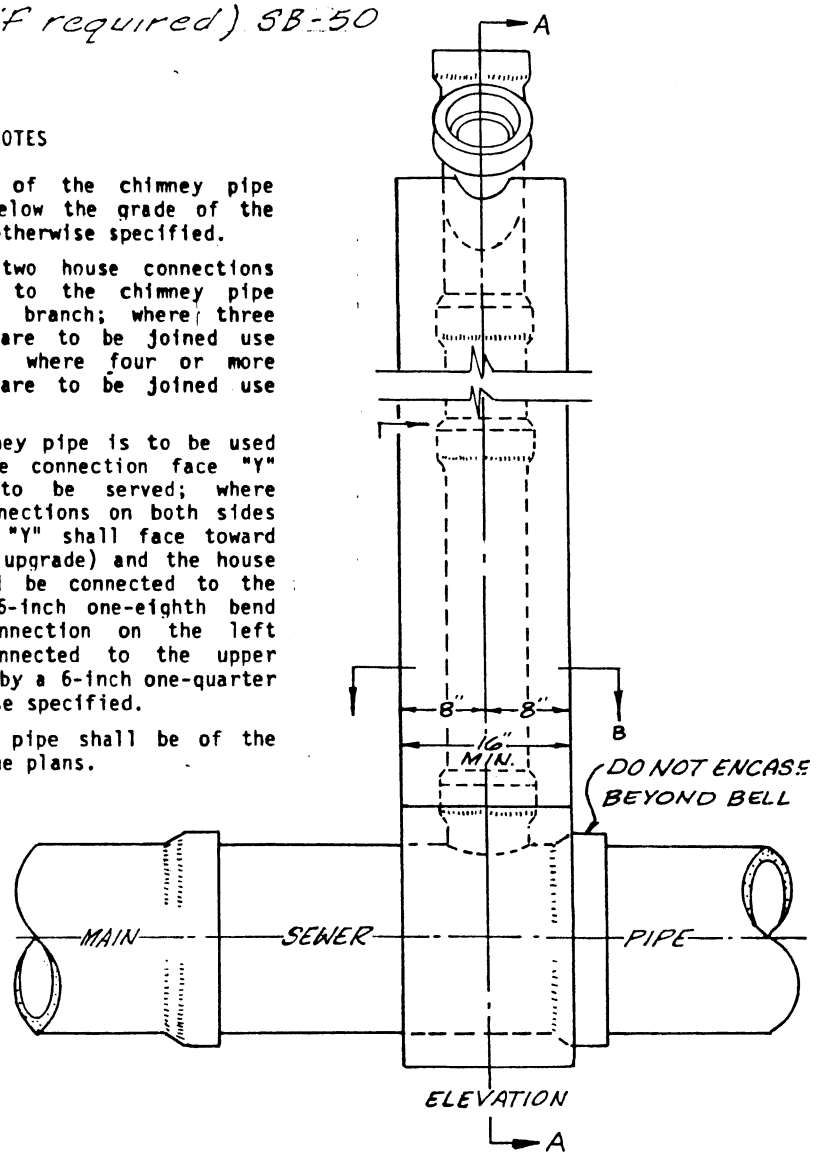
NOTES

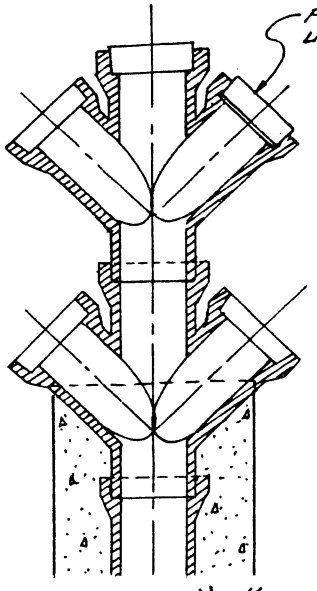
1. The upper end of the chimney pipe shall be 8 feet below the grade of the lower curb, unless otherwise specified.

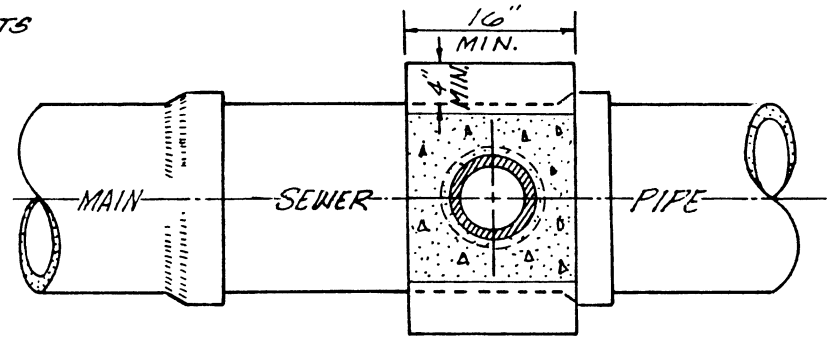
2. Where one or two house connections are to be joined to the chimney pipe use a single "Y" branch; where three house connections are to be joined use double "Y" branch; where four or more house connections are to be joined use Section "C".

3. Where the chimney pipe is to be used for a single house connection face "Y" towards property to be served; where used for house connections on both sides of the sewer, the "Y" shall face toward the right (looking upgrade) and the house on that side shall be connected to the "Y" branch by a 6-inch one-eighth bend and the house connection on the left side shall be connected to the upper end of the chimney by a 6-inch one-quarter bend unless otherwise specified.

4. The main sewer pipe shall be of the material shown on the plans.





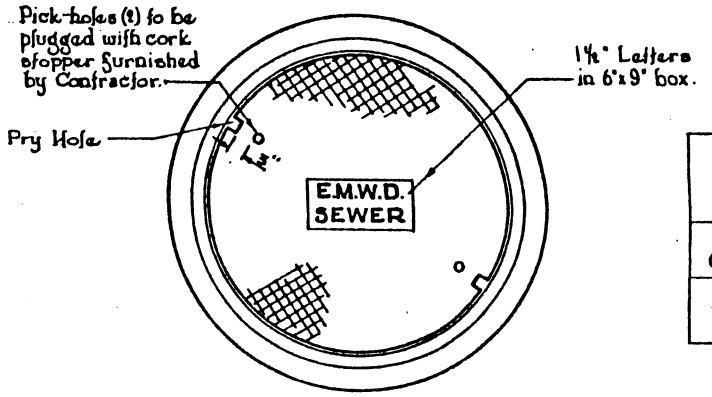


REVISIONS	SCALE	INITIAL	DATE
1 CHANGED CL.C TO SL.P CONC. 11/86	DESIGNED		
	DRAWN G.H. 2/19/82		
	CHECKED		2/[illegible]
	RECOMMENDED		3-13-85
	APPROVED		
	DATE	CHIEF ENG.	

EASTERN MUNICIPAL WATER DISTRICT
RIVERSIDE COUNTY, CALIFORNIA

SEWER CHIMNEY LATERAL STANDARD DRAWING

SA-87

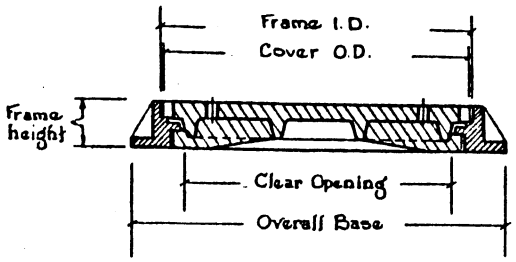


TOP VIEW

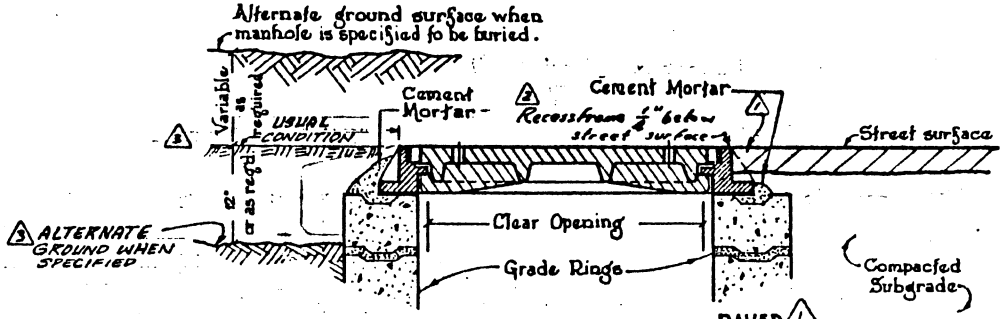
MANHOLE COVER & FRAME REQUIRED DIMENSIONS					
Clear Opening	Cover O.D.	Frame I.D.	Frame Height	Overall Base	Total Wt.
22 ¾"	24"	24 ¼"	4 ⅛"	30 ¼"	365 lbs.

NOTES

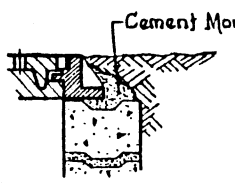
1. Manhole cover shall be designed for A.A.S.H.O. H-20 loading.
2. Cast iron shall have min. tensile strength of 30,000 lb. per sq. in.
3. Manhole cover shall be Alhambra Foundry Co. Type A-1175 for 22¾" dia. (Catlg. 17-Mar.'65) or approved equal.
3 4. Marker posts shall be installed to mark manhole locations in unimproved areas



SECTION



OPEN FIELD



DIRT ROADWAY OR 1 ROAD WAY SHOULDER

3 (Use A.C. Apron on all unimproved roads - (Std. Dwg. SA-47)

SECTION THRU FRAME SHOWING TYPICAL INSTALLATION

REVISIONS				
NO.	DATE	INITIAL	DESCRIPTION	APP'VD
1	1-16-72	M.M	Revised conc. mortar detail on paved rdway	Lmf
2	12-19-79	LAM	Added Alt. No. 2 Collar & ½" recess	Lmf
3	3-21-85	G.H.	Removed Conc. Collar & other Rev.	

REFERENCES

APPROVALS

DESIGN	CONSTRUCTION	OPERATIONS
J.T.S.		MEP 7/1/71

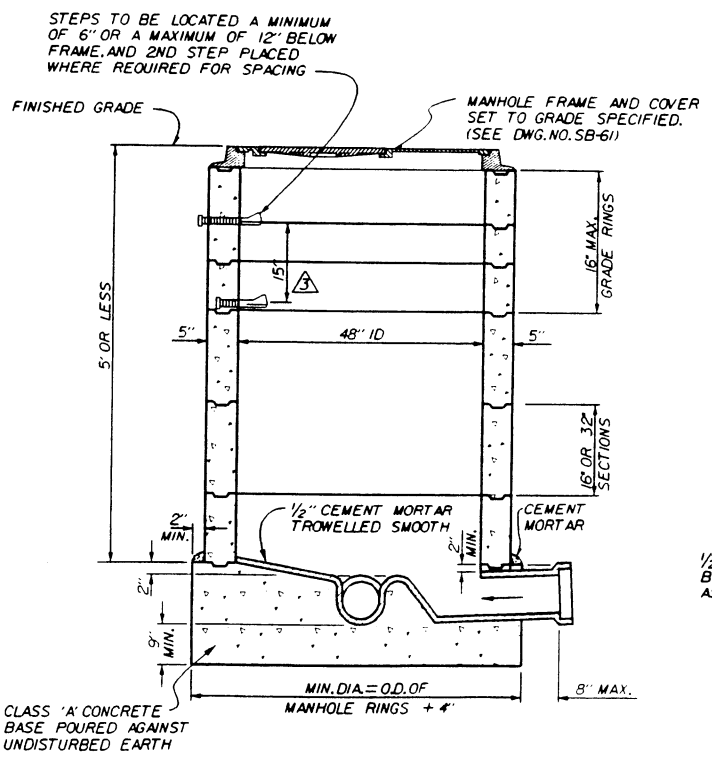
SCALE		DATE
DESIGNED		
DRAWN	SJ	6-21-71
TRACED		
CHECKED		
SUBMITTED	Lmf 7-1-71	
RECOMMENDED		

EASTERN MUNICIPAL WATER DISTRICT
RIVERSIDE COUNTY, CALIFORNIA

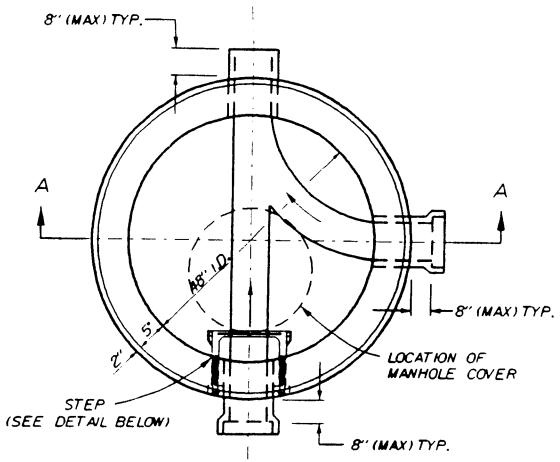
STANDARD DRAWING
LOCKING TYPE
MANHOLE COVER AND FRAME

APPROVED — GENERAL MANAGER & CHIEF ENGINEER

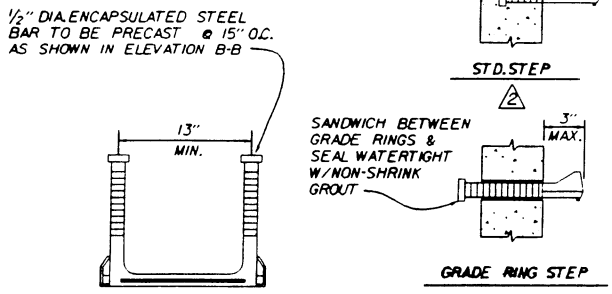
SB-8



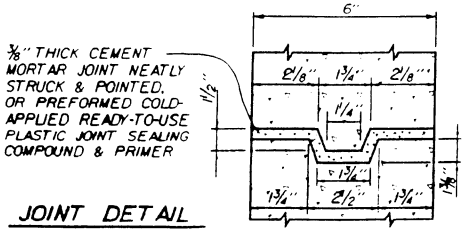
SECTIONAL ELEVATION A-A



BASE PLAN



MANHOLE STEP DETAILS 3



JOINT DETAIL

NOTES

1. REINFORCED PRECAST CONCRETE MANHOLES SHALL CONFORM TO THE APPLICABLE REQUIREMENTS OF A.S.T.M. C-478 AND:
   A. SHALL BE DESIGNED FOR A.A.S.H.O. H-20 LOADING.
   B. CONCRETE SHALL BE COMPACTLY VIBRATED, CENTRIFUGALLY SPUN, OR MECHANICALLY TAMPED.
2. SEWER MAINS ARE TO BE LAID THRU THE MANHOLE WHERE POSSIBLE AND USED AS A FORM FOR THE INVERT. THE TOP 1/2 DIAMETER OF THE PIPE IS TO BE BROKEN OUT TO A NEAT LINE. BROKEN EDGES SHALL BE PLASTERED SMOOTH WITH CEMENT MORTAR.
3. CONCRETE BASE SHALL BE OF CLASS "A" CONCRETE AND PLACED IN ONE OPERATION. CONCRETE INVERTS SHALL BE TRUE TO GRADE AND ALIGNMENT, AND FINISHED WITH A SMOOTH SURFACE. SPECIAL CARE SHALL BE USED IN FORMING ALL CHANNELS TO FACILITATE THE FLOW OF SEWAGE.
4. SHALLOW MANHOLE AS SHOWN HEREON TO BE INSTALLED WHEN DEPTH TO PIPE SHELF IS LESS THAN 5' FROM FINISHED STREET GRADE.
5. SEE DRAWING SB-61 FOR DETAILS AND INSTALLATION OF MANHOLE COVER AND FRAME.
6. MANHOLE STEPS SHALL BE CAST IN PLACE AND ORIENTED 180° FROM MANHOLE OUTLET. GRADE RING STEPS SHALL BE 2 PLACED BETWEEN GRADE RINGS AND GROUTED IN PLACE. 3 BOTTOM STEP TO BE USED AS CLEANING HOOK AND SHALL BE PLACED 6" MIN. AND 12" MAX FROM TOP OF SHELF.

REVISIONS					
NO.	DATE	INITIAL	DESCRIPTION	APP'D	DATE
1	8/6/96	K.E.R.	REDRAWN W/CADD ON MYLAR	VAB	8 7 96
2	11/13/96	K.E.R.	REVISED STEP DETAIL AND NOTE 6	VAB	11/14/96
3	12/11/96	K.E.R.	REVISED STEP DETAIL AND NOTE #6	VAB	12/11/96
4	7/21/97	KER	REVISED SHALLOW MANHOLE	VAB	8/28/97

APPROVALS		
	INITIAL	DATE
DESIGN	C.A.S.	1/20 72
CONSTRUCTION		
INSPECTION		
OPERATIONS		
SUBMITTED	L.M.	4 24 72

EASTERN MUNICIPAL WATER DISTRICT
STANDARD DRAWING

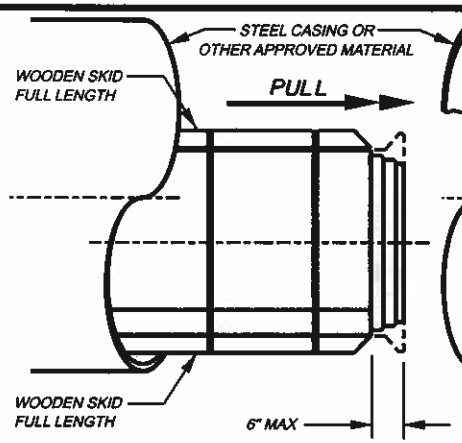
REINFORCED PRECAST SHALLOW MANHOLE

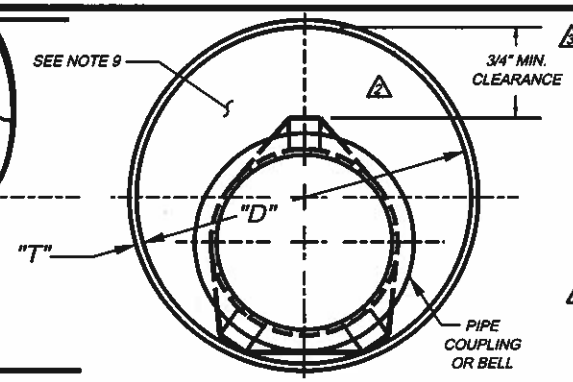
REFERENCES: ORIGINAL SB-30 DRAWN 4-20-72 | SCALE: NONE
FILE I.D.: /USR/KARL/STNDRDS/SB30NEW.DGN | DRAWN BY KER

RECOMMENDED _____ DIRECTOR OF ENGINEERING DATE

APPROVED Doyle F. Boen CHIEF ENGINEER 4/72 DATE

SB-30 4





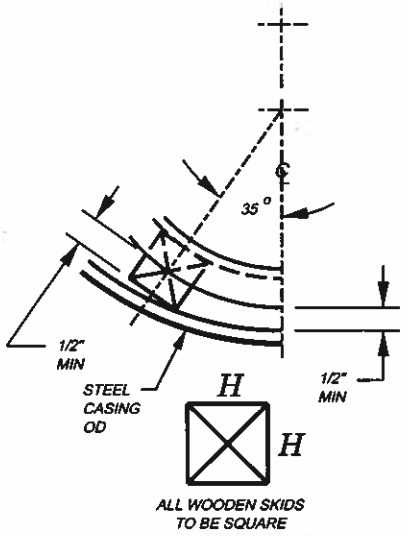


TABLE "A"

	STREETS & HWYS THICKNESS "T" MIN		RAILROADS
DIAMETER "D" (INCHES)	UP TO 150' LENGTH	OVER 150' LENGTH	STEEL THICKNESS "T" (MINIMUM)
4'-10" ID	1/4"	1/4"	4"-12":1/4"
*12"-16" OD	1/4"	1/4"	14"-16":9/32"
18"-20" OD	1/4"	1/4"	18":5/16" 20":11/32"
22" OD	1/4"	1/4"	3/8"
24" OD	1/4"	1/4"	13/32"
26" OD	1/4"	1/4"	7/16"
28" OD	1/4"	1/4"	15/32"
30" OD	3/8"	1/2"	15/32"
32" OD	3/8"	1/2"	1/2"
34"-36" OD	3/8"	1/2"	17/32"
38" OD	3/8"	1/2"	9/16"
40" OD	1/2"	3/4"	9/16"
42" OD	1/2"	3/4"	9/16"
48"-60" OD	1/2"	3/4"	AS REQUIRED
62"-72" OD	3/4"	3/4"	AS REQUIRED

GENERAL NOTES

1. THE STEEL CASING SHALL BE INSTALLED BY MEANS OF JACKING OR DRY BORING, EXCEPT WHERE SPECIFICALLY NOTED ON THE PLANS TO BE INSTALLED BY OPEN TRENCH CONSTRUCTION.
2. CASING DIAMETER SHALL BE A MINIMUM OF 4 INCHES GREATER THAN THE OUTSIDE BELL DIAMETER, AND SEWER PIPE CASING SHALL NOT BE LESS THAN 30 INCHES IN DIAMETER UNLESS SPECIFICALLY NOTED.
3. MINIMUM CASING THICKNESS SPECIFIED IN "TABLE A" IS REQUIRED FOR STEEL CASING IN PLACE, AND DOES NOT ACCOUNT FOR CONSTRUCTION LOADS. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR THE STRUCTURAL SUFFICIENCY OF THE CASING DURING CONSTRUCTION, AND ALSO THE METHOD OF INSTALLATION.
4. GRAVITY SEWER PIPELINES AND PRESSURE PIPELINES SHALL BE SUPPORTED ON PIPE SKIDS SUBJECT TO THE APPROVAL OF THE ENGINEER.
5. ALL SKIDS ARE TO BE SQUARE IN CROSS SECTION AND MAY BE MADE FROM REDWOOD, #2 OR BETTER DOUGLAS FIR, SOUND MATERIAL, TO BE WALMANIZED OR CREOSOTED (REDWOOD NEED NOT BE TREATED).
6. SKIDS SHALL BE ATTACHED TO PIPE BY STRAPPING WITH A STANDARD STRAPPING MACHINE TO HOLD SKIDS IN PLACE DURING PULLING OPERATIONS. USE STAINLESS STEEL BANDS, OR METHOD OF "CLEATING" SKIDS TOGETHER, AS APPROVED.
7. FLEXIBLE PIPE (PVC, ABS, ETC.) SHALL HAVE SPACER GUIDE ALONG ON THE TOP TO PREVENT PIPE FROM FLOATING. PIPE WITHIN CASING TO BE BONDED TOGETHER AT THE JOINTS FOR AN INTEGRAL UNIT PER MANUFACTURER'SRECOMMENDATONS.
   TWO (2) APPROVED FLEXIBLE COUPLINGS SHALL BE USED AT EACH END OF CASING PER SB-63.
8. NOTICE AS REQUIRED BY THE DISTRICT SHALL BE GIVEN PRIOR TO CONSTRUCTION, FOR THE DISTRICT INSPECTION OF CASING PIPE AND CARRIER PIPE INSTALLATION. THE AS BUILT LOCATION AND GRADE OF CASING PIPE SHALL BE APPROVED BY THE DISTRICT PRIOR TO INSTALLATION OF THE CARRIER PIPE. DEPARTURES FROM PLANNED LOCATION OR GRADE OF THE CASING PIPE SHALL REQUIRE A FIELD SURVEY FOR CARRIER PIPE REDESIGN IF FEASIBLE, OR ABANDONMENT IN FAVOR OF A NEW INSTALLATION.
9. THE TOTAL ANNULAR SPACE SHALL BE GROUTED PER EMWD SPEC. SECT. 03604, UNLESS OTHERWISE SPECIFIED ON THE CONSTRUCTION DRAWINGS.

REVISIONS

NO.	DATE	INITIAL	DESCRIPTION	APP'D	DATE
1	1/22/99	GR	REDRAWN W/CADD ON MYLAR	MF	
2	8/29/03	CM	REVISED NOTES & ADDED TOP SKID		8/29/03
3	4/14/10	RE	REVISED NOTE	SMM	04/14/10

APPROVALS

	INITIAL	DATE
DESIGN	JVS	3/21/72
CONSTRUCTION	RLM	
INSPECTION		
OPERATIONS	CAG	
SUBMITTED	LAM	6/29/72

EASTERN MUNICIPAL WATER DISTRICT

EASTERN MUNICIPAL WATER DISTRICT
STANDARD DRAWING

PIPE CASING
SEWER MAIN PIPELINE

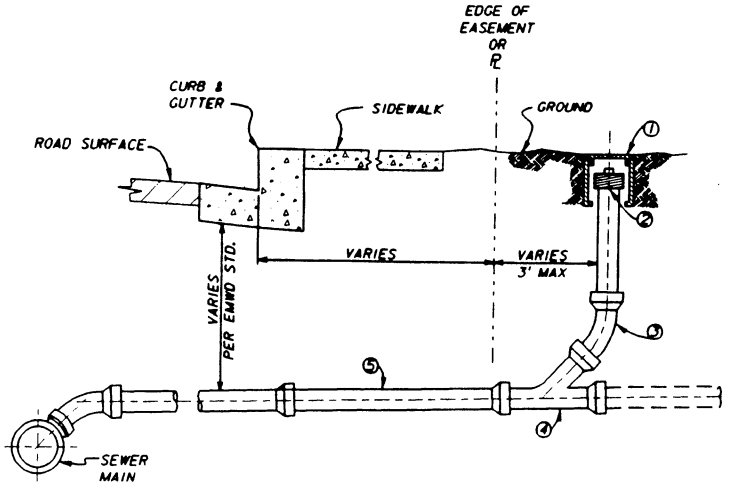
REFERENCES:
FILE I.D.: \kaua\engl\std dwgs\sb49.dgn

SCALE: NONE
DRAWN BY MCM

APPROVED Doyle F. Boen
GENERAL MANAGER AND CHIEF ENGINEER DATE

SB-49

3



MATERIALS LIST

① BROOKS I-RT VALVE BOX MARKED "SEWER", OR APPROVED EQUAL.

② THREADED CAP WITH SQUARE NUT.

