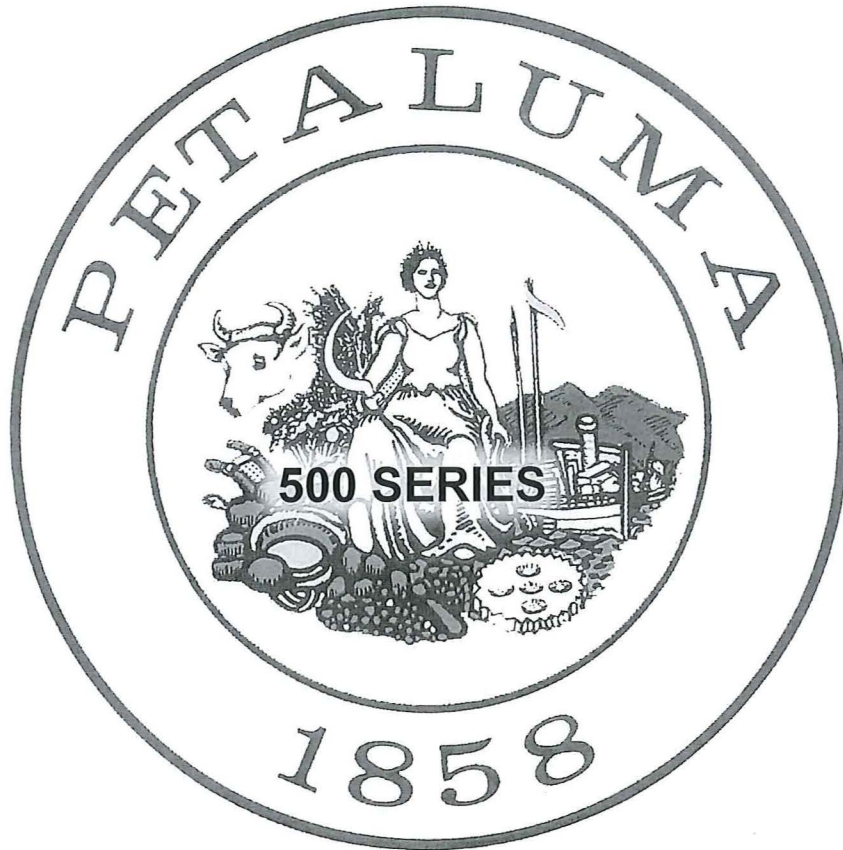


Sewer System

- Design and Construction Guidelines
- Construction Standards
- Approved Materials List



City of Petaluma - Sonoma County - California
Public Works & Utilities
202 North McDowell Boulevard
Petaluma, CA 94954

APPROVED BY:

 1/18/19
Date

Kent R. Carothers, P.E., Operations Manager

Sewer System Construction Standards

Standards List

<u>Std. No.</u>	<u>Title</u>	<u>Date Approved</u>
500	Standard 48" Diameter precast Concrete Manhole Sanitary Sewer	April 1999
501	Standard 60" Diameter precast Concrete Manhole Sanitary Sewer	April 1999
502	Standard Trench Details	January 2019
503	Inside Drop-in Sanitary Sewer Manhole	April 1995
504	Ductile Iron Fittings for Outside Drop Inlet Manhole.....	April 1995
505	Permanent Mainline Cleanout	April 1995
506	Temporary Mainline Cleanout	April 1995
507	Abandoned Pipe Plug Detail.....	April 1995
508	Abandoned Manhole Detail	April 1995
509	Standard Precast Concrete Manhole reducer slab Sanitary Sewer.....	April 1995
510	Standard Manhole Frame and Cover	April 1995
511	Sewer Service Lateral.....	April 1995
512	Pipe-Pipe Crossing Details	April 1995
513	Pipe-Structure Crossing Detail	April 1995
514	Precast Grease Interceptor	April 1995
515	Sand and Grease Interceptor	April 1995
516	Sampling Manhole Exterior Use	April 1995
517	Standard Sampling Port Detail	April 1995
518	Sampling Box Building Interior	April 1995
519	Engineer's Approved List.....	April 1995
	Detail Specification No. 21	October 1998

NOTE

1. When manholes are installed in unimproved areas, the top of the cover shall be a min. of 1-foot above adjacent finished grade.

2. Minimum of one 3" and one 6" grade adjustment rings. Maximum height of grade adjustment rings - 20". Alternately, contractor may cast grade rings in place.

3. Set all barrel sections and taper sections in approved gasket / sealer. "Ram-nek" or approved equal. Typical joint uses one (1) 3/4"x2-1/2" "Ram-nek" seal or two seals in high water table areas.

4. Cone section (taper) must be concentric for 48" manhole unless otherwise specified and approved by the *Director of Engineering*.

5. Construct all flow channels of pipe where possible after low ring section is set, break out top half of pipe flush with inside face of manhole wall and construct shelf and U-shaped channel. Make elevation changes gradually and directional changes with smooth curves.

6. Poured-in-place base shall be poured full thickness to undisturbed sides of excavation or shall be formed. Precast bases may be used only with direct approval of *Director of Engineering*, and shall be placed on 12" thick 3/4" drain rock sub-base installed against undisturbed earth.

7. Joint between base and barrel to be sealed with approved gasket / sealer.

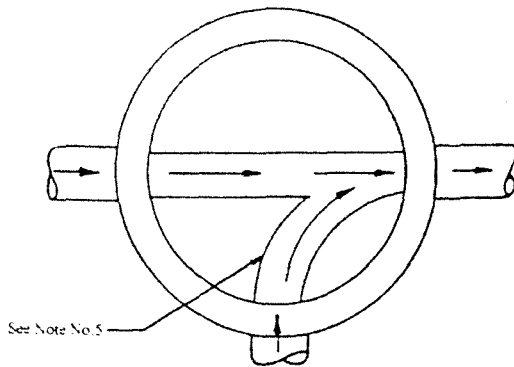
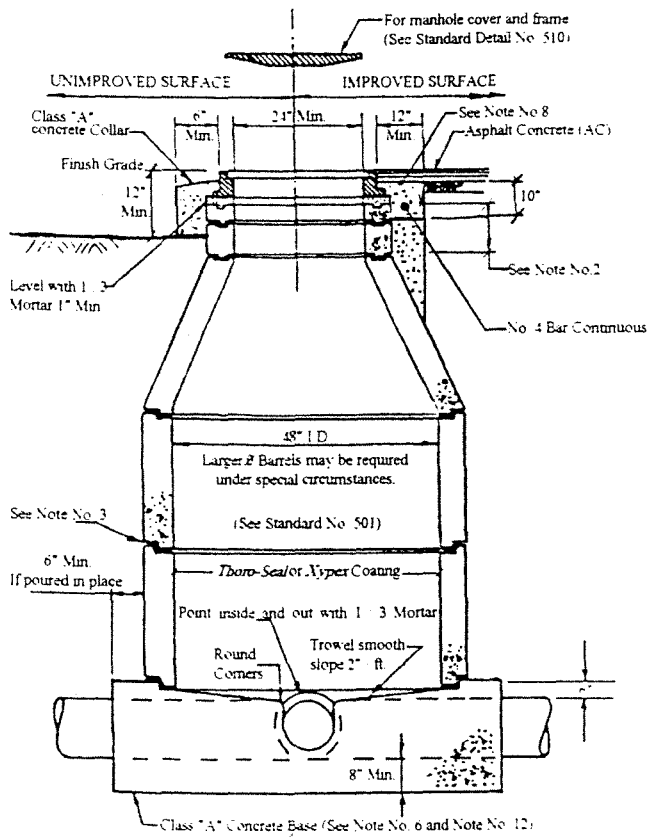
8. Class "A" concrete collar shall be 1-1/2" below finished grade.

9. Standard manhole barrel section per *ASTMC478*.

10. 48" I.D. manhole to be used for sewer mains less than 18" on center and less than 8-feet deep from finished grade.

11. Manhole reducer slab may be used where pipe is too shallow for taper section.

12. When dimension from finished grade to the sewer flow line is greater than 8'-0", the base shall have No.4 reinforcing steel bars @ 12" on center both ways.



MANHOLE BASE
Channelization Plan

CITY OF PETALUMA
Department of Engineering

22 Bassett Street - Petaluma California 94952
707-784-3044 - Fax 707-784-4437

Approved By:

Thomas S. Hargis - R.C.E. 22366

Standard 48" Ø Precast
**CONCRETE
MANHOLE**
Detail

Drawn by
Butch Smith

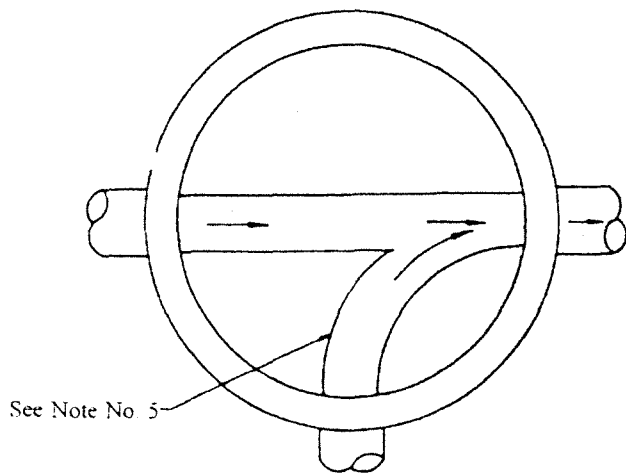
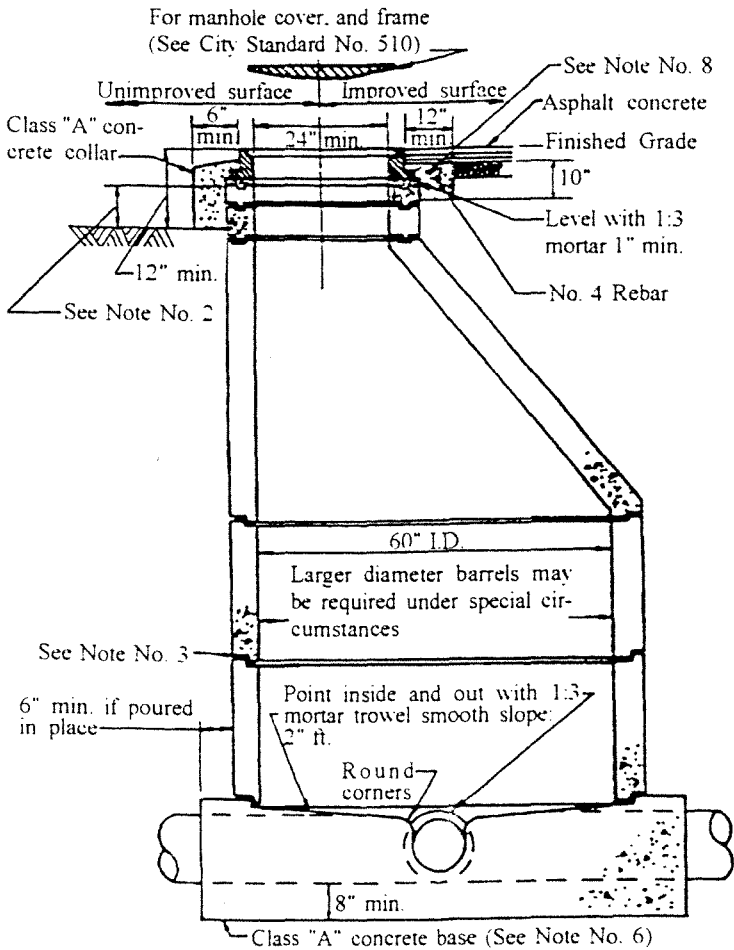
Scale
N. T. S.

Date
April 14th 1999 (Rev.)

File Number
Std. Det. SSS0000.500



Page
500



MANHOLE BASE
Channelization Plan

NOTES:

- When manholes are installed in unimproved areas, the top of the cover shall be a minimum of 1-foot above adjacent finished grade.
- Minimum of one 3" and one 6" grade adjustment rings. Maximum height of grade adjustment rings is 20". Alternately contractor may cast grade rings in place.
- Set all barrel sections and taper section in approved gasket / sealer. "Ram-nek" or approved equal. Typical joint uses one 3/4"x2-1/2" "Ram-nek" seal or two seals in high water table areas.
- Cone section (taper) must be eccentric for 60" manholes unless otherwise specified and approved by the *Director of Engineering*.
- Construct all flow channels of pipe wherever possible. After lower ring section is set, break out top half of pipe flush with inside face of manhole wall and construct shelf and u-shaped channel. Make elevation changes gradually and directional changes with smooth curves.
- Poured in place base shall be poured full thickness to undisturbed sides of excavation or shall be formed. Precast bases may be used only with direct approval of *Director of Engineering*, and shall be placed on 12" thick 3/4" drain rock sub-base installed against undisturbed earth.
- Joint between base and barrel shall be sealed with approved gasket / sealer.
- Class "A" concrete collar shall be 1-1/2" below finished grade.
- Standard manhole barrel section per *A.S.T.M. C478*.
- 60" I.D. manhole to be used for all trunk and collector sewers 18" to 48" or where dimension from finished grade to the sewer flow line is greater than 8'-0", as indicated on the design plans.
- Manhole reducer slab may be used where pipe is too shallow for taper section.

