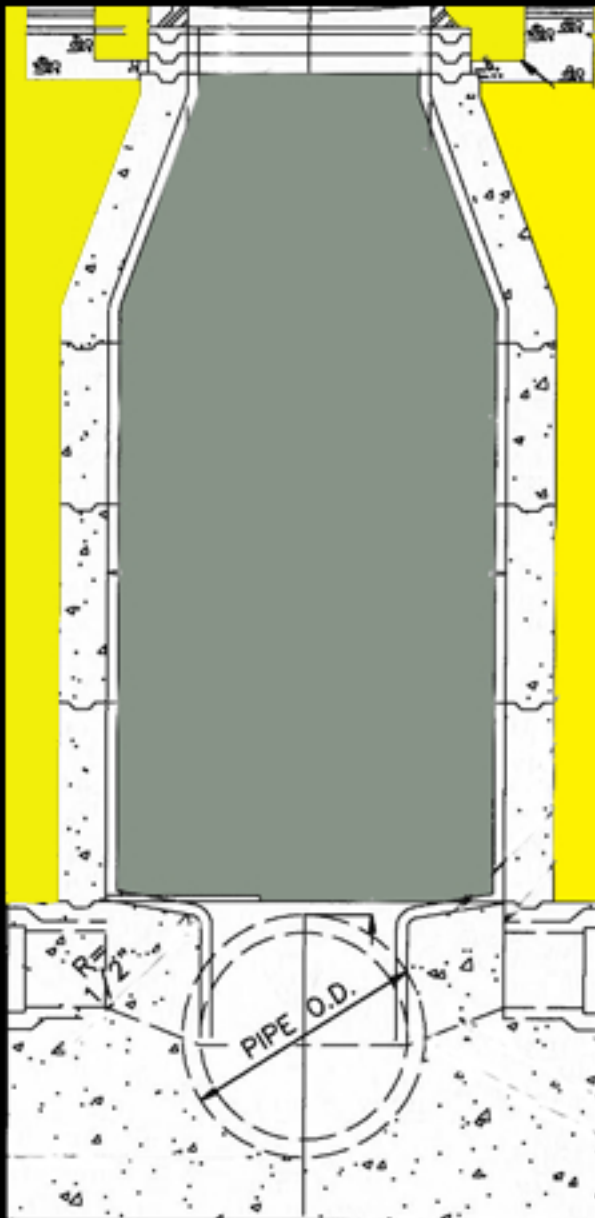


CITY OF NORWALK

Sewer Standard Plans and Design Standards for Sewer Facilities



CITY OF NORWALK
Norwalk, California

April 2009



CITY OF NORWALK

**SEWER STANDARD PLANS
AND
DESIGN STANDARDS FOR SEWER FACILITIES**

Prepared By:

**AKM CONSULTING ENGINEERS
553 Wald
Irvine, California 92618
(949) 753-7333**

Prepared For:

**CITY OF NORWALK
12700 Norwalk Boulevard
Norwalk, California 90650
(562) 929-5723**

APRIL 2009

CITY OF NORWALK

**SEWER STANDARD PLANS
AND
DESIGN STANDARDS FOR SEWER FACILITIES**

Prepared By:

**AKM CONSULTING ENGINEERS
553 Wald
Irvine, California 92618
(949) 753-7333**



Prepared For:

**CITY OF NORWALK
12700 Norwalk Boulevard
Norwalk, California 90650
(562) 929-5723**

APRIL 2009

**CITY OF NORWALK
SEWER STANDARD PLANS AND
DESIGN STANDARDS FOR SEWER FACILITIES**

TABLE OF CONTENTS

SECTION 1

S-100	MANHOLE DETAILS
S-101	CONCRETE BASE AND JOINT DETAILS
S-102	SEWER DROP MANHOLE WITH CLEANOUT
S-103	MANHOLE FRAME AND COVER
S-104	MANHOLE SHAFT OPENING ORIENTATION PLAN
S-105	LATERAL CLEANOUT DETAIL
S-106	PVC PIPE BEDDING AND MANHOLE CONNECTION DETAILS
S-107	VCP PIPE BEDDING DETAILS
S-180	CONCRETE SLOPE ANCHORS
S-110	STEEL CASING PIPE
S-111	VCP OR PVC TYPICAL LATERAL
S-112	CUT IN WYE CONNECTION
S-113	PVC MANHOLE LINER
S-114	PVC T-LOCK LINER DETAILS
S-115	PVC LINER WITH GAS FLAP INSTALLATION
S-116	FLAT TOP MANHOLE
S-117	TYPICAL GREASE INTERCEPTOR
S-118	DESIGN CRITERIA FOR SEPARATION OF WATER AND SEWER MAINS

TABLE OF CONTENTS
(Continued)

SECTION 2 (STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION)

201-1	PRECAST CONCRETE SHALLOW MANHOLE
203-1	BRICK SEWER MANHOLE
205-1	SEWER MANHOLE ADJUSTMENT
206-1	MANHOLE RAISING RINGS
207-1	PRECAST REINFORCED CONCRETE MANHOLE BASE
208-1	BREAKING INTO EXISTING MANHOLES
210-2	610mm (24") MANHOLE FRAME AND COVER – LOCKING TYPE
211-1	MANHOLE FRAME AND COVER – PRESSURE TYPE
212-1	ANCHOR SYSTEM FOR PRESSURE COVER
220-2	CHIMNEYS
223-1	HOUSE CONNECTION REMODELING
224-1	SUPPORTS FOR CONDUITS ACROSS TRENCHES
225-1	BLANKET PROTECTION FOR PIPES

SECTION 3

DESIGN STANDARDS FOR SEWER FACILITIES

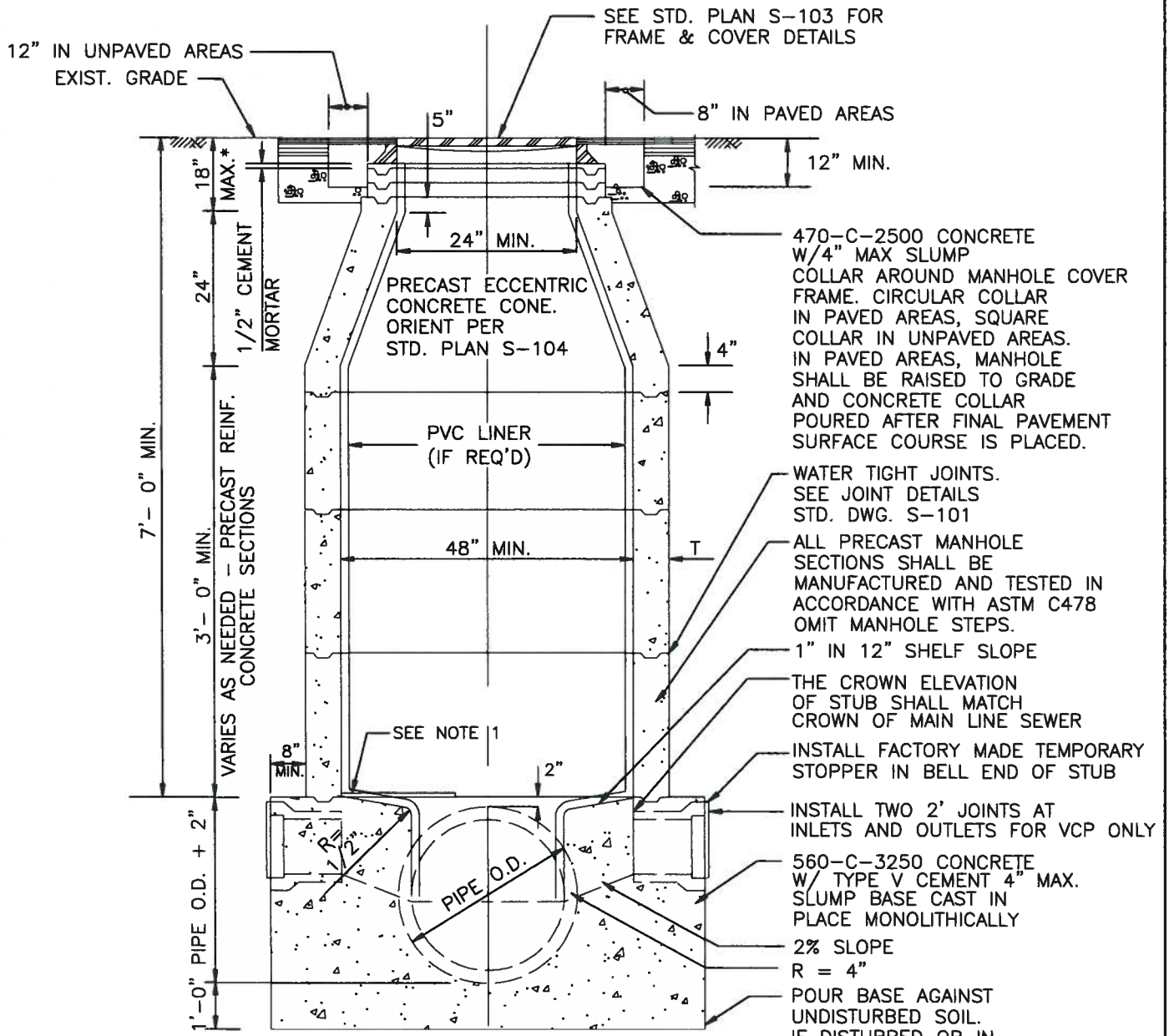
CITY OF NORWALK
SEWER STANDARD PLANS

SECTION 1

TABLE OF CONTENTS

SERIES S-100 SEWER

S-100	MANHOLE DETAILS
S-101	CONCRETE BASE AND JOINT DETAILS
S-102	SEWER DROP MANHOLE WITH CLEANOUT
S-103	MANHOLE FRAME AND COVER
S-104	MANHOLE SHAFT OPENING ORIENTATION PLAN
S-105	LATERAL CLEANOUT DETAIL
S-106	PVC PIPE BEDDING AND MANHOLE CONNECTION DETAILS
S-107	VCP PIPE BEDDING DETAILS
S-180	CONCRETE SLOPE ANCHORS
S-110	STEEL CASING PIPE
S-111	VCP OR PVC TYPICAL LATERAL
S-112	CUT IN WYE CONNECTION
S-113	PVC MANHOLE LINER
S-114	PVC T-LOCK LINER DETAILS
S-115	PVC LINER WITH GAS FLAP INSTALLATION
S-116	FLAT TOP MANHOLE
S-117	TYPICAL GREASE INTERCEPTOR
S-118	DESIGN CRITERIA FOR SEPARATION OF WATER AND SEWER MAINS



NOTES:

SEE SHEET 2 OF 2

* 12" MINIMUM



City of Norwalk

12700 Norwalk Blvd
Norwalk, CA 90651
(562) 929-5700

MANHOLE DETAILS

Approved _____

Date _____

REVISIONS

BY

DATE

STD. PLAN NUMBER

S-100

City Engineer _____

Sheet 1 of 2

MANHOLE DETAILS NOTES:

1. PLACE TWO HALF MOON SHAPED TEMPORARY PLYWOOD COVERS (5/8" THICK MINIMUM) IN BOTTOM OF MANHOLE AFTER SHAFTS HAVE BEEN SET TO KEEP DEBRIS FROM ENTERING SEWER.
2. FOR DROP MANHOLE SEE STD. PLAN. S-102.
3. FOR MANHOLES LOCATED OUTSIDE PAVED AREAS, THE FRAME AND COVER SHALL BE SET A MINIMUM OF 0.1 FT. ABOVE FINISH GRADE IN SHOULDER AREAS, UNPAVED ROADS OR LANDSCAPING AREAS, AND 18" IN UNFINISHED AREAS.
4. ALL INLETS AND OUTLETS SHALL BE SUPPORTED WITH CONCRETE SUPPORTS PRIOR TO POURING MANHOLE BASE.
5. MANHOLE LOCATIONS SHALL BE MARKED ON CURB FACE.
6. WALL THICKNESS (T) SHALL BE MINIMUM 5" FOR 48" MANHOLES, 6" FOR 60" MANHOLES, 7" FOR 72" MANHOLES.
7. SIDES OF BASE SHALL BE EITHER FORMED OR POURED AGAINST VERTICAL SMOOTH EARTH.
8. WHEN DEPTH OF MANHOLE EXCEEDS 15 FEET FROM TOP OF PIPE TO FINISH GRADE, MANHOLE SHAFT SHALL BE INCREASED TO 60 INCH DIAMETER.
9. A PLASTIC SIGN SHALL BE ATTACHED 12 INCHES BELOW THE TOP OF MANHOLE FRAME WITH INSCRIPTION:
10. MANHOLE STEPS SHALL CONFORM TO SPPWC 636-1. MANHOLE STEPS SHALL BE UNIFORMLY SPACED AT A MAXIMUM OF 16 INCHES. THE LOWEST STEP SHALL BE PLACED NOT LESS THAN 8-INCHES NOR MORE THAN 18" ABOVE THE SHELF. STEPS SHALL PROJECT 5 INCHES INSIDE THE MANHOLE.
11. THE TOP OPENING OF THE MANHOLE AND STEPS SHALL BE PLACED DIRECTLY OVER THE OUTLET OF THE STRUCTURE EXCEPT AS OTHERWISE NOTED IN PLANS.

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

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



City of Norwalk
12700 Norwalk Blvd
Norwalk, CA 90651
(562) 929-5700

MANHOLE DETAILS

Approved _____ Date _____ _____ City Engineer	REVISIONS _____ _____ _____	BY _____ _____ _____	DATE _____ _____ _____	STD. PLAN NUMBER S-100 Sheet 2 of 2
----------------------------------------------------------------	--------------------------------------	-------------------------------	---------------------------------	----------------------------------------------------------

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

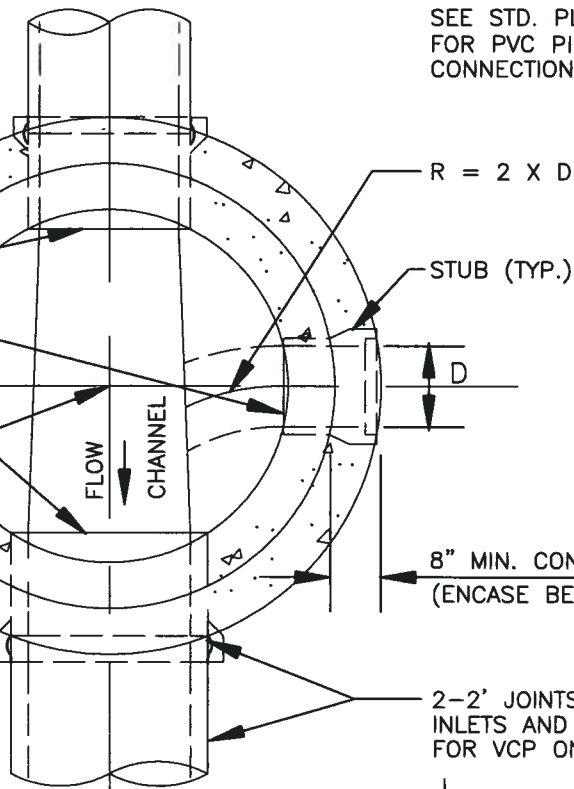
PIPE SHALL BE LAID
WITH END SQUARE INTO
M.H. BASE, UNLESS
OTHERWISE NOTED.
REMOVE TOP PORTION
OF PIPE, THEN
CONSTRUCT FILLET
SHELF OVER PIPE TO
DRAIN

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

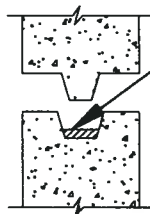
M.H. STATIONING

8" MIN.
BASE

PROVIDE 0.10' FALL ACROSS
M.H. WHERE POSSIBLE

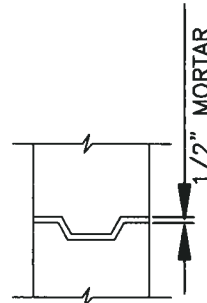


PLAN



JOINT SEALING
COMPOUND

PLASTIC JOINT
REQ. IN GROUNDWATER



1/2" MORTAR

MORTAR JOINT

NOTES:

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



City of Norwalk
12700 Norwalk Blvd
Norwalk, CA 90651
(562) 929-5700

**CONCRETE BASE
AND JOINT DETAILS**

Approved _____

Date _____

City Engineer

REVISIONS

BY

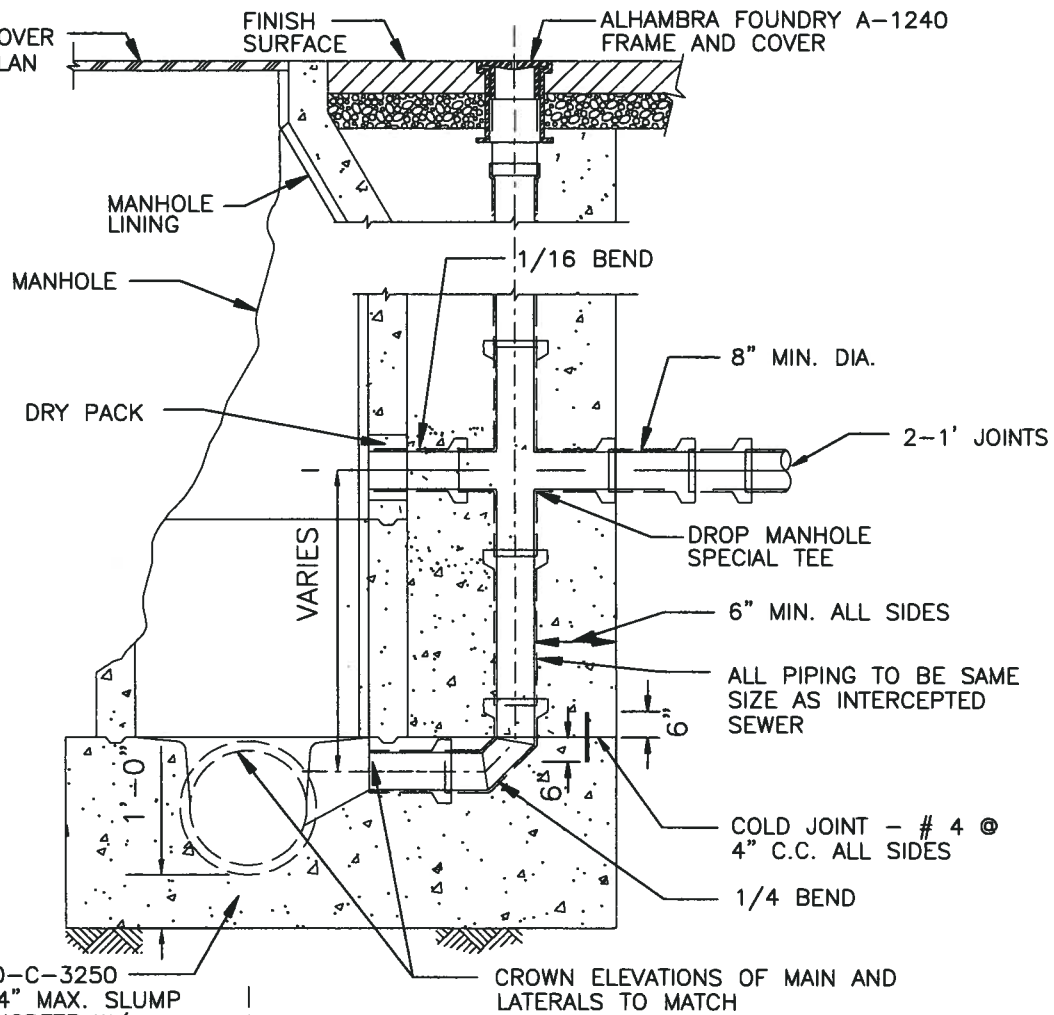
DATE

STD. PLAN NUMBER

S-101

Sheet 1 of 1

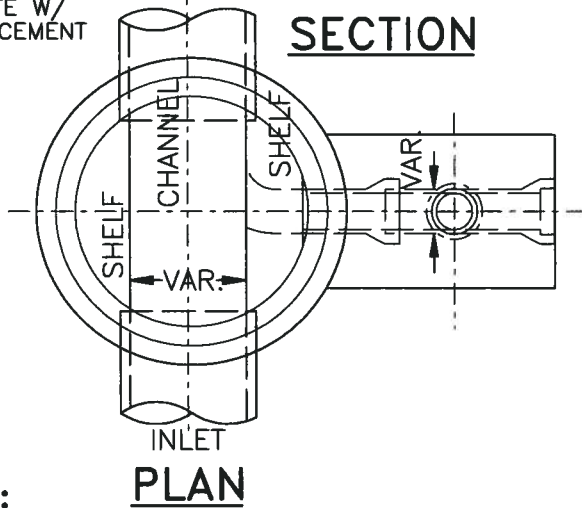
STA. MH
 FRAME & COVER
 SEE STD. PLAN
 S-103



560-C-3250
 W/4" MAX. SLUMP
 CONCRETE W/
 TYPE V CEMENT

CROWN ELEVATIONS OF MAIN AND
 LATERALS TO MATCH

SECTION



NOTES:

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



City of Norwalk
 12700 Norwalk Blvd
 Norwalk, CA 90651
 (562) 929-5700

**SEWER DROP MANHOLE
 WITH CLEANOUT**

Approved _____

Date _____

REVISIONS

BY

DATE

STD. PLAN NUMBER

S-102

City Engineer

Sheet 1 of 1

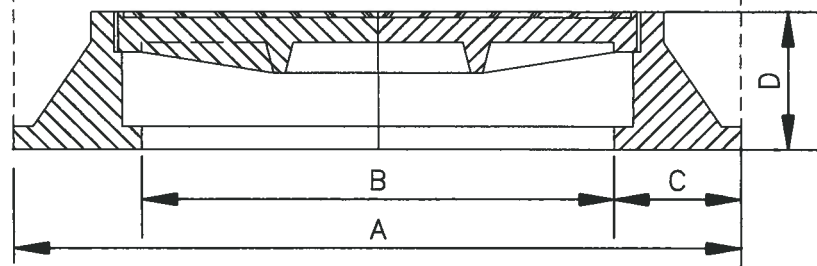
RADIAL BLOCK TREAD

1" VENT HOLE

SEWER

PICK HOLE (TYP)