③ MINIMUM 3-1/2" SEWER PIPE PER UNIFORM PLUMBING CODE.

④ WYE PER UNIFORM PLUMBING CODE.

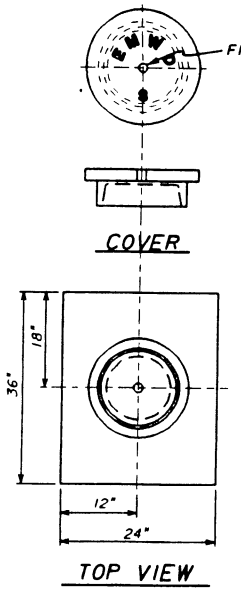
⑤ MINIMUM 4" LATERAL, OR AS SHOWN ON PLANS, PER EMWD STANDARDS.

NOTES

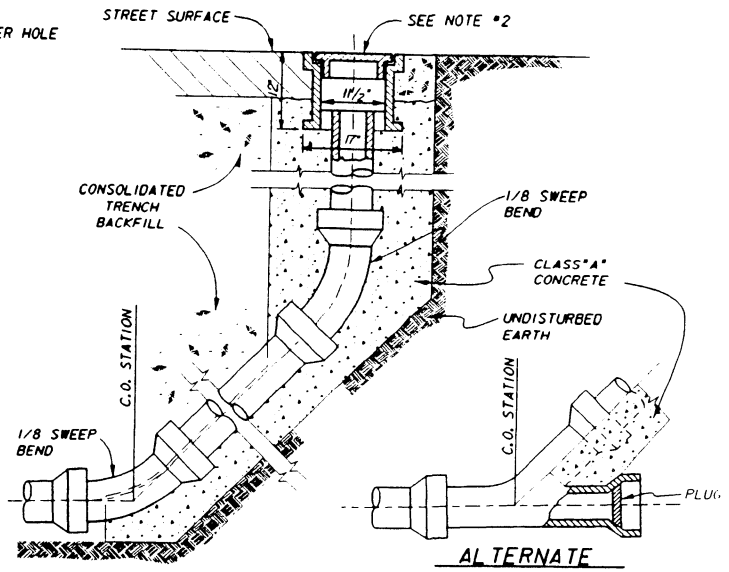
1. PLACE CLEANOUT A MAXIMUM OF 3' BEHIND PROPERTY LINE OR EDGE OF EASEMENT.
2. LID MUST BE CAST IRON FOR LOCATING PURPOSES, MARKED "SEWER"

ON-SITE CLEANOUT

N.T.S.



TOP VIEW



ALTERNATE

FOR LOWER 1/8 BEND, WHERE ORDERED BY ENGINEER OR SHOWN ON PLANS

NOTES

1. CLEANOUT PIPE MUST BE THE SAME DIAMETER AND MATERIAL AS MAIN LINE SEWER.
2. CASTING SHALL BE ALHAMBRA FOUNDRY NUMBER A-1241 OR APPROVED EQUAL.
3. COVER, FRAME, AND CONCRETE PAD ARE TYPICAL FOR 8" I.D. MAIN LINE SEWERS ONLY.
4. USE CLASS "A" CONCRETE THROUGHOUT.
5. PLUGS SHALL BE CEMENTED IN PLACE WITH CEMENT MORTAR OR SHALL BE NEOPRENE PLUG OR APPROVED EQUAL.
6. STATION OF LOWER 1/8 BEND OR WYE SHALL CORRESPOND TO THE CLEANOUT STATION SHOWN ON THE CONSTRUCTION DRAWINGS WITH CLEANOUT CONSTRUCTION EXTENDED BEYOND THAT POINT AS NECESSARY.

MAIN LINE CLEANOUT

N.T.S.

REVISIONS					
NO.	DATE	INITIAL	DESCRIPTION	APP'D	DATE
1	2/10/97	KER	REDRAWN W/CADD ON MYLAR	WB	4/23/98

APPROVALS		
	INITIAL	DATE
DESIGN	SJD	8/63
CONSTRUCTION		
INSPECTION		
OPERATIONS		
SUBMITTED		

EASTERN MUNICIPAL WATER DISTRICT
STANDARD DRAWING

SEWER CLEANOUTS
MAIN LINE & ON-SITE

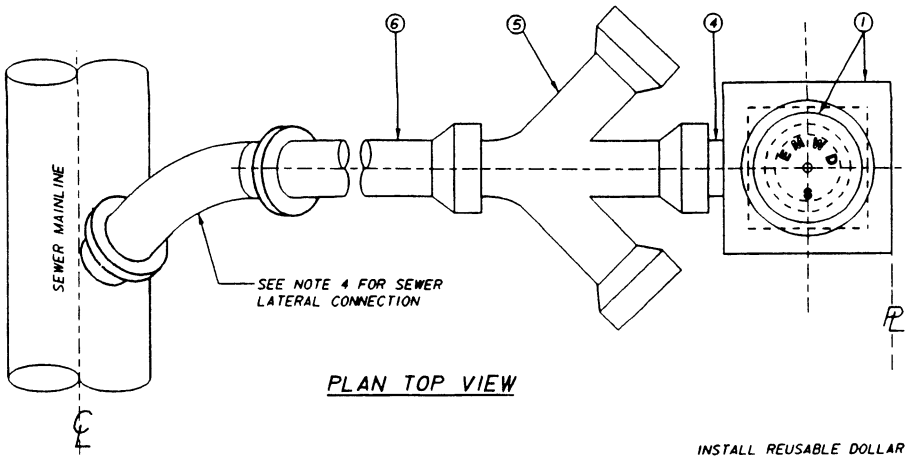
REFERENCES: SUPERCEDES SA-90
FILE I.D.: /USR/KARL/STNDRDS/SB-52

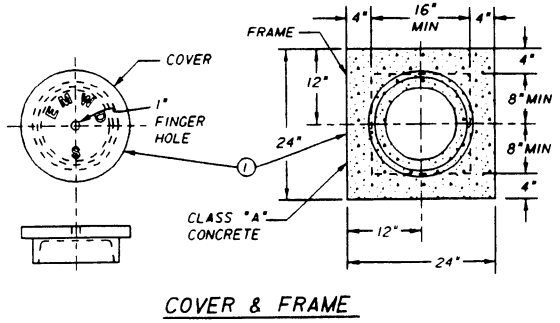
SCALE: NONE
DRAWN BY K.E.R.

RECOMMENDED _____ DIRECTOR OF ENGINEERING DATE

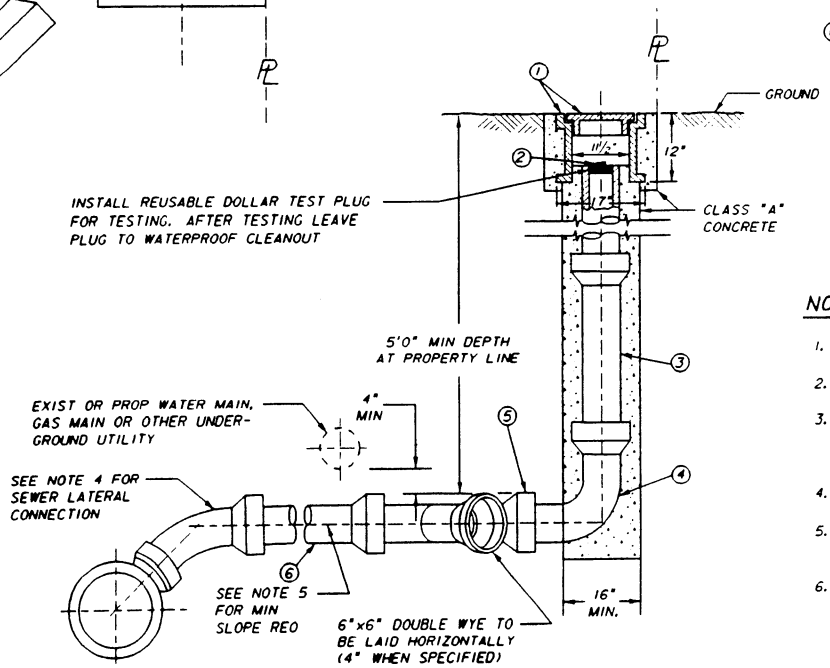
APPROVED Doyle F. Boon CHIEF ENGINEER 8/63 DATE

SB-52





COVER & FRAME



PROFILE

MATERIALS LIST

ITEM NO.	DESCRIPTION
①	CLEANOUT COVER & FRAME ALHAMBRA FOUNDRY A-1241 OR APPROVED EQUAL
②	DOLLAR TEST PLUG
③	6" SEWER PIPE
④	6" 1/4 BEND LONG RADIUS ELBOW OR 4" WHEN SPECIFIED
⑤	6" X 6" DOUBLE WYE OR 4" WHEN SPECIFIED
⑥	6" LATERAL PER SB-177

NOTES

1. ALL MATERIALS MUST BE APPROVED BY EMWD.
2. USE CLASS "A" CONCRETE THROUGHOUT.
3. WYES NOT BEING USED MUST HAVE PLUGS CEMENTED IN PLACE WITH CEMENT MORTAR OR SHALL HAVE NEOPRENE PLUGS OR APPROVED EQUAL.
4. FOR SEWER LATERAL CONNECTIONS SEE SB-176 & SB-177.
5. MINIMUM LATERAL SLOPE MUST BE .020 RISE PER FOOT UNLESS OTHERWISE SPECIFIED ON PLAN AND PROFILE.
6. WYES MUST BE A MINIMUM OF 5'0" DEEP FROM TOP OF SURFACE TO TOP OF WYE AT THE PROPERTY LINE.

REVISIONS				
NO.	DATE	INITIAL	DESCRIPTION	APP'D	DATE
1	1/25/99	GR	REDRAWN W/CADD ON MYLAR	WB	4/29/99

APPROVALS	INITIAL	DATE
DESIGN	JVS	1/24/85
CONSTRUCTION		
INSPECTION	JEW	
OPERATIONS		
SUBMITTED	LAM	3/13/85

EASTERN MUNICIPAL WATER DISTRICT

EASTERN MUNICIPAL WATER DISTRICT
STANDARD DRAWING

SEWER TREE LATERALS AND CLEANOUT

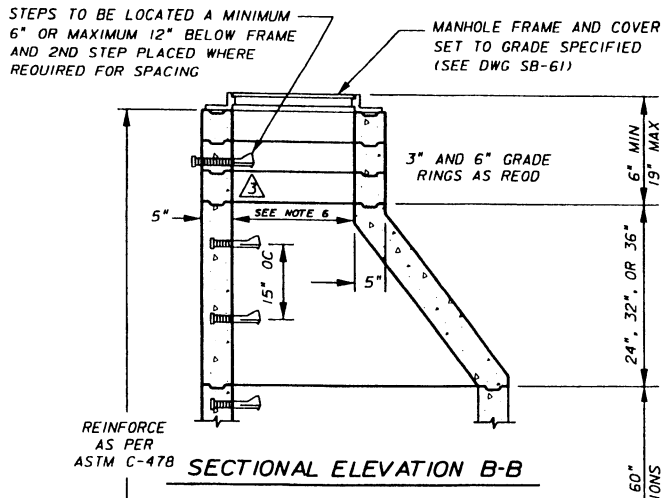
REFERENCES:
FILE I.D.: d_standards: sb52a.dgn

SCALE: NONE
DRAWN BY GH

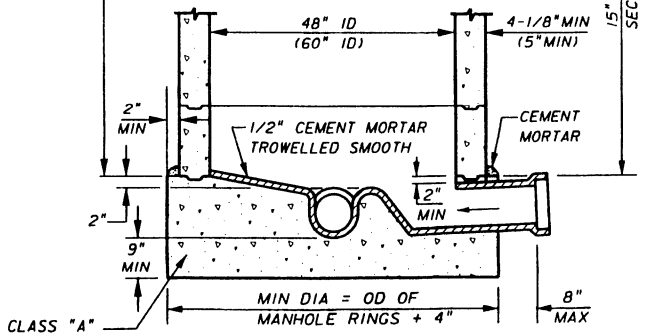
RECOMMENDED _____ DIRECTOR OF ENGINEERING DATE

APPROVED James H. Bunts, Jr. CHIEF ENGINEER 3/13/85 DATE

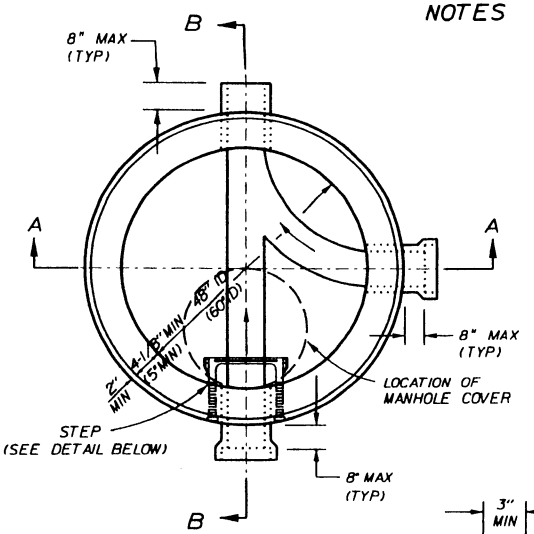
SB-52A 1



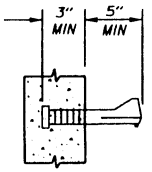
SECTIONAL ELEVATION B-B



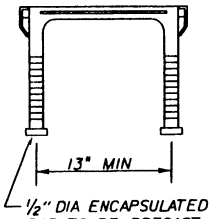
SECTIONAL ELEVATION A-A



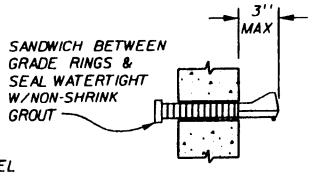
BASE PLAN



STD STEP △2 △3



½" DIA ENCAPSULATED STEEL BAR TO BE PRECAST @ 15" OC AS SHOWN IN ELEVATION B-B



GRADE RING STEP

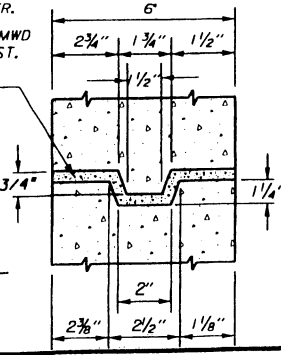
MANHOLE STEP DETAILS △3

NOTES

1. PRECAST REINFORCED CONCRETE MANHOLES SHALL CONFORM TO THE APPLICABLE REQUIREMENTS OF ASTM C-478 AND:
   A. SHALL BE DESIGNED FOR AASHO H-20 LOADING.
   B. CONCRETE SHALL BE COMPACTLY VIBRATED, CENTRIFUGALLY SPUN, OR MECHANICALLY TAMPED.
2. SEWER MAINS ARE TO BE LAID THRU THE MANHOLE WHERE POSSIBLE AND USED AS A FORM FOR THE INVERT. THE TOP 1/2 DIAMETER OF THE PIPE IS TO BE BROKEN OUT TO A NEAT LINE. BROKEN EDGES SHALL BE PLASTERED SMOOTH WITH CEMENT MORTAR.
3. CONCRETE BASE SHALL BE OF CLASS "A" CONCRETE AND PLACED IN ONE OPERATION. CONCRETE INVERTS SHALL BE TO GRADE AND ALIGNMENT AND FINISHED WITH A SMOOTH SURFACE. SPECIAL CARE SHALL BE USED IN FORMING ALL CHANNELS TO FACILITATE THE FLOW OF SEWAGE.
4. ALL MANHOLE TOPS SHALL BE INSTALLED WITH THE MANHOLE COVER OVER THE UPSTREAM INLET, EXCEPT AS OTHERWISE SPECIFIED.
5. SEE DRAWING SB-61 FOR DETAILS AND INSTALLATION OF MANHOLE COVER AND FRAME.
6. CONTRACTOR TO USE MANHOLES WITH A 24" CLEAR OPENING FOR SEWERS 24" DIA AND SMALLER AND 36" CLEAR OPENING FOR SEWERS LARGER THAN 24" DIA UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
7. STANDARD 48" & 60" MANHOLES AS SHOWN HEREON TO BE INSTALLED WHEN DEPTH TO PIPE SHELF IS GREATER THAN 5' FROM FINISHED STREET GRADE.
8. MANHOLE STEPS SHALL BE EITHER CAST IN PLACE OR M.A. INDUSTRIES STEEL REINFORCED COPOLYMER POLYPROPYLENE PLASTIC DRIVE-IN STEP. INSTALLATION TO BE BY MANHOLE MANUFACTURER. ALL STEPS ORIENTED 180° FROM MANHOLE OUTLET. GRADE RING STEPS SHALL BE PLACED BETWEEN GRADE RINGS AND GROUTED IN PLACE. BOTTOM STEP SHALL BE CAST IN PLACE TO BE USED AS CLEANING HOOK AND SHALL BE PLACED 6" MIN AND 12" MAX FROM TOP OF SHELF.
9. DIMENSIONS PERTAINING TO 60" ID REINFORCED MANHOLES SHOWN IN PARENTHESES (X").
10. JOINT SHALL BE 3/8" THICK CEMENT MORTAR NEATLY STRUCK AND POINTED OR PREFORMED COLD-APPLIED READY-TO-USE PLASTIC JOINT SEALING COMPOUND AND PRIMER.

△2 △3 △4

NOTE: ALL MATERIALS TO BE PER EMWD APPROVED MATERIALS LIST.



JOINT DETAIL

REVISIONS					
NO.	DATE	INITIAL	DESCRIPTION	APP'D	DATE
△1	8/6/96	KER	REDRAWN W/CADD ON MYLAR	VJB	8/7/96
△2	11/13/96	KER	REVISED STEP DETAIL AND NOTE 8	VJB	11/14/96
△3	12/11/96	KER	REVISED STEP DETAIL AND NOTE 8	VJB	12/11/96
△4	1/9/03	C.M.	REVISED NOTE 8, M.A. IND. DRIVE-IN STEP	VJB	10/15/03

APPROVALS		
	INITIAL	DATE
DESIGN	M.M	1/31/67
CONSTRUCTION		
INSPECTION		
OPERATIONS		
SUBMITTED	LM	

REFERENCES: ORIGINAL SB-53 DRAWN 1-31-67

FILE I.D.: \\niagra ap\eng\std wgs\sb53.dgn

SCALE: NONE

DRAWN BY KER

EASTERN MUNICIPAL WATER DISTRICT

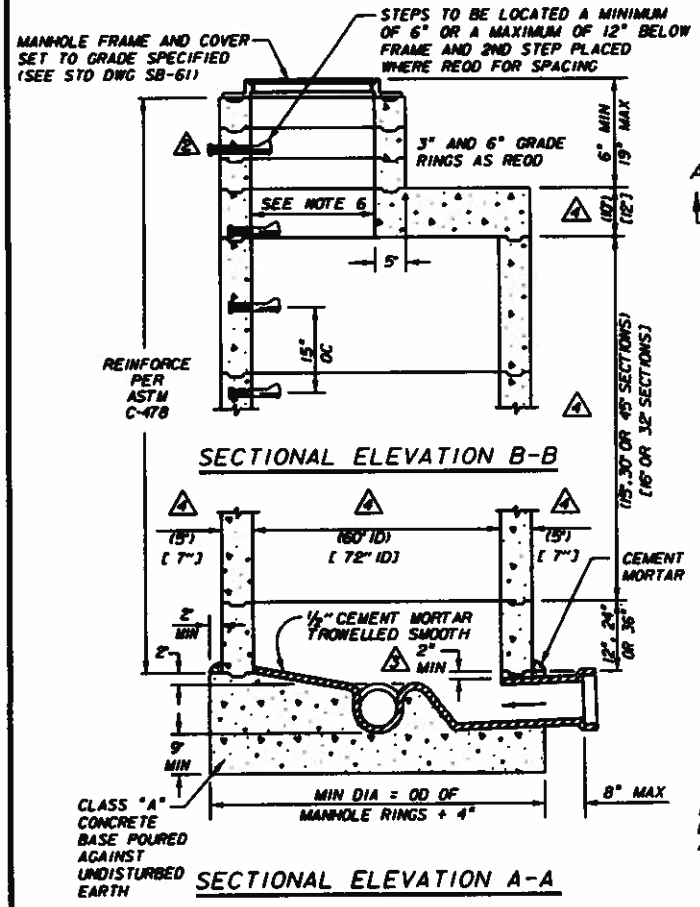
EASTERN MUNICIPAL WATER DISTRICT

EASTERN MUNICIPAL WATER DISTRICT
STANDARD DRAWING

PRECAST REINFORCED CONCRETE STANDARD 48" & 60" I.D. MANHOLE

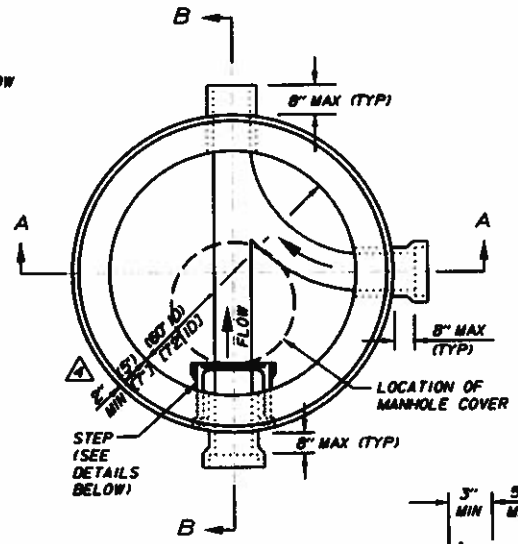
APPROVED Doyle F. Boen CHIEF ENGINEER 1/67 DATE

SB-53 △4

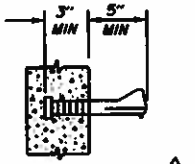


SECTIONAL ELEVATION B-B

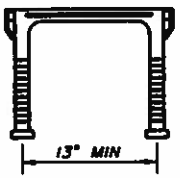
SECTIONAL ELEVATION A-A



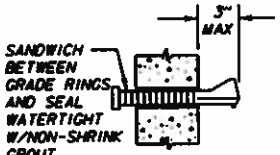
BASE PLAN



STANDARD STEP



1/2" DIA ENCAPSULATED STEEL BAR TO BE PRECAST @ 15" OC AS SHOWN IN ELEVATION B-B

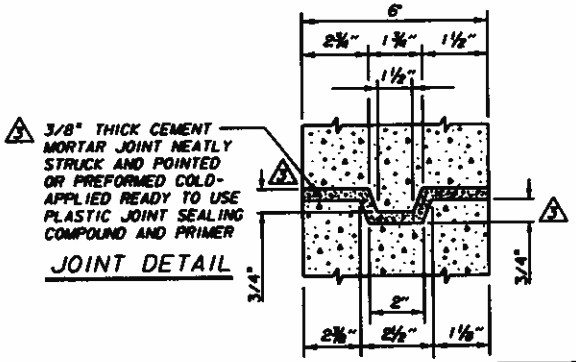


GRADE RING STEP

MANHOLE STEPS DETAILS

NOTES

1. PRECAST REINFORCED CONCRETE MANHOLES SHALL CONFORM TO APPLICABLE REQUIREMENTS OF ASTM C-478 AND:
   A. SHALL BE DESIGNED FOR AASHO H-20 LOADING.
   B. CONCRETE SHALL BE COMPACTLY VIBRATED, CENTRIFUGALLY SPUN, OR MECHANICALLY TAMPED.
2. SEWER MAINS ARE TO BE LAID THRU THE MANHOLE WHERE POSSIBLE AND USED AS A FORM FOR THE INVERT. THE TOP 1/2 DIAMETER OF THE PIPE IS TO BE BROKEN OUT TO A NEAT LINE. BROKEN EDGES SHALL BE PLASTERED SMOOTH WITH CEMENT MORTAR.
3. CONCRETE BASE SHALL BE OF CLASS "A" CONCRETE AND PLACED IN ONE OPERATION. CONCRETE INVERTS SHALL BE TO GRADE AND ALIGNMENT AND FINISHED WITH A SMOOTH SURFACE. SPECIAL CARE SHALL BE USED IN FORMING ALL CHANNELS TO FACILITATE THE FLOW OF SEWAGE.
4. ALL MANHOLE TOPS SHALL BE INSTALLED WITH THE MANHOLE COVER OVER THE UPSTREAM INLET, EXCEPT AS OTHERWISE SPECIFIED.
5. SEE DWG SB-61 FOR DETAILS AND INSTALLATION OF MANHOLE COVER AND FRAME.
6. CONTRACTOR TO USE MANHOLES WITH A 24" CLEAR OPENING FOR SEWERS 24" DIA AND SMALLER AND 36" CLEAR OPENING FOR SEWERS LARGER THAN 24" UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
7. MANHOLE STEPS SHALL BE CAST IN PLACE AND ORIENTED 180° FROM MANHOLE OUTLET. GRADE RING STEPS SHALL BE PLACED BETWEEN GRADE RINGS AND GROUTED IN PLACE. BOTTOM STEP TO BE USED AS CLEANING HOOK AND SHALL BE PLACED 6" MIN AND 12" MAX FROM TOP OF SHELF.
8. DIMENSIONS PERTAINING TO 60" ID REINFORCED MANHOLES SHOWN IN PARENTHESES (X"). DIMENSIONS PERTAINING TO 72" ID REINFORCED MANHOLES SHOWN IN BRACKETS [X"].



JOINT DETAIL

REVISIONS					
NO.	DATE	INITIAL	DESCRIPTION	APP'D	DATE
1	11/14/96	KER	REDRAWN W/CADD ON MYLAR	VJB	11/14/96
2	12/11/96	KER	REVISED STEP DETAIL AND NOTE #8	VJB	12/11/96
3	9/22/06	RE.	REVISED NOTE #3 & JOINT DETAIL DIMENSIONS	JM	9/25/06
4	2/2/07	RE.	REVISED NOTE #7 & SECTIONAL ELEVATIONS	JM	2/12/06

APPROVALS		
	INITIAL	DATE
DESIGN	JLS	1/30/67
ELEC. SERV.		
MECH. SERV.		
OPERATIONS		
FIELD SERV.		