CITY OF PETALUMA
Department of Engineering
22 Bassett Street - Petaluma California 94952
Tel. 707. 843 004 - Fax 707. 843 443
Approved By:
Thomas S. Hargis
Thomas S. Hargis - R.C.E. 22366

Standard
60" diameter precast
Concrete Manhole
Detail

Drawn By:
Butch Smith
Scale:
N. T. S.
Date:
April 14th 1999 (Rev.)
File Number:
Std. Det. SSS0000.501

Page
5 0 1

PLEASE REFER TO CITY STANDARDS
219.1 – 219.3



CITY OF PETALUMA

PUBLIC WORKS & UTILITIES
UTILITIES DIVISION

202 N. McDOWELL BLVD. TEL. 707-778-4546
PETALUMA, CALIFORNIA 94954 FAX. 707-778-4508

**STANDARD TRENCH
DETAILS**

DATE: JAN 3, 2019

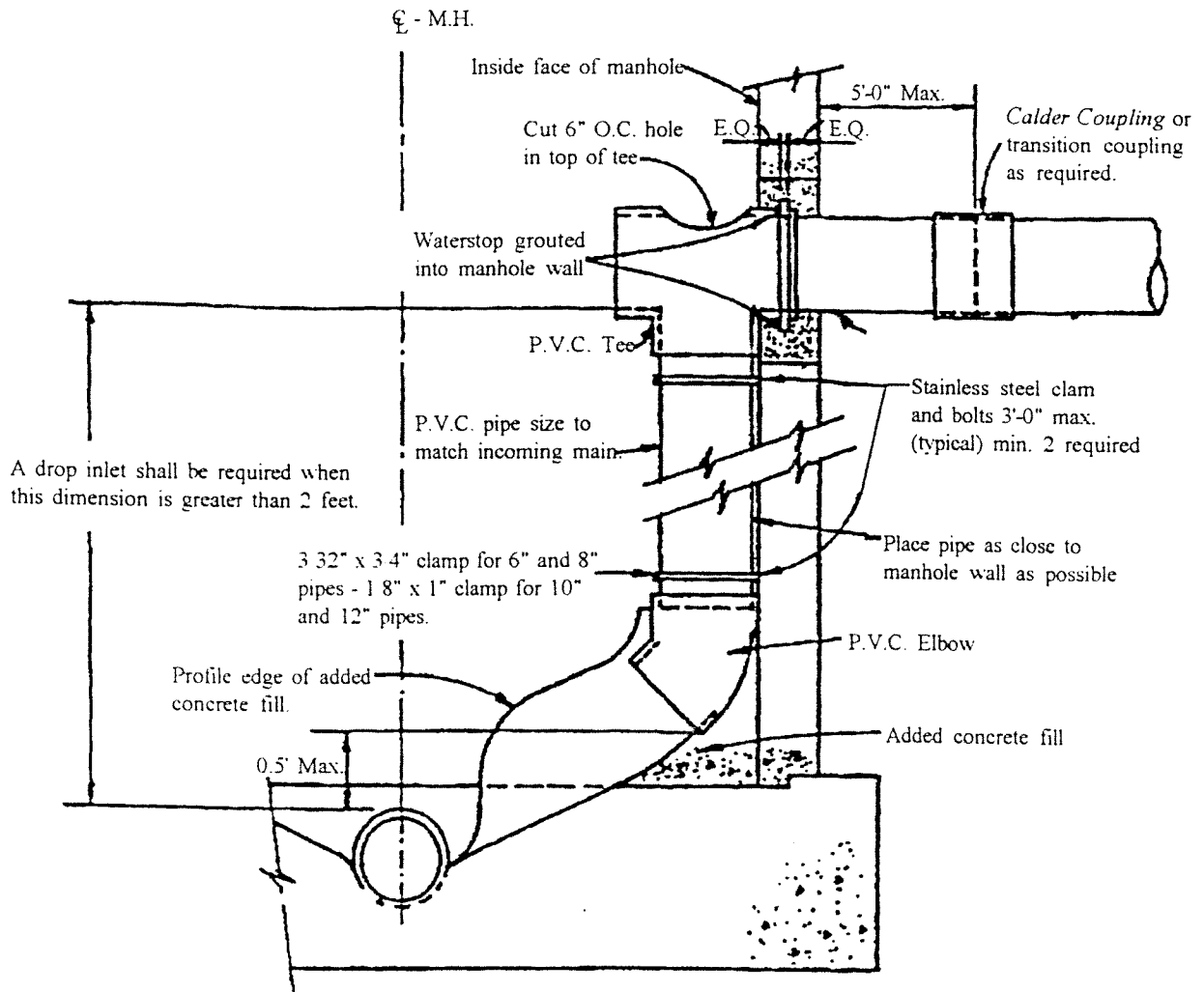
SCALE: N.T.S.

APPROVED BY:

Kent R. Carothers, P.E. Operations Manager C60671

DRAWN BY: TKM

NO. 502



NOTE:

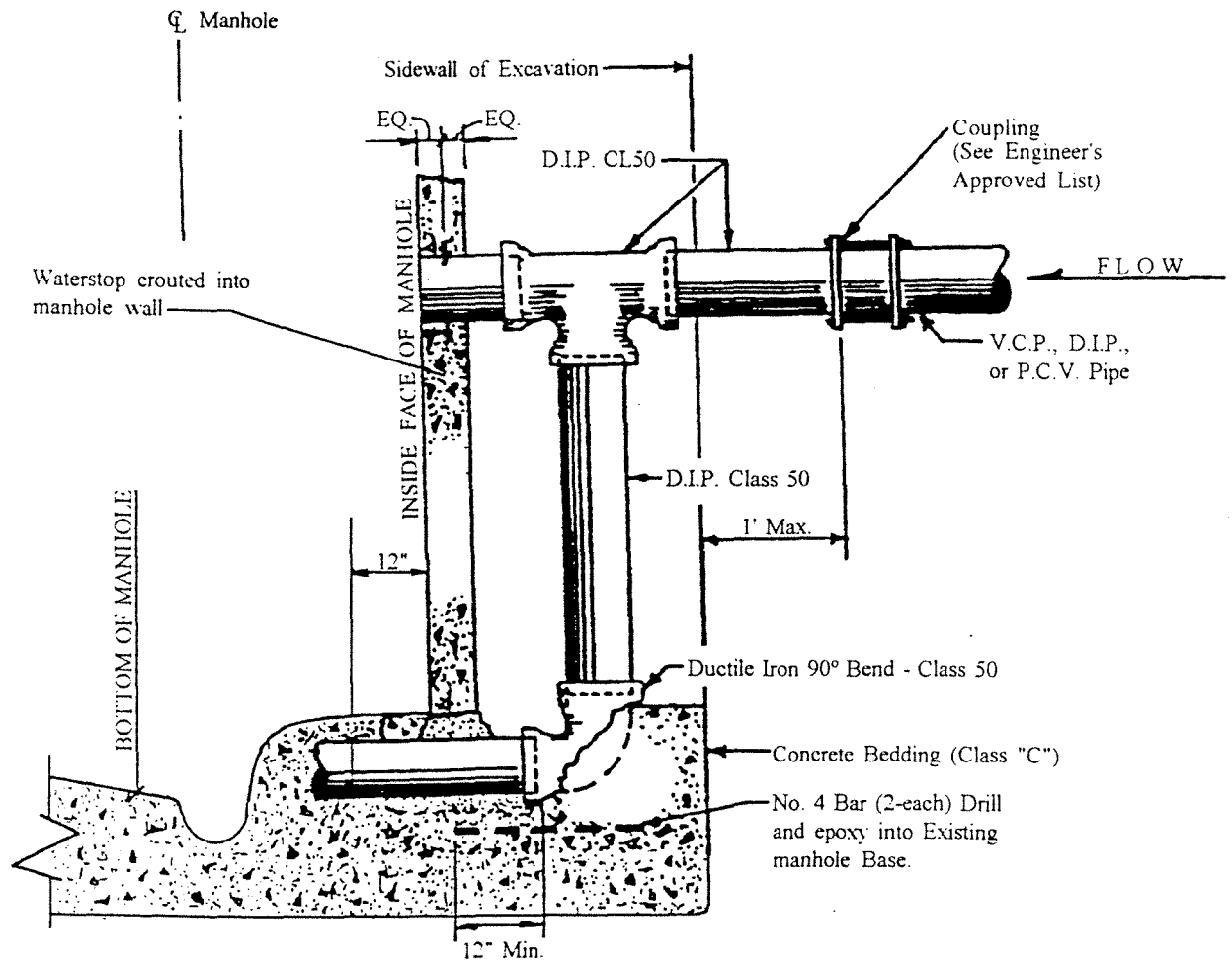
1. Install waterstop in accordance with manufacturer's instructions as shown.
2. New manholes constructed using this standard shall be 60 inches in diameter, and installed in conformance with Standard No. 501.
3. Enclose elbow in concrete. Form smooth channel to manhole flowline.
4. See Standard No. 504 for Standard outside drop installation.
5. P.V.C. pipe and fittings to be S.D.R. 35 P.V.C. Schedule 40.

CITY OF PETALUMA
 Department of Engineering
 22 Bassett Street - Petaluma California 94952
 707.778-4304 - Fax 707.778-4437
 Approved By
Thomas S. Hargis
 Thomas S. Hargis - R.C.E. 22366

Inside Drop
 in
Sanitary Sewer
Manhole

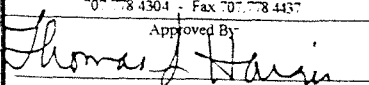

Drawn By:
Butch Smith
 Scale:
N. T. S.
 Date:
March 31st 1995
 File Number:
Std. Det. SSS0000.503

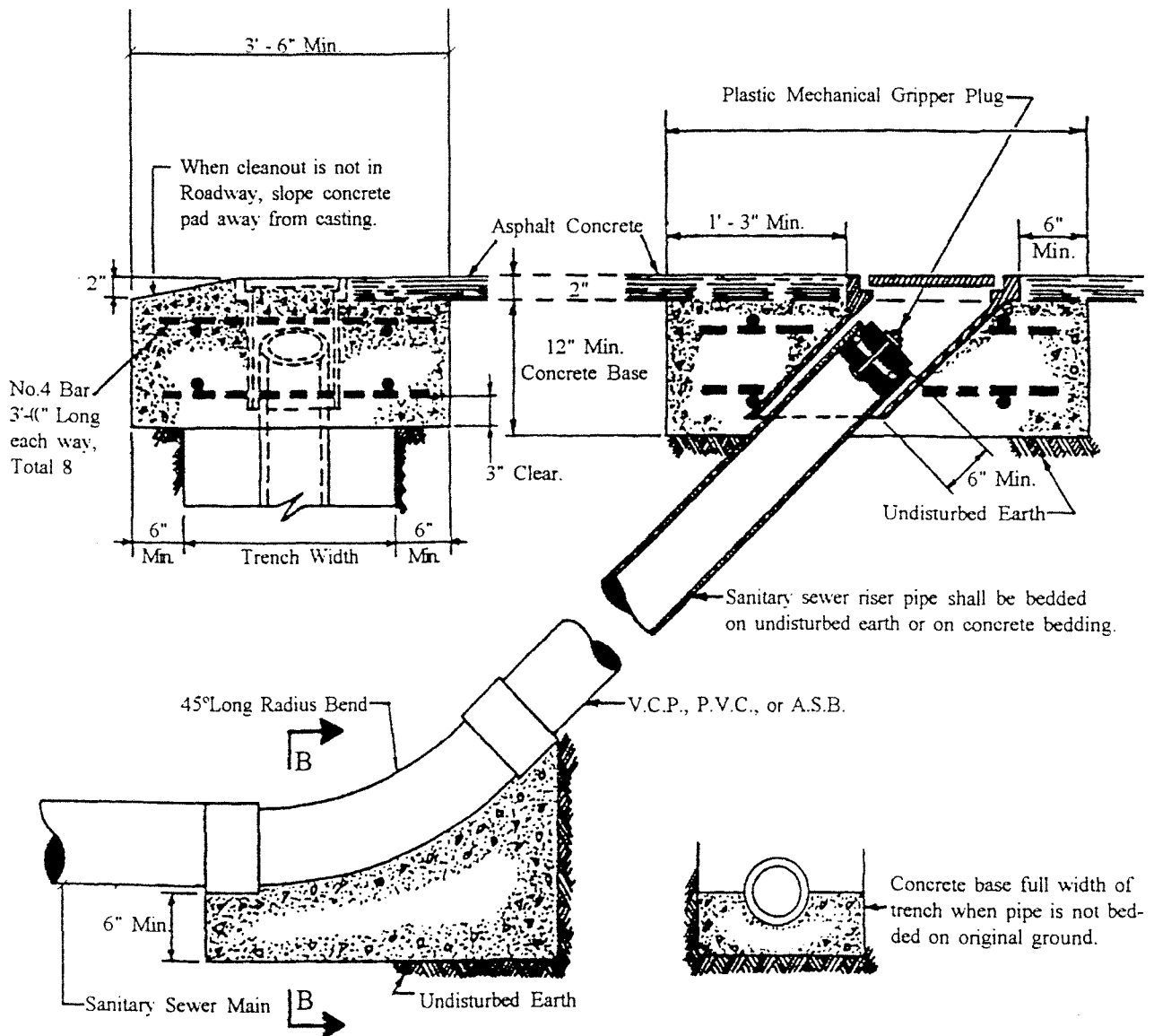




NOTE

1. Ductile iron pipe and fittings shall be Class 50 conforming to the requirements of ANSI A21.51
2. Pipe and fittings shall be furnished with bell and spigot ends, "Tyton Joint" or Mechancial Joint.
3. To be installed at existing 48" manholes or where specifically approved by the Director of Engineering.
4. Drop inlet pipe and fittings shall be the same size as the incoming sewer main.
5. See Standard No. 503 for Standard inside drop installation.
6. Install waterstop in accordance with manufacturer's instructions as shown.

<p>CITY OF PETALUMA Department of Engineering 22 Bassett Street - Petaluma California 94952 707 778 4304 - Fax 707 778 4437</p> <p>Approved By:  Thomas S. Hargis - R.C.E. 22566</p>	<p>Ductile Iron Fittings for Outside Drop Inlet Manhole</p>	<p>Drawn By: Butch Smith</p> <p>Scale: N. T. S.</p> <p>Date: March 31st 1995</p> <p>File Number: Std. Det. SSS0000.504</p>	 Page 504
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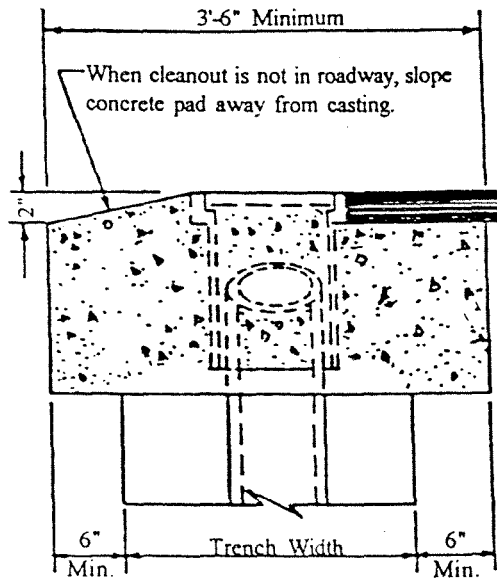
CITY OF PETALUMA
 Department of Engineering
 22 Bassett Street - Petaluma California 949 2
 707.778.4304 - Fax 707.778.4437

Approved By:
Thomas S. Hargis
 Thomas S. Hargis - R.C.E. 22366

Permanent
**MAINLINE
 CLEANOUT**
 Detail

Drawn By:
Butch Smith
 Scale:
 N. T. S.
 Date:
 March 31st 1995
 File Number:
 Std. Det. SSS0000.505

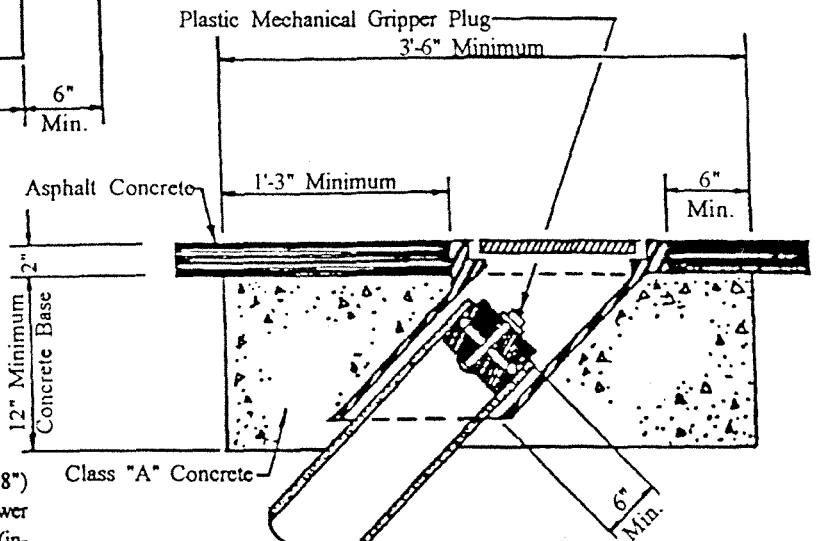
Page
 505



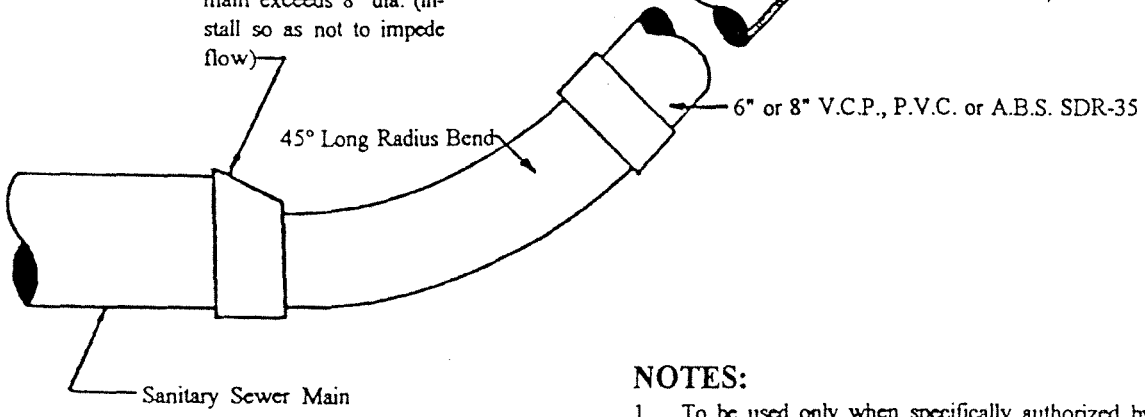
Asphalt Concrete

APPROVED RIM AND COVER

See Engineer's Approved List
Bolt - Down Cleanout Covers will not be allowed.