MANHOLE COVER SHALL BE EMBOSSED WITH STD. LETTERS NORWALK



SECTION A-A

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

NOTES:

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



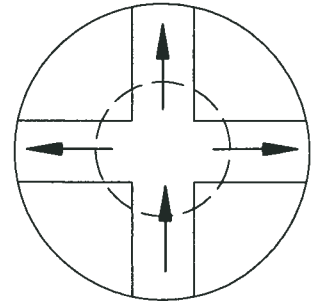
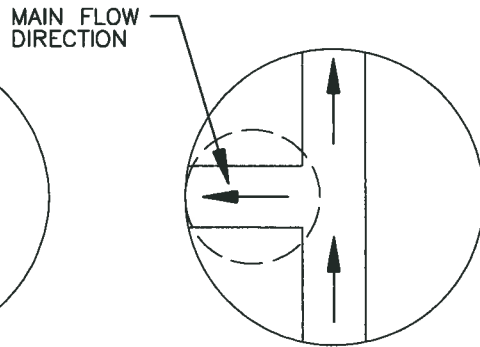
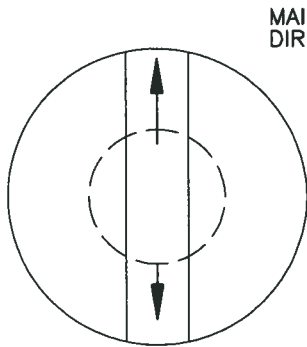
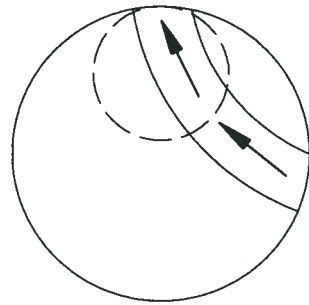
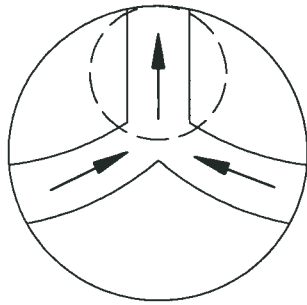
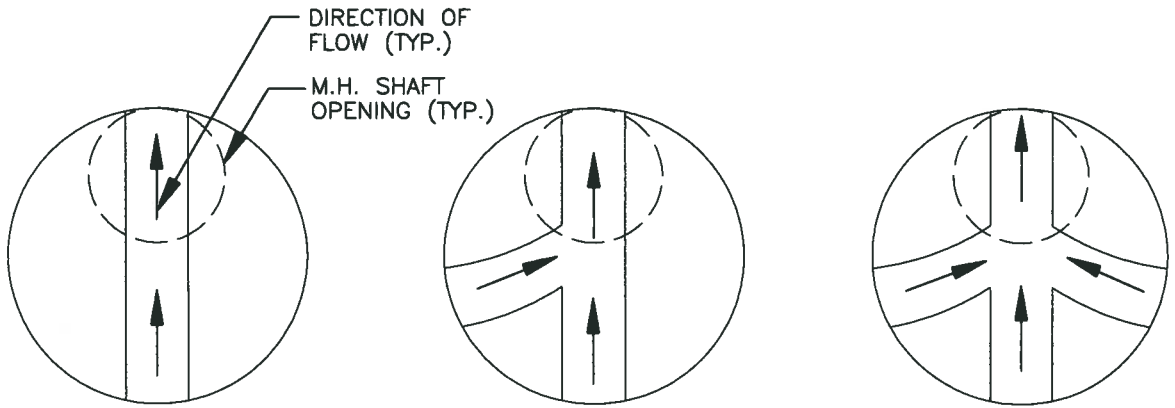
City of Norwalk
 12700 Norwalk Blvd
 Norwalk, CA 90651
 (562) 929-5700

**MANHOLE FRAME AND COVER
 (TRAFFIC LOADING)**

Approved _____ Date _____

REVISIONS	BY	DATE	STD. PLAN NUMBER
			S-103

City Engineer _____



SUMMIT M.H.
EITHER SIDE

SUMMIT M.H.

SUMMIT M.H.
ANY POSITION



City of Norwalk
12700 Norwalk Blvd
Norwalk, CA 90651
(562) 929-5700

MANHOLE SHAFT OPENING ORIENTATION PLAN

Approved _____

Date _____

REVISIONS

BY

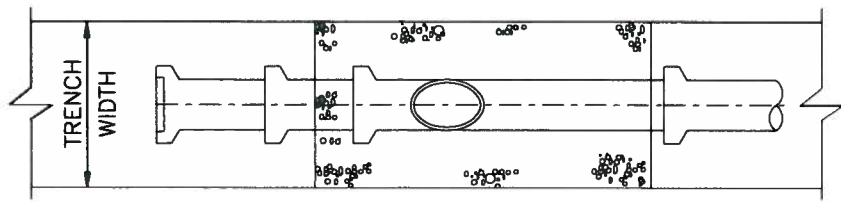
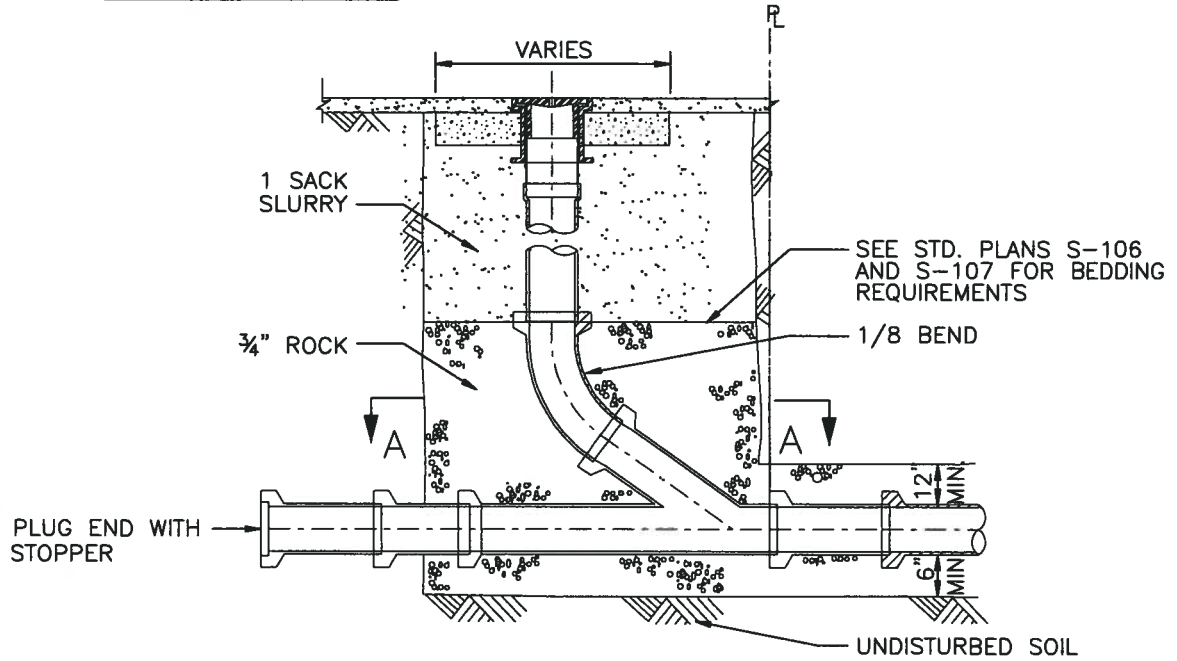
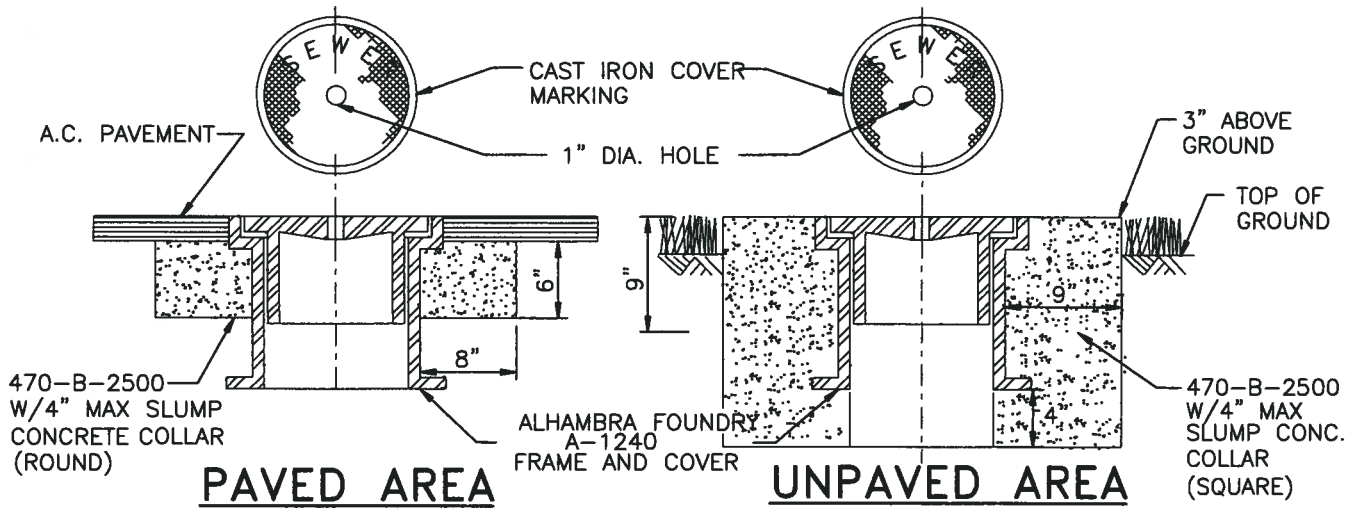
DATE

STD. PLAN NUMBER

S-104

City Engineer _____

Sheet 1 of 1



NOTES:

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



City of Norwalk
 12700 Norwalk Blvd
 Norwalk, CA 90651
 (562) 929-5700

LATERAL CLEANOUT DETAIL

Approved _____

Date _____

REVISIONS

BY

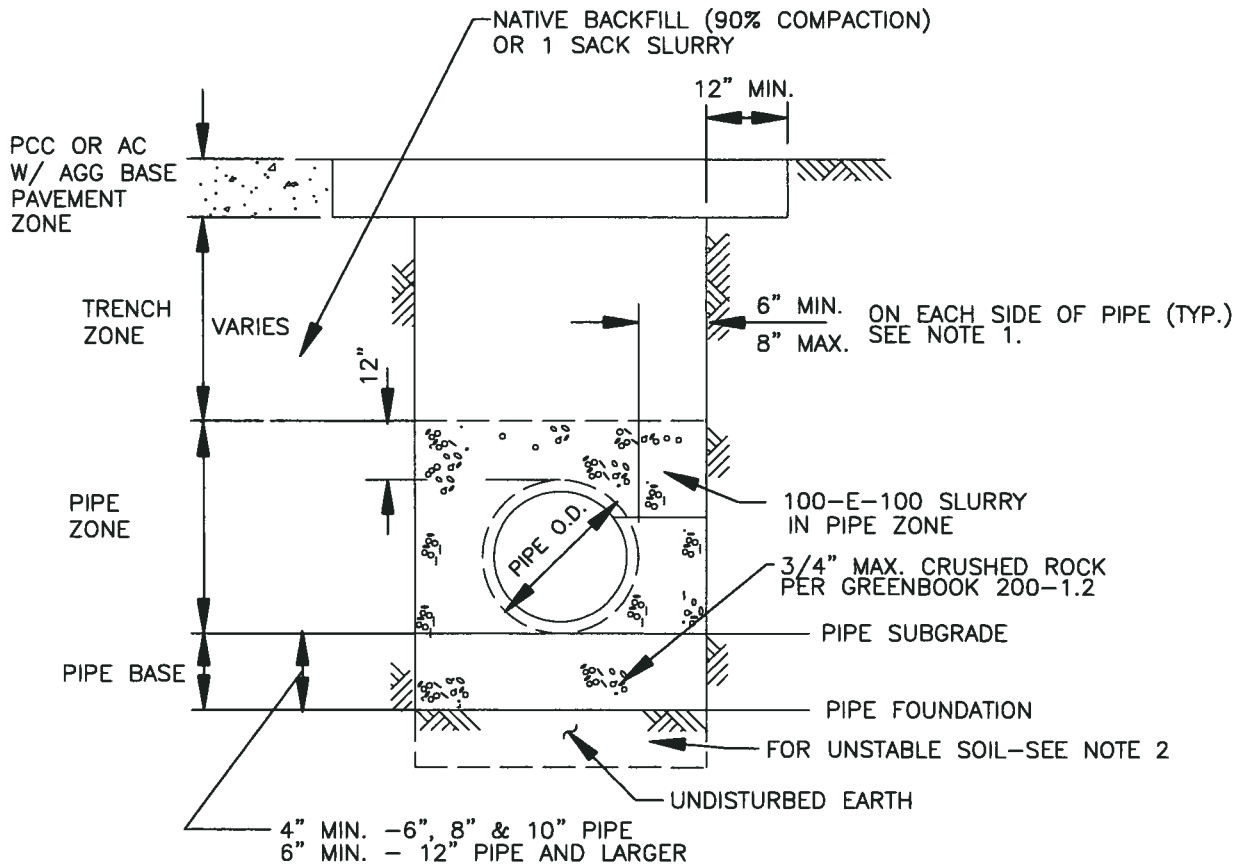
DATE

STD. PLAN NUMBER

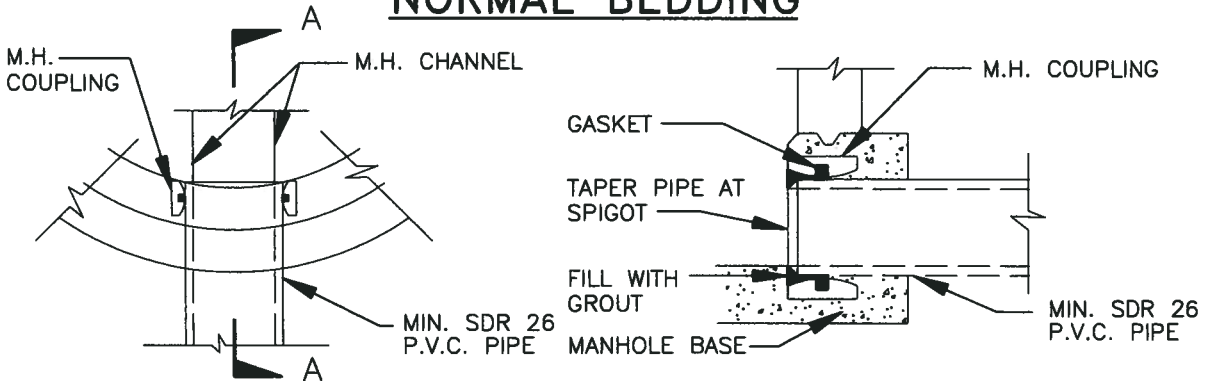
S-105

City Engineer _____

Sheet 1 of 1



NORMAL BEDDING



PLAN

SECTION A - A

PVC PIPE MANHOLE CONNECTION DETAILS

NOTES:

1. CONCRETE ENCASEMENT PER STD. DWG. S-108 SHALL BE USED WHERE THE TRENCH WIDTH AT THE UPPER LIMIT OF THE PIPE ZONE EXCEEDS THE MAXIMUM WIDTH SPECIFIED ABOVE.
2. IF UNSTABLE SOIL IS ENCOUNTERED, CITY REPRESENTATIVE SHALL DETERMINE DEPTH OF REMOVAL AND THICKNESS OF FOUNDATION ROCK REFILL MATERIAL.
3. SEE STD. PLANS S-101, S-102 AND S-103 FOR MANHOLE DETAILS.



City of Norwalk

12700 Norwalk Blvd
Norwalk, CA 90651
(562) 929-5700

P.V.C. PIPE BEDDING & MANHOLE CONNECTION DETAILS

Approved _____

Date _____

REVISIONS

BY

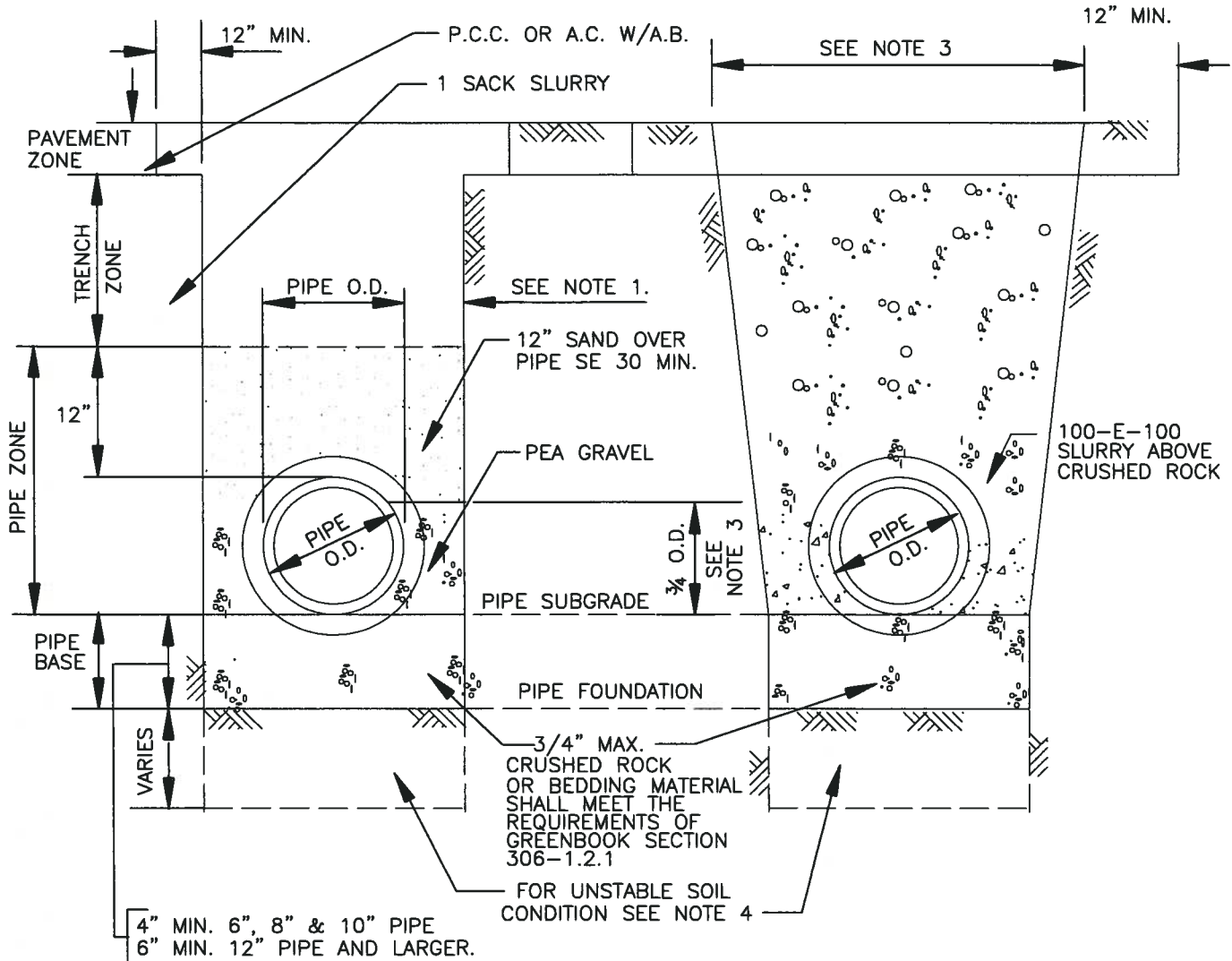
DATE

STD. PLAN NUMBER

S-106

City Engineer

Sheet 1 of 1



TYPICAL NORMAL BEDDING

OVERWIDTH BEDDING

SEE NOTE 2

NOTES:

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



City of Norwalk

12700 Norwalk Blvd
 Norwalk, CA 90651
 (562) 929-5700

**V.C.P. PIPE
 BEDDING DETAILS**

Approved _____

Date _____

REVISIONS

BY

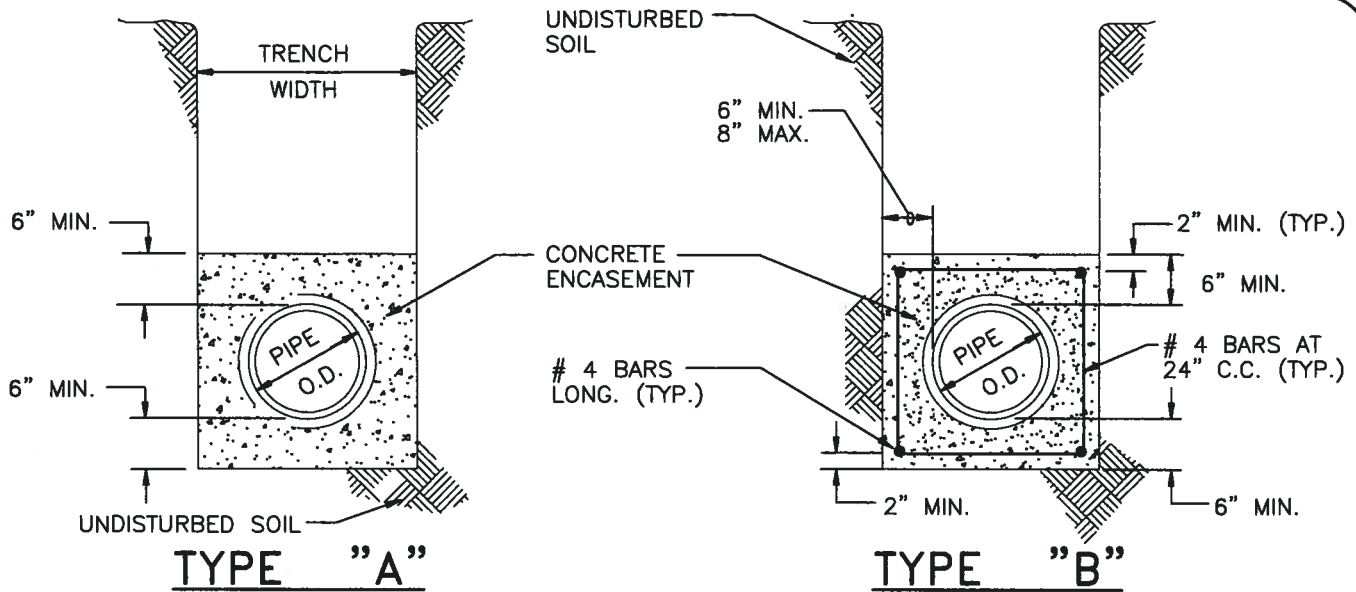
DATE

STD. PLAN NUMBER

S-107

City Engineer _____

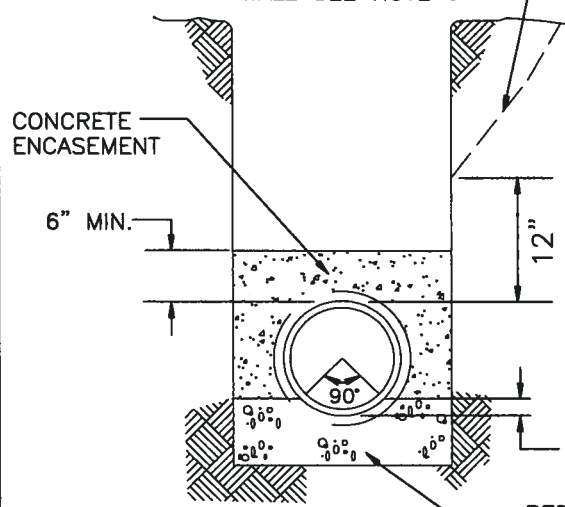
Sheet 1 of 1



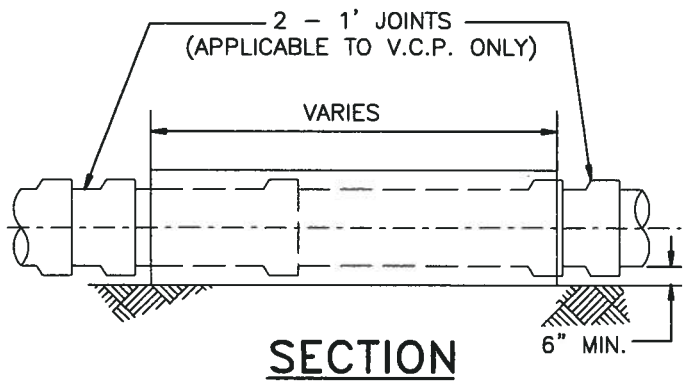
TYPE "A"

TYPE "B"

ALTERNATE TRENCH WALL SEE NOTE 5



TYPE "C"



SECTION

BEDDING - SEE STD. PLAN B-106 OR B-107

NOTES:

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



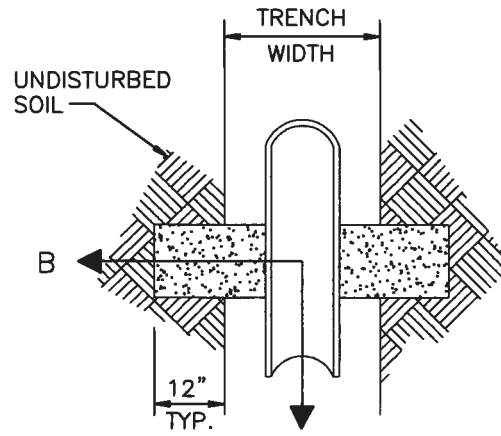
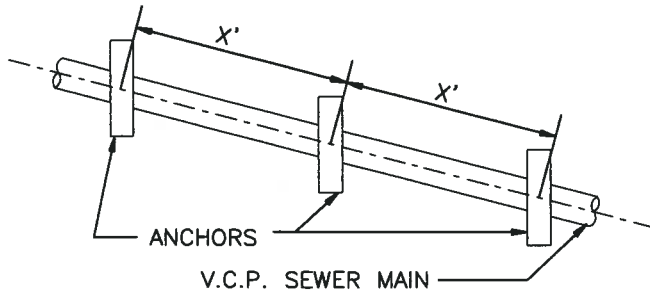
City of Norwalk
12700 Norwalk Blvd
Norwalk, CA 90651
(562) 929-5700

**CONCRETE ENCASEMENT
TYPE A, B, & C**

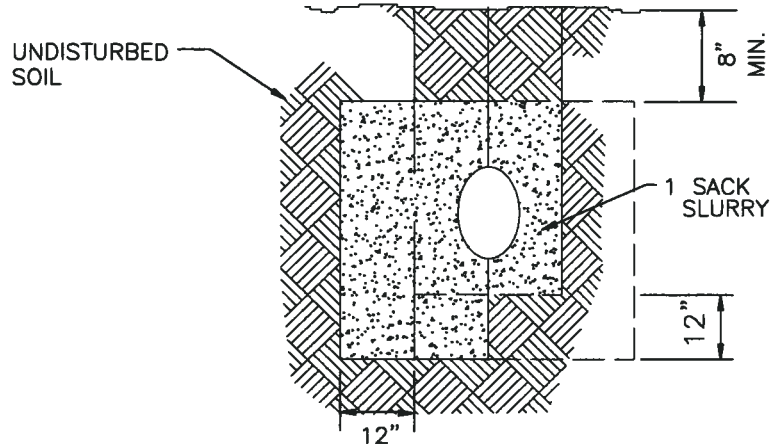
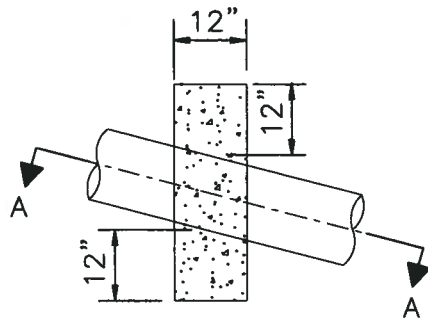
Approved _____ Date _____

REVISIONS	BY	DATE	STD. PLAN NUMBER
			S-108

City Engineer _____



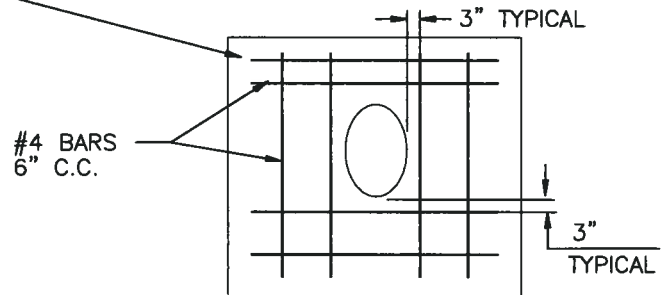
SECTION A-A



SECTION B-B

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

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



REINFORCING STEEL PATTERN

NOTES:

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



City of Norwalk
12700 Norwalk Blvd
Norwalk, CA 90651
(562) 929-5700

CONCRETE SLOPE ANCHORS

Approved _____

Date _____

REVISIONS

BY

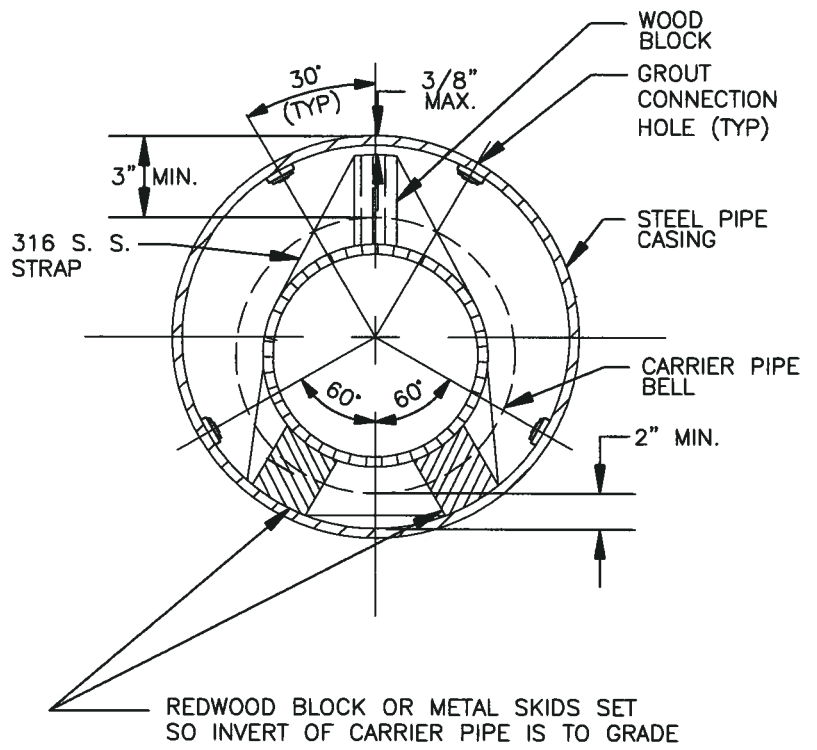
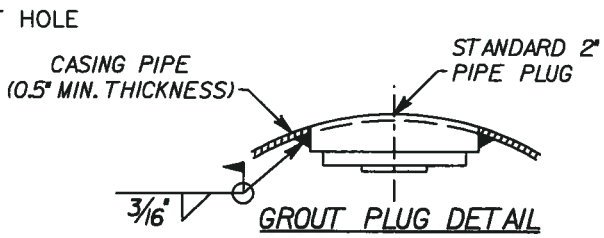
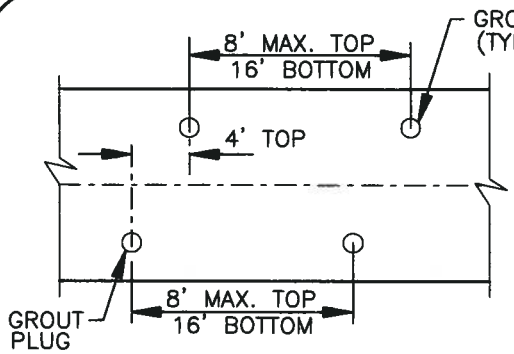
DATE

STD. PLAN NUMBER

S-109

City Engineer

Sheet 1 of 1



REDWOOD BLOCK OR METAL SKIDS SET SO INVERT OF CARRIER PIPE IS TO GRADE

NOTES:

CASING DETAIL

1. UNLESS NOTED OTHERWISE, CASING SHALL BE INSTALLED BY THE JACK AND BORE, AND/OR TUNNEL METHOD. IF OPEN-CUT INSTALLATION OF CASING IS ALLOWED, BACKFILL SHALL BE IN ACCORDANCE WITH STD. PLAN S-106 OR S-107
2. MINIMUM CASING SIZE SHALL BE 24" AND MINIMUM CASING THICKNESS SHALL BE 0.5"
3. ALL STEEL CASING PIPE FIELD JOINTS SHALL BE WELDED FULL-CIRCUMFERENCE.
4. UNFINISHED REDWOOD SKIDS SHALL BE PROVIDED PER DETAIL ABOVE.
5. CARRIER PIPE SHALL BE AIR PRESSURE TESTED PRIOR TO FILLING OF ANNULAR SPACE.
6. UPSTREAM AND DOWNSTREAM ELEVATIONS OF CARRIER PIPE SHALL BE VERIFIED PRIOR TO FILLING OF ANNULAR SPACE.
7. EACH END OF CASING SHALL BE SEALED WITH CONCRETE MORTAR, OR MANUFACTURED CASING END COVER.
8. PERIPHERY OF CASING SHALL BE PRESSURE GROUTED.
9. ANNULAR SPACE SHALL BE FILLED WITH LEAN GROUT.
10. FOR REDWOOD BLOCKS, 3' LONG SKIDS BEVELED AT BOTH ENDS SHALL BE STRAPPED IN PLACE 3" FROM EACH JOINT OF PIPE, NOTCH SKID SET TO SEAT STRAP.