REFERENCES: ORIGINAL SB-54 DRAWN 1/30/67
FILE I.D.: KAUAI/ENG/STD/DWG/SB-57.DGN
SCALE: AS SHOWN
DRAWN BY KER

EASTERN MUNICIPAL WATER DISTRICT

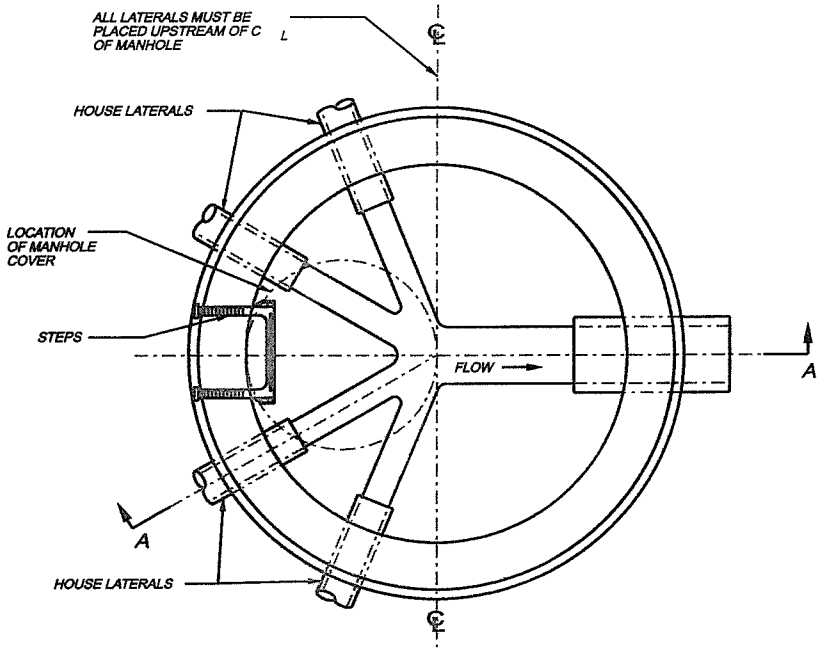
EASTERN MUNICIPAL WATER DISTRICT
RIVERSIDE COUNTY, CALIFORNIA

PRECAST REINFORCED CONCRETE 60" & 72" ID FLAT TOP MANHOLE

APPROVED Doyle F. Boen, DIRECTOR OF MAINTENANCE 1/67 DATE

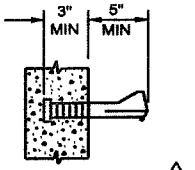
SB-54

4

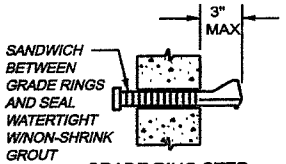


PLAN

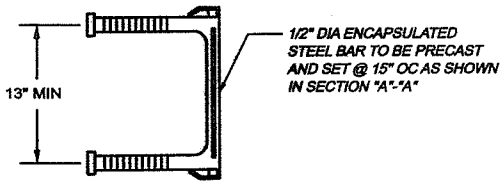
TERMINUS MANHOLE WITH HOUSE LATERALS



STANDARD STEP 1



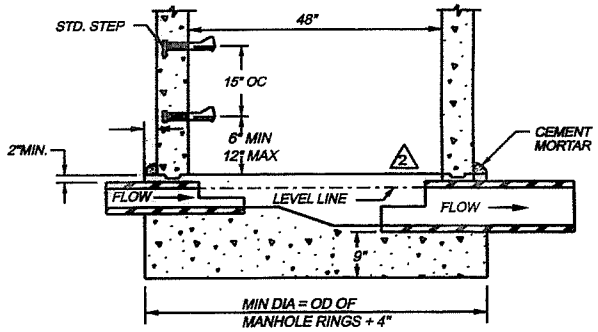
GRADE RING STEP



MANHOLE STEP DETAILS

NOTES

1. REFER TO STANDARD DRAWINGS OF MANHOLES FOR DETAILS PERTAINING TO MANHOLES ONLY.
2. THE TOP ONE-HALF DIAMETER OF THE PIPE IS TO BE BROKEN OUT TO A NEAT LINE. BROKEN EDGES SHALL BE PLASTERED SMOOTH WITH CEMENT MORTAR.
3. 2 THE MAXIMUM NUMBER OF LATERALS INTO A TERMINUS MANHOLE SHALL BE LIMITED TO FOUR.



SECTION "A"-"A"

REVISIONS					
NO.	DATE	INITIAL	DESCRIPTION	APP'D	DATE
1	2/3/99	GR	REDRAWN W/CADD ON MYLAR	VJB	4/29/99
2	9/22/06	R.E.	REVISED #3 NOTE & LEVEL LINE DETAIL A-A	KM	9/26/06

APPROVALS		
	INITIAL	DATE
DESIGN	JVS	3/27/86
ELEC.SERV.	JEW	
MECH.SERV.		
OPERATIONS	DWH	
FIELD SERV.	LAM	5/13/86

EASTERN MUNICIPAL WATER DISTRICT

EASTERN MUNICIPAL WATER DISTRICT
RIVERSIDE COUNTY, CALIFORNIA

TERMINUS MANHOLE WITH LATERALS

REFERENCES: ORIG DRAWN 3/27/86
FILE I.D.: KAUAI/ENG/STD/DWG

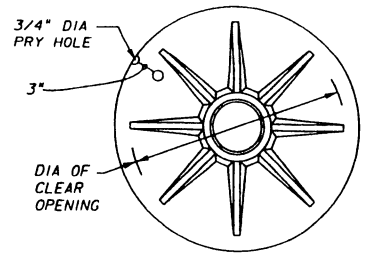
SCALE: AS SHOWN
DRAWN BY: SKD

APPROVED James H. Bunts, Jr. May 15, 1986
DIRECTOR OF MAINTENANCE DATE

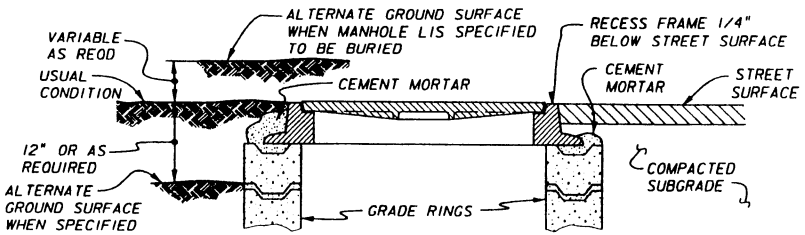
SB-58

2

sb58v7.dgn 9/25/2006 11:51:10 AM



BOTTOM VIEW



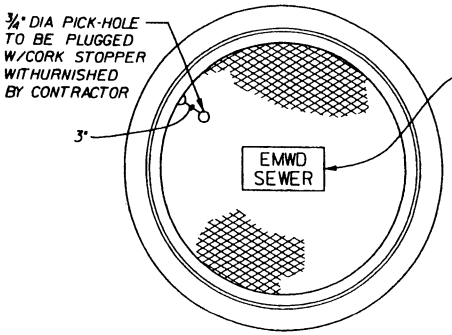
OPEN FIELD
REQUIRES LOCKING MANHOLE COVER (SEE DWG SB-8)

PAVED ROADWAY

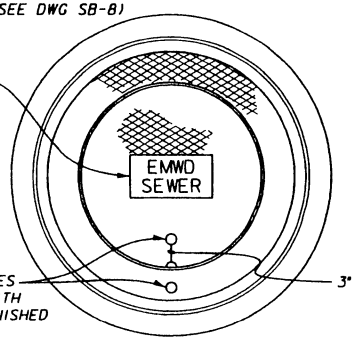
NOTES

1. MANHOLE COVER SHALL BE DESIGNED FOR AASHO H-20 LOADING.
2. CAST IRON SHALL HAVE A MINIMUM TENSILE STRENGTH OF 3000 LBS PER SQUARE INCH.
3. MANHOLE COVER SHALL BE ALHAMBRA FOUNDRY CO TYPE A-1254 FOR 24" CLEAR OPENING OR A-1325 FOR 36" CLEAR OPENING WITH A TWO-PIECE COVER ASSEMBLY (OR APPROVED EQUAL).
4. MARKER POSTS SHALL BE INSTALLED TO MARK MANHOLE LOCATIONS IN UNIMPROVED AREAS.
5. CONTRACTOR TO USE MANHOLES WITH 24"CLEAR OPENING FOR SEWERS 24" DIA AND SMALLER AND 36" CLEAR OPENING FOR SEWERS LARGER THAN 24" DIA UNLESS OTHERWISE DIRECTED BY ENGINEER.
6. USE TWO-PIECE COVER ASSEMBLY FOR 36" CLEAR OPENING UNLESS OTHERWISE DIRECTED BY ENGINEER.
7. ONE-PIECE COVER SHOWN HERE IS FOR 24" CLEAR OPENING FOR 36" CLEAR OPENING REFER TO MANUFACTURER'S CATALOG.
8. USE TWO-PIECE SHALLOW MH COVER BY SOUTH BAY FOUNDRY SBF-1348 (OR APPROVED EQUAL) FOR SHALLOW MANHOLES PER SB-30.

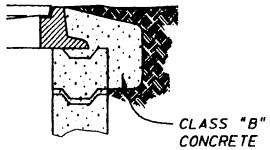
△3 △2



TOP VIEW



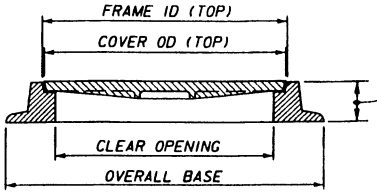
TOP VIEW
TWO-PIECE COVER



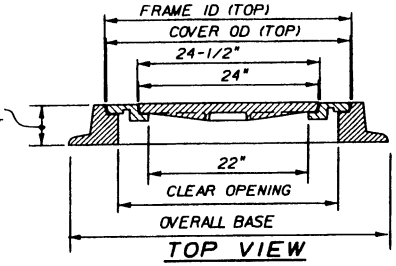
ROADWAY SHOULDER OR DIRT ROADWAY
USE AC APRON ON ALL UNIMPROVED ROADS (SEE STD DWG SA-47)

△4

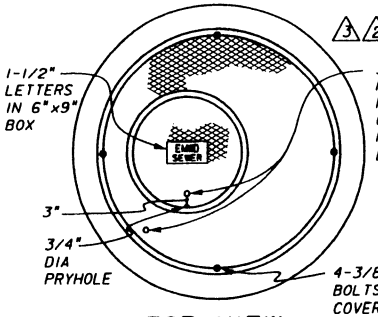
MANHOLE COVER & FRAME REQUIRED DIMENSIONS					
CLEAR OPENING	COVER O.D.	FRAME I.D.	FRAME HEIGHT	OVERALL BASE	TOTAL WEIGHT
24"	25-1/2"	25-3/4"	3-1/2"	32"	305 LBS.
36"	38"	38-1/4"	6"	44"	600 LBS.
36" TWO PIECE	38-1/8"	38-5/8"	6"	44"	850 LBS.
△3 △2 2-PC SHALLOW MH COVER	50½"	50¾"	4-1/2"	58"	1320 LBS.



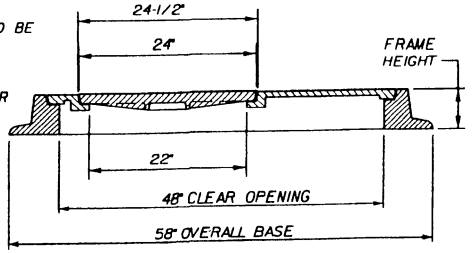
SECTION



TOP VIEW



△3 △2 TWO-PIECE SHALLOW MH COVER



△3 △2 TWO-PIECE SHALLOW MH COVER

REVISIONS					
NO.	DATE	INITIAL	DESCRIPTION	APP'D	DATE
1	10/19/95	KER	REDRAWN WITH CADD ON MYLAR	VJB	10/95
2	8/6/96	KER	ADDED 2-PC RECTANGULAR COVER	VJB	8/7/96
3	7/21/97	KER	REVISED SHALLOW MH COVER	VJB	10/28/97
4	1/9/03	C.M.	REVISE 24" COVER & FRAME I.D.	VJB	10/15/03

APPROVALS		
	INITIAL	DATE
DESIGN		
CONSTRUCTION		
INSPECTION		
OPERATIONS	LM	10/23/95
SUBMITTED	VJB	10/20/95

EASTERN MUNICIPAL WATER DISTRICT

EASTERN MUNICIPAL WATER DISTRICT
STANDARD DRAWING

MANHOLE COVER AND FRAME STANDARD & WATERTIGHT MANHOLES

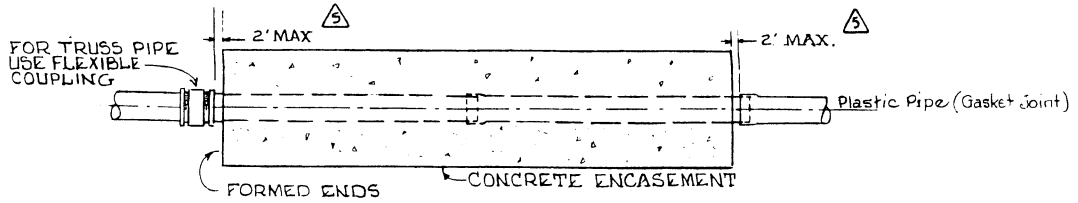
REFERENCES:
FILE I.D.: \\nlagra ap\eng\std dwgs\sb61.dgn

SCALE: NONE
DRAWN BY K.E.R.

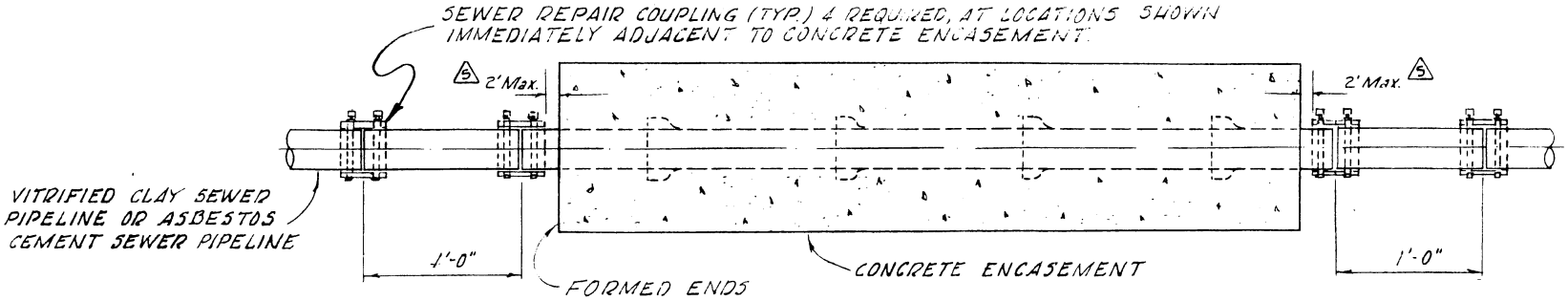
RECOMMENDED Joseph D. Van Sickle 10/20/95
DIRECTOR OF ENGINEERING DATE

APPROVED G. Hooite Rugge 10/20/95
CHIEF ENGINEER DATE

SB-61 △4



4 PLAN VIEW
PLASTIC PIPE



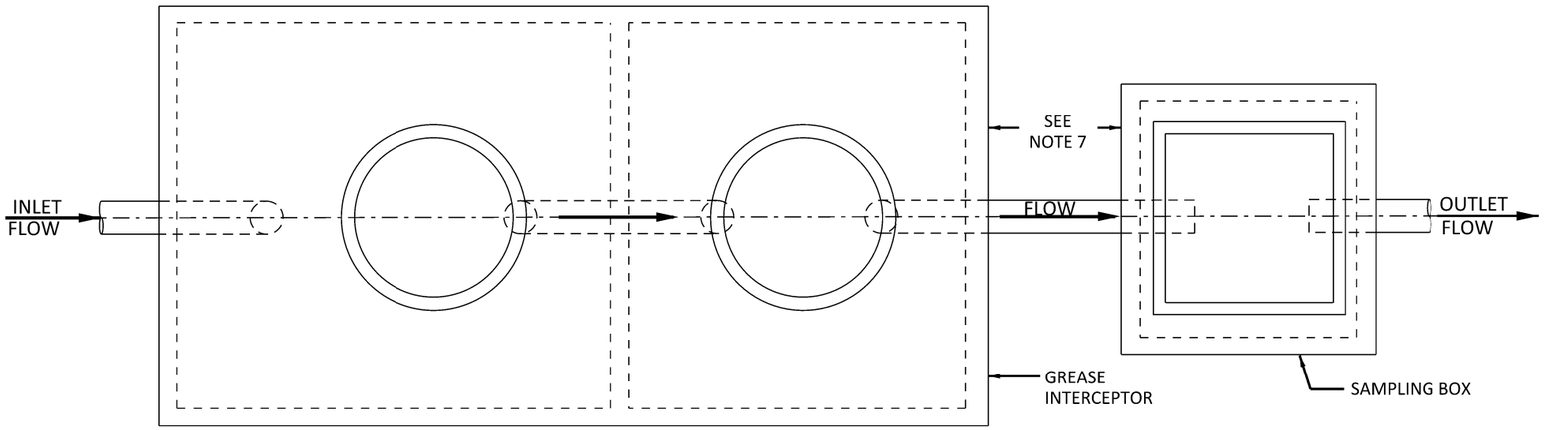
PLAN VIEW
V.C.P. OR A.C.P.

NOTES FOR V.C.P. OR A.C.P. :

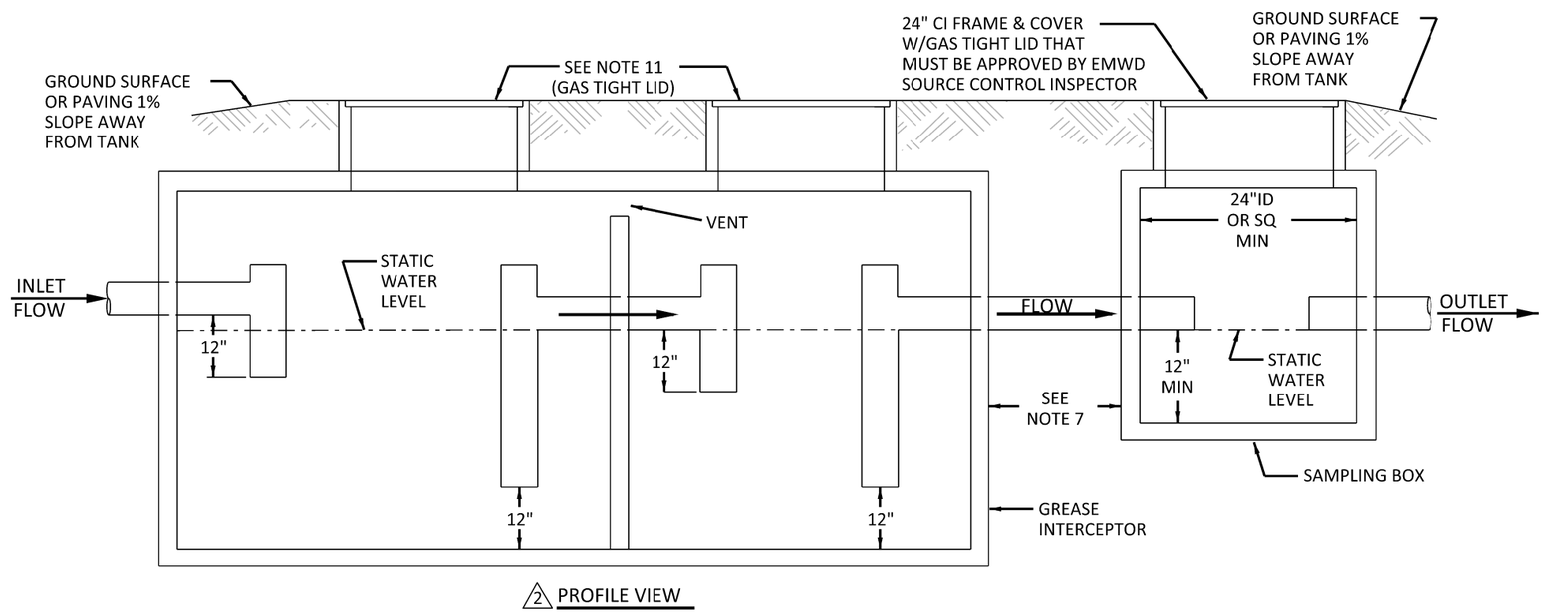
1. NO CONNECTION ALLOWABLE AT BELL END OF V.C.P OR A.C.P.; CUT BELL END OFF PIPE PRIOR TO MAKING CONNECTION.
2. SEWER REPAIR COUPLING SHALL BE REPAIR COUPLING WITH SHEAR RING AS MANUFACTURED BY MISSION CLAY PRODUCTS, OR APPROVED EQUAL, IN CONFORMANCE WITH THE REQUIREMENTS OF A.S.T.M.C 594 § 5.1.2.3. THE COMPRESSION BANDS AND CLIPS SHALL BE FABRICATED FROM STAINLESS STEEL AISI TYPE 316. AND THE BOLTS & NUTS FROM STAINLESS STEEL AISI TYPE 305, AND THE SHEAR RING FROM STAINLESS STEEL AISI TYPE 304.

REVISIONS					REFERENCES				EASTERN MUNICIPAL WATER DISTRICT
NO.	DATE	INITIAL	DESCRIPTION	APP'VD		SCALE	NONE	DATE	RIVERSIDE COUNTY, CALIFORNIA
1 & 2	10-29-70	H.S	GENERAL REVISIONS	[illegible]		DESIGNED	LAM		STANDARD DRAWING
3	2-16-73	MoM	REVSD TO SAY "PLAN VIEW"	[illegible]		DRAWN	H. S.	9-10-70	SEWER CONNECTION AT CONC. ENCASM'T
4	4-10-79	SBJ	Added Plastic Pipe	[illegible]		TRACED			V.C.P., A.C.P GRAVITY SEWER & PLASTIC GRAVITY SEWER
5	2-2-93	CFW	REVISED DISTANCE BETWEEN FLEX CPLG. AND CONC. ENCASEMENT	[illegible]		CHECKED			
					APPROVALS	SUBMITTED	[illegible]		
					DESIGN / CONSTRUCTION / OPERATIONS	RECOMMENDED			APPROVED [illegible] GENERAL MANAGER & CHIEF ENGINEER

SD - 63 5



2 PLAN VIEW



2 PROFILE VIEW

NOTES

1. STRUCTURES SHALL BE INSTALLED TO ALLOW ACCESS FOR MAINTENANCE OR INSPECTION AT ALL TIMES.
2. WHERE SUBJECT TO VEHICLE LOADING, DESIGN ADEQUACY SHALL BE SUBSTANTIATED AND STRUCTURE SHALL BE PLACED ON SUITABLE BASE OF COMPACTED SOIL OR UNDISTURBED EARTH.
3. ALL SURFACE WATER MUST DRAIN AWAY FROM THE SAMPLING BOX AND INTERCEPTOR TO EXCLUDE RAIN WATER FROM THE SEWER SYSTEM.
4. FLOW TO THE SAMPLING BOX AND/OR INTERCEPTOR SHALL EXCLUDE ALL SANITARY SEWAGE AND SURFACE DRAINAGE.
5. EACH INSTALLATION IS SUBJECT TO REVIEW BY EMWD FOR ADEQUATE CAPACITY PRIOR TO CONSTRUCTION.
6. INSPECTION COVERS SHALL BE BROUGHT TO GRADE TO PERMIT VISUAL INSPECTION OF INTERNAL FITTINGS, WITH RISERS AS REQUIRED.
3 7. SAMPLING BOX SHALL BE A MINIMUM OF 24" ID OR 24" SQUARE AND MUST RETAIN A STATIC WATER LEVEL OF 12". SAMPLING BOX MAY BE ATTACHED OR AT A VARIABLE DISTANCE FROM THE INTERCEPTOR AND MUST BE APPROVED BY EMWD SOURCE CONTROL INSPECTOR.
3 8. EACH CHAMBER SHALL HAVE A GAS TIGHT, TRAFFIC RATED, PICKABLE METAL INSPECTION COVER WITH A MINIMUM DEMENSION OF 24" ID OR 24" SQUARE AND MUST BE APPROVED BY EMWD SOURCE CONTROL INSPECTOR.
9. MINIMUM CAPACITY OF INTERCEPTOR IS 750 GALLONS.
3 10. TWO (2) CHAMBER INTERCEPTOR IS ACCEPTABLE.
3 11. INTERCEPTORS REQUIRING MORE THAN 8 FEET OF GRADE RINGS MUST HAVE APPROVAL OF EMWD BEFORE INSTALLATION.