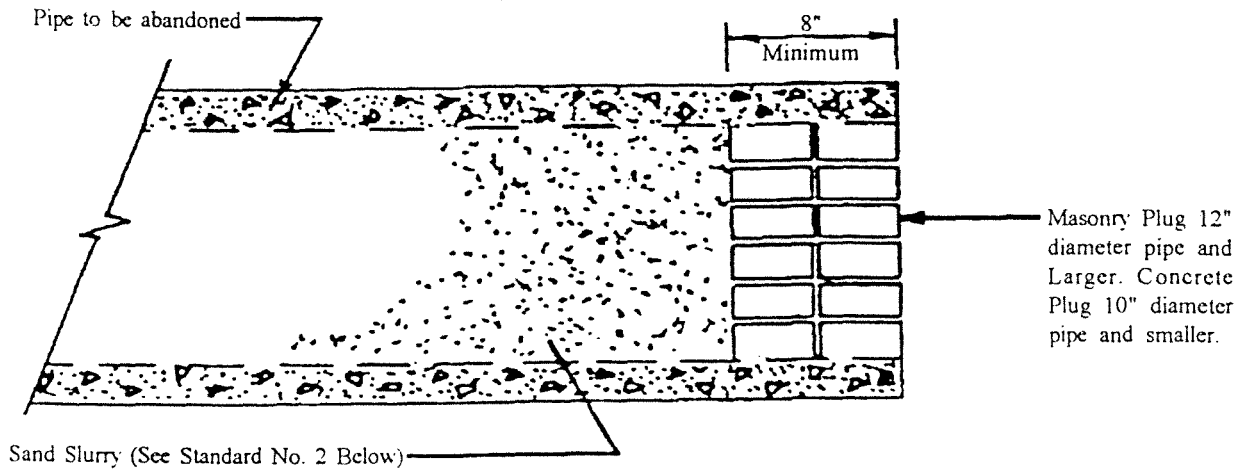
Eccentric reducer (to 8")
to be installed when sewer
main exceeds 8" dia. (in-
stall so as not to impede
flow)



NOTES:


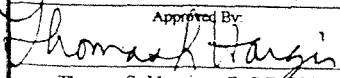
- To be used only when specifically authorized by the Director of Engineering.

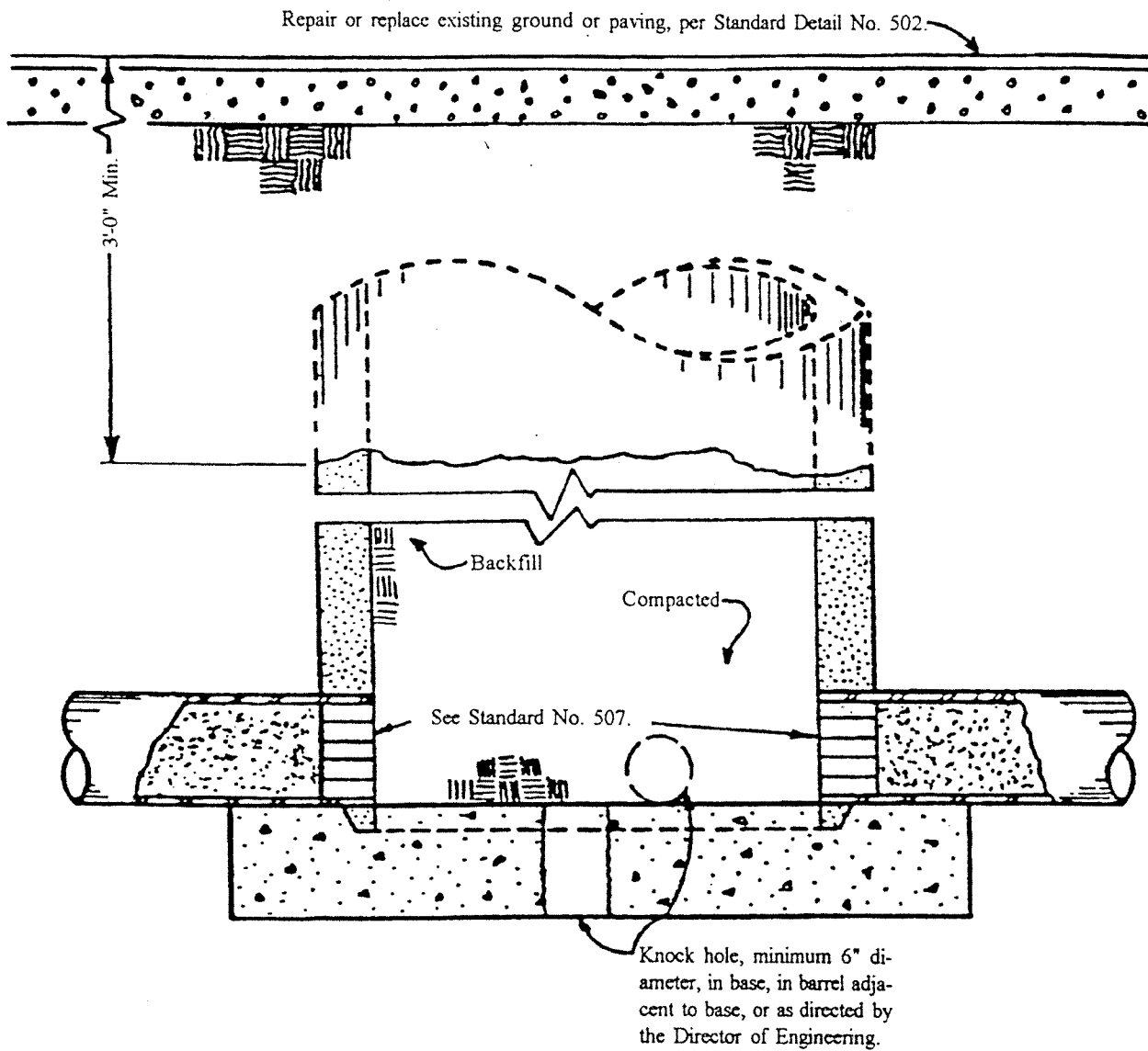
<p>CITY OF PETALUMA Department of Engineering 22 Bassett Street - Petaluma California 949 2 707.778.4304 - Fax 707.778.4437</p> <p>Approved By: <i>Thomas S. Hargis</i> Thomas S. Hargis - R.C.E. 22366</p>	<p>Standard TEMPORARY MAINLINE CLEANOUT</p>	<p>Drawn By: Butch Smith</p> <p>Scale: N. T. S.</p> <p>Date: March 24th 1995</p> <p>File Number: Std. Det. SSS0000 506</p>	 <p>Page 506</p>
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NOTE:

1. Pipe plugs shall be installed to the satisfaction of the Director of Engineering.
2. All abandoned pipes, shall be broken into every 50'-0" and shall be filled completely with sand slurry.

<p>CITY OF PETALUMA Department of Engineering 22 Bassett Street - Petaluma California 94952 707.778.4304 - Fax 707.778.4437</p>	<p>Standard ABANDONED PIPE PLUG Detail</p>	<p>Drawn By Butch Smith</p>	
<p>Approved By:  Thomas S. Hargis - R.C.E. 22366</p>		<p>Scale N. T. S.</p>	
		<p>File Number Std. Det. SSS0000.507</p>	<p>Page 507</p>



NOTES:

1. Remove frame, cover, taper and barrel sections.
2. After plugging all pipes in manhole, the remaining portion of the barrel section and all voids created by the removal of the upper portions of the manhole, shall be backfilled and compacted to 90% relative density. Use trench backfill or pipe bedding material.

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 Department of Engineering
 22 Bassett Street - Petaluma California 94952
 707.778.4304 - Fax 707.778.4437

Approved By:
Thomas S. Hargis
 Thomas S. Hargis - R.C.E. 22766

Standard
**ABANDONED
 MANHOLE**
 Detail

Drawn By:
 Butch Smith
 Scale:
 N. T. S.
 Date:
 March
 File Number:
 Std. Det. SSS0000 508



Lifting eyes of balance point, two places.

No. 6 Rebar at 3-1/2" o.c. (on-center)

Top of lifting eye to flush with top of slab.

Hook Recess

No.6 Rebar as shown

Bottom Reinforcing

LIFTING EYE DETAIL

4 No. 4 Rebar Hoops around access opening

No.2 Rebar at 6" o.c. around opening (See Standard Note No.2)

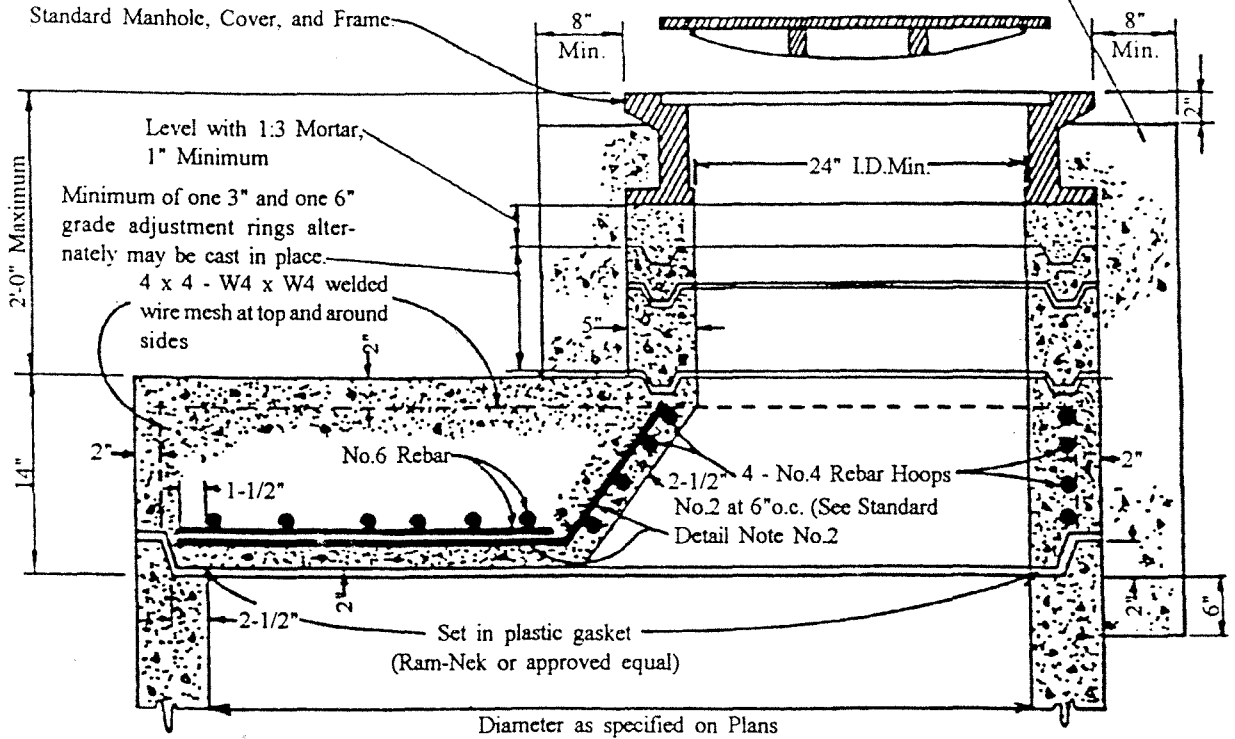
No. 6 Rebar at 6" o.c.

No. 6 Rebar at 3-1/2" o.c.

No. 6 Rebar at 3-1/2" o.c.