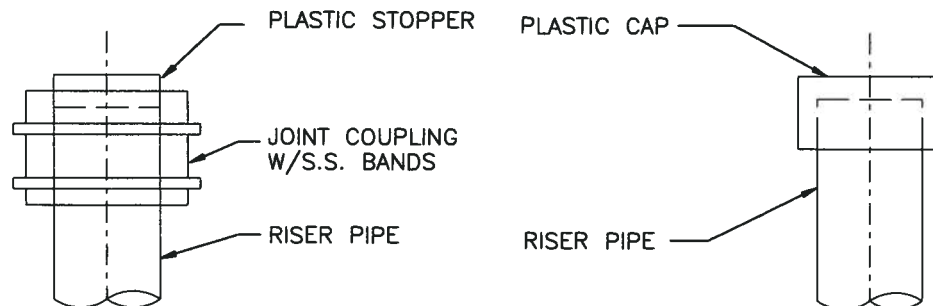
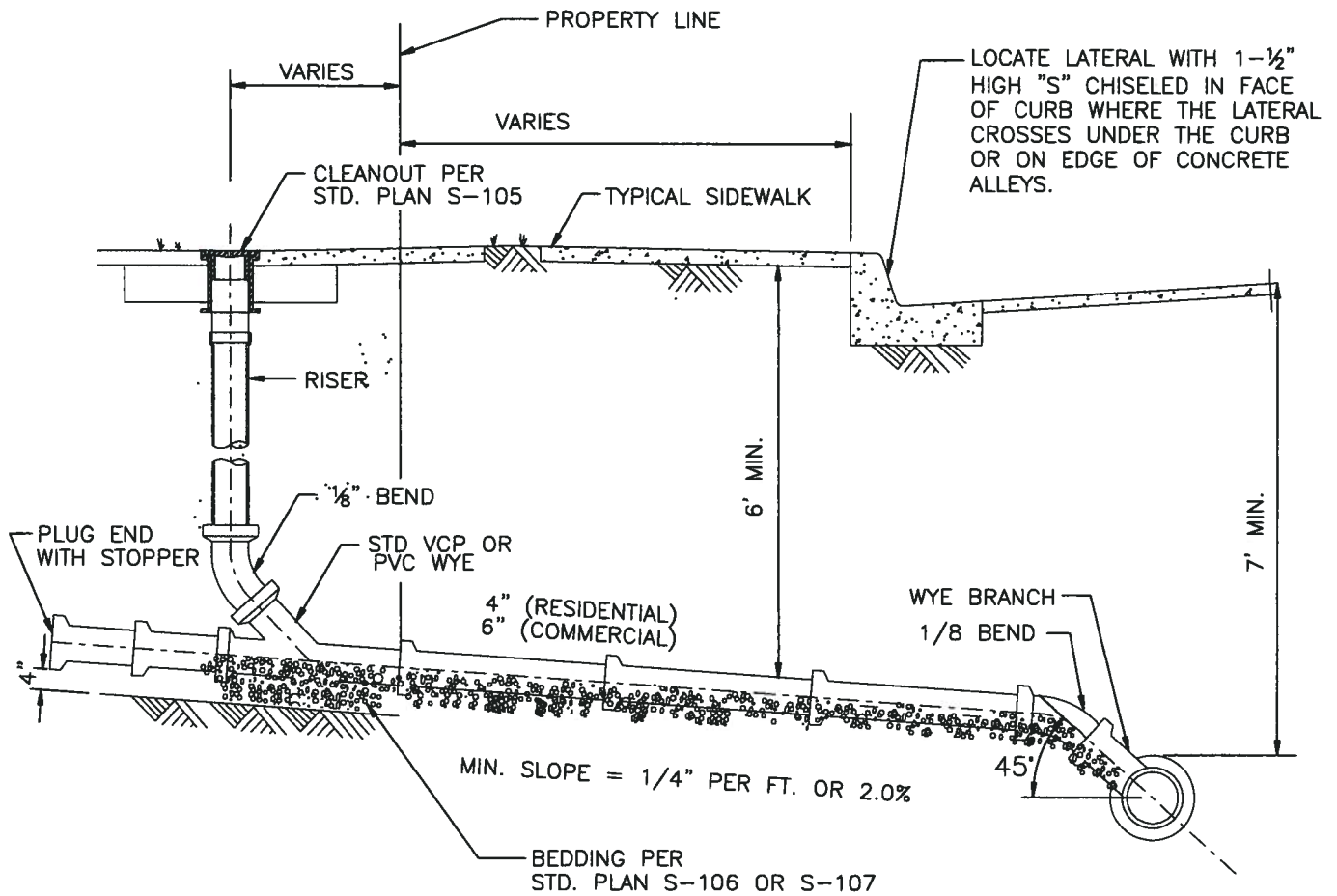
City of Norwalk
 12700 Norwalk Blvd
 Norwalk, CA 90651
 (562) 929-5700

STEEL CASING PIPE

Approved _____ Date _____

City Engineer

REVISIONS	BY	DATE	STD. PLAN NUMBER
			S-110



OPTIONAL STOPPER DETAILS

NOTES:

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



City of Norwalk
 12700 Norwalk Blvd
 Norwalk, CA 90651
 (562) 929-5700

VCP OR PVC TYPICAL LATERAL

Approved _____

Date _____

REVISIONS

BY

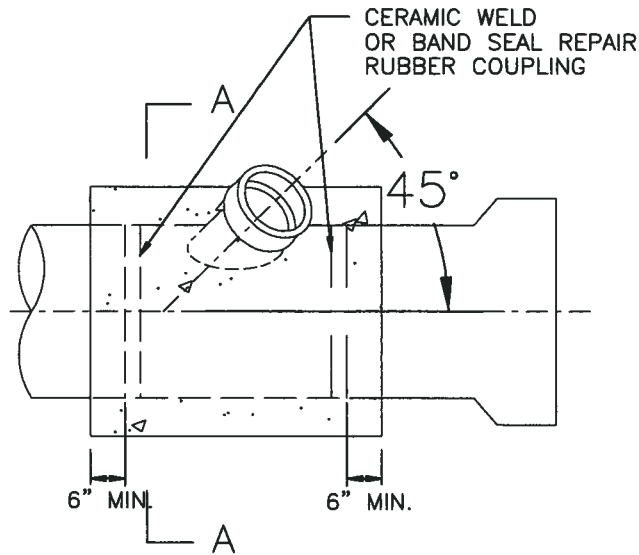
DATE

STD. PLAN NUMBER

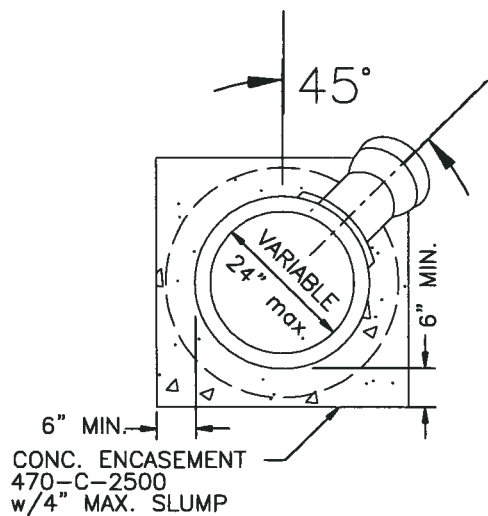
S-111

City Engineer

Sheet 1 of 1



CUT IN WYE



SECTION A-A

NOTES:

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



City of Norwalk

12700 Norwalk Blvd
Norwalk, CA 90651
(562) 929-5700

CUT IN WYE CONNECTION

Approved _____

Date _____

REVISIONS

BY

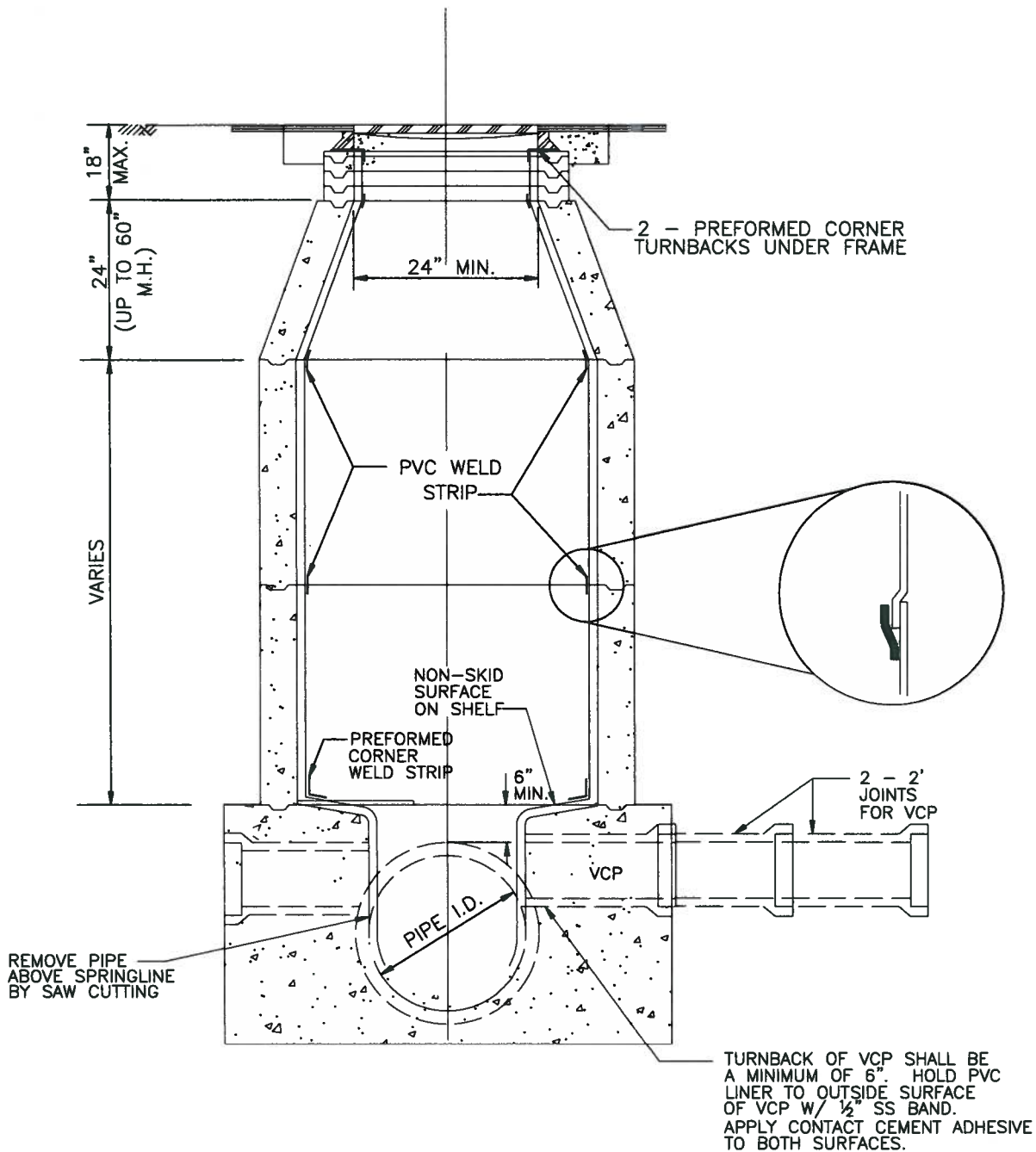
DATE

STD. PLAN NUMBER

S-112

City Engineer

Sheet 1 of 1



SEE STD. PLANS S-100, S-101, S-102, & S-103



City of Norwalk
 12700 Norwalk Blvd
 Norwalk, CA 90651
 (562) 929-5700

PVC MANHOLE LINER

Approved _____

Date _____

REVISIONS

BY

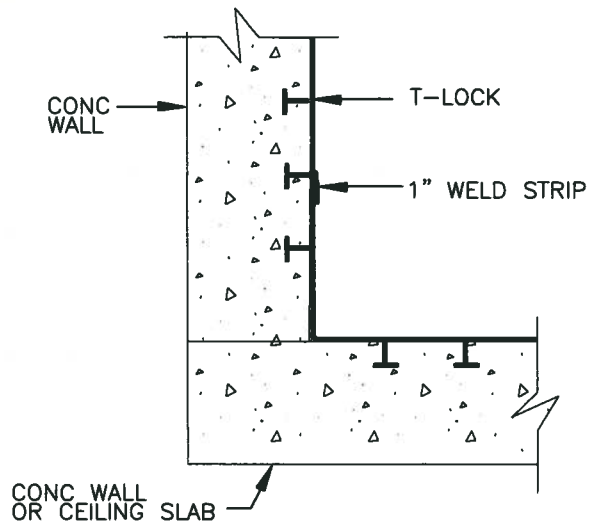
DATE

STD. PLAN NUMBER

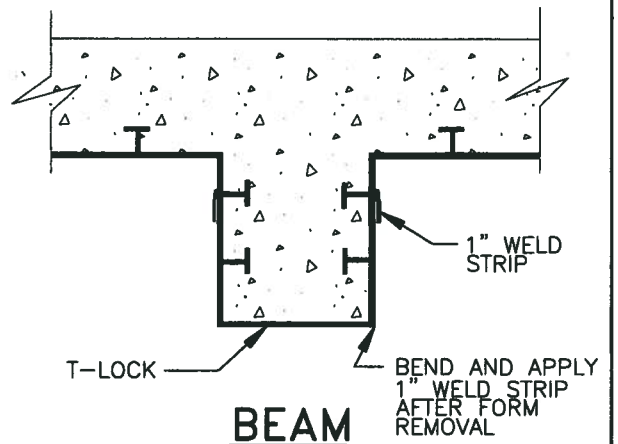
S-113

City Engineer

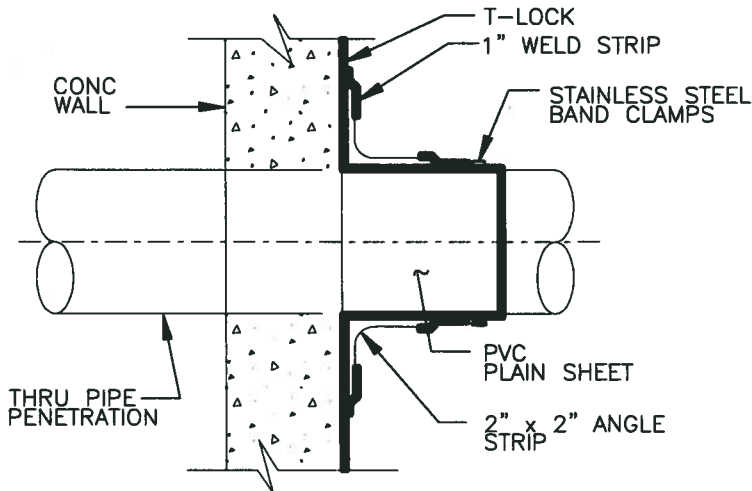
Sheet 1 of 1



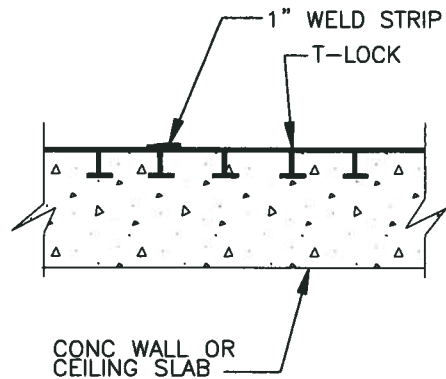
CORNER



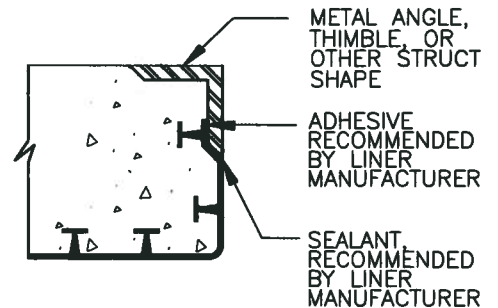
BEAM



PIPE PENETRATION



SPLICE



METAL EMBED

NOTE

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



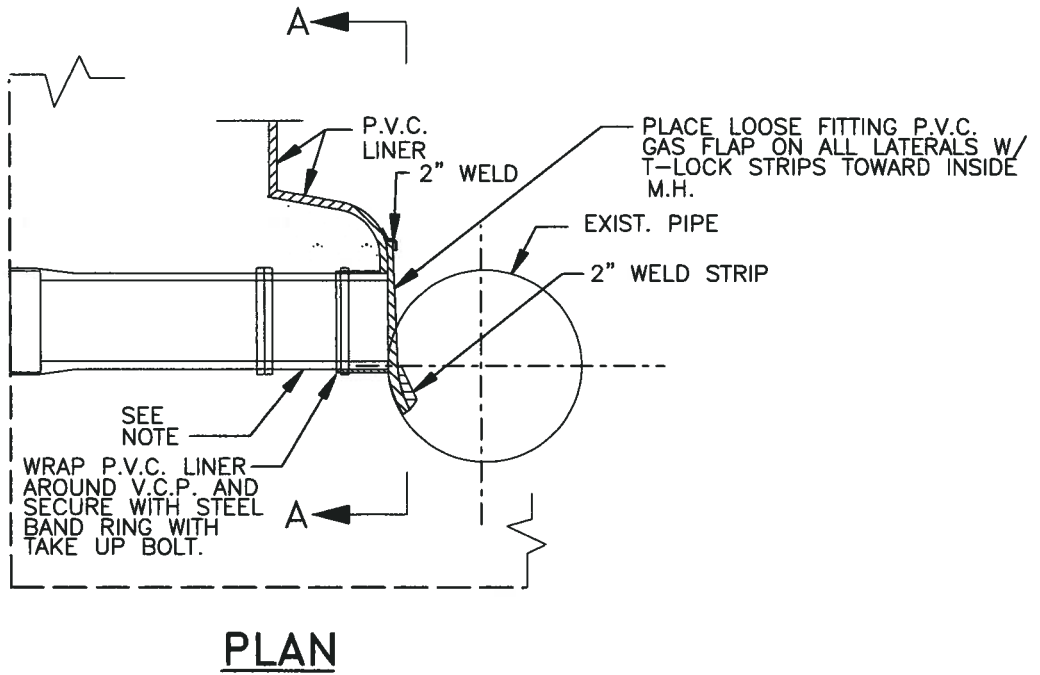
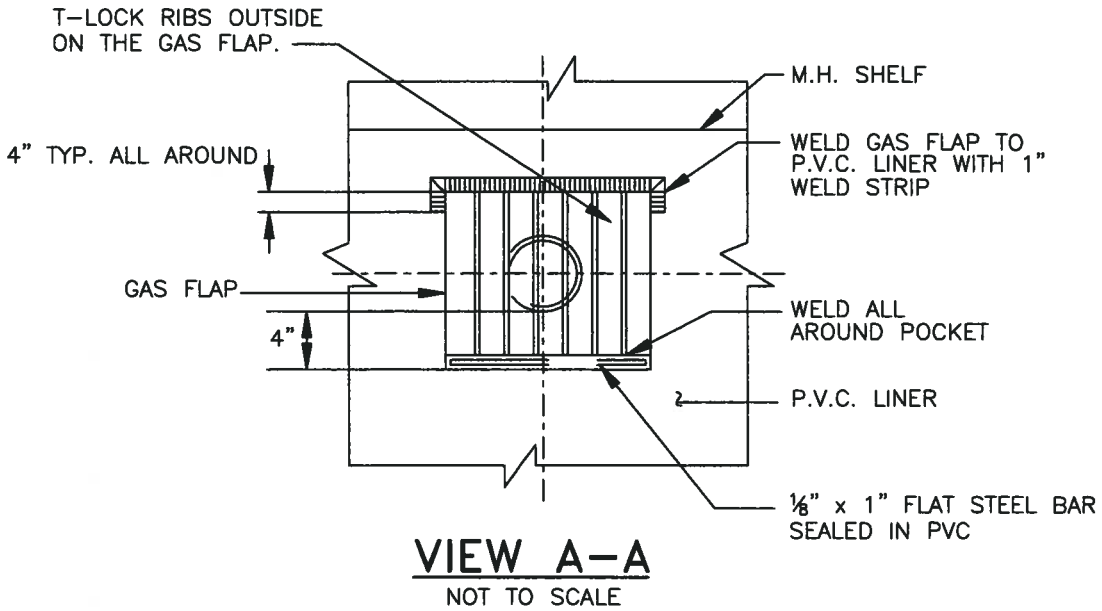
City of Norwalk
 12700 Norwalk Blvd
 Norwalk, CA 90651
 (562) 929-5700