REVISIONS					
NO.	DATE	INITIAL	DESCRIPTION	APP'D	DATE
3	3/27/18	GS	REVISED NOTES 7, 8, & 10, REMOVED NOTE 11, UPDATED LOGO	AGA	3/27/18
2	2/13/15	GS	REVISED PLAN & PROFILE, NOTE 11 AND UPDATED CALLOUTS	AGA	2/13/15
1	2/19/99	GR	REDRAWN W/CADD & COMBINED W/SB-156	VJB	5/6/99

REFERENCES: SUPERCEDES SB-156 | SCALE: NONE

FILE I.D.: \kauai\eng\std dwgs\SB-70.dgn | DRAWN BY: GS

APPROVALS		
	INITIAL	DATE
DESIGN	VJB	12/28/90
CONSTRUCTION		
INSPECTION		
OPERATIONS	JAG	1/10/91
SUBMITTED		

RECOMMENDED _____ DIRECTOR OF ENGINEERING DATE

emwd EASTERN MUNICIPAL WATER DISTRICT

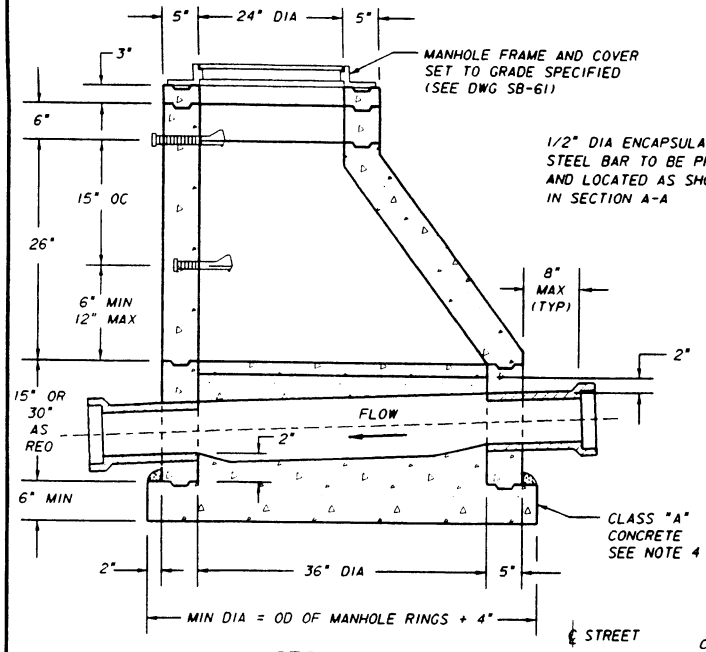
EASTERN MUNICIPAL WATER DISTRICT
STANDARD DRAWING

GREASE INTERCEPTOR WITH 24" SAMPLE BOX

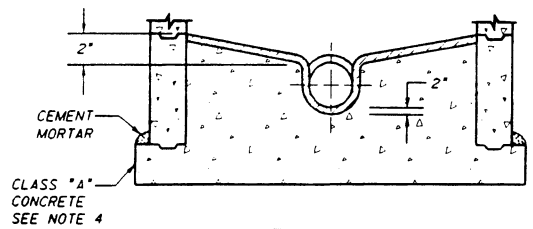
APPROVED Joseph D. Sickle 1/16/91
ASSISTANT GENERAL MANAGER DATE

SB-70

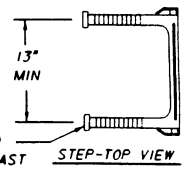
3

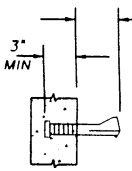


SECTION A-A

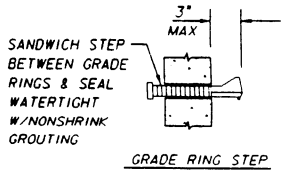


SECTION B-B



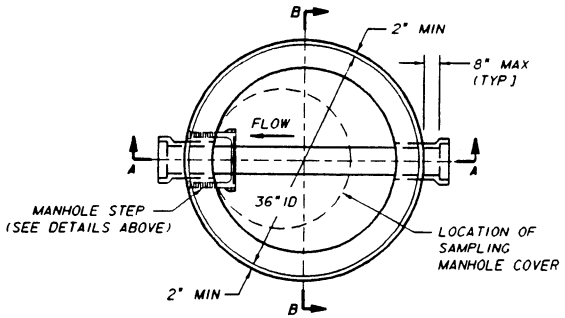


STD STEP

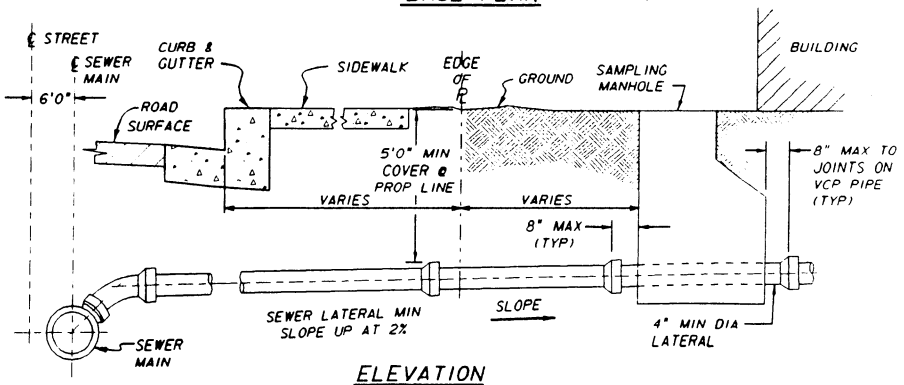


GRADE RING STEP

MANHOLE STEP DETAILS



BASE PLAN



ELEVATION

NOTES

1. PRECAST REINFORCED CONCRETE MANHOLES AS SHOWN SHALL CONFORM TO APPLICABLE REQUIREMENTS OF ASTM C-478 & NON-REINFORCED PRECAST CONCRETE MANHOLES SHALL CONFORM TO APPLICABLE ASTM REQUIREMENTS. BOTH SHALL CONFORM TO:
   A. SHALL BE DESIGNED FOR AASHO H-20 LOADING.
   B. CONCRETE SHALL BE COMPACTLY VIBRATED, CENTRIFUGALLY SPUN, OR MECHANICALLY TAMPED.
2. MANHOLE TO BE INSTALLED ON BUILDING SEWER AND LOCATED SUCH THAT THE MANHOLE WILL BE ACCESSIBLE AT ALL TIMES.
3. WHERE NO BUILDING SET-BACK IS AVAILABLE, SET MANHOLE IN PARKWAY AREA; WHERE MANHOLE MUST BE SET IN CONCRETE WALK, PLUG PICK-HOLE FLUSH. LOCATE MANHOLE TO CLEAR OTHER UTILITIES.
4. CONCRETE BASE SHALL BE OF CLASS "A" CONCRETE & PLACED IN ONE OPERATION. CONCRETE INVERTS SHALL BE TRUE TO GRADE AND ALIGNMENT AND FINISHED WITH A SMOOTH SURFACE. SPECIAL CARE SHALL BE USED IN FORMING ALL CHANNELS TO FACILITATE THE FLOW OF SEWAGE.
5. ALL MANHOLE TOPS SHALL BE INSTALLED WITH THE MANHOLE COVER OVER THE DOWNSTREAM OUTLET, EXCEPT AS OTHERWISE SPECIFIED.
6. SEE DRAWING SB-61 FOR DETAILS AND INSTALLATION OF MANHOLE COVER AND FRAME.
7. GRADE RINGS SHALL BE 24"ID, EXCEPT AS OTHERWISE NOTED.
8. JOINTS SHALL BE 3/8" THICK CEMENT MORTAR NEATLY STRUCK AND POINTED; OR PREFORMED COLD APPLIED READY-TO-USE PLASTIC JOINT SEALING COMPOUND AND PRIMER AS SHOWN IN JOINT DETAIL HEREON.
9. MANHOLE STEPS SHALL BE CAST IN PLACE AND ORIENTATED 180 DEG FROM MANHOLE INLET. GRADE RING STEPS SHALL BE PLACED BETWEEN GRADE RINGS AND GROUTED IN PLACE. BOTTOM STEP TO BE USED AS A CLEANING HOOK AND SHALL BE PLACED BETWEEN 6" MIN AND 12" MAX FROM TOP SHELF.

REVISIONS				
NO.	DATE	INITIAL	DESCRIPTION	APP'D	DATE
1	2/16/99	GR	REDRAWN W/CADD ON MYLAR	VdB	4/29/99

APPROVALS		
	INITIAL	DATE
DESIGN	JVS	9/9/77
CONSTRUCTION	LAM	
INSPECTION		
OPERATIONS	WBP	
SUBMITTED	LAM	9.13.77

EASTERN MUNICIPAL WATER DISTRICT

EASTERN MUNICIPAL WATER DISTRICT

EASTERN MUNICIPAL WATER DISTRICT
STANDARD DRAWING

PRECAST REINFORCED CONCRETE 36" ID SAMPLING MANHOLE

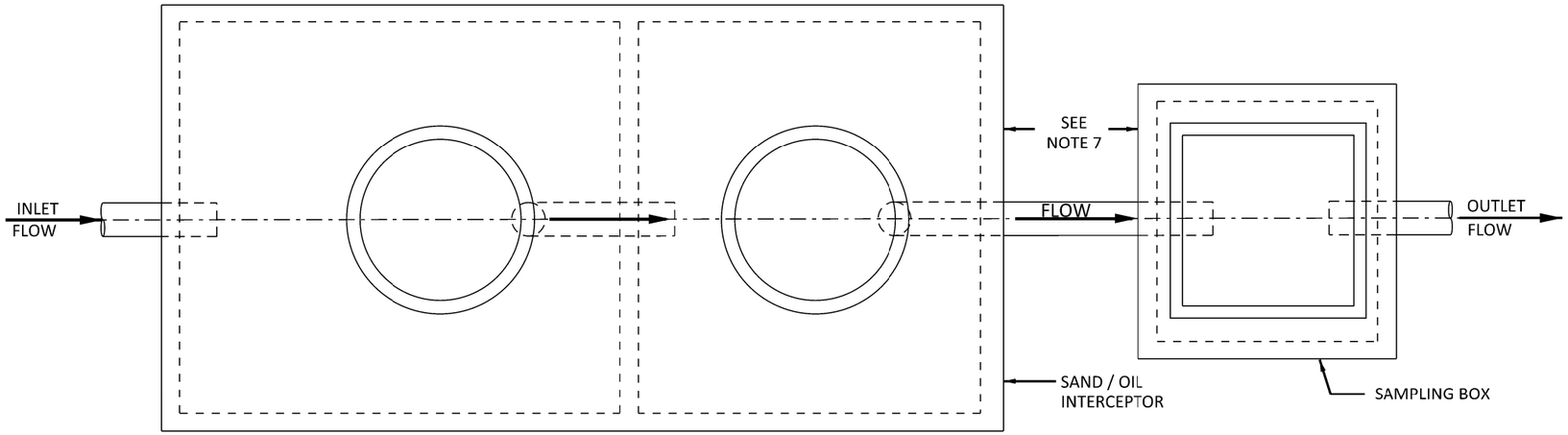
REFERENCES: ORIGINAL SB-73 DRAWN 9/9/77
FILE I.D.: d_standards: sb73.dgn

SCALE: NONE
DRAWN BY: JMA

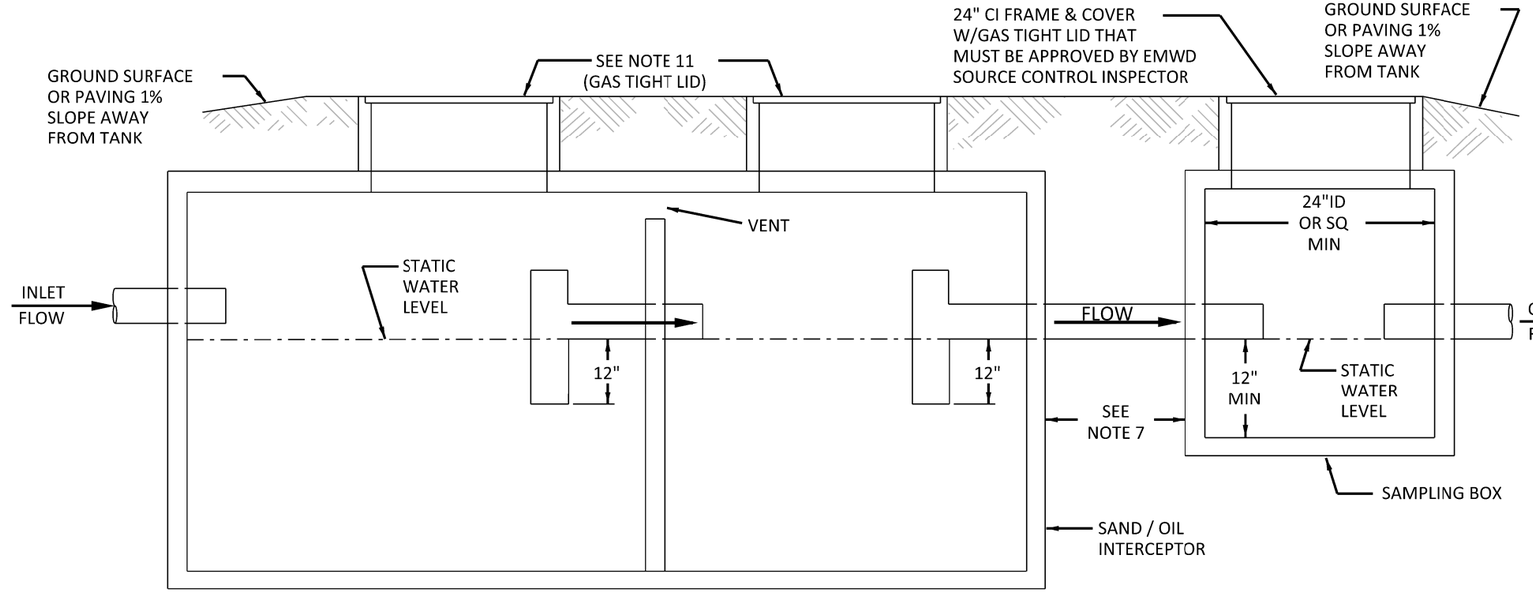
RECOMMENDED _____ DIRECTOR OF ENGINEERING DATE

APPROVED Doyle J. Boen 9/77 GENERAL MANAGER AND CHIEF ENGINEER DATE

SB-73 1



△2 PLAN VIEW



△2 PROFILE VIEW

NOTES

1. STRUCTURES SHALL BE INSTALLED TO ALLOW ACCESS FOR MAINTENANCE OR INSPECTION AT ALL TIMES.
2. WHERE SUBJECT TO VEHICLE LOADING, DESIGN ADEQUACYSHALL BE SUBSTANTIATED AND STRUCTURE SHALL BE PLACED ON SUITABLE BASE OF COMPACTED SOIL OR UNDISTURBED EARTH.
3. ALL SURFACE WATER MUST DRAIN AWAY FROM THE SAMPLING BOX AND INTERCEPTOR TO EXCLUDE RAIN WATER FROM THE SEWER SYSTEM.
4. FLOW TO THE SAMPLING BOX AND/OR INTERCEPTOR SHALL EXCLUDE ALL SANITARY SEWAGE AND SURFACE DRAINAGE.
- △2 5. INTERCEPTOR VOLUME SHALL BE ADEQUATE TO PROVIDE TWO (2) HOURS RETENTION FOR DISCHARGE FLOW.
6. EACH INSTALLATION IS SUBJECT TO REVIEW BY EMWD FOR ADEQUATE CAPACITY PRIOR TO CONSTRUCTION.
7. INSPECTION COVERS SHALL BE BROUGHT TO GRADE TO PERMIT VISUAL INSPECTION OF INTERNAL FITTINGS, WITH RISERS AS REQUIRED.
- △3 8. SAMPLING BOX SHALL BE A MINIMUM OF 24" ID OR 24" SQUARE AND MUST RETAIN A STATIC WATER LEVEL OF 12". SAMPLING BOX MAY BE ATTACHED OR AT A VARIABLE DISTANCE FROM THE INTERCEPTOR AS APPROVED BY EMWD SOURCE CONTROL INSPECTOR.
- △3 △2 9. EACH CHAMBER SHALL HAVE A GAS TIGHT, TRAFFIC RATED, PICKABLE METAL INSPECTION COVER WITH A MINIMUM DIMENSION OF 24" ID OR 24" SQUARE, AND MUST BE APPROVED BY EMWD SOURCE CONTROL INSPECTOR.
- △2 10. MINIMUM CAPACITY OF INTERCEPTOR IS 750 GALLONS.
- △3 △2 11. INTERCEPTOR SHALL BE TWO (2) CHAMBERS MINIMUM.
12. INTERCEPTORS REQUIRING MORE THAN 8 FEET OF GRADE RINGS MUST HAVE APPROVAL OF EMWD BEFORE INSTALLATION.
- △3 13. FOR CARWASH USING RECLAMATION SYSTEM, THERE SHALL BE A MINIMUM OF ONE CHAMBER BETWEEN THE CHAMBER WITH THE RECLAMATION SUCTION LINES AND THE SAMPLING BOX TO PREVENT EXCESS SAND FROM ENTERING THE COLLECTION SYSTEM.

REVISIONS

NO.	DATE	INITIAL	DESCRIPTION	APP'D	DATE
△3	3/27/18	GS	REVISED NOTES 8, 9, & 14, DELETED 12, UPDATED LOGO	AGA	3/27/18
△2	3/30/15	GS	REVISED PLAN & PROFILE, NOTES 5, 9, 11, 12, 14 AND UPDATED CALLOUTS	AGA	4/24/15
△1	2/19/99	GR	REDRAWN W/CADD & COMBINED W/SB-156	VJB	5/6/99

REFERENCES: SUPERCEDES SB-156
FILE I.D.: \kauai\eng\std dwgs\SB-75.dgn
SCALE: NONE
DRAWN BY: MAG

APPROVALS

	INITIAL	DATE
DESIGN	VJB	12/28/90
CONSTRUCTION		
INSPECTION		
OPERATIONS	JAG	1/10/91
SUBMITTED		

RECOMMENDED _____ DIRECTOR OF ENGINEERING DATE

emwd EASTERN MUNICIPAL WATER DISTRICT

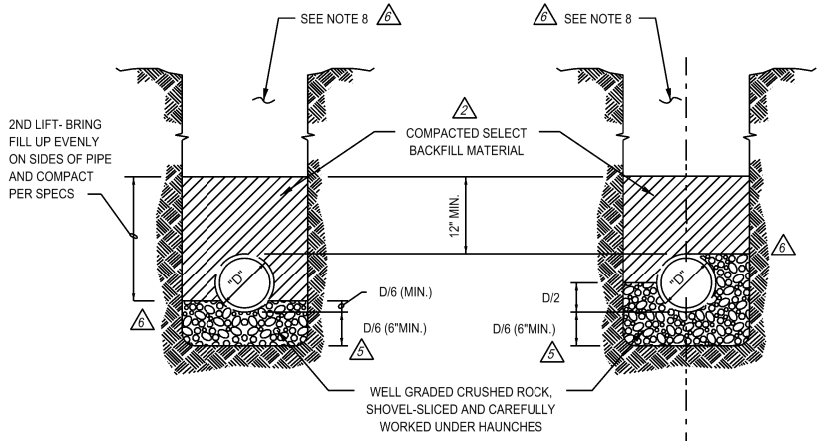
EASTERN MUNICIPAL WATER DISTRICT
STANDARD DRAWING

SAND / OIL INTERCEPTOR WITH 24" SAMPLE BOX

APPROVED Joseph D. Van Sickle 1/16/1991
ASSISTANT GENERAL MANAGER DATE

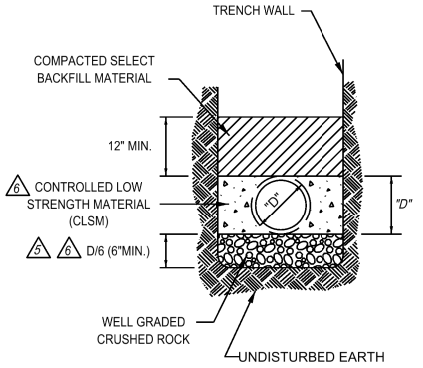
SB-75

△3

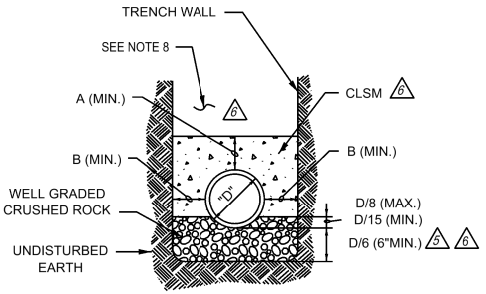


CLASS "C" 6
CRUSHED ROCK PAD

CLASS "B" | **CLASS "BB"**
CRUSHED ROCK BED | CRUSHED ROCK ENVELOPE

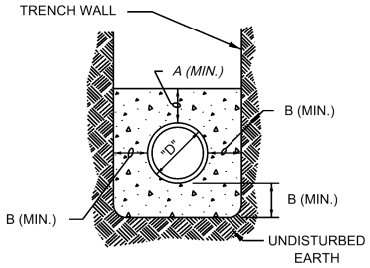


CLASS "CLSM" 4 6
SIDE CRADLING

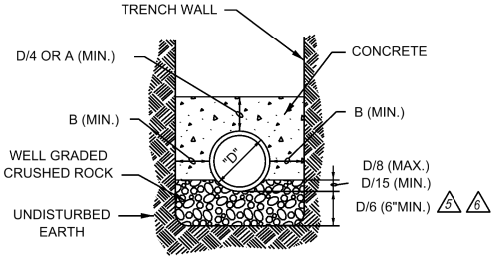


CLSM CRADDLE 6

NOTE: TO BE USED FOR SHALLOW PIPES. USE CLSM UNLESS OTHERWISE INSTRUCTED BY THE ENGINEER,OR AS SHOWN IN THE CONTRACT DRAWINGS.



CONCRETE ENCASEMENT NO.1



CONCRETE ENCASEMENT NO.2

NOTE: USE CONCRETE ENCASEMENT NO.2 UNLESS OTHERWISE INSTRUCTED BY THE ENGINEER, OR AS SHOWN IN THE CONTRACT DRAWINGS.

NOTE: REFER TO STD. DWG SB-159 FOR BEDDING CLASSIFICATION

PIPE I.D.	DIMENSIONS "A"	"B"
6"	5"	6"
8"	5"	6"
10"	5"	6"
12"	5"	6"
15"	5"	6"
18"	5"	6"
21"	6"	6"
24"	6"	6"
27"	7"	7"
30"	8"	8"
33"	9"	9"
36"	9"	9"
39"	10"	10"
42"	11"	11"

CRUSHED ROCK SIEVE ANALYSIS PER ASTM C33, SIZE NO. 67

100% PASSING	1"
90-100% PASSING	3/4"
20-55% PASSING	3/8"
0-10% PASSING	#4
0-5% PASSING	#8

NOTES 6

1. CLSM CRADLE AND ARCHES SHALL BE INSTALLED AS REQUIRED BY THE SPECIFICATIONS OR AS DIRECTED BY THE ENGINEER.
2. ALL CLSM SHALL BE PER EMWD STANDARD SPECIFICATIONS.
3. ALL CRUSHED ROCK SHALL MEET THE REQUIREMENTS OF ASTM C33. SIZE NO. 67.
4. TWO APPROVED FLEXIBLE JOINTS SHALL BE USED AT EACH END OF SEWER PIPE ENCASEMENTS PURSUANT TO STD. DWG. SB-63.
5. CLSM CAN BE POURED AGAINST TRENCH WALL OR MAY BE FORMED.
7. CONSOLIDATING BACKFILL MATERIAL BY WATER FLOODING NOT PERMITTED IN CLAY SOILS.
6. 8. ALL COMPACTION ABOVE THE PIPE ZONE,WITHIN A ROAD RIGHT-OF-WAY, TO BE PER THE REGULATORY ROAD AGENCY AND STD. DWG. SB-158

REVISIONS					
NO.	DATE	INITIAL	DESCRIPTION	APP'D	DATE
6	4/11/13	GS	REVISE ROCK BEDDING, NOTES, AND REMOVED CLASS "A" & "AA"	AGA	4/15/13
5	6/4/99	KER	REVISE ROCK THICKNESS UNDER PIPE TO 6"	CB	6/4/99
4	11/4/98	KER	CLARIFY CLASS "A" CONCRETE SIDE CRADLING	VJB	11/4/98
3	2/19/97	KER	REDRAWN TO INCLUDE ALL PREVIOUS REVISIONS	VJB	7/28/97
2	1/31/95	KER	REVISED CALLOUT FOR TRENCH BACKFILL	VJB	1/31/95

APPROVALS		
	INITIAL	DATE
INSPECTIONS		
OPERATIONS		
SUBMITTED	VJB	3/1/93

EASTERN MUNICIPAL WATER DISTRICT

EASTERN MUNICIPAL WATER DISTRICT
RIVERSIDE COUNTY, CALIFORNIA

PIPE ZONE BEDDING FOR SEWER PIPE

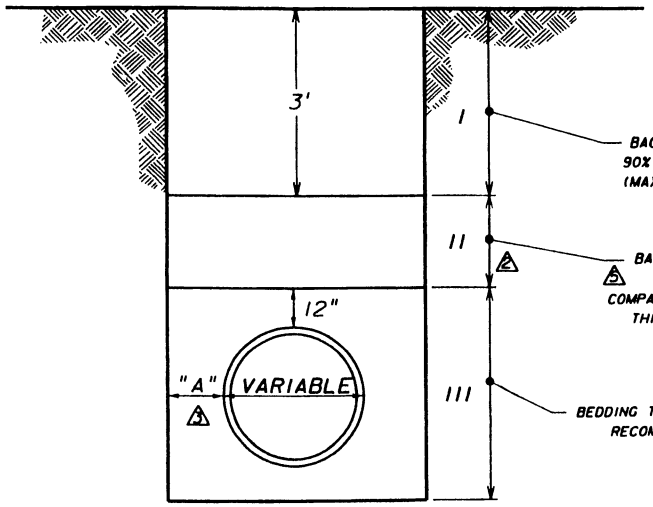
REFERENCES: SUPERCEDES SB-76
FILE I.D.: KAUAI/ENGINEERING/STDDWG
SCALE: NONE
DRAWN BY: KER

RECOMMENDED Joseph D. Van Sickle 3/5/93
DIRECTOR OF ENGINEERING DATE

APPROVED William E. Plummer 3/8/93
CHIEF ENGINEER DATE

SB-157 6

UNSURFACED MEDIANS, ROADSIDE STRIPS, △ OR EASEMENTS

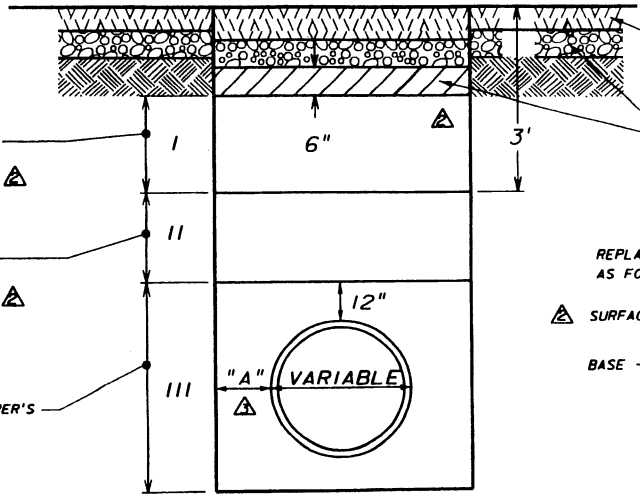


BACKFILL COMPACTED TO 90% RELATIVE COMPACTION (MAXIMUM LIFT THICKNESS 2 IS 6 INCHES).