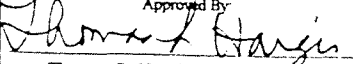
SLAB PLAN

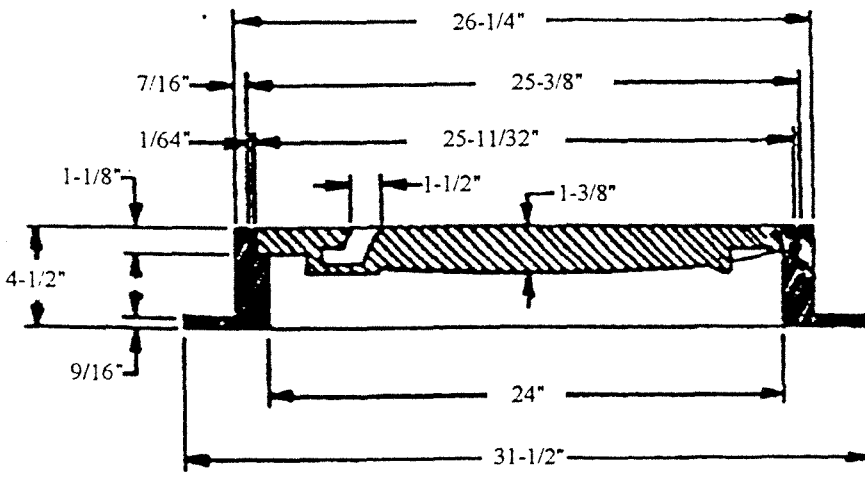
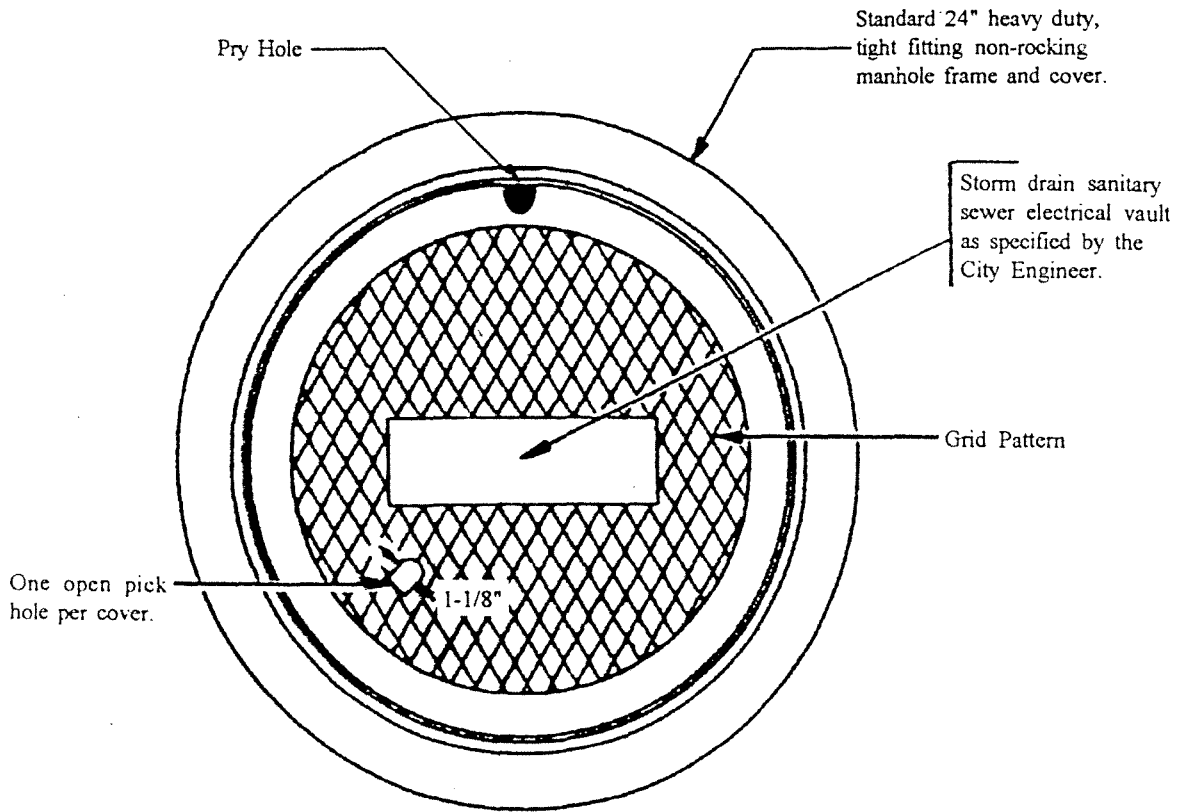
See Standard Detail Note No. 3



NOTES:

1. For Details and Specifications of base and barrel sections, See City of Petaluma Standard Detail No. 500 and 501.
2. No. 2 Rebars bent up and spaced 6" on center around 24" opening. Horizontal legs to fan out equally spaced, 2-1/2" clear at edge of slab.
3. Class "A" Concrete collar top down 2" from finished grade. In high traffic areas - collar 1" from F.G. per Public Works Construction Inspector.

<p>CITY OF PETALUMA Department of Engineering 22 Bassett Street - Petaluma California 94952 707.778.4304 - Fax 707.778.4437</p>	<p>Standard PRECAST CONCRETE MANHOLE REDUCE SLAB Detail</p>	<p>Drawn By: Butch Smith Scale: N. T. S. Date: March 24th 1995 File Number: Std Det SSS0000.509</p>	 Page 509
<p>Approved By:  Thomas S. Hargis - R.C.E. 26366</p>			




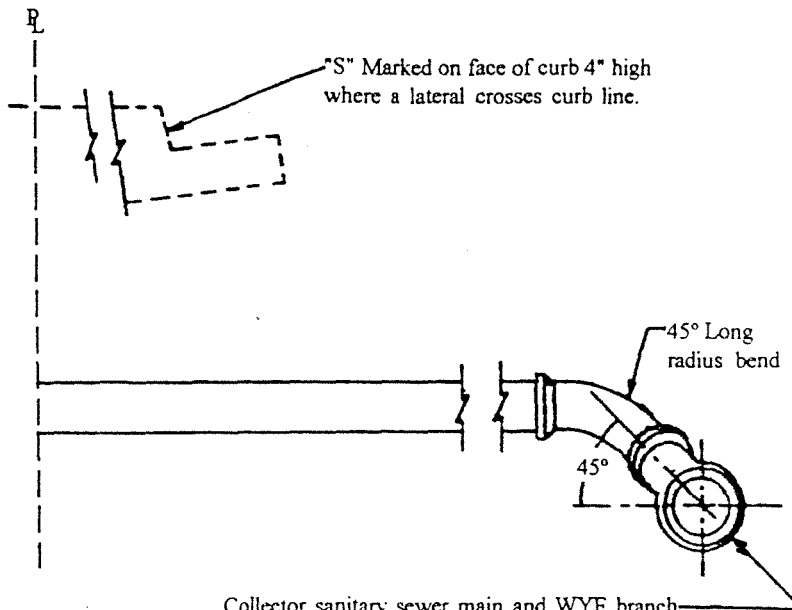
NOTES:

1. Specify Sanitary Sewer, Storm Drain, or Electrical Vault when ordering. All casting shall be dipped in approved Asphalt Paint.
2. All material used in manufacturing shall conform to A.S.T.M. designation A-159-G3000, or of United States Government Specifications QQ-652b.
3. Minimum Weight Components: Cover - 130 lbs.
Frame - 135 lbs.

• APPROVED MANHOLE FRAME & COVER •

Phoenix Iron Works Cat. No. P-1090CPH - D & L Supply Cat. No. A-1024 CPH
 South Bay Foundry Cat. No. SBF-1900CPH - Pinkerton Foundry Cat. No. A-640

<p>CITY OF PETALUMA Department of Engineering 22 Bassett Street - Petaluma California 94952 707.778.4364 - Fax 707.778.4437</p> <p>Approved By: <i>Thomas S. Hargis</i> Thomas S. Hargis - R.C.E. 22366</p>	<p>Standard Mainhole Frame and Cover Detail</p>	<p>Drawn By Butch Smith Scale N. T. S. Date March 15th 1995 File Number: Std Det. SSS0000.510</p>	 <p>Page 510</p>
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Collector sanitary sewer main and WYE branch.
(Tee not allowed) minimum invert elevation of
WYE branch equals centerline of sewer main.

**LATERAL PIPE MATERIAL TO
BE 4" MINIMUM AND ONE OF
THE FOLLOWING:**

- Ductile Iron Pipe (DIP)
- Vitrified Clay Pipe, extra strength
- Acrylonitrile - butadiene - styrene (ABS Pipe, SDR-35)
- Polyvinyl chloride (PVC pipe, SDR-35 when used with a manufactured "Y" shall be of the same material as the sewer main.

NOTES:

1. The sewer service lateral shall be of sufficient depth to adequately serve the building site, and in no case shall be less than 3-feet deep at the back of the P.U.E. (Public Utility Easement) unless otherwise authorized by the Director of Engineering.

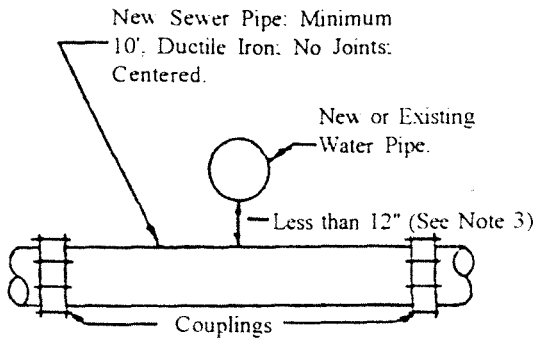
2. Where problems are anticipated in providing sewer service to a given building site, the lateral invert at the P.U.E. shall be staked by the owner's engineer.

3. Minimum 2% slope except where a variation is specifically approved by the Director of Engineering.

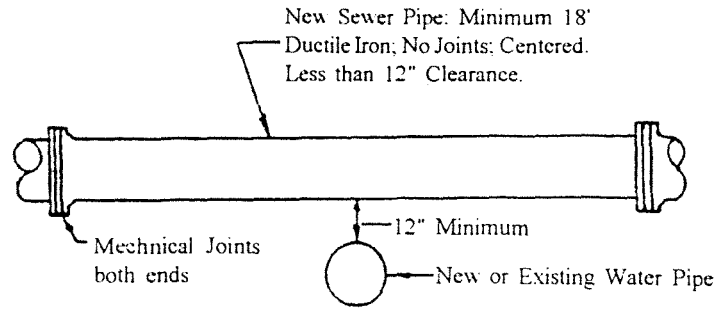
LATERAL CONNECTIONS TO EXISTING MAINS:

- ACP: Saddle from approved list
- PVC, ABS (SDR-35)
- 4" - 8" cut in WYE
- 10" and Larger: glue on saddle with strap ties.

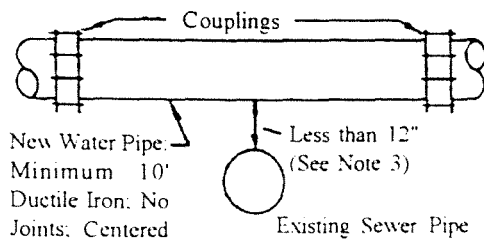
<p>CITY OF PETALUMA Department of Engineering 22 Bassett Street - Petaluma California 94952 707.778.4304 - Fax 707.778.4437</p> <p>Approved By <i>Thomas S. Hargis</i> Thomas S. Hargis - R.C.E. 22366</p>	<p>Standard SEWER SERVICE LATERAL Detail</p>	<p>Drawn By: Butch Smith Scale: N. T. S. Date: March 16th 1995 File Number: Std Det. SSS0000.511</p>	 <p>Page 511</p>
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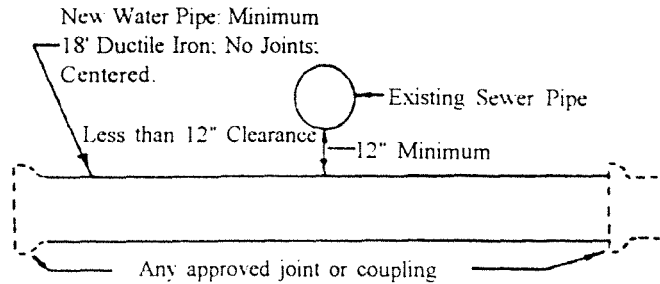
NEW SEWER UNDER NEW OR EXISTING WATER
CASE 1



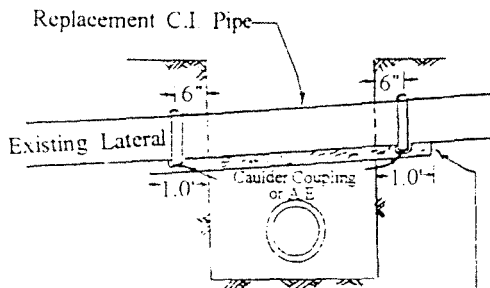
NEW SEWER OVER NEW OR EXISTING WATER
CASE 2



NEW WATER OVER EXISTING SEWER
CASE 3

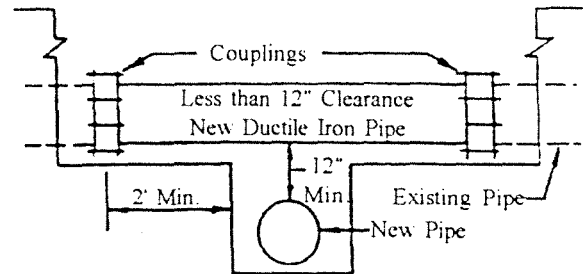


NEW WATER UNDER EXISTING SEWER
CASE 4



Install 2"x 6" Redwood Boards to support repaired lateral when backfilling or compacting. Note: Pipe shall rest on boards not caulder coupling.

SEVERED SANITARY SEWER LATERAL DETAIL
CASE 6




NEW PIPE UNDER EXISTING
CASE 5 (SEE NOTE 4)

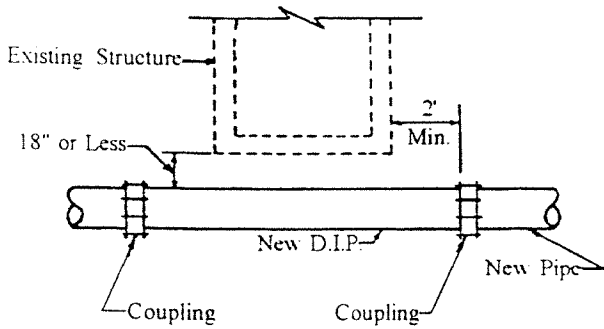
APPROVED COUPLINGS

See Engineer's Approved List.

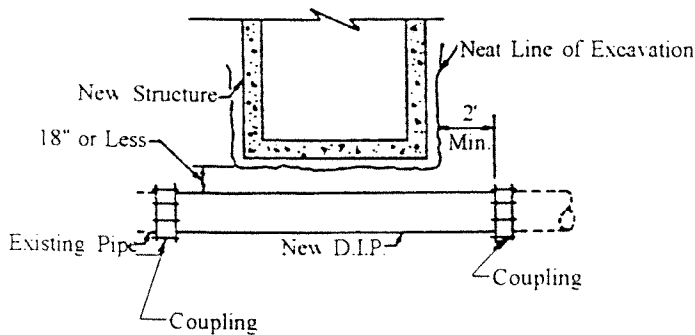
NOTES:

1. This standard applies to pipes up to and including 16" diameter. All crossings of larger diameter shall be as approved by the Director of Engineering.
2. All new ductile iron shall be wrapped in polyethylene per City of Petaluma Standard Details.
3. Where sewer crosses below a water main, with 1'-0" or more vertical clearance, no special installation is required.
4. "New Pipe" under existing-case 5" shall be used when the existing pipe has a joint over or within 2'-0" of the new trench.
5. Any pipe-pipe crossing with less than 6" vertical clearance shall not be installed without approval of the director of Engineering.
6. For water main lowering detail, See City Water Main Standards.

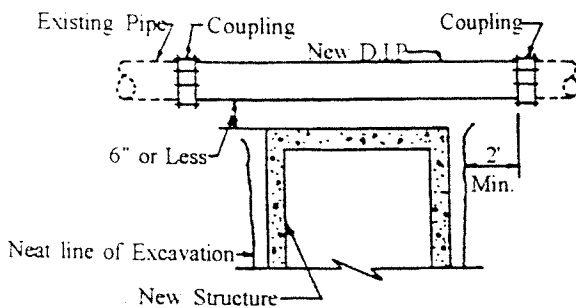
<p>CITY OF PETALUMA Department of Engineering 22 Bassett Street - Petaluma California 94952 707.778 4304 - Fax 707.778 4435</p> <p>Approved By: <i>Thomas S. Hargis</i> Thomas S. Hargis - R.C.E. 22366</p>	<p>Standard PIPE - PIPE CROSSING Detail</p>	<p>Drawn by: Butch Smith Scale N. T. S. Date March 31st 1995 File Number Std. Det. SSS0000.512</p>	 <p>Page 512</p>
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NEW PIPE UNDER EXISTING
TYPE A



NEW STRUCTURE OVER EXISTING
TYPE B



NEW STRUCTURE UNDER EXISTING
TYPE C

NOTES:

1. This Standard applies to pipes up to and including 16" diameter. All crossings involving pipes of larger diameter shall be as approved by the Director of Engineering.
2. When pipes cross within the dimensions shown a new ductile iron pipe section shall be installed as detailed.
3. All ductile iron pipe shall be encased in polyethylene film in tube form.
4. Any type "A" installation requiring more than one length of pipe shall be encased per City Requirements.

APPROVED COUPLINGS

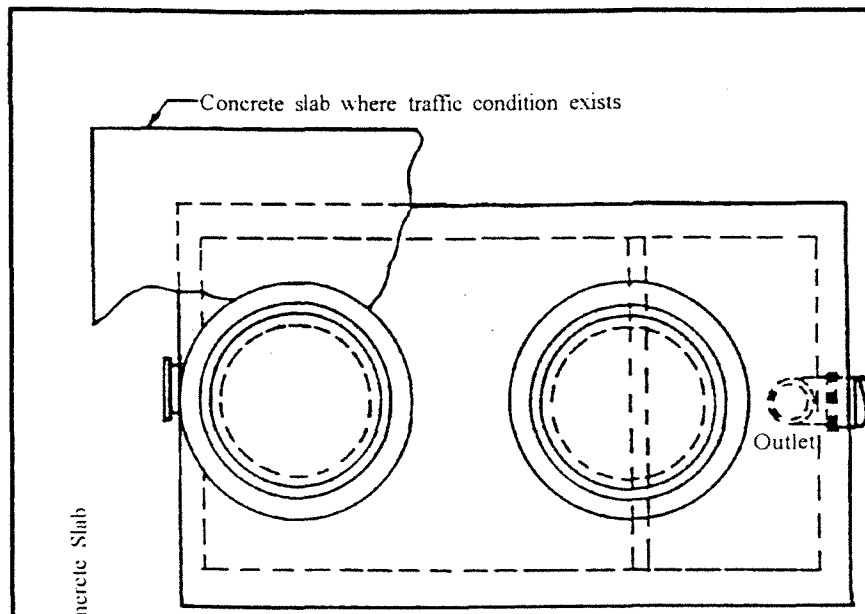
See Engineer's Approved List

CITY OF PETALUMA
Department of Engineering
22 Bassett Street - Petaluma California 94952
"6" 78 4364 - Fax "0" 78 443"
Approved By
Thomas S. Hargis
Thomas S. Hargis - R.C.E. 22366

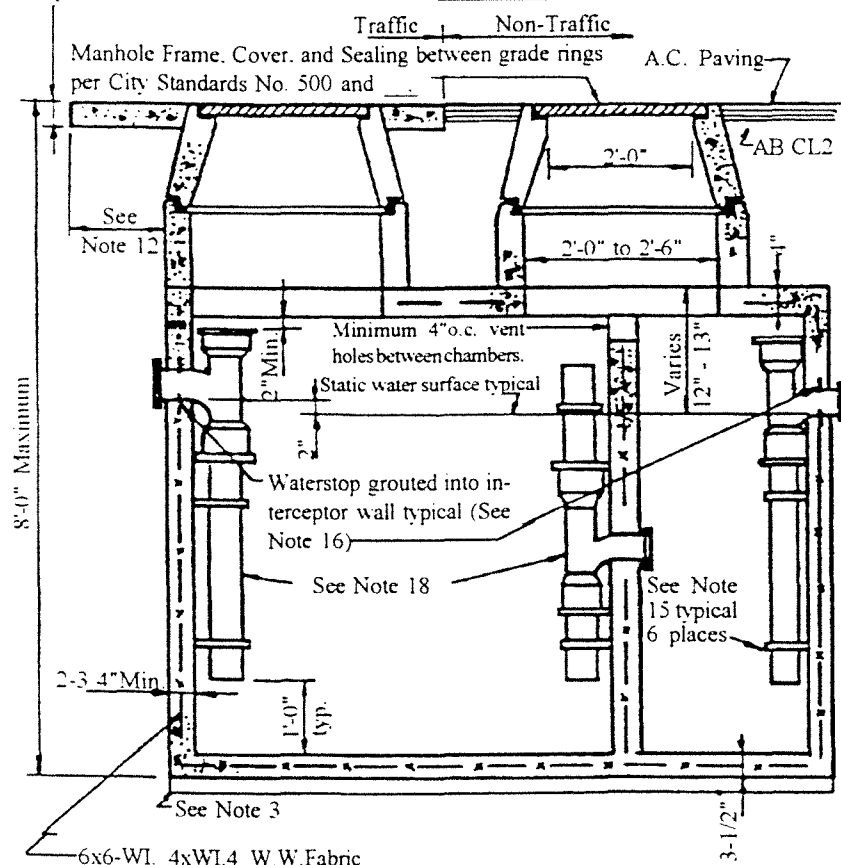
Standard
PIPE STRUCTURE
CROSSING
Detail

Drawn by
Butch Smith
Scale
N. T. S.
Date
March 16th 1995
File Number
Std Det. SSS0000.513





PLAN



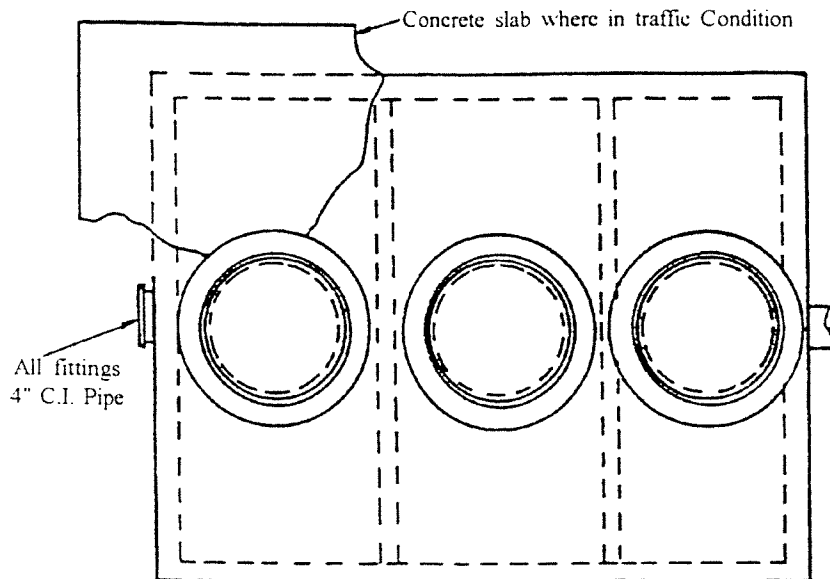
SECTION

NOTE:

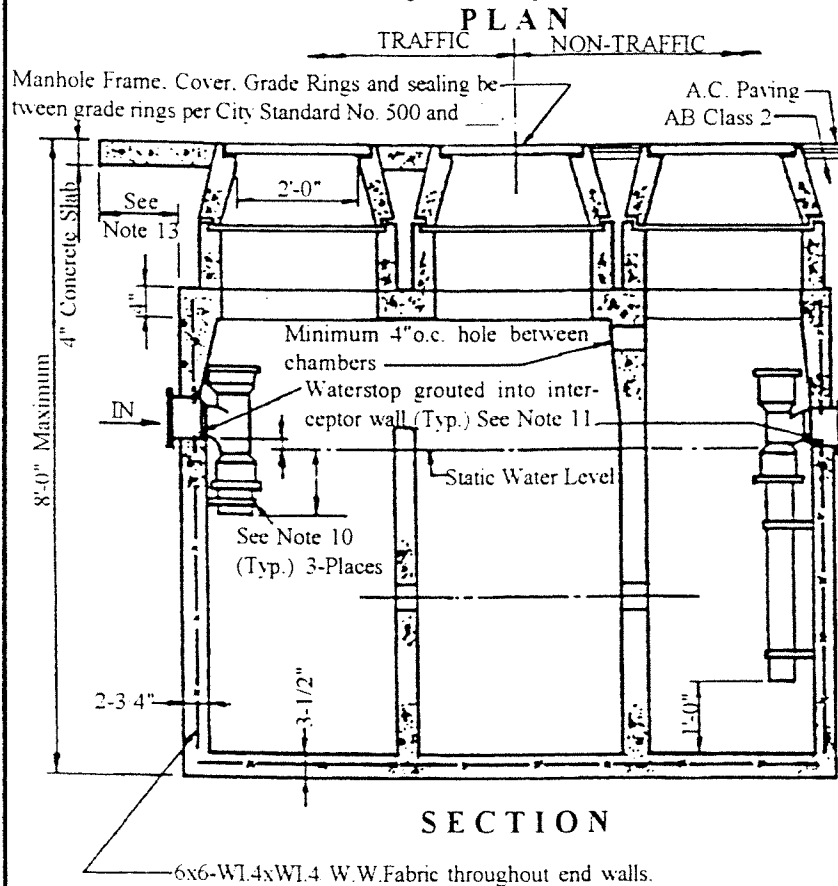
1. Tank to be precast as per Engineer's Approved List.
2. Polyethylene tanks acceptable in non-traffic areas upon specific approval of the Director of Engineering.
3. 3" minimum bedding material.
4. All surface water must drain away from manhole.
5. Pipe shall be 6" maximum o.c. per U.P.C.
6. Concrete minimum compressive strength of 3000 p.s.i. at 28 days.
7. All wyes shall be one-way cleanout wyes except as noted. Type per U.P.C.
8. Grease interceptors shall be located outside of buildings in a location accessible to wastehauler pumper.
9. All grease interceptors shall be located outside public right-of-way except with written approval of the Director of Engineering.
10. Excavations shall be neat line typically all sides.
11. Interceptor to be used in conjunction with "Sampling Manhole" per City Standard No. 516 or "Sampling Port" per Director of Engineering.
12. Slab to extend minimum 24" beyond all sides of tank. (Traffic Area)
13. All waste must enter through inlet fitting only.
14. Tank to be stenciled on upper left hand corner of inlet end in white.
15. Stainless steel clamp and bolts 3'-0" o.c. maximum (typical) minimum 2 required.
16. A waterstop consisting of a standard manhole adapter gasket as supplied by the pipe manufacturer shall be grouted into the interceptor wall near the center of the wall.
17. Tank capacity to be determined at the time of industrial waste permit application.
18. Pipe and Fittings to be 4" Schedule 40 PVC.
19. Reinforced bar intermediate grade ASTM A615-62T and A305-56T reinforcing wire fabric ASTM A185-61T.
20. Alternate design by a registered Engineer may be substituted for review by City.

<p>CITY OF PETALUMA Department of Engineering 22 Bassett Street - Petaluma California 94952 707-784304 - Fax 707-778-4437</p>	<p>Standard PRECAST GREASE INTERCEPTOR Detail</p>	<p>Drawn By: Butch Smith Scale N. T. S. Date March 31st 1995</p>	 Page 514
<p>Approved By  Thomas S. Hargis - R.C.E. 22566</p>		<p>File Number Std. Det. SSS0000.514</p>	

NOTE: Tank to be stenciled on upper left-hand corner of inlet end in white.



NOTE: All waste must enter through inlet fitting only.



NOTE:

1. Tank shall be precast as per Engineer's Approved List.
2. All grease interceptors shall be located outside public right-of-way except with written approval of the Director of Engineering.
3. Grease interceptors shall be located outside of buildings in a location accessible to wastehauler pumper. Location subject to the approval of the Director of Engineering.
4. Alternate design by a registered Engineer may be substituted for review by the City.
5. Pipe shall be 6" Maximum diameter type per U.P.C.
6. Excavation shall be neat line typically all sides.
7. Height of tank above fittings variable One feet sections may be added to required finish grade.
8. All wyes shall be one-way cleanout wyes, except as noted. Type per U.P.C.
9. Interceptor to be used in conjunction with "Sampling Manhole" per City Standard No. 516 or "Sampling Port", per Director of Engineering.
10. Stainless steel clamp and bolts 3'-0" o.c. maximum (Typical) minimum 2 required.
11. A waterstop consisting of a standard manhole adapter gasket as supplied by the pipe manufacturer shall be grouted into the interceptor wall near the center of the wall.
12. 3'-0" minimum bedding material.
13. Slab to extend minimum 24" beyond all sides of tank. (Traffic Area)
14. Tank capacity to be determined at time of industrial waste permit application.
15. Pipe and Fittings to be 4" Schedule 40 PVC.

MATERIAL SPECIFICATIONS

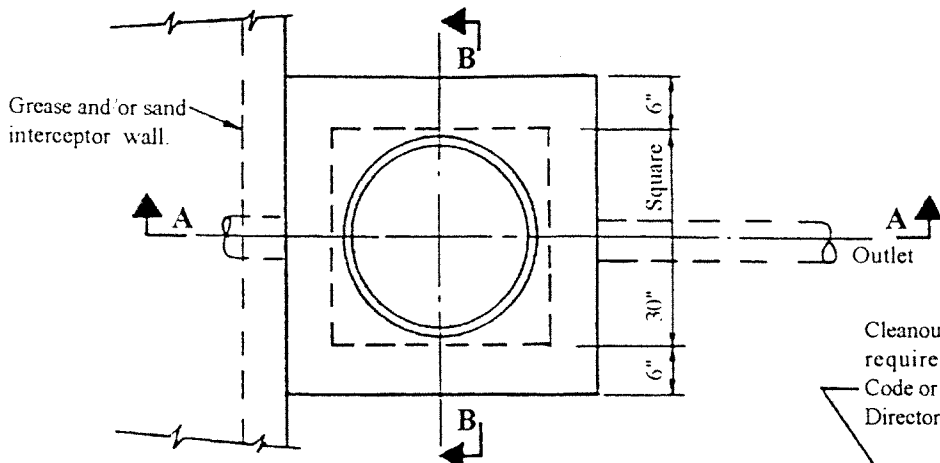
Concrete Minimum: Compressive strength of 3000 p.s.i. at 28 days. Reinforcing bar-intermediate grade *ASTM A615-62T* and *A304-56T* reinforcing wire fabric *ASTM A185-61T*.