2 5 BACKFILL COMPACTED TO 90% RELATIVE COMPACTION. MAXIMUM LIFT 2 THICKNESS IS 2 FEET.

BEDDING TO BE PER MANUFACTURER'S RECOMMENDATIONS AND PER STD DWG SB-157. 1

UNSURFACED ROADWAYS, SURFACED STREETS OR SURFACED EASEMENTS



SURFACING (EXCLUDING GRAVEL ROADS)

BASE MATERIAL AND SUBGRADE, COMPACTED TO 95% RELATIVE COMPACTION. 2

REPLACE STRUCTURAL SECTION AS FOLLOWS:

2 SURFACING - EXISTING THICKNESS PLUS 1" (IN) OR 3" (IN) MINIMUM.

BASE - SAME TYPE AND THICKNESS AS EXISTING BASE MATERIAL, 4" (IN) MIN 2 OR AS SPECIFIED.

NOTE: 2 WHEN A FIRM FOUNDATION IS NOT ENCOUNTERED, DUE TO SOFT, SPONGY, OR OTHER UNSUITABLE MATERIAL, SUCH MATERIAL SHALL BE REMOVED TO THE LIMITS DIRECTED BY THE ENGINEER, AND THE RESULTING EXCAVATION BACKFILLED WITH PIPE BEDDING MATERIAL COMPACTED TO 90% RELATIVE COMPACTION.

CLEARANCE "A" 5

1. CLAY PIPE: SEE STD. DWG. SB-159
2. PLASTIC PIPE: PIPE SIZES THROUGH 12"- "A"=6"-9"
   PIPE SIZES OVER 12"- "A"=1'-0" MIN.

I. STRUCTURAL ZONE
II. INTERMEDIATE ZONE
III. PIPE AND UTILITY ZONE

REVISIONS					
NO.	DATE	INITIAL	DESCRIPTION	APP'D	DATE
1	7/15/93	CFW	ADDED STD DWG NO TO ZONE C	VJB	7/22/93
2	1/31/95	KER	ADDED PIPE TO TRENCH CLEARANCE REQ	VJB	2/3/95
3	7/11/95	KER	REV'D TO COMPLY W/CURRENT GREEN BOOK	VJB	7/13/95
4	2/19/97	KER	REV'D TO INCLUDE ALL PREVIOUS REVISIONS	VJB	7/28/97
5	0/15/03	CM	REVISED COMPACTION REQUIREMENT	VJB	10/15/03

REFERENCES: SUPERCEDES SB-76

FILE I.D.: m:\graphics\visio\main\standard dwg\sb158.dgn

SCALE: NONE

DRAWN BY KER

APPROVALS		
	INITIAL	DATE
DESIGN		
CONSTRUCTION		
INSPECTION		
OPERATIONS		
SUBMITTED	VJB	3/1/93

RECOMMENDED Joseph D. Van Sickle 3/5/93
DIRECTOR OF ENGINEERING DATE

EASTERN MUNICIPAL WATER DISTRICT

EASTERN MUNICIPAL WATER DISTRICT
STANDARD DRAWING

TRENCH BACKFILL FOR SEWER PIPE

APPROVED William E. Plummer 3/8/93
CHIEF ENGINEER DATE

SB-158 5

THIS TABLE APPLIES TO HIGH STRENGTH VITRIFIED CLAY PIPE (VCP)

DEPTHS LISTED BELOW = DEPTH OF COVER (IN FEET) TO TOP OF PIPE

NARROW DITCH CONDITION ("Y")

Y= MAXIMUM EXCAVATED WIDTH	SEWER PIPE I.D.	CLASSIFICATION OF BEDDING 1 7					
		CLSM CRADDLE	D	C	B	BB	CLSM
2'-6"	8"	1-4	4-12	12-17	17-50	*	*
2'-6"	10"	1-4	4-11	11-21	21-50	*	*
2'-9"	12"	1-4	4-10	10-19	19-50	*	*
3'-6"	15"	1-4	4-8	8-13	13-20	20-27	27-50
4'-0"	18"	1-4	4-8	8-13	13-18	18-25	25-50
4'-3"	21"	1-4	4-9	9-14	14-20	18-27	27-50
4'-6"	24"	1-4	4-10	10-15	15-23	23-30	30-50
4'-9"	27"	1-4	4-10	10-15	15-22	22-30	30-50
5'-0"	30"	1-4	4-10	10-15	15-22	22-29	29-50
5'-3"	33"	1-4	4-10	10-15	15-21	21-27	27-50
5'-6"	36"	1-4	4-10	10-15	15-22	22-28	28-50
6'-0"	39"	1-4	4-9	9-14	14-20	20-25	25-50
6'-3"	42"	1-4	4-9	9-14	15-20	20-25	25-50

7 INTERMEDIATE DITCH CONDITION ("Y")

Y= MAXIMUM EXCAVATED WIDTH	SEWER PIPE I.D.	CLASSIFICATION OF BEDDING 7 7 7 7 7					
		CLSM CRADDLE	D	C	B	BB	CLSM
2'-9"	8"	1-4	4-12	12-17	17-21	21-36	*
3'-0"	10"	1-4	4-10	10-14	14-18	18-27	27-50
3'-3"	12"	1-4	4-10	10-14	14-18	18-25	25-50
3'-9"	15"	1-4	4-9	9-13	13-16	16-21	21-50
4'-3"	18"	1-4	4-9	9-13	13-16	16-20	20-50
4'-6"	21"	1-4	4-9	9-12	12-18	18-23	23-50
5'-2"	24"	1-4	4-9	9-12	12-16	16-21	21-50
5'-5"	27"	1-4	4-9	9-12	12-17	17-21	21-50
5'-9"	30"	1-4	4-8	8-12	12-16	16-20	20-50
6'-2"	33"	1-4	4-8	8-11	11-15	15-19	19-50
6'-6"	36"	1-4	4-7	7-11	11-16	16-19	19-50
6'-11'	39"	1-4	4-7	7-11	11-15	15-19	19-50
7'-5"	42"	1-4	4-7	7-11	11-15	15-18	18-50

WIDE TRENCH CONDITION ("X")

X= TRANSITION WIDTH	SEWER PIPE I.D.	CLASSIFICATION OF BEDDING 7 7					
		CLSM CRADDLE	D	C	B	BB	CLSM
3'-2"	8"	1-4	4-12	12-17	17-21	21-25	25-50
3'-7"	10"	1-4	4-10	10-14	15-18	18-20	20-50
4'-0"	12"	1-4	4-10	10-14	14-17	17-19	19-50
4'-7"	15"	1-4	4-9	9-13	13-16	16-18	18-50
5'-1"	18"	1-4	4-9	9-12	13-16	16-18	18-50
5'-7"	21"	1-4	4-9	9-12	12-16	16-18	18-50
6'-4"	24"	1-4	4-9	9-12	12-16	16-18	18-50
6'-7"	27"	1-4	4-9	9-12	12-15	15-18	18-50
7'-1"	30"	1-4	4-8	8-12	12-15	15-17	17-50
7'-6"	33"	1-4	4-7	7-11	11-14	14-16	16-50
7'-11"	36"	1-4	4-7	7-11	11-14	14-16	16-50
8'-5"	39"	1-4	4-7	7-11	11-14	14-16	16-50
8'-10"	42"	1-4	4-7	7-10	10-13	13-15	15-50

THIS TABLE APPLIES TO PLASTIC PIPE

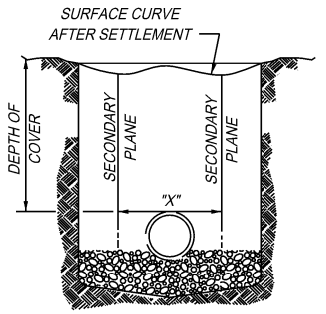
ABS SOLID WALL PIPE (SDR 35) & PVC SOLID WALL (SDR 35) 4" TO 15" DIA		ABS COMPOSITE PIPE (TRUSS) - 8" TO 15" DIA PVC COMPOSITE PIPE (TRUSS) - 8" TO 15" DIA ABS SOLID WALL (SDR 23.5) - 4" & 6" DIA	
DEPTH OF COVER TO TOP OF PIPE A A	CLASSIFICATION OF BEDDING A A	DEPTH OF COVER TO TOP OF PIPE	CLASSIFICATION OF BEDDING
6 4" TO 20'	CLASS "BB"	LESS THAN 4'	ENCASEMENT NO. 2
GREATER THAN 20'	SPECIAL DESIGN *	4' TO 9'	CLASS "D"
		9' TO 20'	CLASS "B"
		20'-30'	ENCASEMENT NO. 2
		GREATER THAN 30'	SPECIAL DESIGN

5 * SPECIAL DESIGN:
ENGINEER TO SUBMIT SPECIAL BEDDING FOR EMWD APPROVAL PRIOR TO START OF CONSTRUCTION.

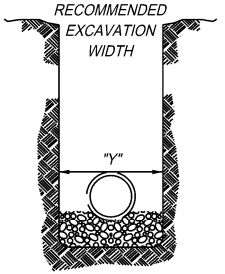
VCP PIPE	EMWD CLASS	BEDDING MATERIAL	LOAD FACT.	2006 NCPI CLASS
	D	SELECT NATIVE MATERIAL	1.1	MOD. D
	C	CRUSHED ROCK PAD	1.5	C
	B	CRUSHED ROCK BED	1.9	B
	BB	CRUSHED ROCK ENVELOPE	2.2	-
	CLSM	CLSM SIDE CRADDLE 7	2.8	CLSM

NOTES

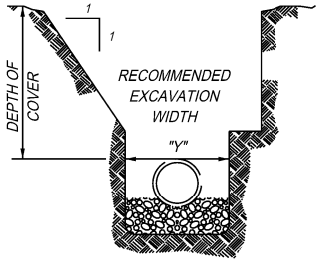
1. * - DEPTHS OF COVER GREATER THAN THOSE LISTED IN THE BEDDING CHARTS REQUIRE A SOILS INVESTIGATION AND ANALYSIS BY THE ENGINEER.
2. X - DENOTES TRANSITION WIDTH WHICH IS THE THE DISTANCE AT WHICH THE TRENCH WIDTH MAY BE INCREASED WITHOUT ADDING TO THE WEIGHT ON THE PIPE.
3. DETERMINATION OF BEDDING TYPES BASED ON CONSTANT TRENCH WIDTH, 1.25 FACTOR OF SAFETY, AND A SOIL WEIGHT - WET CLAY = 130 LBS/CUBIC FOOT PER NCPI MANUAL.
4. 7 REFERENCE NCPI TRENCH DESIGN, http://www.ncpi.org/toolbox.asp, AND STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION (GREEN BOOK) 2012 EDITION.
5. BEDDING CLASS SHALL EQUAL OR EXCEED THAT GIVEN IN THE APPLICABLE BEDDING TABLES.



WIDE TRENCH CONDTION



DITCH CONDITION



ALTERNATE DITCH CONDITION

FOR BEDDING REQUIREMENTS REFER TO STD DWG SB-157

REVISIONS

NO.	DATE	INITIAL	DESCRIPTION	APP'D	DATE
7	4/11/13	GS	REVISED TABLES FOR CLSM, ADDED D, C, B BEDDING TO INTERMEDIATE DITCH CONDITION TABLE, REMOVED A & AA BEDDING, AND UPDATED NOTES	AGA	4/11/13
6	9/22/06	R.E.	REVISED TABLE	JM	9/25/06
5	6/2/00	KR	DEFINED SPECIAL DESIGN CRITERIA	VJB	6/2/00
4	1/6/00	GR	REVISED BEDDING CLASS & DEPTHS FOR SDR 35	VJB	1/26/00

APPROVALS

	INITIAL	DATE
INSPECTIONS		
OPERATIONS		
SUBMITTED	VJB	3/1/93

EASTERN MUNICIPAL WATER DISTRICT

EASTERN MUNICIPAL WATER DISTRICT
RIVERSIDE COUNTY, CALIFORNIA

CLASSIFICATION OF PIPE ZONE BEDDING FOR SEWER PIPE

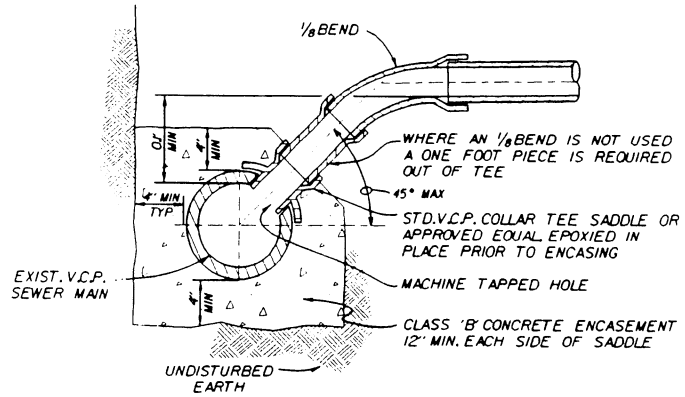
REFERENCES: SUPERCEDES SB-76
FILE I.D.: KAUAI/ENGINEERING/STDDWG

SCALE: NONE
DRAWN BY: KER

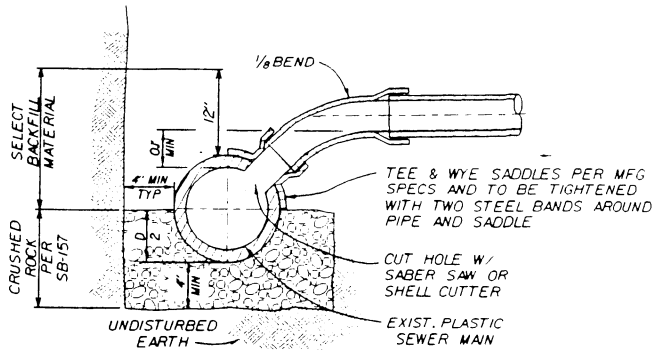
RECOMMENDED Joseph D. Van Sickle 3/3/93
DIRECTOR OF ENGINEERING DATE

APPROVED William E. Plummer 3/8/93
ASST. GENERAL MANAGER ENGINEERING DATE

SB-159 7



V.C.P.
SADDLE CONNECTION



PLASTIC PIPE
SADDLE CONNECTION

REVISIONS					
NO.	DATE	INITIAL	DESCRIPTION	APP'D	DATE

APPROVALS		
	INITIAL	DATE
DESIGN		
CONSTRUCTION		
INSPECTION	JEW	4/24/97
OPERATIONS		
SUBMITTED	VJB	4/23/97

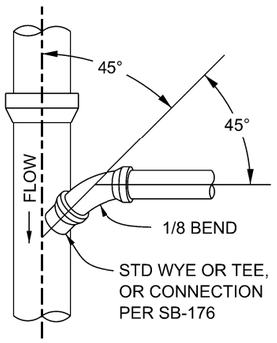
REFERENCES: SUPERCEDES SA-44, SA-86 | SCALE: NONE
FILE I.D.: /USR/KARL/STNDRDS/SB176.DGN | DRAWN BY KER

EASTERN MUNICIPAL WATER DISTRICT
STANDARD DRAWING

SEWER LATERAL CONNECTIONS

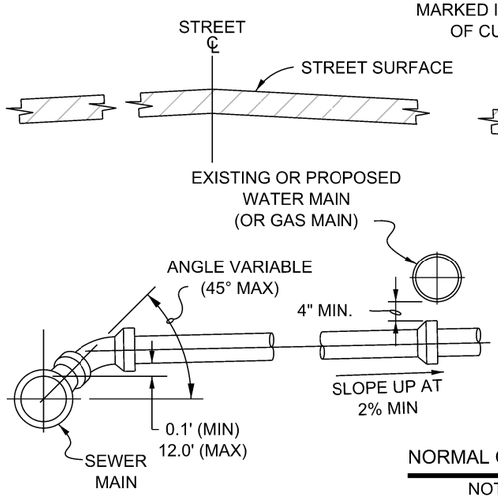
APPROVED _____ ASST. GENERAL MANAGER ENGINEERING 4/25/97 DATE

SB-176



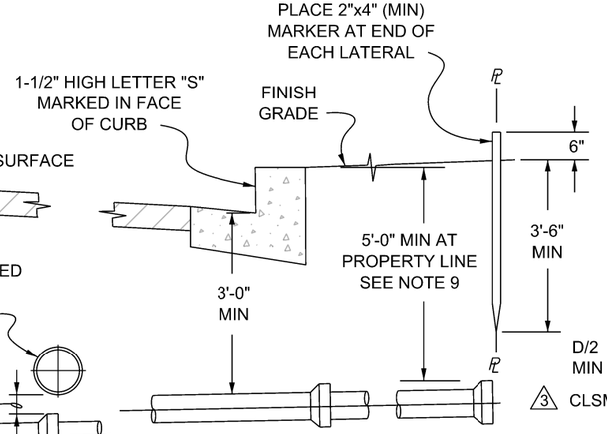
PLAN (TYP)

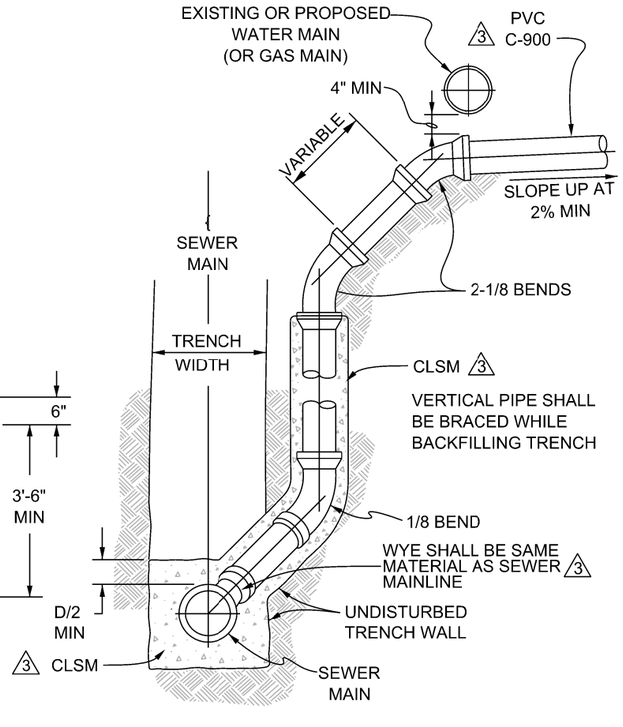
NOT TO SCALE



NORMAL CUT ELEVATION

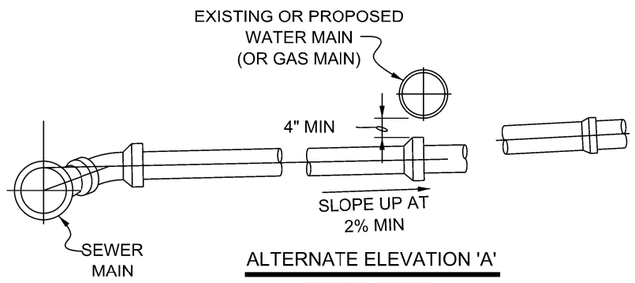
NOT TO SCALE





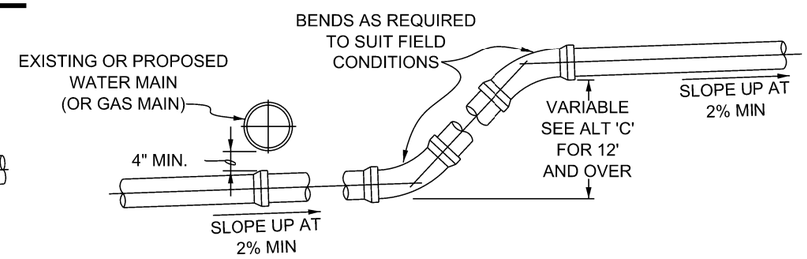
ALTERNATE ELEVATION 'C'

NOT TO SCALE 2



ALTERNATE ELEVATION 'A'

NOT TO SCALE



ALTERNATE ELEVATION 'B'

NOT TO SCALE

NOTES

1. SEWER LATERALS SHALL HAVE A MINIMUM SLOPE OF 2% EXCEPT AS OTHERWISE NOTED ON THE PLANS.
2. PLUGS SHALL BE CEMENTED IN WITH CEMENT MORTAR, OR SHALL BE NEOPRENE STOPPER OR APPROVED EQUAL.
3. VIN NO CASE SHALL A LATERAL CONNECT TO THE SEWER MAIN DIRECTLY ON TOP OF THE PIPE.
4. 2" WIDE METALLIC DETECTABLE LOCATOR TAPE SHALL BE PLACED APPROXIMATELY 6" ABOVE EACH LATERAL, BUT NOT GREATER THAN 6' DEEP, UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
5. MINIMUM 5' SEPARATION BETWEEN SEWER LATERAL AND WATER SERVICE.
6. WHERE SEWER LATERAL CROSSES ABOVE AN EXISTING OR PROPOSED WATER MAIN, USE CI PIPE (CL 150 W/HOT DIP BITUMINOUS COATING) 10' ON EACH SIDE OF WATER MAIN. USE COUPLERS PER SB-178.
7. LATERALS SHALL END AT THE PROPERTY LINE UNLESS OTHERWISE NOTED ON THE PLANS.
8. SEE STANDARD DRAWING SB-178 FOR CONNECTION TO BUILDING SEWER.
1 9. WHERE JOINT UTILITY TRENCH IS PROPOSED BEHIND CURB, SEWER LATERAL SHALL HAVE 5'-0" COVER BELOW CURB GRADE AT PROPERTY LINE. TYPICAL OF ALL ALTERNATE ELEVATIONS.
3 10. ALTERNATE ELEVATIONS ARE TO BE CONSTRUCTED WHEN THE FOLLOWING CONDITIONS APPLY:
   - ALTERNATE 'A': TO BE CONSTRUCTED WHEN VERTICAL DIFFERENCE BETWEEN WATER AND SEWER MAINS DOES NOT ACCOMMODATE NORMAL CUT ELEVATION.
   - ALTERNATE 'B': TO BE CONSTRUCTED WHEN A VERTICAL TRANSITION LESS THAN 12' IS REQUIRED BETWEEN THE WATER CROSSING AND PROPERTY LINE.
   - ALTERNATE 'C': TO BE CONSTRUCTED WHEN A VERTICAL TRANSITION 12' OR GREATER IS REQUIRED BETWEEN SEWER MAIN AND WATER CROSSING.
3 11. ALL CLSM SHALL BE PER EMWD STANDARD SPECIFICATIONS.

REVISIONS

NO	DATE	INITIAL	DESCRIPTION	APP'D	DATE
3	6/19/15	GS	REMOVED ALL REFERENCES TO ALT. "D", ADDED	AGA	6/19/15
			CLSM ENCASEMENT, AND REVISED NOTE 11		
2	9/16/03	CM	ADD NOTE #11, ALT "D" NOT TO BE USED	VJB	10/15/03
1	4/19/99	GR	REV NOTE 8 & ID-/USR/KARL/STNDRDS/177B.DGN	VJB	5/4/99

APPROVALS

	INITIAL	DATE
DESIGN	VJB	4/23/97
CONSTRUCTION		
INSPECTION		
OPERATIONS		
SUBMITTED	VJB	4/23/97

EASTERN MUNICIPAL WATER DISTRICT

EASTERN MUNICIPAL WATER DISTRICT

EASTERN MUNICIPAL WATER DISTRICT
STANDARD DRAWING

SEWER LATERALS

REFERENCES: SUPERCEDES SB-48, SB-50, & SB-51

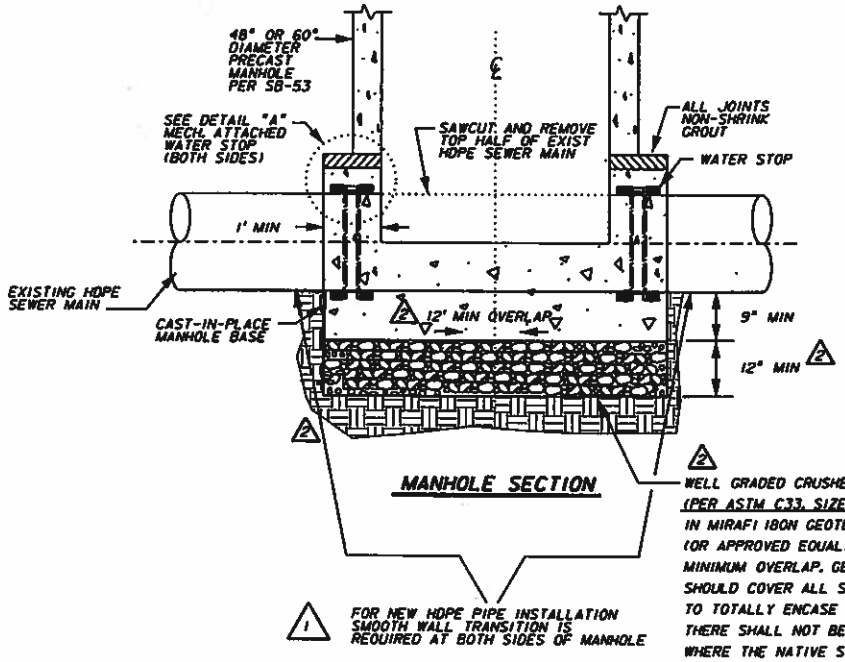
FILE I.D.: \kauai\eng\std dwgs\SD-177.dgn

SCALE: NONE

DRAWN BY: KER

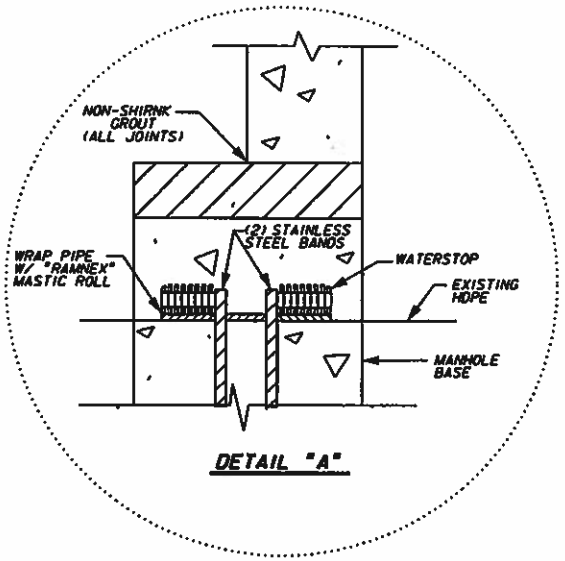
APPROVED Charles J. Bachmann 4/25/97
ASST. GENERAL MANAGER ENGINEERING DATE

SB-177 3



MANHOLE SECTION

2 WELL GRADED CRUSHED ROCK (PER ASTM C33, SIZE NO. 67), WRAPPED IN MIRAFI 180N GEOTEXTILE FABRIC (OR APPROVED EQUAL) WITH 12-INCH MINIMUM OVERLAP. GEOTEXTILE FABRIC SHOULD COVER ALL SIDES OF FOUNDATION TO TOTALLY ENCASE THE GRAVEL LAYER. THERE SHALL NOT BE ANY LOCATION WHERE THE NATIVE SOILS ARE IN CONTACT WITH WELL GRADED CRUSHED ROCK.



DETAIL "A"

NOTES

1. PVC WATERSTOP GREENSTREAK STYLE SERRATED #783 OR #679 OR APPROVED EQUAL. BUTT JOINT OF PVC WATERSTOP TO BE PVC GLUED
2. ALL CEMENT MORTAR FOR PRE-CAST JOINTS TO BE SIKA GROUT 212 NON-SHRINK OR APPROVED EQUAL.

REVISIONS					
NO.	DATE	INITIAL	DESCRIPTION	APP'D	DATE
1	9/10/03	CM	ADD REQUIREMENT FOR NEW PIPE	VB	10/15/03
2	8/12/08	RE	REVISED CRUSH ROCK DEPTH AND ADDED GEOTEXTILE FABRIC	VB	8/14/08

APPROVALS		
	INITIAL	DATE
DESIGN	GB	2/29/00
CONSTRUCTION		
INSPECTION	JCW	3/1/2000
OPERATIONS		
SUBMITTED		

EASTERN MUNICIPAL WATER DISTRICT

EASTERN MUNICIPAL WATER DISTRICT
STANDARD DRAWING

48" AND 60" DIAMETER MANHOLE INSTALLATION FOR HDPE SEWER MAIN

REFERENCES:

FILE I.D.: \cad\eng\std drgs\sb179.dgn

SCALE: NONE

DRAWN BY: KENYON 8/31/99

APPROVED Charles J. Bachmann
ASST. GENERAL MANAGER-ENGINEERING DATE

SB-179 2

sb179.dgn 8/14/2008 1:10:43 PM

SPECIFICATIONS - DETAILED PROVISIONS
Section 02761 - Furnish & Install Vitrified Clay Sewer Pipe System

C O N T E N T S

SECTION 02761
FURNISH & INSTALL VITRIFIED CLAY SEWER PIPE SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION

The Contractor shall furnish all labor, material, tools, and equipment required for the complete construction of pipelines, manholes, clean-outs, and other allied structures and appurtenances as stated on the Bidding Sheets, shown on the Contract Drawings, and specified herein, all within the time as stated in the Contract Documents.

Refer to Section 02201 of the District's standard specifications for requirements relating to Construction Methods and Earthwork and Section 02221 for requirements relating to Trenching, Backfilling and Compacting.

1.02 RECORDS

A true and accurate record of the location of all wye branches, laterals, clean-outs, and other connections and appurtenances shall be kept by the Contractor, and such record shall be furnished to the Engineer prior to, or immediately upon, completion of the work. The location of the end of all laterals and main stub-outs shall be shown at ground surface by a marker approved by the Engineer.

1.03 JOB CONDITIONS

The Contractor shall familiarize himself and comply with all applicable state, county and municipal rules and regulations pertaining to sanitation, fire protection and safety, and all provisions of the Contract Documents.

1.04 PAYMENT

A. Measurement For Payment. Quantities for installation of sewer pipe, manholes, and other appurtenances on District-administered contracts shall be measured for payment as specified herein.

1. Main Sewer Lines will be measured in place along the horizontal centerline of the pipe by the linear foot. The measurement will be continuous through all wye and tee branches, fittings, and manholes, except that said measurement will be taken to the center only of manholes where sewer lines terminate.

2. Laterals will be measured in place along the horizontal centerline of the pipe by the linear foot from the centerline of the main line sewer to the end of the lateral as shown on the construction drawings.

3. Clean-outs will be measured on the basis of each clean-out installed, including wye branch, riser, screw plug, and box with cover.

4. Manholes will be measured on the basis of each manhole completely installed, including required stub-outs.

5. Special Bedding will be measured on the basis of the cubic yards of special bedding required to bring the bedding up to grade for the trench size excavated up to the maximum size of trench allowable under these specifications. No allowance will be made for over-excavation except as directed by the Engineer.

6. Bore Casing will be measured on the basis of horizontal centerline distance and shall include all excavation, furnishing and placement of casing, furnishing and placement of all required backpacking and grouting around casing, backfilling within casing, pipe bracing, restoration of surfaces, and all labor and material for a finished job. Furnishing and installation of pipe within casing shall be included in pipeline measurement.

7. Paving will be measured as a part of project causing removal and/or replacement of paving, except as otherwise specified on the Bidding Sheet.

B. Payment. Payment for quantities of sewer pipe and manholes will be paid in the manner described herein below. No additional compensation will be paid above the unit bid price for changes in quantities.

Requests for partial payments will not be approved if the record drawings and revised Construction Progress Schedule and bar chart are not kept current, and request for final payment will not be approved until the completed record drawings, showing all variations between the work "as-constructed" and as originally shown on the contract drawings or other contract documents, has been delivered to the District.

1. Sewer Pipe. Quantities of main sewer pipe and laterals measured as stated above and accepted, will be paid for at the respective unit bid prices per horizontal linear foot for the several kinds and sizes of pipe, which prices and payments shall constitute full compensation for furnishing all labor, materials, tools, and equipment necessary to complete the work in place, including pipe, wye branches, fittings, clean-outs, appurtenances, excavation, backfill, imported select granular backfill, special bedding, cradles or encasements, laterals where required, testing, removal and restoration of pavements, curbs, gutters and sidewalks, and disposal of surplus earth and rock spoil.

Payment for pipe in place shall be further broken down based upon the Contractor's submittal under Section F-10 of these specifications, as concurred by the Engineer, but not to exceed in the ordinary project the following percentages of the linear foot price stated on the Bidding Sheets

Trench excavation 10%
Pipe laid in place and shaded.....65%
Trench backfilled and backfill compacted.....20%
Testing and clean-up, exclusive of pavement replacement 5%

2. Wye or Tee Branches. Payment for quantities of wye or tee branches and 1/8 bends shall be included in the payment for the unit bid prices for sewer pipe, which prices and payments shall constitute full compensation for furnishing all labor, materials, tools, and equipment necessary to complete the work in place, including wye or tee branches only or wye or tee branches plus 1/8 bends or short pipe sections as applicable, and no additional payment shall be made therefore.

3. Clean-outs. Payment for quantities of clean-outs measured as stated above and accepted will be paid for at the unit bid price stated on the Bidding Sheets, which prices and payments shall constitute full compensation for furnishing all labor, materials, tools and equipment necessary to complete the work in place, including wye branch, riser, screw plug, and box with cover, and no additional payments will be made therefore.

4. Manholes. Quantities of manholes measured as stated above and accepted, will be paid for at the respective unit bid prices for the sizes of manholes stated on the Bidding Sheets, which prices and payment shall constitute full compensation for furnishing all labor, materials, tools and equipment necessary to complete the work in place, including concrete base, manhole rings and tops, drop manhole inlets and supports, mortar, manhole frames and covers, stubs, earthwork, testing, removal and restoration of pavement, and disposal of surplus earth.

5. Special Bedding. Quantities of special bedding measured as stated above and accepted, will be paid for at the stipulated cost price, or the respective unit bid price for the quantities as stated on the Bidding Sheets, which price shall constitute full compensation for all labor, materials, and equipment necessary to complete the work in place, including the special bedding material.

6. Bore Casing. Payment for bore casing in place measured as stated above shall be made as specified on the Bidding Sheets.

7. Paving. Payment for quantities of paving measured as stated above and accepted shall be included in the unit bid price for pipeline Work includes removal and/or restoration of paving and all earthwork, and no additional compensation will be made therefore, except as otherwise provided on the Bidding Sheets.

1.05 GUARANTEE

All work, materials, and equipment shall be guaranteed for the periods of time set forth elsewhere in the Contract Documents for general guaranty or warranty.

PART 2 - PRODUCTS & MATERIALS

2.01 MATERIALS FURNISHED BY CONTRACTOR

The Contractor shall furnish all materials required for the work, in accordance with these specifications and the latest revision of the applicable specifications for materials specified herein.

A. Vitrified Clay Pipe (VCP). Unless otherwise shown, or when shown as VCP, all pipes shall be high strength vitrified clay pipe meeting the requirements of Section 207-8 of the Standard Specifications For Public Works Construction, 1991 Edition. All pipe and fittings shall be clearly marked with the name or trademark of the manufacturer and the strength designation.

Where ground water is encountered, or when specified on the construction drawings all pipe will be treated for absorption resistance with one of the following:

1. Dow-corning 722 silicon, 3% (by weight); or polyvinyl acrylic emulsion, 4% (by volume).

2. Union Carbide - Silicone water repellent R-20 (Solium methyl silanotate) 5% (by volume).

Application shall be by total immersion.

B. Pipe Joints. The types of joints approved for use with the types of pipe previously described in this specification are:

1. Compression Joints. Plastisol, Roll-on, and Ring-tite joints, or their approved equal, shall be installed on the respective types of pipe in accordance with the manufacturer's directions.

2. Repair Clamps & Connection Clamps shall be as specified in ASTM 594 Section 5.1.2.3 Test Condition II, with stainless steel A1S1316 bands and clips, stainless steel A1S1305 bolts and nuts, and stainless steel A1S1304 shear ring; except as otherwise approved by the Engineer.

C. Cast Iron Pipe. Cast iron sewer pipe and fittings, when specifically required, shall conform to the latest revision of AWWA Spec. C-106, -108, or -151, with bituminous inside and outside coatings. Joints shall be mechanical or push-on joints conforming to the latest revision of AWWA Spec. C-111 or EMWD standard drawings. Ductile Iron Pipe Class 2 (ANSI Thickness Class 52) may be used in lieu of Cast Iron Pipe.

D. Portland Cement Concrete. All concrete shall meet the requirements of the Detailed Provisions of the District standard specifications, except that only Type V or Type II Portland Cement shall be used.

E. Portland Cement Mortar. All cement mortar used for construction purposes shall consist of one (1) part Portland Cement (Type V or Type II) to two (2) parts of silica sand by volume and moistened with sufficient water to permit placing, buttering, caulking or coating without crumbling, unless otherwise approved by the Engineer.

F. Manholes. All manholes, covers, frames and steps shall meet the requirements of the Detailed Provisions of the District standard specifications, and of the District standard drawings. One-piece cone and shaft will not be accepted.

Manhole stub-outs shall be included in manhole installations, and shall be of vitrified clay pipe of the size designated on the drawings. All stub-outs shall be plugged for future connection, with neoprene stoppers or approved equal.

Manhole frames and covers will be furnished by the Contractor upon prior approval by the District of shop drawings. Such prior approval by the District shall in no way nullify the District's right to accept or reject any individual unit as furnished or as installed.

PART 3 - EXECUTION

3.01 INSTALLATION OF PIPE

Installation of pipe shall start at the low end of each section and proceed upgrade. All bell and spigot pipe shall be laid with the bell end upgrade. Assembly of all types of pipe shall be done in strict conformance with the requirements of the pipe manufacturer.

Pipe shall be accurately laid to alignment and grade shown on the drawings or established by the Engineer. Where grade stakes are provided with which to establish the proper pipeline grade, pipe shall be laid to grade within a tolerance of 0.02', or 0.05' cumulative deviation from elevations set at 100' stations.

Sags, or standing water in pipe, shall meet the following criteria:

Complies with Specification	Does not Comply with Specifications Resulting in No Payment	Does not Comply with Specifications and Reconstruction is Required
1/2" or less sag	greater than 1/2" sag	greater than 1" sag

It shall be the Contractor's responsibility to prove to the Engineer's satisfaction that sags do not exceed the limits stated. Lines must be replaced if visual measurements and documentation cannot be provided.

If standing water depth in the sag exceeds the value listed under "No Payment", then to compensate for anticipated higher than average pipeline operation and maintenance cost, no payment will be made for construction. The nonpayment amount will include all construction costs including such items as excavation, pipe installation, backfilling, resurfacing, etc., for the length of standing water that exceeds the value for "No Payment".

Due to unacceptably high operation and maintenance costs and poor system reliability, pipelines with sag depths exceeding those listed for "Reconstruction is Required" will be rejected. Reconstruction of the entire length of standing water plus 20 feet on each side of the standing water will be required. Damaged pipe must be removed and not reused.

A. Bedding. All pipes shall be laid in a bed prepared by hand work, dug true to line and grade, to furnish a true and firm bearing for the pipe throughout its entire length. Adjustment of pipes to lines and grade shall be made by scraping away or filling in and tamping material under the body of the pipe throughout its entire length, and not by blocking or wedging. Where a hand-shaped trench bottom conforming to barrel of the pipe is not available or practical, Class "C" bedding shall be utilized below the pipe to a depth of one-eighth (1/8) the outside diameter of the pipe, but not less than 4".

B. Bell Holes shall be provided at the ends of each pipe length, of sufficient size to permit making up the particular type of joint being used.

C. Alignment. Pipes shall be laid in accurate conformity with the prescribed lines and grades, which alignment shall be obtained by plumbing and measuring from a tightly stretched wire or line running parallel with the flow line grade and supported over the centerline of the sewer by batterboards or bars accurately placed and firmly fastened in place across the trench; or by some other comparable method acceptable to the Engineer.

Alternate use of commercial LASER grade setting systems in lieu of string lines specified herein are acceptable when the following requirements and conditions are met:

The Contractor shall have the responsibility of providing an instrument operator who is qualified and trained in the operation of the Laser and said operator must adhere to the provisions of the State of California Construction Safety Orders issued by the Division of Industrial Safety. Attention is particularly directed to Section 1516, and 1800 through 1801, of said Orders for applicable requirements.

All LASER control points shall be established bench marks or construction off-set stakes identified on cut sheets and set in the field for the work. LASER set up points shall be on these control points or on points set directly from them by instrument.

Pipe alignment shall not deviate from that shown on the plans by more than 3/4 pipe diameter, nor shall it change in alignment more than 2 inches in 20 feet.

After each length of pipe has been laid to line and grade, it shall be jointed to the preceding section as hereinafter specified, and after said jointing procedure has commenced, there shall be no movement of the pipe whatsoever in subsequent operations.

D. Pipe Cleaning. Before each new length of pipe is placed, the interior of the preceding pipe shall be carefully cleaned of all dirt and debris. At all times when the work of installing pipe is not in progress, all openings into the pipe and the ends of the pipe in the trench shall be tightly closed to prevent entrance of animals and foreign materials.

The Contractor shall take all necessary precautions to prevent the pipe from floating due to water entering the trench from any source, shall assume full responsibility for any damage due to this cause and shall at his own expense restore and replace the pipe to its specified condition and grade if it is displaced due to floating.

3.02 LATERALS AND CLEAN-OUTS

Laterals and clean-outs shall be constructed at the points indicated on the plans, and in accordance with the standard drawings. Connections of house laterals to sewer mains shall be either wye or tee type connections as shown on EMWD standard drawings except that only one type shall be used universally throughout the project.

Wye branches shall be laid with the axis of the "Y" entering the main sewer at an angle above the horizontal axis of said main, unless specifically called out otherwise on the plans or in the Special Conditions, but, unless specifically called out otherwise, this angle shall not exceed 45°.

Where tee type connections of house laterals to sewer mains are selected in accordance with the requirements, the Contractor shall provide a 1-foot long section of lateral sewer pipe out of the tee-type branch.

Wherever any service connection is to be temporarily blanked off, it shall be plugged with a terra cotta cover secured and made watertight with cement mortar.

Lateral connections to existing mains shall be made pursuant to the provisions of the appropriate standard drawing for saddle connection to the existing main pipe material.

3.03 MANHOLES

Manholes shall be constructed in the locations and to the dimensions as shown on the drawings. Cast-in-place concrete shall conform to the requirements set forth in Section "Portland Cement Concrete" in these specifications. Pre-cast units shall be assembled accurately with full-bed mortar joints.

Unless otherwise shown on the drawings, the sewer pipe shall be laid continuously through the location of the manhole. After the manhole has been constructed, the open channel shall be formed by splitting the pipe and removing the top half. If the open channel cannot be formed in this manner, it shall be formed of concrete with the depth equal to the diameter of the sewer pipe. The floor of the manhole shall slope at least 2" from the sides of the manhole to the open channel.

When completed, the top of the manhole cover shall be accurately brought to the elevation called for on the drawings, or if no elevation is indicated, it shall be brought flush with the surface of the surrounding ground or pavement. The manholes shall be constructed so that there is not more than 19" of throat section between the top of the cone and the top of the frame.

When located in roadway subgrades, manholes shall be constructed up to the proper elevation preparatory to street paving, and temporarily covered with planks or steel plates. After paving operations have been completed the temporary covers shall be removed and the frames and covers installed flush with pavement grade.

3.04 CLEANING SEWER LINES

All sanitary sewer mains and laterals shall be flushed with water and "balled" or cleaned by acceptable method prior to testing to ensure that all dirt, debris, and obstructions are removed. This work must be performed in the presence of and to the satisfaction of the Engineer, and the Contractor shall notify the Engineer at least one (1) working day in advance of starting the cleaning work.

The Contractor shall, following backfill compaction and line cleaning provide:

A. 3/8" minimum pull ropes from manhole to manhole.

B. Equipment and traffic control to assist in the T.V. inspection performed by district's sub-contractor.

3.05 LEAKAGE TESTS

All sanitary sewers shall be tested for tightness after they and all appurtenances have been completed, backfilled (except for test tees) and compacted, and are ready for service. In shallow systems, leakage testing shall follow placement of road base material. Tests shall be made on each section, including manholes, from one manhole or test tee to the next, unless grades are flat enough to permit testing two or more sections at one time.

The method of required test (water test or air test) shall be determined by the Inspector.

A. Preparation for Tests. Each section of sewer, including house laterals, between successive manholes shall be tested by closing the lower end of the section to be tested, the inlet sewer of the upper manhole, and the ends of house laterals with stoppers, and filling the pipe and manhole with water to a level of 4' above the invert of the open sewer in the upper terminal. After the section has been filled, it shall be allowed to stand for a sufficient length of time to allow the pipe to absorb what water it will, prior to making the leakage test described in the following paragraphs (Water Test and Air Test). This period of time for absorption of water shall not be less than 30 minutes nor greater than 24 hours.

B. Test Procedure and Allowable Leakage.

1. Water Test. The leakage test shall consist of measuring the quantity of water required to maintain the water level at the elevation prescribed in the above paragraph for a period of one (1) hour. The water used in the test shall be measured through a meter or by other means satisfactory to the Engineer. The allowable leakage shall be computed from the following formula:

$$E = 0.0015\ DL/h$$

Where E = allowable leakage in gallons
D = inside diameter of the pipe in inches
L = length of line being tested in feet
h = difference in elevation (in feet) between the water surface in the upper manhole and the invert of the pipe in the lower manhole

If the leakage during the test period exceeds the allowable leakage, the sewer line shall be overhauled and, if necessary, relaid until the joints hold satisfactorily under the test.

2. Air Test. Installed pipeline shall be field tested in accordance with the air test specified in the National Clay Pipe Institute 1967 Supplement to Engineering Manual, and its supplementary tables contained in the NCPI publication entitled "Low Pressure Air Test for Sanitary Sewers (Procedures and Tables)." Isolation of defects by air test shall be the Contractor's responsibility to perform; however, if performed by the District or its agent, they shall be performed at the Contractor's expense.

C. Alternate Infiltration Test. If excessive groundwater is encountered in the construction of a section of the sewer, the test for leakage previously described shall not be used. The end of the sewer at the upper structure shall be closed sufficiently to prevent the entrance of water and pumping of groundwater shall be discontinued for at least three (3) days, after which the section shall be tested for infiltration.

The infiltration into each individual reach of sewer between adjoining manholes shall not exceed 100 gallons per inch of inside diameter of sewer per 24 hours per mile. Infiltration in excess of this amount shall be reduced to a quantity within the specified amount before the sewer will be accepted. In any case, the Contractor shall stop any individual leaks that may be observed.

Unless otherwise specified, infiltration will be measured through a meter or by other means satisfactory to the Engineer.

D. Manhole Leakage. Should an initial test show excessive leakage in a section of line, it is permissible to draw off the water of a water test and test the manhole that contained water. This test shall be made by plugging all openings in the manhole, filling same with water to the same elevation as used for the initial test, and checking the loss in a one hour period. The leakage so determined may be deducted from the total leakage in the section of pipe initially tested. If, in the opinion of the Engineer, the manhole leakage thus determined is excessive, the Contractor shall waterproof the interior of the manhole by applying a coating of grout or an approved waterproofing material. Excessive leakage is defined to be 50 gallons per hour when filled to the top of the barrel sections (not including cone or grade rings). Shallow rectangular manholes shall be filled to the top of the manhole sections (not including grade rings), with 50 gallons per hour leakage allowed.

3.06 SEWER PIPE REPAIRS

Sewer pipe leakage in excess of the allowable maximum shall be corrected by repairs acceptable to the Engineer, and retesting as required. Mere sealing of leaks shall not be an acceptable repair.

3.07 LATERAL MARKERS

It shall be required of the Contractor to place the required markers at the end of each lateral and to also return after curb construction to place the required mark in the face of the curb. An "L" may be used in place of the required "S" mark in the curb face.

END OF SECTION 02761

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SPECIFICATIONS - DETAILED PROVISIONS
Section 02762 - Furnish & Install Plastic Sewer System

C O N T E N T S

SECTION 02762
FURNISH & INSTALL PLASTIC SEWER SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION

The Contractor shall furnish all labor, material, tools, and equipment required for the complete construction of pipelines, manholes, clean-outs, and other allied structures and appurtenances as stated on the Bidding Sheets, shown on the Contract Drawings, and specified herein, all within the time as stated in the Contract Documents.

These provisions establish the requirements for the use of plastic pipe (i.e., ABS, PVC, and ABS and PVC Composite pipe) for house lateral and main line sewer construction. Use is limited to those projects which specify or indicate plastic sewer pipe as an alternate.

Plastic pipe may only be used where indicated on plans approved by the District. Where plastic pipe is used, one type shall be used between consecutive manholes and shall include the house laterals in that system. When pipe and fittings are fabricated by the same manufacturer, contractor will not be allowed to use fittings from other manufacturers. ABS solid wall pipe shall be used for laterals with ABS and PVC Composite pipe systems. Plastic laterals may be used with clay pipe main except those mains subject to industrial flows, as determined by the Engineer.

Plastic pipe shall not be used for curved sewers which are 12" diameter or larger. Plastic pipe shall not be used for sewers serving industrial areas, or areas that, in the opinion of the District, are likely to be rezoned to industrial zones.

Refer to Section 02201 of the District's standard specifications for requirements relating to Construction methods and Earthwork and Section 02221 for requirements relating to Trenching, Backfilling and Compacting.

1.02 RECORDS

A true and accurate record of the location of all wye or tee branches, laterals, clean-outs, and other connections and appurtenances shall be kept by the Contractor, and such record shall be furnished to the Engineer prior to, or immediately upon, completion of the work. The location of the end of all laterals and main stub-outs shall be shown at ground surface by a marker approved by the Engineer.

1.03 CARE & HANDLING

Pipe shall be stored at the jobsite in unit packages provided by the manufacturer. Caution shall be exercised to avoid compression, damage or deformation to bell ends of the pipe. If pipe is to be exposed to direct sunlight for more than 14 days, pipe must be covered with an opaque material while permitting adequate air circulation above and around the pipe to prevent excessive heat accumulation.

If pipe is strung along trench prior to installation, string only pipe to be used within a 24-hour period; all pipe is to be laid on a flat surface. The interior as well as all sealing surfaces of pipe, fittings, and other accessories shall be kept free from dirt and foreign matter. Gaskets shall be protected from excessive exposure to heat, direct sunlight, ozone, oil and grease. Solvent cement when used shall be stored in tightly sealed containers away from excessive heat.

1.04 JOB CONDITIONS

The Contractor shall familiarize himself and comply with all applicable state, county and municipal rules and regulations pertaining to sanitation, fire protection and safety, and all provisions of the Contract Documents.

1.05 PAYMENT

A. Measurement For Payment. Quantities for installation of sewer pipe, manholes, and other appurtenances on District-administered contracts shall be measured for payment as specified herein:

1. Main Sewer Lines will be measured in place along the horizontal centerline of the pipe by the linear foot. The measurement will be continuous through all wye branches, fittings, and manholes, except that said measurement will be taken to the center only of manholes where sewer lines terminate.

2. Laterals will be measured in place along the horizontal centerline of the pipe by the linear foot from the centerline of the main line sewer to the end of the lateral as shown on the construction drawings.

3. Clean-outs will be measured on the basis of each clean-out installed, including wye branch, riser, screw plug, and box with cover.

4. Manholes will be measured on the basis of each manhole completely installed, including required stub-outs.

5. Special Bedding will be measured on the basis of the cubic yards of special bedding required to bring the bedding up to grade for the trench size excavated up to the maximum size of trench allowable under these specifications. No allowance will be made for over-excavation except as directed by the Engineer.