CITY OF PETALUMA
 Department of Engineering
 22 Bassett Street - Petaluma California 94952
 707-78-4504 - Fax 707-78-4457
 Approved By

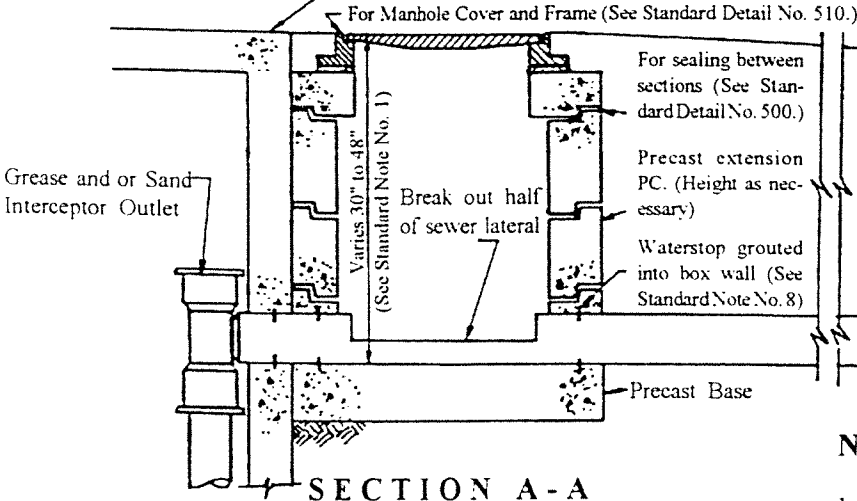
 Thomas S. Harris - R.C.E. 2566

Standard
SAND & GREASE INTERCEPTOR
 Detail
 Drawn by
 Butch Smith
 Scale
 N. T. S.
 Date
 March 31st 1995
 File Number
 Std. Det. SSS0000.515

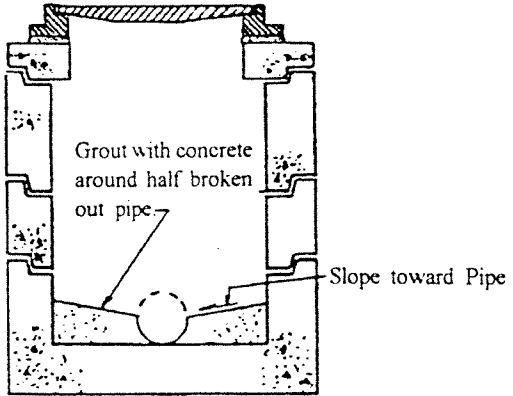
Page
 515



PLAN



SECTION A-A



SECTION B-B

Cleanout trap and vent as required by Plumbing Code or as directed by the Director of Engineering.

NOTES:

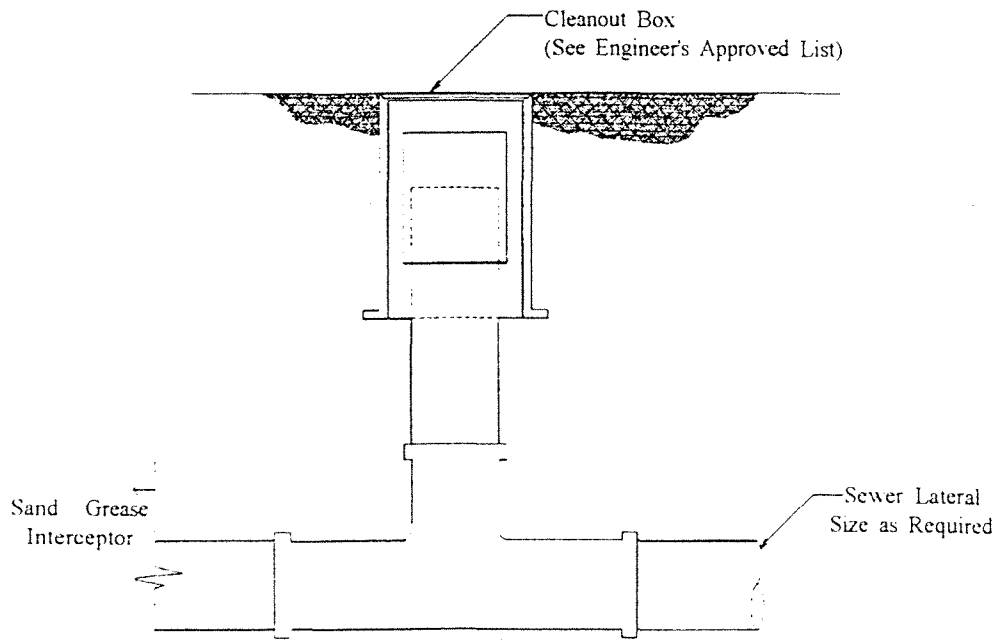
1. If less than 30" review with industrial Waste Division for additional vault requirements. If greater than 48" install sampling Manhole similar to Standard Detail No. 500 with flow-through cut-away pipe as per this Standard.
2. Sampling Manhole to be located outside of Public Right-of-Way except with written approval of the Director of Engineering.
3. An alternate design by a Registered Engineer may be submitted for review by the Department of Engineering.
4. Location subject to the approval of the Director of Engineering.
5. Manhole shall be as per Engineer's Approved List.
6. All surface water must drain away from Sampling Manhole.
7. Sampling Manhole to be used in conjunction with either Standard Detail No. 514 or No. 515.
8. A waterstop consisting of a Standard Manhole adapter gasket as supplied by the pipe manufacturer to be grouted into the box wall near the center of the wall.

CITY OF PETALUMA
 Department of Engineering
 22 Bassett Street - Petaluma California 94952
 707.778.4304 - Fax 707.778.4437
 Approved By:
Thomas S. Hargis
 Thomas S. Hargis - R.C.E. 2366



Standard
**SAMPLING
 MANHOLE**
 (Exterior Use)

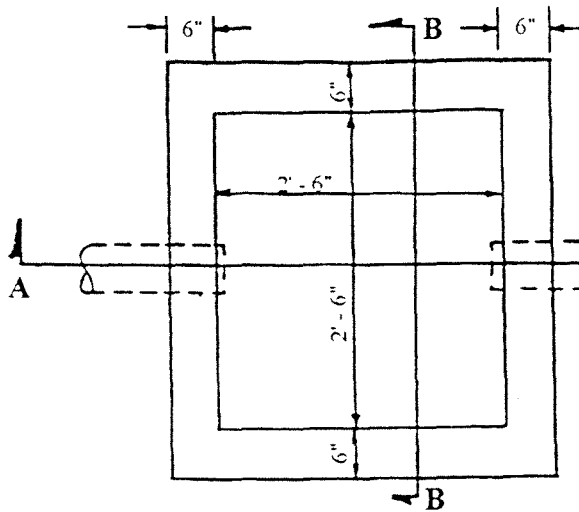
Drawn By:
Butch Smith
 Scale:
N. T. S.
 Date:
March 31st 1995
 File Number:
Std Det. SSS0000.516





Alternate to Standard Detail No. 516 - As directed by the Director of Engineering

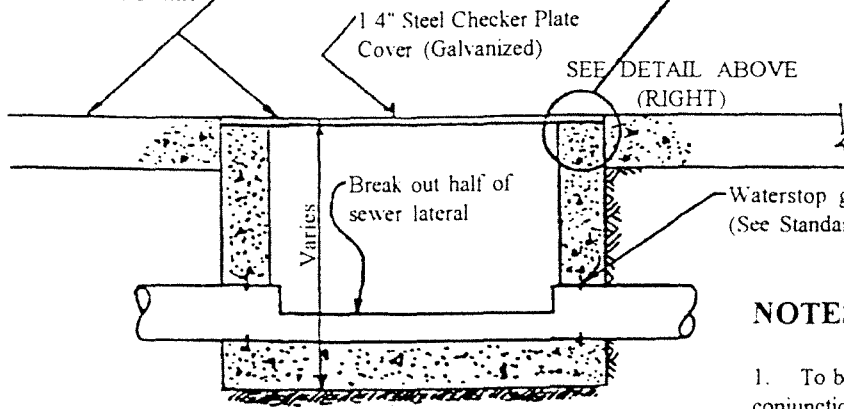
<p>CITY OF PETALUMA Department of Engineering 22 Bassett Street - Petaluma California 94952 707 784 3004 - Fax 707 784 4437</p>	<p>Standard SAMPLING PORT Detail</p>	<p>Drawn By Butch Smith</p> <p>Scale N. T. S.</p> <p>Date March 31st 1995</p>	
<p>Approved By  Thomas S. Hargis - R.C.E. 22366</p>		<p>File Number Std. Det. SSS0000.517</p>	



PLAN

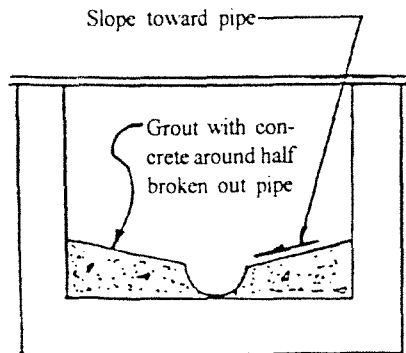
Scale: N.T.S.

Set Box so Top Cover is flush with finished flowline



SECTION A-A

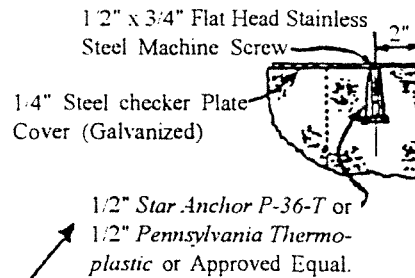
Scale: N.T.S.



SECTION B-B


Scale: N.T.S.

STEEL PLATE COVER FASTENER DETAIL



NOTES:

1. To be used in the interior of buildings in conjunction with sampling manhole and to be upstream of the sampling manhole.
2. Location subject to the approval of the Director of Engineering.
3. To be used only with the approval of the Director of Engineering.
4. Alternate design by a Registered Engineer may be submitted for review by the City of Petaluma.
5. Box shall be as per Engineer's Approved List.
6. All surface water must drain away from sampling box.
7. Sampling box to be used in conjunction with either Standard Detail No. 514 or 515.
8. A waterstop consisting of a Standard Manhole adapter gasket as supplied by the pipe manufacturer shall be grouted into the box wall near the center of the wall.

<p>CITY OF PETALUMA Department of Engineering 22 Bassett Street - Petaluma California 94952 707 784304 - Fax 707 784437</p> <p>Approved By: Thomas S. Hargis - R.C.E. 22366</p>	<p>Standard SAMPLING BOX BUILDING INTERIOR Detail</p>	<p>Drawn By: Butch Smith Scale: N. T. S. Date: March 31st 1995 File Number: Std. Det. SSS0000.518</p>	 <p>Page 518</p>
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CITY OF PETALUMA

ENGINEER'S LIST OF APPROVED ITEMS
FOR USE WITH SEWER SYSTEM CONSTRUCTION
STANDARDS APPROVED

Standard 504, 512, 513

Couplings

<i>APAC</i>	300 Series
<i>Power Seal</i>	3500 Series
<i>Rockwell</i>	441 Series
<i>Romac</i>	500 Series

Standard 505, 506

Rim and Cover

<i>South Bay Foundry</i>	SBF - 1249
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Standard 512

Manhole Frame and Cover

<i>Phoenix Iron Works</i>	P - 1090CPH
<i>D & L Supply</i>	A - 1024CPH
<i>South Bay Foundry</i>	SBF - 1900CPH
<i>Pinkerton Foundry</i>	A - 640

Standard 514, 515

Precast Tank

M. C. Nottingham
Pacific Concrete Products
Selvage Concrete Products

Standard 516, 518

Precast Inlet Box

<i>Santa Rosa Cast Products</i>	5K
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Standard 516, 518

Precast Manhole Transition

<i>Santa Rosa Cast Products</i>	5K w/5K x 24" dia. transition slab
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Standard 517

Cleanout Box

<i>Geneco</i>	CC4 w/Lid Marked Sewer
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Rim and Cover

<i>Christy</i>	G5
<i>Bes</i>	M2

CITY OF PETALUMA
Department of Engineering
22 Bassett Street - Petaluma California 94952
707 778 4304 - Fax 707 778 4437

Approved By
Thomas S. Hargis
Thomas S. Hargis - R.C.E. 22566

Engineer's
**APPROVED
LIST**

Drawn By
Butch Smith
Scale:
N. T. S.
Date
March 31st 1995
File Number
Std. Det. SSS0000.519



City of Petaluma
Petaluma, California

SANITARY SEWER INSTALLATION

DETAIL SPECIFICATION NO. 21

DESCRIPTION

- 2101.1 Description. The work shall consist of furnishing and installing sewer mains, manholes, laterals, fittings, and appurtenances and testing, flushing and cleaning the same in accordance with the plans and these specifications. The end result being a complete project ready for use.

MATERIALS

- 2102.1 Ductile Iron Pipe. Ductile iron pipe used as sanitary sewer shall be Class 50 and shall conform with City of Petaluma Water Main Installation Detail Specification No. 11 except that the pipe inside lining shall be as follows:

Six (6") inch and eight (8") inch ductile iron pipe for sanitary sewers in only residential areas shall have an inside coating of type V Cement mortar a minimum of one-sixteenth (1/16") inch thick and a petroleum asphaltic material a minimum of three (3) mil. thick over the cement mortar both conforming to the requirements of ANSI/AWWA C104/A21.4-80. Ten (10") inch and larger ductile iron pipe and fittings used for sanitary sewer in any area and **all** other ductile iron pipe and fittings regardless of size used in industrial areas shall have an inside coating of minimum 40-mil thick polyurethane.

- 2102.2 Polyvinyl Chloride (PVC) Sewer Pipe and Fittings: PVC shall conform with ASTM D3034 SDR35 Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings or ASTM F949 Poly (vinyl chloride) (PVC) Corrugated Sewer Pipe with Smooth Interior and Fittings except that service bends shall be long radius sweeps. Bends shown on Table 3 "Laying Lengths of Long Ben Fittings (min)" of ASTM D3034 shall not be used for PVC service sweeps. PVC sweeps shall have a minimum radius of 36 inches. PVC shall have a uniform minimum "Pipe Stiffness" (F/ Y=46 PSI). PVC pipe dimensions shall conform with ASTM D3034 Table 1, or ASTM F949 Table 1.

PVC SDR35 sewer pipe and fittings shall be "ring-tyte" as manufactured by J-M Pipe, "Fluid-Tite" as manufactured by Certainteed or equal.

Minimum wall thickness shall be as follows:

<u>Nominal Diameter</u>	4"	6"	8"	10"	12"
Minimum Wall Thickness	0.125"	0.180"	0.240"	0.300"	0.310"

PVC Joints. PVC sewer pipe and fittings shall have bell and spigot type joints with elastometric sealing rings all in conformance with ASTM D3212 Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals. Rubber sealing gaskets shall meet the requirements of ASTM designation D-1869. No solvent cement joints will be permitted by Contractor.

Deflection. Maximum allowable deflection for PVC sewer pipe shall be five (5%) percent of the average inside pipe diameter. Deflection shall be measured after trench backfill is in place and compacted and after aggregate subbase (if specified) but prior to installation of aggregate base and/or asphalt concrete.

Mandrel Test. Installed PVC sewer pipe deflection shall be checked in accordance with Clause 2103.10B Mandrel Test of the No. 21 Detail Specifications except that maximum allowable deflection shall be five (5%) percent in lieu of four (4%) percent and the Mandrel shall be ninety-five (95%) percent of the specified average inside pipe diameter in lieu of ninety-six (96%) percent.

2102.3 Precast Reinforced Concrete Manhole Sections. Precast manhole sections shall conform with the plans and with ASTM C478-68 as amended to date. Manhole cones shall be the concentric type unless otherwise shown on the plans or required by the Special Provisions. Manholes shall be constructed without steps. A minimum of eighteen (18") inches and a maximum of twenty-four (24") inches total depth of three (3") inch and six (6") inch grade rings, as shown on the standard drawings, shall be required on all manholes unless otherwise required by the Special Provisions or contract plans.