6. Bore Casing will be measured on the basis of horizontal centerline distance and shall include all excavation, furnishing and placement of casing, furnishing and placement of all required backpacking and grouting around casing, backfilling within casing, pipe bracing, restoration of surfaces, and all labor and material for a finished job. Furnishing and installation of pipe within casing shall be included in pipeline measurement.

7. Paving will be measured as a part of project causing removal and/or replacement of paving, except as otherwise specified on the Bidding Sheets.

B. Payment. Payment for quantities of sewer pipe and manholes will be paid in the manner described herein below. No additional compensation will be paid above the unit bid price for changes in quantities.

Requests for partial payments will not be approved if the record drawings and revised Construction Progress Schedule and bar chart are not kept current, an request for final payment will not be approved until the completed record drawings, showing all variations between the work "as-constructed" and as originally shown on the contract drawings or other contract documents, has been delivered to the District.

1. Sewer Pipe. Quantities of main sewer pipe and laterals measured as stated above and accepted, will be paid for at the respective unit bid prices per horizontal linear foot for the several kinds and sizes of pipe, which prices and payments shall constitute full compensation for furnishing all labor, materials, tools, and equipment necessary to complete the work in place, including pipe, wye branches, fittings, clean-outs, appurtenances, excavation, backfill, imported select granular backfill, special bedding, cradles or encasements, laterals where required, testing, removal and restoration of pavements, curbs, gutters and sidewalks, and disposal of surplus earth and rock spoil. Payment for pipe in place shall be further broken down based upon the Contractor's submittal under Section F-10 of these specifications, as concurred by the Engineer, but not to exceed in the ordinary project the following percentages of the linear foot price stated on the Bidding Sheet:

Trench excavation 10%
Pipe laid in place and shaded 65%
Trench backfilled and backfill compacted.....20%
Testing and clean-up, exclusive of pavement replacement 5%

2. Wye or Tee Branches. Payment for quantities of wye or tee branches and 1/8 bends shall be included in the payment for the unit bid prices for sewer pipe, which prices and payments shall constitute full compensation for furnishing all labor, materials, tools, and equipment necessary to complete the work in place, including wye branches only or wye branches plus 1/8 bends or short pipe sections as applicable, and no additional payment shall be made therefore.

3. Clean-outs. Payment for quantities of clean-outs measured as stated above and accepted will be paid for at the unit bid price stated on the Bidding Sheets, which prices and payments shall constitute full compensation for furnishing all labor, materials, tools and equipment necessary to complete the work in place, including wye branch, riser, screw plug, and box with cover, and no additional payments will be made therefore.

4. Manholes. Quantities of manholes measured as stated above and accepted, will be paid for at the respective unit bid prices for the sizes of manholes stated on the Bidding Sheets, which prices and payments shall constitute full compensation for furnishing all labor, materials, tools and equipment necessary to complete the work in place, including concrete base, manhole rings and tops, drop manhole inlets and supports, mortar, manhole frames and covers, stubs, earthwork, testing, removal and restoration of pavement, and disposal of surplus earth.

5. Special Bedding. Quantities of special bedding measured as stated above and accepted, will be paid for at the stipulated cost price, or the respective unit bid price for the quantities as stated on the Bidding Sheets, which price shall constitute full compensation for all labor, materials, and equipment necessary to complete the work in place, including the special bedding material.

6. Bore Casing. Payment for bore casing in place measured as stated above shall be made as specified on the Bidding Sheets.

7. Paving. Payment for quantities of paving measured as stated above and accepted shall be included in the unit bid price for pipeline. Work includes removal and/or restoration of paving and all earthwork, and no additional compensation will be made therefore, except as otherwise provided on the Bidding Sheets.

1.06 GUARANTEE

All work, materials, and equipment shall be guaranteed for the periods of time set forth elsewhere in the Contract Documents for general guaranty or warranty.

PART 2 - PRODUCTS & MATERIALS

2.01 MATERIALS FURNISHED BY CONTRACTOR

A. Acrylonitrile-Butadiene-Styrene (ABS) solid wall pipe shall meet the requirements of ASTM designation D-2751, SDR 23.5 or 35.

B. Polyvinyl Chloride (PVC) Plastic Pipe. PVC solid wall pipe shall meet the requirements of ASTM designation D-3034, SDR 35.

C. Pipe Jointing for the various types of plastic shall be as follows:

1. PVC Pipe Gasketed Joint Assembly. The assembly of the gasketed joint should be performed as recommended by the pipe manufacturer. The elastomeric gaskets may be supplied separately in cartons or prepositioned in the bell joint or coupling at the factory. When gaskets are color coded, be sure to consult the pipe manufacturer or his literature for the significance. In all cases, clean the gaskets, the bell or coupling interior, especially the groove area (except when gasket is permanently installed) and the spigot area with a rag, brush or paper towel to remove any dirt or foreign material before the assembling.
Inspect the gasket, pipe spigot bevel, gasket groove, and sealing surfaces for damage or deformation. When gaskets are separate, use only gaskets which are designed for and supplied with the pipe. Insert them as recommended by the manufacturer.

   Lubricant should be applied as specified by the pipe manufacturer. Bacterial growth, damage to the gaskets or the pipe, may be promoted by use of nonapproved lubricants. Use only lubricant supplied by the pipe manufacturer. After lubrication, the pipe is ready to be joined. Good alignment of the pipe is essential for ease of assembly. Align the spigot to the bell and insert the spigot into the bell until it contacts the gasket uniformly. Do not swing or "stab" the joint; that is, do not suspend the pipe and swing into the bell. When field-cut is necessary, a square cut is required. Use a factory-finished beveled end as guide for proper bevel angle and depth of bevel plus distance to the insertion reference mark.

2. PVC Solvent-Cemented Joint Assembly. Solvent-cemented joints should be made in accordance with manufacturer's recommendations or in accordance with ASTM D-2855, Standard Recommended Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.

3. ABS Pipe Joint Assembly. Solvent-welded jointing of ABS pipe shall be in accordance with the manufacturer's printed instructions which shall be furnished to the Engineer. Joint solvent cement shall be an ABS cement conforming to ASTM D-2235. The ends of ABS Composite Pipe shall be thoroughly coated with solvent cement. All safety precautions prescribed by the manufacturer in use of solvent cement are to be observed. Gaskets observed shall conform to the requirements of the manufacturer's pipe supplied.

D. Portland Cement Concrete. All concrete shall meet the requirements of the Detailed Provisions of the District standard specifications, except that only Type V or Type II Portland Cement shall be used.

E. Portland Cement Mortar. All cement mortar used for construction purposes shall consist of one (1) part Portland Cement (Type V or Type II) to two (2) parts of silica sand by volume and moistened with sufficient water to permit placing, buttering, caulking or coating without crumbling, unless otherwise approved by the Engineer.

F. Manholes. All manholes, covers, frames and steps shall meet the requirements of the Detailed Provisions of the District standard specifications, and of the District standard drawings. One-piece cone and shaft will not be accepted.

Manhole stub-outs shall be included in manhole installations, and shall be of clay pipe of the size designated on the drawings. All stub-outs shall be plugged for future connection, with neoprene stoppers or approved equal.

Manhole frames and covers will be furnished by the Contractor upon prior approval by the District of shop drawings. Such prior approval by the District shall in no way nullify the District's right to accept or reject any individual unit as furnished or as installed.

G. Manhole Connections. Connections of plastic sewer pipe to a manhole shall be watertight. Concrete manhole connections shall be "O" ring type produced from elastomeric compound or prefabricated manhole waterstop, grouted or locked into the manhole wall, the type to be approved by the Engineer. Additional requirements may be imposed by District for manhole connections in projects constructed in areas of high or potentially high ground water.

PART 3 - EXECUTION

3.01 INSTALLATION OF PIPE

Installation of pipe shall start at the low end of each section and proceed upgrade. All bell and spigot pipe shall be laid with the bell end upgrade. Assembly of all types of pipe shall be done in strict conformance with the requirements of the pipe manufacturer. Curved sewers shall not be constructed of plastic pipe.

Pipe shall be accurately laid to alignment and grade shown on the drawings or established by the Engineer. Where grade stakes are provided with which to establish the proper pipeline grade, pipe shall be laid to grade within a tolerance of 0.02', or 0.05' cumulative deviation from elevations set at 100' stations.

Sags, or standing water in pipe, shall meet the following criteria:

Complies with Specification	Does not Comply with Specifications Resulting in No Payment	Does not Comply with Specifications and Reconstruction is Required
1/2" or less sag	greater than 1/2" sag	greater than 1" sag

If standing water depth in the sag exceeds the value listed under "No Payment", then to compensate for anticipated higher than average pipeline operation and maintenance cost, no payment will be made for construction. The nonpayment amount will include all construction costs including such items as excavation, pipe installation, backfilling, resurfacing, etc., for the length of standing water that exceeds the value for "No Payment".

Due to unacceptably high operation and maintenance costs and poor system reliability, pipelines with sag depths exceeding those listed for "Reconstruction is Required" will be rejected. Reconstruction of the entire length of standing water plus 20 feet on each side of the standing water will be required. Damaged pipe must be removed and not reused.

A. Bedding. All pipes shall be laid in a bed prepared by hand work, dug true to line and grade, to furnish a true and firm bearing for the pipe throughout its entire length. Adjustment of pipes to lines and grade shall be made by scraping away or filling in and tamping material under the body of the pipe throughout its entire length, and not by blocking or wedging. Where a hand-shaped trench bottom conforming to barrel of pipe is not available or practical, Class "C" bedding shall be utilized below the pipe to a depth of one-eighth (1/8) the outside diameter of the pipe, but not less than 4".

The flexibility of plastic pipe may cause a possible problem in maintaining line and grade. Therefore, special care must be taken in the preparation of the subgrade and in the placement of bedding to ensure that the pipe is laid true to line and grade as required in this specification.

Plastic pipe shall be bedded as shown in the following table:

Type of Pipe	**Depth of Cover**	**Bedding Required**
Solid Wall (ABS & PVC) 4" to 15" size	0' to 20'	Crushed rock envelope Per SB-157, Class “BB”
	greater than 20'	Special Design
ABS & PVC Composite	less than 4'	Encasement per SB-157

Type of Pipe	Depth of Cover	Bedding Required
8" to 15" size		No. 2
or		
ABS Solid Wall SDR 23.5, 4"	4' to 9'	SB 157, Class "D"
to 6" diameter	9' to 20'	Crushed rock bedding to spring line per SB-157, Class "B"
	20' to 30'	Encasement per SB-157 No. 2
	greater than 30'	Special Design

B. Bell Holes shall be provided at the ends of each pipe length, of sufficient size to permit making up the particular type of joint being used.

C. Alignment. Pipes shall be laid in accurate conformity with the prescribed lines and grades, which alignment shall be obtained by plumbing and measuring from a tightly stretched wire or line running parallel with the flow line grade and supported over the centerline of the sewer by batterboards or bars accurately placed and firmly fastened in place across the trench; or by some other comparable method acceptable to the Engineer.

Alternate use of commercial LASER grade setting systems in lieu of string lines specified herein is acceptable when the following requirements and conditions are met:

1. The Contractor shall have the responsibility of providing an instrument operator who is qualified and trained in the operation of the LASER and said operator must adhere to the provisions of the State of California Construction Safety Orders issued by the Division of Industrial Safety. Attention is particularly directed to Section 1516, and 1800 through 1901, of said Orders for applicable requirements.

2. All LASER control points shall be established bench marks or construction off-set stakes identified on cut sheets and set in the field for the work. LASER set up points shall be on these control points or on points set directly from them by instrument.

3. Pipe alignment shall not deviate from that shown on the plans by more than 3/4 pipe diameter, nor shall it change in alignment more than 2 inches in 20 feet.

4. After each length of pipe has been laid to line and grade, it shall be jointed to the preceding section as hereinafter specified, and after said jointing procedure has commenced, there shall be no movement of the pipe whatsoever in subsequent operations.

D. Pipe Cleaning. Before each new length of pipe is placed, the interior of the preceding pipe shall be carefully cleaned of all dirt and debris. At all times when the work of installing pipe is not in progress, all openings into the pipe and the ends of the pipe in the trench shall be tightly closed to prevent entrance of animals and foreign materials.

The Contractor shall take all necessary precautions to prevent the pipe from floating due to water entering the trench from any source, shall assume full responsibility for any damage due to this cause and shall at his own expense restore and replace the pipe to its specified condition and grade if it is displaced due to floating.

E. Laterals and Clean-outs shall be constructed at the points indicated on the plans, and in accordance with the standard drawings. Connections of house laterals to sewer mains shall be made with factory-molded wye or tee connections as shown on EMWD standard drawings, except that only one type shall be used universally throughout the project.

Wye or tee branches shall be laid with the axis of the "Y" or "T" entering the main sewer at an angle above the horizontal axis of said main, unless specifically called out otherwise on the plans or in the Special Conditions, but, unless specifically called out otherwise, this angle shall not exceed 45°.

Whenever any service connection is to be temporarily blanked off, it shall be plugged with a cover or plug recommended by the manufacturer of the pipe.

Lateral connections to existing mains shall be made pursuant to the provisions of the appropriate standard drawing for saddle connection to the existing main pipe material. All sewers of this project are new sewers. Accordingly, laterals installed by saddle connections as shown on Std. Dwg. SB-176 and will be allowed only where unanticipated laterals are added after the sewer main is laid past the point of connection. In such case the already laid sewer main is shown on the standard drawing as "existing sewer main."

F. New Sewer Laterals on Existing Plastic Main. The required excavation and cleaning of main surfaces for a tap and saddle shall be performed by the Contractor and when such taps are installed by District forces, the Contractor shall have the additional materials and equipment at the jobsite as follows: barricades; proper pipe; standard bedding material as specified in these specifications; and a ladder long enough to extend two-and-one-half (2-1/2) feet above the top of the excavation. The excavation shall provide a minimum clearance of 3" under and 6" on each side of the main sewer for a distance of 12" each way along the main from the point of connection. The outer surface of the main in this exposed area shall be thoroughly cleaned.

New sewer laterals on existing vitrified clay pipe mains subject to commercial or industrial flows shall be constructed of vitrified clay pipe in accordance with the requirements for vitrified clay pipe.

The excavation above the main, for the tap working area, shall be a minimum of 2' in width without under-cut sides and shall be properly shored. Before the tap is made, the Contractor shall have sufficient standard bedding material at the site of the work to adequately backfill under the saddle to support it. No backfill shall be placed on the saddle fitting within one-half (1/2) hour after the completion of the work by District forces. If the Contractor breaks or otherwise damages the main while excavating for the tap, he shall notify the District and the District shall make repairs as necessary at the expense of the Contractor.

3.02 MANHOLES

Manholes shall be constructed in the locations and to the dimensions as shown on the drawings. Cast-in-place concrete shall conform to the requirements set forth in Section "Portland Cement Concrete" in these specifications. Pre-cast units shall be assembled accurately with full-bed mortar joints.

Unless otherwise shown on the drawings, the sewer pipe shall be laid continuously through the location of the manhole. After the manhole has been constructed, the open channel shall be formed by cutting the pipe and removing the top half. If the open channel cannot be formed in this manner, it shall be formed of concrete with the depth equal to the diameter of the sewer pipe. The floor of the manhole shall slope at least 2" from the sides of the manhole to the open channel.

When completed, the top of the manhole cover shall be accurately brought to the elevation called for on the drawings, or if no elevation is indicated, it shall be brought flush with the surface of the surrounding ground or pavement. The manholes shall be constructed so that there is not more than 19" of throat section between the top of the cone and the top of the frame.

When located in roadway subgrades, manholes shall be constructed up to the proper elevation preparatory to street paving, and temporarily covered with planks or steel plates. After paving operations have been completed the temporary covers shall be removed and the frames and covers installed flush with pavement grade.

3.03 CLEANING SEWER LINES

All sanitary sewer mains and laterals shall be flushed with water and "balled" or cleaned by acceptable method prior to testing to ensure that all dirt, debris, and obstructions are removed. This work must be performed in the presence of and to the satisfaction of the Engineer, and the Contractor shall notify the Engineer at least one (1) working day in advance of starting the cleaning work.

The Contractor shall, following backfill compaction and line cleaning provide:

A. 3/8" minimum pull ropes from manhole to manhole.

B. Equipment and traffic control to assist in the T.V. inspection performed by District's sub-contractor.

3.04 MANDREL TEST OF ABS & PVC PIPE

Following the placement and densification of backfill and prior to the placing of permanent pavement, all main line pipe shall be cleaned and then mandrelled to measure for obstructions (deflections, joint offsets and lateral pipe intrusions). A rigid mandrel, approved by the Engineer, with a circular cross section having a diameter of at least 95% of the specified average inside diameter, shall be pulled through the pipe by hand.

Ninety-five percent (95%) of the specified average inside diameter for flexible plastic pipe taken from the appropriate ASTM requirements are as follows:

	ABS Solid Wall (ASTM D-2751) SDR		PVC Solid Wall (ASTM D-3034) SDR
Pipe Nominal Dia.	23.5	35	35
4”	3.65”	3.77”	3.77”
6”	5.45”	5.61”	5.61”
8”	---	---	7.51”
10”	---	---	9.39”
12”	---	---	11.17”
15”	---	---	13.68”

Ninety-six percent (96%) of the specified average inside diameter for semirigid plastic pipe taken from ASTM D-2680:

Pipe Nominal Dia.	ABS & PVC Composite Wall (ASTM D-2680)
8”	7.44”
10”	9.36”
12”	11.28”
15”	14.16”

Mandrel testing shall be performed 30 days or longer after installation and backfill compaction. In the event permanent pavement is placed prior to that time, mandrel-testing shall be required prior to pavement placement and a second mandrel test 30 days or longer after compaction of backfill.

The backfill shall be removed and recompacted for any section of pipe that fails the mandrel test.

Re-rounders shall not be used to correct excessive pipe deformation.

3.05 LEAKAGE TESTS

All sanitary sewers shall be tested for tightness after they and all appurtenances have been completed, backfilled (except for test tees) and compacted, and are ready for service. Tests shall be made on each section, including manholes, from one manhole or test tee to the next, unless grades are flat enough to permit testing two or more sections at one time.

The method of required test (water test or air test) shall be determined by the Inspector.

A. Preparation for Tests. Each section of sewer, including house laterals, between successive manholes shall be tested by closing the lower end of the section to be tested, the inlet sewer of the upper manhole, and the ends of house laterals with stoppers, and filling the pipe and manhole with water to a level of 4' above the invert of the open sewer in the upper terminal. After the section has been filled, it shall be allowed to stand for a sufficient length of time to allow the manhole to absorb what water it will, prior to making the leakage test described in the following paragraphs (Water Test and Air Test). This period of time for absorption of water shall not be less then 30 minutes nor greater than 24 hours.

B. Test Procedure and Allowable Leakage.

1. Water Test. The leakage test shall consist of measuring the quantity of water required to maintain the water level at the elevation prescribed in the above paragraph for a period of one (1) hour. The water used in the test shall be measured through a meter or by other means satisfactory to the Engineer. The allowable leakage shall be computed from the following formula:

E = 0.0012 LD /H

Where E = allowable leakage in gallons

L = length of the sewer and house connections tested in feet

D = inside diameter of the pipe in inches

H = difference in the elevation (in feet) between water surface in the upper manhole and the invert of the pipe at the lower manhole.

If the leakage during the test period exceeds the allowable leakage, the sewer line shall be overhauled and, if necessary, relaid until the joints hold satisfactorily under the test.

2. Air Test. Installed pipeline shall be field tested in accordance with the air test required for vitrified clay pipe specified in the National Clay Pipe Institute 1967 Supplement to Engineering Manual, and its supplementary tables contained in the NCPI publication entitled "Low Pressure Air Test for Sanitary Sewers (Procedures and Tables)."

Isolation of defects by air test shall be the Contractor's responsibility to perform; however, if performed by the District or its agent, they shall be performed at the Contractor's expense.

C. Alternate Infiltration Test. If excessive groundwater is encountered in the construction of a section of the sewer, the test for leakage previously described shall not be used. The end of the sewer at the upper structure shall be closed sufficiently to prevent the entrance of water and pumping of groundwater shall be discontinued for at least three (3) days, after which the section shall be tested for infiltration. The allowable infiltration for any portion of the sewer system should not exceed 100 gallons per inch of internal pipe diameter per mile per day (4.6 l/mm/km/day), including manholes. Infiltration in excess of this amount shall be reduced to a quantity within the specified amount before the sewer will be accepted. In any case, the Contractor shall stop any individual leaks that may be observed.

Unless otherwise specified, infiltration will be measured through a meter or by other means satisfactory to the Engineer.

D. Manhole Leakage. Should an initial test show excessive leakage in a section of line, it is permissible to draw off the water of a water test and test the manhole that contained water. This test shall be made by plugging all openings in the manhole, filling same with water to the same elevation as used for the initial test, and checking the loss in a one hour period. The leakage so determined may be deducted from the total leakage in the section of pipe initially tested.

If, in the opinion of the Engineer, the manhole leakage thus determined is excessive, the Contractor shall waterproof the interior of the manhole by applying a coating of grout or an approved waterproofing material. Excessive leakage is defined to be 50 gallons per hour when filled to the top of the barrel sections (not including cone or grade rings). Shallow rectangular manholes shall be filled to the top of the manhole sections (not including grade rings), with 50 gallons per hour leakage allowed.

3.06 SEWER PIPE REPAIRS

Sewer pipe leakage in excess of the allowable maximum shall be corrected by repairs acceptable to the Engineer, and retesting as required.

The section of damaged pipe will be cut out and the ends of the remaining pipe and replacement pipe will be prepared per Article 2.01 C.1. The closure will be made with a "closure coupling" as supplied by the manufacturer of type pipe used.

3.07 LATERAL MARKERS

It shall be required of the Contractor to place the required markers at the end of each lateral and to also return after curb construction to place the required mark in the face of the curb. An "L" may be used in place of the required "S" mark in the curb face. Unless waived by the Engineer, 2" wide metallic detectable locator tape shall be placed with each lateral, approximately 6" above the pipe.

END OF SECTION 02762

SPECIFICATIONS - DETAILED PROVISIONS
Section 02769 - Furnish & Install High Density Polyethylene (HDPE) Sewer Pipe System

C O N T E N T S

SECTION 02769
FURNISH & INSTALL HIGH DENSITY POLYETHYLENE (HDPE) SEWER PIPE SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION

The Contractor shall furnish all labor, material, tools, and equipment required for the complete construction of pipelines, manholes, clean-outs, and other allied structures and appurtenances as stated on the Bidding Sheets, shown on the Contract Drawings, and specified herein, all within the time as stated in the Contract Documents.

These provisions establish the requirements for the use of High Density Polyethylene (HDPE) larger diameter profile wall sewer for main line sewer construction. Use is limited to those projects which specify or indicate the use of (HDPE) as an alternate.

HDPE pipe may only be used where indicated on plans approved by the District. Where HDPE pipe is used, one type of pipe shall be used between consecutive manholes. No service laterals shall be directly connected to the sewer main.

1.02 RECORDS

A true and accurate record of all "as built" conditions shall be furnished to the Engineer prior to, or immediately upon, completion of the work.

1.03 CARE & HANDLING

Pipe shall be stored at the jobsite in unit packages provided by the manufacturer. Caution shall be exercised to avoid compression, damage or deformation to bell ends of the pipe. If pipe is to be exposed to direct sunlight for more than 14 days, pipe must be covered with an opaque material while permitting adequate air circulation above and around the pipe to prevent excessive heat accumulation.

If pipe is strung along trench prior to installation, string only pipe to be used within a 24-hour period; all pipe is to be laid on a flat surface. The interior as well as sealing surfaces of pipe, fittings, and other accessories shall be kept free from dirt and foreign matter. Gaskets shall be protected from excessive exposure to heat, direct sunlight, ozone, oil and grease.

1.04 JOB CONDITIONS

The Contractor shall familiarize himself and comply with all applicable state, county and municipal rules and regulations pertaining to sanitation, fire protection and safety, and all provisions of the Contract Documents.

1.05 PAYMENT

A. Measurement For Payment. Quantities for installation of sewer pipe, manholes, and other appurtenances on District-administered contracts shall be measured for payment as specified herein:

1. Main Sewer Lines will be measured in place along the horizontal centerline of the pipe by the linear foot. The measurement will be continuous through all wye branches, fittings, and manholes, except that said measurement will be taken to the center only of manholes where sewer lines terminal.

2. Manholes will be measured on the basis of each manhole completely installed, including required stub-outs.

3. Special Bedding. In addition to the bedding requirements of the District's standard drawing SB-157 and the drawing bedding details, if due to conditions not anticipated by soils report or shown on construction drawings and over excavation is ordered by the engineer, the bedding will be measured on the basis of the cubic yards of special bedding required to bring the bedding up to grade for the trench size excavated up to the maximum size of trench allowable under these specifications. No allowance will be made for over-excavation except as directed by the Engineer.

4. Bore Casing will be measured on the basis of horizontal centerline distance and shall include all excavation, furnishing and placement of casing, furnishing and placement of all required backpacking and grouting around casing, backfilling within casing, pipe bracing, restoration of surfaces, and all labor and material for a finished job. Furnishing and installation of pipe within casing shall be included in pipeline measurement.

5. Paving will be measured as a part of project causing removal and/or replacement of paving, except as otherwise specified on the Bidding Sheets.

B. Payment. Payment for quantities of sewer pipe and manholes will be paid in the manner described herein below. No additional compensation will be paid above the unit bid price for changes in quantities.

Requests for partial payments will not be approved if the record drawings and revised Construction Progress Schedule and bar chart are not kept current, and request for final payment will not be approved until the completed record drawings, showing all variations between the work "as constructed" and as originally shown on the contract drawings or other contract documents, has been delivered to the District.