2102.4 Castings. Castings for manhole ring, cover and other purposes, shall conform accurately to the form and dimensions shown on the detailed drawings. Castings must be of workmanlike finish, free from blow and sand holes or defects of any kind, and shall be made from a superior quality of tough even-grained gray iron and shall possess a tensile strength of not less than twenty thousand (20,000) pounds per square inch.

Before leaving the foundry they shall be thoroughly cleaned and coated by dipping in asphalt applied at a temperature of three hundred (300°) degrees Fahrenheit in such a manner as to provide a firm, durable, tenacious coating.

2102.5 Portland Cement. Portland Cement shall conform to ASTM designation C150-67, Type II.

2102.6 Portland Cement Concrete. Portland Cement Concrete for manhole bases shall conform to the requirements of Section 90 of the Standard Specifications current revision and as herein specified.

The concrete shall be Class "A" containing six (6) sacks of Portland Cement per cubic yard of concrete. The grading of the combined aggregate shall conform with the requirements for one and one-half (1 1/2") inch

maximum. The consistency of the fresh concrete shall be such that the slump does not exceed four (4") inches as determined by Test Method No. California 519A or 520. The test method used shall be determined by the Engineer.

2102.7 Mortar. All mortar used in the construction of manholes shall consist of one (1) part Portland Cement and two (2) parts sand, and shall conform to Section 65-1.06A of the Standard Specifications and as herein specified.

2102.8 Select Backfill Material. Select backfill material shall be granular material of the quality herein specified.

Select backfill material shall have a size and a gradation falling within the following limits:

<u>Sieve Size</u>	<u>% Passing Sieve</u>
1"	100
3/4"	90 to 100
No. 4	35 to 55
No. 30	10 to 30
No. 200	3 to 9

The material shall compact to a relative compaction of ninety (90%) percent. The relative compaction is that determined by Test Method No. California 216. The material shall have a minimum sand equivalent value of twenty-five (25) as determined by the test method currently in use by the California Division of Highways.

The in-place density and moisture of soils and aggregates may be determined by the use of nuclear methods and the area concept as per Test Method No. California 231 with the following conditions. The text maximum density shall be determined as specified in Part II of Test Method No. California 216. A minimum of one in-place density test using the sand volume method as prescribed in Part I of Test Method No. California 216 shall be taken to standardize the nuclear gauge for each type of soil or aggregate. After correlation is assured and the equipment standardized, then the nuclear gauge may be used as directed by the Engineer.

CONSTRUCTION METHODS

2103.1 Handling of Materials. Vitriified clay pipe, fittings, precast concrete manhole sections, and cast iron manhole covers must be carefully handled at all times. Only suitable and proper equipment and appliances shall be used for the safe loading, hauling, unloading, handling and placing of materials. Special care shall be exercised so that the performed resilient joints on pipe and fittings will not be damaged. Any pipe or fitting with a joint damaged or flattened will cause that pipe or fitting to be rejected.

2103.2 Trench Excavation. Any existing pavement over the trench shall be cut, removed and hauled away from the job. Pavement shall be cut as specified in Section 2103.9-C of these specifications. All sewer mains

shall be laid in open trench or tunnels and open trench as indicated on the plans or as directed by the Engineer. Trenches having a depth greater than eight (8') feet shall be limited in width at the top of the pipe to the following:

<u>Pipe</u>	<u>Trench Width</u>
6"	24"
8"	27"
10"	30"
12"	33"
15"	36"

Whenever the maximum allowable trench width is exceeded for any reason, the Contractor shall, at his expense, embed or cradle the pipe in concrete in a manner satisfactory to the Engineer. In no case shall the free working space on each side of the pipe be less than six (6") inches.

The trench shall be excavated a minimum of four (4") inches below the grade of the bottom of the pipe and sufficient "Select Backfill Material" shall be placed in the trench and tamped to bring the trench bottom up to the grade of the bottom of the pipe. The relative compaction of the tamped material shall not be less than ninety (90%) percent as determined by Test Method No. California 216. It is the intention of these requirements to provide firm, uniform bearing for the pipe.

Material excavated in streets and roadways shall be laid alongside the trench and kept trimmed up so as to cause as little inconvenience as possible to public traffic. All material excavated in streets and roadways not required for backfill shall be immediately removed and disposed of by the Contractor. No surplus material shall be placed on private property unless written permission is furnished the Engineer, signed by the owner of the property.

At street crossings or where existing driveways occur on a street, the Contractor shall make provisions for trench crossings at these points, either by means of backfill or temporary bridges, as the Engineer may direct. Free access must be provided to all fire hydrants, water gate valves and private drives. Means shall be provided whereby all storm and waste water can flow uninterrupted in the gutters or drainage channels.

2103.3 Bracing and Shoring. The Contractor's attention is directed to Section 3(f) "Excavation and Trenching Safety" of the General Provisions. Excavation shall be supported as set forth in the rules, orders and regulations of the State of California Division of Industrial Safety. Failure to comply with any of these rules, orders and regulations shall be sufficient cause for the Engineer to immediately suspend all work. Compensation for losses incurred by the Contractor by such an emergency suspension shall not be allowed. The Contractor shall backfill the ditch in a manner such that the removal of the shoring will not disturb the initial backfill.

2103.4 Control of Dust. The Contractor shall at all times keep the streets sufficiently watered and swept of all loose material produced by his

operations in order that traffic and construction does not raise an objectionable amount of dust. When directed by the Engineer, the Contractor shall apply a suitable dust palliative to control dust.

2103.5 Control of Waste Water. The Contractor shall furnish, install and operate all necessary equipment to keep trenches reasonably free from water. All water removed from trenches or flushed from pipes shall be disposed of in a manner that will cause no injury to public or private property or cause no nuisance or menace to the public. Under no circumstances will the laying of pipe or the placing of concrete in water be permitted.

2103.6 Pipe Laying. No pipe shall be laid until the Engineer inspects and approves the condition of the bottom of the trench.

Following the preliminary excavation of the trench, cross-bars with vertical slats nailed thereto shall be placed across the trench at intervals not exceeding twenty-five (25') feet. Points shall be set on each vertical slat at some uniform distances above the flow line of the pipe. A fine string line or wire shall then be stretched along a minimum of three of those points and secured. A measuring pole and plumb bob used in connection therewith shall provide the means to shape the bottom of the trench and to lay the pipe accurately to line and grade.

Pipe laying shall proceed upgrade with the spigot ends of bell and spigot pipe pointing in the direction of flow. Each piece shall be laid true to line and grade and in such a manner as to form a close concentric joint with the adjoining pipe and to prevent sudden offsets in the flow line. As the work progresses, the interior of the sewer shall be cleaned of all dirt and debris of every description. Pipe shall not be laid when the condition of the trench or the weather is unsuitable. At times when work is not in progress, open ends of pipe and fittings shall be closed.

Unless otherwise indicated on the drawings or directed by the Engineer, pipe shall be placed on prepared subgrade of imported material at least four (4") inches deep below the barrel of the pipe. The imported material shall be gravel-sand mixture as specified in Section 2102.8 of these specifications and thoroughly compacted to obtain a final density of at least ninety (90%) percent of maximum at optimum moisture as determined by Test Method No. California 216.

As pipe laying proceeds, bell holes shall than be excavated at each joint to facilitate the jointing operations and shall be only of sufficient size for that purpose. In order that bell holes may be properly located, not more than six (6) bell holes shall be excavated ahead of actual pipe laying. Bell holes shall be excavated so that pipe, when laid, will have a uniform bearing under the full length of the pipe to a width of at least sixty (60%) percent of the internal diameter of the pipe.

All A.B.S. pipe entering or leaving a manhole or concrete structures shall have standard manhole water stop gaskets, as supplied by the A.B.S. pipe manufacturer. The gasket shall be installed as recommended by the manufacturer.

2103.6A Trench Bottom Drainage and Stabilization. When additional gravel or crushed rock is required to stabilize a soft, wet or spongy foundation caused by the operations of the Contractor, such gravel or crushed rock shall be furnished at the Contractor's expense.

The Engineer shall be the sole judge of the suitability of the trench bottom and as to the amount of gravel required to stabilize a soft foundation. The Contractor shall remove any soft material and replace it with gravel or crushed rock when ordered to do so by the Engineer.

Gravel or crushed rock shall have a size and gradation falling within the following limits:

<u>Sieve Size</u>	<u>% Passing Sieve</u>
2"	100
1"	90 - 100
3/4"	5 - 30
3/8"	5 - 20
No. 200	0 - 4

2103.7 Backfilling. When jetting, it is important that proper precautions be taken to prevent floating of and damage to the pipe.

2103.7A Initial Backfill. "Select Backfill Material" as specified in Section 2102.8 of these specifications shall be used for initial backfill. After the pipe has been properly laid and inspected, select backfill material shall be placed on both sides and over the pipe to such a depth that after thorough compaction, the final depth shall be at least twelve (12") inches above the top of the pipe. The Contractor shall be wholly responsible for damage to the pipe.

The initial backfill shall be compacted by hand tamping. The use of machine tampers will not be permitted. The initial backfill material shall be hand tamped in layers not exceeding four (4") inches in uncompacted depth. The final depth of compacted initial backfill shall be at least twelve (12") inches above the top of the pipe.

After hand tamping, the relative compaction of the initial backfill material shall be not less than ninety (90%) percent as determined by Test Method No. California 216.

2103.7B Subsequent Backfill. Above the level of the initial backfill, the trench shall be backfilled with structural backfill (excluding pea gravel) as specified in paragraph 19-3.06 Structure Backfill of the State of California, Department of Transportation, Standard Specifications, dated July 1984. Unless otherwise specified in the Special Provisions or certified by an approved soil testing laboratory that the native trench excavated material meets the requirements of structural backfill as stated above - native excavated trench material shall not be used for backfill in any portion of the trench.

The Contractor shall compact by tamping and/or rolling, the backfill material in layers not exceeding eight (8") inches in loose depth, each layer being thoroughly compacted by tamping and/or rolling before succeeding layers are placed. "Stomper" type equipment for compaction shall not be permitted. Vibrating equipment that does not damage the pipe or adjacent facilities may be used for compaction.

Subsequent backfill compacted by tamping and/or rollings shall be free from stones or lumps exceeding three (3") inches in greatest dimension, vegetable matter, or other unsatisfactory material, and shall be compacted to a relative compaction of not less than ninety (90%) percent as determined by Test Method California No. 216, except that within two and one-half (2 1/2') feet of finished permanent surfacing grade the relative compaction shall not be less than ninety-five (95%) percent. The Contractor will be charged for the cost of all compaction tests where the test results do not meet the above specifications.

If the Contractor elects to compact by tamping and/or rolling the backfill material shall be placed in layers not exceeding eight (8") inches in loose depth, each layer being thoroughly compacted by tamping and/or rolling before succeeding layers are placed. The use of machine tampers, except manually held types, will not be permitted unless authorized by the Engineer.

Where A.B.S. pipe is installed there shall be at least thirty (30") inches of cover over the top of pipe before the trench is wheel-loaded and when hydro-hammering is authorized by the Engineer for trench compaction, there shall be a minimum of four (4') feet of cover over the top of A.B.S. pipe before utilization of the hydro-hammer.

Compaction of subsequent backfill within two and one-half (2 1/2') feet of finished permanent surfacing grade shall be accomplished by tamping and/or rolling as specified above. Jetting will not be permitted within two and one-half (2 1/2') feet of finished permanent surfacing grade.

Subsequent backfill placed by jetting or by tamping and/or rolling shall be free from stones or lumps exceeding three (3") inches in greatest dimension, vegetable matter, or other unsatisfactory material, and shall be compacted to a relative compaction of not less than ninety (90%) percent as determined by Test Method California No. 216, except that within two and one-half (2 1/2') feet of finished permanent surfacing grade the relative compaction shall not be less than ninety-five (95%) percent. The Contractor shall be charged for the cost of all compaction tests where the results do not meet the above specifications.

2103.7C Re-excavation. If the compaction requirements as specified above are not met, the trench shall be re-excavated. Backfill material shall then be compacted by tamping and/or rolling as specified above until the compaction requirements are satisfied.

2103.8 Subgrade Preparation. The finished subgrade immediately prior to placing base material thereon shall have a relative compaction of not less than ninety-five (95%) percent for a depth of two and one-half (2 1/2') feet below finished permanent surfacing grade, as determined by Test Method

California No. 216. Mud or other soft or spongy material shall be removed and the space filled with select backfill material and rolled or tamped in layers not exceeding eight (8") inches in thickness until the above relative compaction requirement is satisfied.

Subgrade preparation is not required in unimproved areas where trench surfacing is not required.

2103.9 Trench Surfacing.

2103.9A General. When an unimproved surface is encountered, the trench shall be restored to its original surface.

Where a gravel surface is encountered, it shall be replaced over the width of the trench with Class 2 aggregate base six (6") inches in depth as specified in Section 26 of the Standard Specifications.

Where the existing surface is some type of asphalt or concrete, it shall be restored with a temporary surface followed by a permanent surface as specified herein.

2103.9B Temporary Surfacing. The temporary surfacing shall be Class 2 aggregate base as specified in Section 26 of the Standard Specifications. The aggregate base shall be equal in depth to the existing pavement structural section, but in any case not less than fourteen (14") inches in depth.

The aggregate base shall be brought within one (1") inch of the top of the existing paving and covered with temporary "cold mix" asphalt paving using an MC-250, MC-800 or approved equal. All temporary surfacing shall be installed the same day as backfilling and shall be level with the existing paving.

The Contractor shall maintain the temporary surfacing level with the existing paved surface at all times. All dirt and gravel and debris of any kind shall be removed from City streets by the end of the day. All temporary asphalt shall comply fully with the Bay Area Air Quality Management District's Regulation 8, Rule 15.

Section 302 of Rule 15 prohibits the use of "cut back" asphalt (including MC-70) during the months of April through October in paving material or in paving and maintenance operations. The Contractor shall use only slow-cure (SC) liquid asphalts for temporary trench paving during April through October.

In the event the Contractor does not comply fully with the above requirements, no further excavation will be permitted until the requirements are met.

2103.9C Permanent Surfacing. Permanent surfacing shall not be constructed until the compaction requirements of Section 2103.7 of these specifications are satisfied. The wearing surface for permanent surfacing shall be replaced "in kind", but in no case shall the new surfacing be less than two (2") inches thick for asphalt concrete or less than six (6") inches thick for

Portland cement concrete. A permanent surface shall be installed no later than ten (10) calendar days from completion of backfill.

- 2103.9C1 Asphalt Concrete. The existing pavement shall be neatly cut to a depth of two (2") inches and removed to at least five (5") inches outside each side line of the pipe trench to permit proper keying in the restored pavement. The existing pavement cut shall be straight, vertical and with no ragged edges.

The base course for permanent surfacing shall be Class 2 aggregate base as specified in Section 26 of the Standard Specifications. The aggregate base shall be equal in depth to the existing pavement structural section, but in any case not less than twelve (12") inches in depth.

The wearing surface for permanent surfacing shall be asphalt concrete two (2") inches minimum in depth. The asphalt shall be "Type B Asphalt Concrete" with one-half (1/2") inch maximum, medium grading aggregate conforming to the requirements of Section 39 of the Standard Specifications.