1. Sewer Pipe. Quantities of main sewer pipe measured as stated above and accepted, will be paid for at the respective unit bid prices per horizontal linear foot for the several kinds and sizes of pipe, which prices and payments shall constitute full compensation for furnishing all labor, materials, tools, and equipment necessary to complete the work in place, including pipe, wye branches, fittings, appurtenances, bore casing, excavation, backfill, imported select granular backfill, special bedding, cradles or encasements, testing, removal and restoration of pavements, curbs, gutters and sidewalks, and disposal of surplus earth and rock spoil. Payment for pipe in place shall be further broken down based upon the Contractor's submittal under Section F-10 of these specifications, as concurred by the Engineer, but not to exceed in the ordinary project the following percentages of the linear foot price stated on the Bidding Sheet:

   Trench excavation 10%
   Pipe laid in place and shaded 65%
   Trench backfilled and backfill compacted.....20%
   Testing and clean-up, exclusive of pavement replacement 5%

2. Manholes. Quantities of manholes measured as stated above and accepted, will be paid for at the respective unit bid prices for the sizes of manholes stated on the Bidding Sheets, which prices and payments shall constitute full compensation for furnishing all labor, materials, tools and equipment necessary to complete the work in place, including concrete base, manhole rings and tops, drop manhole inlets and supports, mortar, manhole frames and covers, stubs, earthwork, testing, removal and restoration of pavement, and disposal of surplus earth.

3. Special Bedding. Quantities of special bedding measured as stated above and accepted, will be paid for at the stipulated cost price, or the respective unit bid price for the quantities as stated on the Bidding Sheets, which price shall constitute full compensation for all labor, materials, and equipment necessary to complete the work in place, including the special bedding material.

4. Bore Casing. Payment for bore casing in place measured as stated above shall be made as specified on the Bidding Sheets.

5. Paving. Payment for quantities of paving measured as stated above and accepted shall be included in the unit bid price for pipeline. Work includes removal and/or restoration of paving and all earthwork, and no additional compensation will be made therefore, except as otherwise provided on the Bidding Sheets.

1.06 GUARANTEE

All work, materials, and equipment shall be guaranteed for the periods of time set forth elsewhere in the Contract Documents for general guaranty or warranty, but the minimum period will be one year from the date of the Notice-of-Acceptance.

PART 2 - PRODUCTS & MATERIALS

2.01 MATERIALS FURNISHED BY CONTRACTOR

A. Pipe & Fittings. The pipe and fittings shall conform to ASTM D-1248 and F 894 standard specification for polyethylene (PE) large diameter profile wall sewer and drain pipe and shall be nominal pipe classification as shown on the construction drawings.

B. Manholes. Manholes shall conform to section 3.02 of this specification.

C. Pipe Jointing shall be accomplished by gaskets bell and spigot in accordance with ASTM F 894 and the manufacturer's recommendations.

D. Portland Cement Concrete. All concrete shall meet the requirements of the Detailed Provisions of the District standard specifications, except that only Type V or Type II Portland Cement shall be used.

E. Manhole Connections. Manhole connections for cast-in-place, pre-cast, and polyethylene units for above and below ground water table shall be per manufacturer's recommendations. All pipe in/out of manholes shall be core-wall.

PART 3 - EXECUTION

3.01 INSTALLATION OF PIPE

Installation of pipe shall start at the low end of each section and proceed upgrade. All bell and spigot pipe shall be laid with the bell end upgrade. Assembly of all types of pipe shall be done in strict conformance with the requirements of the pipe manufacturer. Curved sewers shall not be constructed of plastic pipe.

Pipe shall be placed in the trench with any elongation oriented vertically. For pipe sizes larger than 36 inches in diameter, struts must be provided and installed per the manufacturer's recommendations. However, the struts shall not cause more than 1½% vertical elongation; in no case will horizontal elongation be permitted.

Pipe shall be accurately laid to alignment and grade shown on the drawings or established by the Engineer. Where grade stakes are provided with which to establish the proper pipeline grade, pipe shall be laid to grade within a tolerance of 0.02', or 0.05' cumulative deviation from elevations set at 100' stations.

Sags, or standing water in pipe, shall meet the following criteria:

Complies with Specification	Does not Comply with Specifications Resulting in No Payment	Does not Comply with Specifications and Reconstruction is Required
1/2" or less sag	greater than 1/2" sag	greater than 1" sag

If standing water depth in the sag exceeds the value listed under "No Payment", then to compensate for anticipated higher than average pipeline operation and maintenance cost, no payment will be made for construction. The nonpayment amount will include all construction costs including such items as excavation, pipe installation, backfilling, resurfacing, etc., for the full length of standing water.

Due to unacceptably high operation and maintenance costs and poor system reliability, pipelines with sag depths exceeding those listed for "Reconstruction is Required" will be rejected. Reconstruction of the length of standing water plus 20 feet on each side of the standing water will be required. Damaged pipe must be removed and not reused.

A. Bedding. All pipes shall be laid in a bed prepared by hand work, dug true to line and grade, to furnish a true and firm bearing for the pipe throughout its entire length. Adjustment of pipes to lines and grade shall be made by scraping away or filling in and tamping material under the body of the pipe throughout its entire length, and not by blocking or wedging. All bedding materials must be mechanically compacted/consolidated to a minimum of 90% standard proctor or as required by the Engineer.

   Bedding shall be per the bedding details shown on the plans. Crushed rock to be placed in the pipe zone in equal lifts of one foot on both sides of the pipe. The bedding operation shall not cause the pipe to have a vertical elongation of more than 1½%.

   If the Engineer determines that ground water will be encountered or that the ground water is anticipated to exceed the springline of the pipe during the service life of the line, the backfill material within the pipe zone shall be approved by the Engineer and be installed at no extra cost to the District.

The flexibility of plastic pipe may cause a possible problem in maintaining line and grade. Therefore, special care must be taken in the preparation of the subgrade and in the placement of bedding to ensure that the pipe is laid true to line and grade as required in this specification.

B. Shoring, sheeting, or trench shields shall be utilized in such a manner as to minimize disturbance of the backfill material beneath the pipe crown. Trench sheeting that extends below the crown should either be left permanently in place or consist of adequately supported steel sheets 1" (one inch) thick or less which can be extracted with minimal disturbance to the pipe embedment. Where moveable trench shields are used, the following steps shall be followed unless an alternate technique that does not disturb the pipe embedment can be demonstrated:

1. Excavation of the trench below the elevation of the pipe crown shall be done from inside of the trench shield to prevent the accumulation of loose or sloughed material along the outside of the shield. Excavation of the trench ahead of the shield at an elevation below the pipe crown is not permitted unless approved by the Engineer.

2. After laying the pipe in the trench, bedding and pipe embedment shall be placed in lifts and the shield must be lifted in steps. As the shield is lifted, embedment material shall be shoveled under the shield so as to fill all voids left by the removal of the shield.

Backfill material placed under the pipe haunches shall be thoroughly shovel sliced along the length of the pipe.

Where compaction/consolidation of bedding and backfill materials is required, compact by mechanical means. Suitable mechanical means includes vibratory sleds, gasoline driven impact tampers, and air driven impact tampers or other approved means. Compact to a minimum of 90% Standard Proctor or as required by the Engineer.

Pipe shall not be subject to a roller or wheel loads until a minimum of one diameter or 36" (whichever is larger) of backfill has been placed over the top of the pipe and a hydrohammer shall not be used until a minimum depth of one diameter or 48" (whichever is larger) of backfill has been placed over the top of the pipe.

C. Alignment. Pipes shall be laid in accurate conformity with the prescribed lines and grades, which alignment shall be obtained by plumbing and measuring from a tightly stretched wire or line running parallel with the flow line grade and supported over the centerline of the sewer by batterboards or bars accurately placed and firmly fastened in place across the trench; or by some other comparable method acceptable to the Engineer.

Alternate use of commercial LASER grade setting systems in lieu of string lines specified herein are acceptable when the following requirements and conditions are met:

The Contractor shall have the responsibility of providing an instrument operator who is qualified and trained in the operation of the LASER and said operator must adhere to the provisions of the State of California Construction Safety Orders issued by the Division of Industrial Safety. Attention is particularly directed to Section 1516, and 1800 through 1801, of said Orders for applicable requirements.

All LASER control points shall be established bench marks or construction off-set stakes identified on cut sheets and set in the field for the work. LASER set up points shall be on these control points or on points set directly from them by instrument.

Pipe alignment shall not deviate from that shown on the plans by more than two inches in 20 feet.

After each length of pipe has been laid to line and grade, it shall be jointed to the preceding section as hereinafter specified, and after said jointing procedure has commenced, there shall be no movement of the pipe whatsoever in subsequent operations.

D. Pipe Cleaning. Before each new length of pipe is placed, the interior of the preceding pipe shall be carefully cleaned of all dirt and debris. At all times when the work of installing pipe is not in progress, all openings into the pipe and the ends of the pipe in the trench shall be tightly closed to prevent entrance of animals and foreign materials.

The Contractor shall take all necessary precautions to prevent the pipe from floating due to water entering the trench from any source, shall assume full responsibility for any damage due to this cause and shall at his own expense restore and replace the pipe to its specified condition and grade if it is displaced due to floating.

3.02 MANHOLES

Manholes shall be constructed in the locations and to the dimensions as shown on the drawings. Cast-in-place concrete shall conform to the requirements set forth in Section "Portland Cement Concrete" in these specifications. Pre-cast units shall be assembled accurately with full-bed mortar joints. Polyethylene units shall conform to ASTM D-1248 and the manufacturer's requirements. The bottom section shall be formed to accept the pipe sizes and configurations as shown on the plans. The bottom section shall be supported by a cast-in-place base that extends from the molded shelf to a minimum of 8 inches below the bottom of the base section and shall be held in place with No. 8 bend bars. The concrete base shall extend at least 12 inches outside of the bottom section of the manhole.

Unless otherwise shown on the drawings, the sewer pipe shall be laid continuously through the location of the manhole. After the manhole has been constructed, the open channel shall be formed by cutting the pipe and removing the top half. If the open channel cannot be formed in this manner, it shall be formed of concrete with the depth equal to the diameter of the sewer pipe.

When completed, the top of the manhole cover shall be accurately brought to the elevation called for on the drawings, or if no elevation is indicated, it shall be brought flush with the surface of the surrounding ground or pavement. The manholes shall be constructed so that there is not more than 19" of throat section between the top of the cone and the top of the frame.

When located in roadway subgrades, manholes shall be constructed up to the proper elevation preparatory to street paving, and temporarily covered with planks or steel plates. After paving operations have been completed the temporary covers shall be removed and the frames and covers installed flush with pavement grade.

3.03 CLEANING SEWER LINES

All sanitary sewer mains shall be flushed with water and "balled" or cleaned by acceptable method prior to testing to ensure that all dirt, debris, and obstructions are removed. This work must be performed in the presence of and to the satisfaction of the Engineer, and the Contractor shall notify the Engineer at least one (1) working day in advance of starting the cleaning work.

The Contractor shall, following backfill compaction and line cleaning provide:

A. 3/8" minimum pull ropes from manhole to manhole.

B. Equipment and traffic control to assist in the T.V. inspection performed by District's sub-contractor.

3.04 MANDREL TEST

Following the placement and densification of backfill and prior to the placing of permanent pavement, all main line pipe shall be cleaned and then mandrelled to measure for obstructions (deflections, joint offsets and lateral pipe intrusions). A rigid mandrel, approved by the Engineer, with a circular cross section having a diameter of at least 95.5% of the nominal inside diameter, shall be pulled through the pipe by hand.

Mandrel testing shall be performed 30 days or longer after installation and backfill compaction. In the event permanent pavement is placed prior to that time, mandrel-testing shall be required prior to pavement placement and a second mandrel test 30 days or longer after compaction of backfill.

In addition to the deflection test described above, the contractor shall deflection test the first 300-400 feet of pipe after it has been backfilled to grade in order to verify that his installation and compaction procedures are adequate to meet the requirements of the content. No additional pipe shall be installed until this test has been successfully completed.

The District, at its discretion and at the contractor's expense, will in the eleventh month after project acceptance have the pipe deflections monitored and any deflections greater than six percent (6%) of the nominal inside diameter will require the contractor to return to the jobsite, excavate, and adjust the vertical deflection to 6% or less.

Re-rounders shall not be used to correct excessive pipe deformation.

3.05 LEAKAGE TESTS

All sanitary sewers shall be tested for tightness after they and all appurtenances have been completed, backfilled (except for test tees) and compacted, and are ready for service. Tests shall be made on each section, including manholes, from one manhole or test tee to the next, unless grades are flat enough to permit testing two or more sections at one time.

The method of required test (water test or air test) shall be determined by the Engineer.

A. Preparation for Tests. Each section of sewer between successive manholes shall be tested by closing the lower end of the section to be tested, the inlet sewer of the upper manhole, and filling the pipe and manhole with water to a level of 2' above the soffit of the open sewer in the upper terminal. After the section has been filled, it shall be allowed to stand for a sufficient length of time to allow the manhole to absorb what water it will, prior to making the leakage test described in the following paragraphs (Water Test and Air Test). This period of time for absorption of water shall not be less than 30 minutes nor greater than 24 hours.

B. Test Procedure and Allowable Leakage.

1. Water Test. The leakage test shall consist of measuring the quantity of water required to maintain the water level at the elevation prescribed in the above paragraph for a period of one (1) hour. The water used in the test shall be measured through a meter or by other means satisfactory to the Engineer. The allowable leakage shall be computed from the following formula:

$$E = 0.0012\ LD.\ H$$

Where E = allowable leakage in gallons
L = length of line being tested in feet
D = inside diameter of the pipe in inches
H = difference in elevation (in feet) between the water surface in the upper manhole and the invert of the pipe in the lower manhole

If the leakage during the test period exceeds the allowable leakage, the sewer line shall be overhauled and, if necessary, relaid until the joints hold satisfactorily under the test.

2. Air Test. Installed pipeline shall be field tested in accordance with the air test required for vitrified clay pipe specified in the National Clay Pipe Institute 1967 Supplement to Engineering Manual, and its supplementary tables contained in the NCPI publication entitled "Low Pressure Air Test for Sanitary Sewers (Procedures and Tables)."

   Isolation of defects by air test shall be the Contractor's responsibility to perform; however, if performed by the District or its agent, they shall be performed at the Contractor's expense.

C. Alternate Infiltration Test. If excessive groundwater is encountered in the construction of a section of the sewer, the test for leakage previously described shall not be used. The end of the sewer at the upper structure shall be closed sufficiently to prevent the entrance of water and pumping of groundwater shall be discontinued for at least three (3) days, after which the section shall be tested for infiltration. The allowable infiltration for any portion of the sewer system should not exceed 50 gallons per inch of internal pipe diameter per mile per day (4.6 l/mm/km/day), including manholes. Infiltration in excess of this amount shall be reduced to a quantity within the specified amount before the sewer will be accepted. In any case, the Contractor shall stop any individual leaks that may be observed.

   Unless otherwise specified, infiltration will be measured through a meter or by other means satisfactory to the Engineer.

D. Manhole Leakage. Should an initial test show excessive leakage in a section of line, it is permissible to draw off the water of a water test and test the manhole that contained water. This test shall be made by plugging all openings in the manhole, filling same with water to the same elevation as used for the initial test, and checking the loss in a one hour period. The leakage so determined may be deducted from the total leakage in the section of pipe initially tested.

   If, in the opinion of the Engineer, the manhole leakage thus determined is excessive, the Contractor shall waterproof the interior of the manhole by applying a coating of grout or an approved waterproofing material. Excessive leakage is defined to be 50 gallons per hour when filled to the top of the barrel sections (not including cone or grade rings). Shallow rectangular manholes shall be filled to the top of the manhole sections (not including grade rings), with 50 gallons per hour leakage allowed.

3.06 SEWER PIPE REPAIRS

Sewer pipe leakage in excess of the allowable maximum shall be corrected by repairs acceptable to the Engineer, and retesting as required.

The section of damaged pipe will be cut out and the ends of the remaining pipe and replacement pipe will be prepared per Article 2.01 C. The closure will be made with a "closure coupling" as supplied by the manufacturer of type pipe used, or alternate welding of repairs as approved by the manufacturer.

END OF SECTION 02769

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SPECIFICATIONS - DETAILED PROVISIONS
Section 15330 - Vitrified Clay Sewer Pipe (Plain End)
(Limited to Maximum Pipe Diameter of 12")

C O N T E N T S

SECTION 15330
VITRIFIED CLAY SEWER PIPE (PLAIN END)
(Limited to Maximum Pipe Diameter of 12")

PART 1 - GENERAL

1.01 REQUIREMENT

Under this specification the Contractor shall be required to furnish, deliver, unload, and string within the time specified in the contract documents, the vitrified clay sewer pipe as specified on the bidding sheets, shown on the contract drawings, and described in these specifications. The coupling shall consist of three (3) parts: a circular rubber sleeve, stainless steel compression bands with stainless steel nuts and bolts type tightening devices, and a steel or plastic shear ring.

1.02 MEASUREMENT AND PAYMENT

Payment for quantities of pipe will be made at the unit prices as stated on the bidding sheets or order-to-do-work; or shall be included with the cost of furnishing and installing sewer pipe, where so stated on the bidding sheets.

PART 2 - PRODUCTS

2.01 PIPE DESIGN

All pipe and rubber coupling joints shall be made in strict conformance with all requirements of the latest revision of ASTM C-700, ASTM C-425, and to the requirements of these specifications. All pipe shall be high strength vitrified clay pipe conforming to the requirements of Section 207-8 of the Standard Specifications For Public Works Construction, 1991 Edition. All joints shall be factory fabricated, with the coupling attached to one end of the pipe at the factory. All pipes shall be manufactured and tested in the United States.

The compression bands and clips shall be fabricated from stainless steel AISI Type 316 and the nuts and bolts shall be manufactured using stainless steel AISI Type 305. The shear ring shall be fabricated from stainless steel AISI Type 304, or with the approval of the Engineer, another stainless steel which is more corrosion resistant than Type 304, or approved corrosion resistant plastic.

The sleeve shall be made of a synthetic rubber which is vulcanized to form a smooth surface, free of pitting, cracks, air marks, porosity, air pockets, and which shall meet all manufacturers requirements.

All pipe and joints manufactured under these specifications shall be suitable for the conveyance of sewage.

2.02 TOLERANCES

Tolerances shall conform to the requirements of the above stated specifications, and the actual cross-sectional area of the inside diameter of the pipe shall be not less than the computed cross-sectional area, based on the stated nominal diameter of the pipe.

PART 3 - EXECUTION

3.01 INSPECTION

The Engineer or his authorized representative shall at all times have the right to inspect the work and the materials.

3.02 JOINT INSTALLATION

Before installing compression bands, the surface of the rubber sleeve shall be thoroughly wetted with a silicone base lubricant approved by the Bureau of Standards. This lubricant shall not be injurious to the rubber sleeve or steel band.

Bands installed in the plant shall be tightened to a tension equivalent to a torque of 70 pound-inches.

Plant equipment used in the installation of the bands shall be calibrated by the Bureau of Standards at least twice a year to assure correct band tension. Factory-installed joints shall be subject to testing in the field.

Bands installed in the field shall be tightened with a torque wrench set to a torque of 70 pound-inches. Torque wrenches to be used in the field shall be furnished by the pipe supplier and shall be calibrated by the Bureau of Standards at the start of each project, and weekly thereafter for the duration of the project.

3.03 FACTORY TESTING OF RUBBER FOR SEALING COMPONENTS

All test specimens (unless otherwise specified) shall be conditioned in a mechanical convection oven for seven (7) days at 110□F. □ 5□and sub
being tested. Test specimens which are exposed to various chemical and bacteriological environments, unless otherwise specified, shall be conditioned in the same manner, both before and after exposure, prior to testing.

3.04 LABORATORY TEST OF JOINT

An assembled joint shall present sufficient resistance to shear loading to allow a weight of 150 pounds per inch of nominal diameter to be uniformly applied over an arc of not less than 120□ and a longitudinal distance of 12" immediately adjacent to one edge of the sleeve coupling. The assembled pipe shall rest on three (3) supports. A support shall be located at each extreme end of the assembly. The third support shall be placed immediately adjacent to the coupling. The shear load shall be placed on the unsupported end of the pipe, immediately adjacent to the coupling. There shall be no visible leakage when tested with an internal hydrostatic pressure of 10 psi for 10 minutes.

The coupling for the 4" through 12" diameter pipe, inclusive, shall exhibit sufficient flexibility when jointed to allow maximum deflection of 5□ in any direction. The deflected joint shall show no visible leakage when subject to the same shear load as indicated in the previous paragraph and when tested under an internal hydrostatic pressure of 10 psi for 10 minutes.

During these tests, the ends of the tested pipe shall be restrained only in the amount necessary to prevent longitudinal movement.

END OF SECTION 15330

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SPECIFICATIONS - DETAILED PROVISIONS
Section 15331 - Vitrified Clay Sewer Pipe (Bell & Spigot)

C O N T E N T S

SECTION 15331
VITRIFIED CLAY SEWER PIPE (BELL & SPIGOT)

PART 1 - GENERAL

1.01 REQUIREMENT

Under this specification, the Contractor shall be required to furnish, deliver, unload and string within the time specified in the Contract Documents, the vitrified clay sewer pipe as specified on the Bidding Sheets, shown on the Contract Drawings, and described in these specifications.

1.02 MEASUREMENT AND PAYMENT

Payment for quantities of pipe will be made at the unit prices as stated on the Bidding Sheets or order-to-do-work; or shall be included with the cost of furnishing and installing sewer pipe, where so stated on the Bidding Sheets.

PART 2 - PRODUCTS

2.01 PIPE DESIGN

All pipe and plastic gasket joints shall be made in strict conformance with all requirements of the latest revision of ASTM C700, ASTM C425, and to the requirements of these specifications. All pipe shall be high strength vitrified clay pipe conforming to the requirements of Section 207-8 of the Standard Specifications For Public Works Construction, 1991 Edition. All pipe shall be manufactured and tested in the United States.

All pipe and joints manufactured under these specifications shall be suitable for the conveyance of sewage. All joint materials shall have a strong, permanent bond to the pipe.

2.02 TOLERANCES

Tolerances shall conform to the latest revision of ASTM C 700, Standard Specifications for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated, and the Standard Specifications for Public Works Construction, section 207-8. Where the two standards are not in agreement, pipe will conform to the more restrictive requirement.

PART 3 - EXECUTION

3.01 INSPECTION

The Engineer or his authorized representative shall at all times have the right to inspect the work and the materials.

END OF SECTION 15331

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SPECIFICATIONS - DETAILED PROVISIONS
Section 15333 - Cast Iron & Ductile Iron Sewer Pipe

C O N T E N T S

SECTION 15333
CAST IRON & DUCTILE IRON SEWER PIPE

PART 1 - REQUIREMENT

1.01 CAST IRON SEWER PIPE AND FITTINGS

Cast iron sewer pipe and fittings shall conform to the latest revision of AWWA Spec. C-106, -108, or -151, with bituminous inside and outside coatings. Joints shall be mechanical or push-on joints conforming to the latest revision of AWWA Spec. C-111 or EMWD standard drawings.

Cast iron pipe shall be of the following thickness classes for the indicated pipe size and depth:

Pipe Diameter (in inches)	**Depth of Cover (in feet)**	**ANSI Thickness Class**
4"	16' and less	22
6"	16' and less	22
8"	less than 12'	22
	12' to less than 16'	23
	16'	24
10"	less than 12'	22
	12' - 16'	24
12"	less than 8'	22
	8' to less than 12'	23
	12' to less than 16'	24
	16'	25
Over 12"	Refer ANSI A21.1-1967, (AWWA C101-67), Table 1-1	

1.02 DUCTILE IRON PIPE

Ductile iron pipe of the following thickness classes for the indicated pipe size and depth may be used in lieu of cast iron pipe.

Pipe Diameter (in inches)	Depth of Cover (in feet)	ANSI Thickness Class	USA Standard Thickness Class
4"	32' and less	51	1
6"	32' and less	50	Use CL. 1
8"	less than 28'	50	Use CL. 1
	28' - 32'	51	1
10"	less than 20'	50	Use CL. 1
	20' to less than 28'	51	1
	28' - 32'	52	2
12"	less than 20'	50	Use CL. 1
	20' to less than 24'	51	1
	24' to less than 32'	52	2
	32'	53	3
Over 12"	Refer ANSI A21.51-1976, (AWWA C151-76). Table 51.1		

END OF SECTION 15333

SPECIFICATIONS - DETAILED PROVISIONS
Section 15340 - Manholes and Fittings

C O N T E N T S

SECTION 15340
MANHOLES AND FITTINGS

PART 1 - GENERAL

1.01 REQUIREMENT

Under this specification, the Contractor shall be required to furnish, deliver and unload within the time specified in the Contract Documents, the manholes and fittings as specified on the Bidding Sheets, shown on the Contract Drawings, and described in these specifications, except as otherwise approved in writing by the Engineer.

1.02 MEASUREMENT AND PAYMENT

Payment for quantities of manholes will be made at the unit prices as stated on the Bidding Sheets.

1.03 GUARANTEE

The Contractor shall guarantee all materials and workmanship of items furnished under these specifications to be free from defects for a period of one (1) year after final completion and acceptance of the entire contract work. The Contractor shall, at his own expense, repair or replace all defective materials or workmanship supplied by him found to be deficient with respect to any provisions of this specification.

PART 2 - PRODUCTS

2.01 MANHOLES

All manhole rings, tops, and cones, as constructed in place, shall be designed for A.A.S.H.O. H-20 highway loading, and shall conform to District standard drawings and the requirements of ASTM C-478 and the following requirements.

2.02 RINGS

All manhole rings shall be centrifugally spun or compactly vibrated in forms.

2.03 TOPS

All manhole tops and cones shall be compactly vibrated in forms.

2.04 MANHOLE COVERS

All manhole covers and frames shall conform to District standard drawings and the requirements for Class 30 gray iron castings in ASTM Designation A-48, or Class 60 Ductile Iron castings in ASTM A-536. The castings shall be thoroughly cleaned and coated with commercial quality asphaltum paint. Frames and covers shall be matchmarked in pairs before delivery to the work site and must be machined matched between cover and frame to avoid rocking.

2.05 MANHOLE STEPS

Manhole steps shall conform to District Standard Drawings and shall be constructed of 1/2" plain steel bar incapsulated with copolymer polypropylene plastic as approved by EMWD. Alternate to be approved by EMWD for casting-in-place.

END OF SECTION 15340