- 2103.9C2 Portland Cement Concrete Paving. The existing pavement shall be neatly sawcut to a minimum depth of two (2") inches and at least five (5") inches outside each side line of the pipe trench to permit proper keying in the restored pavement. The Contractor shall chip along the edge of the existing concrete pavement and remove all loose pieces prior to replacing the wearing surface for permanent surfacing.

The base course for permanent surfacing shall be Class 2 aggregate base as specified in Section 26 of the Standard Specifications. The aggregate base shall be equal in depth to the existing pavement structural section less than six (6") inches, but in any case not less than six (6") inches in depth.

The wearing surface for permanent surfacing shall be Portland Cement Concrete in conformance with Section 90 of the Standard Specifications.

- 2103.9D Restoration of Existing Facilities. Whenever existing improvements such as pavements, curbs, gutters, sidewalks, driveways, storm drains, sanitary sewers, laterals, utilities, utility services, etc., have been cut or damaged in order to construct sanitary sewers and appurtenances, the backfill shall be thoroughly compacted and all improvements restored to their original condition. The cost of restoring all original improvements shall be concluded in the unit bid price for sanitary sewer pipe and appurtenances and no additional allowance shall be made therefor.

- 2103.10 Test for Sanitary Sewers. Sewer pipe joints shall be made in strict conformity to specifications and the workmanship on the entire sewerage project (pipe joints, connections, manholes, etc.) and the backfilling of granular material around the pipe shall be such that the entire project shall be so watertight that leakage into the sewer by ground water infiltration shall not exceed 0.026 gallons per minute, per inch diameter, per one thousand (1,000') feet of main line sewer being tested (200 gallons per inch diameter, per mile of main line, per day).

2103.10A Air Test for Sewers. Low pressure air test may be substituted for hydrostatic test at the option of the Contractor.

Prior to air testing, the sewer main shall be cleaned in accordance with Paragraph 2103.11, "Flushing and Cleaning Sewer Lines" of these specifications. Air testing shall conform with the recommendations of the Bay Area Committee on Air Testing by using the formulas and procedure given on Table 7 - "Recommended Procedure for Conducting Acceptance Test" reprinted from "Low Pressure Air Test for Sanitary Sewers" by Roy E. Ramseier and George C. Riek, Journal of Sanitary Engineering Division A.S.C.E. April 1964: "The pipeline shall be considered acceptable when tested at an average pressure of 3.0 pounds per square inch greater than the average back pressure of any ground water that may submerge the pipe, of: (1) the total rate of air loss from any section tested in its entirety between manhole and cleanout structures does not exceed 2.0 cubic feet per minute, or (2) the section under test does not lose air at a rate greater than 0.003 cubic feet per minute per square foot of internal pipe surface".

Table 7 - "Recommended Procedure for Conducting Acceptance Test" and Fig. 13 - "Nonomgraph for the solution of $K = 0.011d^2 L$; $c = 0.0003882dL$, $tq = K$ divided by C " shall be used to determine the acceptability of the pipe being air tested.

The measure of the infiltration shall be construed to be the leakage out of the pipe line when the lower end is plugged at the manhole and the upper end is filled at a manhole so as to create a hydrostatic head in the line of a minimum four (4') feet above the invert at the lower end of the line. If ground water is encountered, the head above the invert of the pipe at the lower end of the line shall be increased so that the net hydrostatic head shall be a minimum of four (4') feet. The amount of leakage in one hour, measured through a water meter or other convenience device by bringing the water level back up to the starting level at the upper manhole, shall determine the rate of leakage. The Contractor shall furnish and install the necessary and required plugs for the tests. The length of the house connections entering the section of main line being tested shall not be included.

In no case shall the Contractor place the newly constructed sewer in operation without the approval of the Engineer and without an infiltration or leakage test.

In the even that ground water infiltration or leakage exceeds the limits indicated above, the Contractor shall at his expense immediately proceed to make necessary repairs and no further payment shall be allowed nor shall the project be finally accepted until the tests indicate that the entire project meets the above requirements.

The Contractor shall furnish the necessary pumps, labor, equipment and materials and shall assist the Engineer in making tests of the completed

sewerage project before the system is placed in operation or connected to other lines.

The Engineer shall designate the length or section of the sewer to be tested and may approve portions or all of the project without testing.

2103.10B Mandrel Test. The maximum allowable deflection for A.B.S. composite and/or A.B.S. solid wall pipe shall be four (4%) percent. Testing for conformance with the deflection limitation of A.B.S. pipe shall be performed by the Contractor, in the presence of the Engineer, by drawing a ridged mandrel through the installed and backfilled pipe, by hand. The mandrel shall have a cross-sectional diameter equal to at least ninety-six (96%) percent of the specified average inside diameter of the pipe being tested and shall have a minimum of nine (9) contact points equally spaced around the circumference and shall be constructed in such a manner so as not to damage the pipe being tested. Mandrels shall be subject to approval of the Engineer.

2103.11 Flushing and Cleaning Sewer Lines. After all backfilling and pavement restoring operations have been completed, the Contractor shall flush and clean all sanitary sewer lines in the following manner under the supervision of the Engineer or Inspector:

A heavy rubber ball, such as "Wayne Ball", manufactured by Sidu Company, Long Beach, California, or approved equal, inflated with air, and having an outside diameter equal to the interior diameter of the pipe to be cleaned, shall be furnished by the Contractor. The ball shall be inflated so that it will fit snugly into the sewer line. The ball shall be placed in the last (upper) manhole on the line and water introduced into the manhole back of the ball. The ball shall pass through the pipe with only the pressure of the water behind it. The rate at which the ball is allowed to pass through the pipe shall be controlled by a rope at all times. Debris flushed out ahead of the ball shall be removed at the lower manhole where its presence is evident. This cleaning shall be conducted on each section of pipe installed. Care shall be exercised not to feed the ball too rapidly in order that all debris can be removed at each manhole.

2103.11A Television Inspection. All new sanitary sewer mains shall be T.V. inspected. Pipe joint separations, low or high spots, cracked or chipped pipe, deflection, improper lateral connections, infiltration, and all other pipe material and/or installation defects identified shall be corrected by the Contractor.

The T.V. inspection shall be conducted after all new main and lateral work, including backfill and pipe testing, is completed and all street structural section aggregate subbase is in place and compacted but prior to placement of aggregate base and A.C. paving.

The Contractor shall hire an independent television inspection service to perform a closed-circuit television inspection of all newly constructed sewers. A video tape of the television inspection shall be produced and delivered to the Engineer in color VHS format, together with a typed log of the inspection.

The following conditions shall exist prior to the television inspection:

- a. All sewer lines shall be installed, backfilled and compacted;
- b. All structures shall be in place, all channeling complete and all pipelines accessible from structures;
- c. All other underground facilities, utility piping and conduit within two feet of the sewer main, shall be installed;
- d. All compaction required shall be completed;
- e. Pipelines to be tested shall be balled, flushed and mandrel tested;
- f. The final air or water test shall have been completed;
- g. Immediately before the television inspection, run fresh water into the sewer until it passes through the downstream manhole.

When the above work has been completed, the Contractor shall notify the Engineer 48 hours in advance of the date for television inspection. During this inspection, the Contractor or his authorized representative shall be present to observe the video pictures as provided by the television camera.

The following video tape observations shall be considered defects in the construction of the sewer pipelines and will require corrections prior to acceptance:

- a. Offgrade - 0.08 foot, or over, deviation from grade;
- b. Joint separations - over 3/4";
- c. Offset joints;
- d. Chips in pipe ends - none more than 1/4" deep;
- e. Cracked or damaged pipe or evidence of the presence of all external object bearing upon the pipe (rocks, roots, etc.);
- f. Infiltration;
- g. Debris or other foreign objects;
- h. Other obvious deficiencies when compared to Approved Plans and Specifications, these Standards and Standard Drawings.

The Contractor shall be notified in writing of any deficiencies revealed by the television inspection that will require repair, following which the Contractor shall excavate and make the necessary repairs and request a television re-inspection. Television re-inspection shall be at the Contractor's expense.

The City Engineer shall be given one week written notice by the Contractor for T.V. inspection.

- 2103.12 Sewer Lateral. Sewer service laterals shall be constructed at the locations and in accordance with the details shown on the plans and in accordance with these specifications. Four (4") inch diameter sewer service laterals for single family residences and six (6") inch sewer service laterals for multiple and commercial dwellings shall be asbestos cement pipe or vitrified clay pipe or A.B.S. solid wall pipe, or PVC. Four (4") inch and six (6") inch asbestos cement sewer pipe shall be Class 2400, conforming to ASTM C644-69, as amended to date, and shall be assembled in full compliance with the current manufacturer's recommendations. Vitrified clay pipe and fittings shall be extra-strength, unglazed bell and spigot pipe conforming to the ASTM C200-66T, as amended to date, and shall be assembled in full compliance with the current manufacturer's recommendations. The vitrified clay pipe joints shall be of the resilient performed type conforming to ASTM C425-66T, as amended to date. Four (4") inch and six (6") inch A.B.S. sewer pipe shall comply with ASTM D-2751, SDR 23.5 or less with a maximum of four (4%) percent deflection. PVC sewer laterals shall conform with the same specifications as the main PVC pipe as specified above. All PVC service bends shall be long radius sweeps (R-36" min).

All new sanitary sewer laterals shall connect to new sanitary sewer mains by means of 1/8 bends and wyes.

All sanitary sewer 1/8 bends (except ductile iron) shall be "long radius sweeps". Short radius or mitered bends shall not be permitted.

- 2103.12A Ductile Iron Sewer Laterals: Ductile iron pipe used as sanitary laterals shall be Class 51 in conformance with paragraph 2102.2B Ductile Iron pipe of this addendum. Laterals in only residential areas shall have cement mortar and petroleum asphaltic material lining but laterals in industrial areas shall have polyethylene lining as described in 2102.2B of this addendum. Sewer lateral fittings shall be (wyes, bends and plugs) cast or ductile iron in conformance with Detail No. 11 Specifications.

- 2103.13 Sewer Clean Outs. The street clean outs shall be constructed at the locations and in conformance to the details shown on the plan.

- 2103.14 Connection to Existing Sewer Main. Sewer lateral taps to existing asbestos cement sewer mains shall be either four (4") inch or six (6") inch "T" nipples secured in the proper orientation to the sewer main by epoxy base grouting and packing material for sewer construction. Said grouting material shall be "Joint Master" as manufactured by Johns-Mansville or an approved equal. Spacing between nipples shall not be less than three (3') feet. Tapping of A.C. sewer mains shall be done by the use of a Marchant Pilot or approved equal tapping machine. The epoxy grouting shall be allowed to cure at least six (6) hours before connecting the service lateral and/or before backfilling the trench.

Four (4") inch or six (6") inch service connections to existing six (6") inch and eight (8") inch vitrified clay mains shall be made by installing a vitrified clay wye into the main line using calder couplings at the joints. Where the flow in six (6") inch or eight (8") inch mains is excessive (in the opinion of the Engineer) or on mains larger than eight (8") inches, the main shall be tapped and drilled with an approved machine and fitted with an approved saddle or fitting such as a "Tap-tite" fitting as manufactured and installed by the Tap-tite Company of Oakland, California, or approved equal.

Four (4") inch or six (6") inch services connection to existing A.B.S. mains shall be made in conformance with the A.B.S. manufacturer's recommendations using A.B.S. fittings by installing mainline wyes or solvent welded saddle wyes.

2103.15 Access Road. The Contractor shall construct a paved access road over all new sanitary sewer pipe mains constructed in easements.

The access road shall conform to the City Detail Plans, the City of Petaluma's Street Construction Detail Specification No. 41 and to these specifications.

The access road shall be eight (8') feet wide (centered over the sewer main) with two (2") inches of asphalt concrete on six (6") inches of Class 2 aggregate base, three-quarter (3/4") inch maximum grading. The subgrade shall be prepared as required in the No. 41 Detail Specifications. Asphalt and aggregate shall conform with the No. 41 Detail Specifications.

The finished grade of the access road shall be even (flush) with the existing natural ground surface prior to the installation of the sewer pipe.

2103.16 Traffic Control. Traffic control shall conform with Section 7-108 "Public Convenience" and Section 7-1.09 "Public Safety" of the State of California Standard Specifications dated July 1984; with the City General Provisions; and, with these Detail Specifications.

All costs including flagging shall be borne by the Contractor. The Contractor shall provide safe passage for vehicular and pedestrian traffic through the work at all times.

Traffic on two (2) lane streets may be reduced to one (1) lane and traffic on three (3) or more lanes may be reduced to two (2) lanes provided that, with all restriction of traffic flow, the Contractor shall furnish flagmen, cones, signs and barricades as required by the Engineer and shall permit the traffic equal flow time in each direction.

a. Public Access - Access to public and private buildings, businesses and driveways shall be maintained by the Contractor. The Contractor shall provide approved metal "bridge" or temporary backfill for access when and where required within one-half (1/2)

hour after request by the Inspector except that emergency vehicles and personnel shall be provided immediate access at all times.

- b. Notification - The Contractor shall notify the property occupant at least twenty-four hours in advance of the trenching across their driveway.

METHOD OF MEASUREMENT

- 2104.1 Sewers. Sewers shall be measured horizontally from the centerline of one manhole to the centerline of the next manhole or cleanout.
- 2104.2 Sewer Lateral. Lateral sewers shall be measured horizontally from the centerline of the main sewer to the end of the lateral. If the Special Provisions indicate the measurement of sewer laterals as a unit then the measurement shall be one complete installed unit as shown on the plans.
- 2104.3 Manholes. Manholes shall be measured as one complete installed unit including base, precast sections, ring and cover.
- 2104.4 Sewer Clean Out. The street cleanouts shall be measured as one complete installed unit, including all concrete backing, riser sections, frame and lid.

BASIS OF PAYMENT

- 2105.1 Sewer Main. The price per linear foot of sewer main shall include all wye branches and connections shown on the drawing and all labor, materials and pipe necessary to excavate the trench, bed place and joint the pipe, backfill the trench, and all other work necessary to produce a complete and finished job in accordance with the drawings and specifications.
- 2105.2 Sewer Lateral. The price per linear foot of sewer lateral shall include 1/8 bends, connections to mainline sewers, and all labor, materials and pipe necessary to excavate the trench, bed, place and joint the pipe, backfill the trench and all other work necessary to produce a complete and finished job in accordance with the drawings and specifications. If specified as a complete installed unit, then the contract price per each sewer service shall include full compensation for all cost necessary and incidental to furnishing and installing a sewer lateral, including connection to existing or new sewer main, 1/8 bends, pipe fittings, drawings and specifications.
- 2105.3 Standard Manhole. The contract unit price per each "Standard Manhole" shall include full compensation for all costs necessary and incidental to furnishing and installing a manhole complete, as herein specified and detailed on the drawings.
- 2105.4 Trench Surfacing. The contract price per linear foot for trench surfacing shall constitute full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved for preparing subgrade and constructing trench surfacing, complete in place, as shown on the plans, as specified herein, and as directed by the Engineer.
- 2105.5 Estimated Quantities. Estimated quantities are intended to indicate the approximate magnitude of the work and to serve as an equitable basis for award of the contract. The actual work performed will be used to compute the total amount due.