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

Approved _____ Date _____

City Engineer

REVISIONS	BY	DATE	STD. PLAN NUMBER
			S-114



NOTE

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



City of Norwalk
12700 Norwalk Blvd
Norwalk, CA 90651
(562) 929-5700

P.V.C. LINER WITH GAS FLAP INSTALLATION

Approved _____

Date _____

REVISIONS

BY

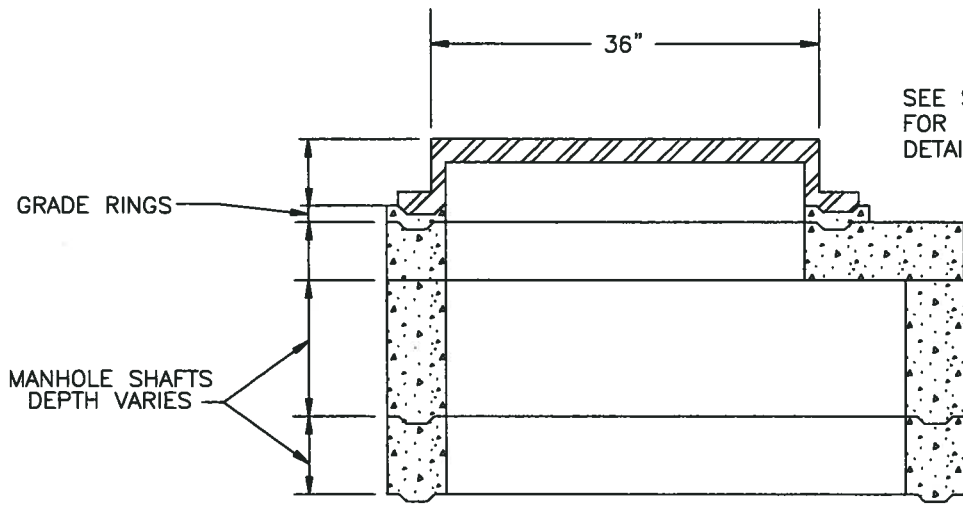
DATE

STD. PLAN NUMBER

S-115

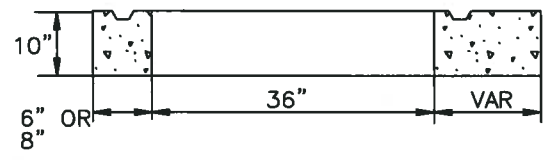
City Engineer _____

Sheet 1 of 1



SEE STD. PLAN S-103
FOR FRAME AND COVER
DETAILS

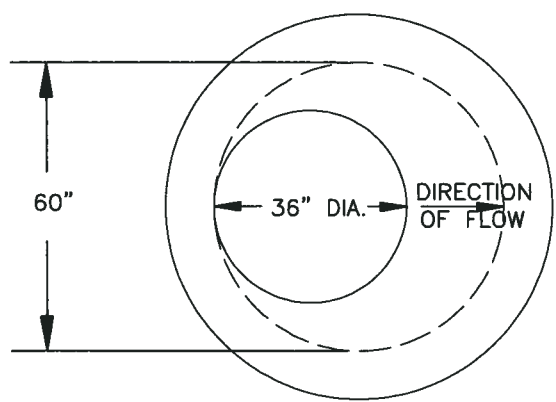
**TYPICAL SECTION
FLAT TOP MANHOLE**



FLAT TOP COVER

NOTES

1. CONSTRUCTION SHALL BE IN ACCORDANCE WITH STD. PLAN S-100, S-101 AND S-103
2. REINFORCED CONCRETE MANHOLE, QUIKSET OR APPROVED EQUAL.
3. USE OF FLAT TOP MANHOLE REQUIRES WRITTEN CITY APPROVAL.



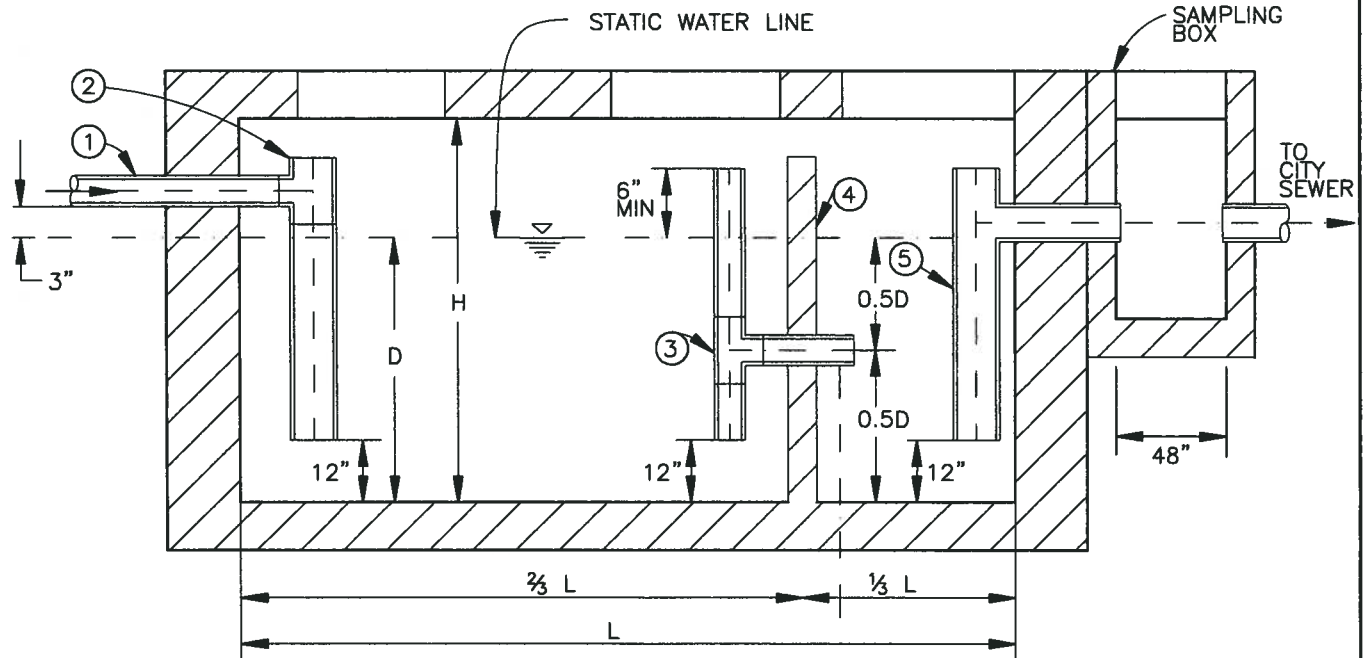
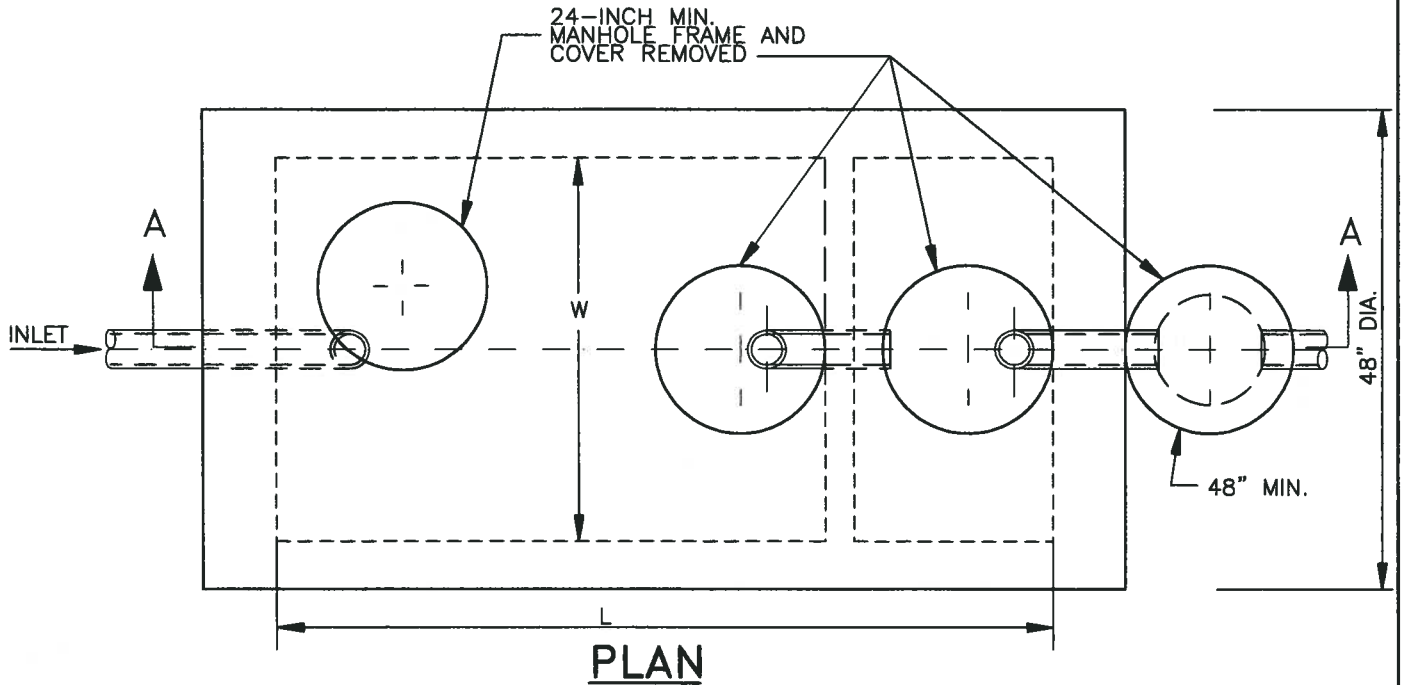
PLAN



City of Norwalk
12700 Norwalk Blvd
Norwalk, CA 90651
(562) 929-5700

FLAT TOP MANHOLE

Approved _____ City Engineer	Date _____	REVISIONS	BY	DATE	STD. PLAN NUMBER
					S-116
					Sheet 1 of 1



SECTION A-A

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

NOTE:

GREASE INTERCEPTOR SHALL BE DESIGNED IN ACCORDANCE WITH THE REQUIREMENTS OF THE UNIFORM PLUMBING CODE, APPENDIX H. MINIMUM CAPACITY SHALL BE 750 GALLONS.



City of Norwalk
 12700 Norwalk Blvd
 Norwalk, CA 90651
 (562) 929-5700

TYPICAL GREASE INTERCEPTOR

Approved _____

Date _____

REVISIONS

BY

DATE

STD. PLAN NUMBER

S-117

City Engineer _____

Sheet 1 of 1

CRITERIA FOR SEPARATION OF SEWERS AND WATER MAINS

The California Department of Public Health is concerned about waterborne disease outbreaks attributed to the entry of sewage-contaminated groundwater into the distribution systems of public water supplies. Therefore, sewers in close proximity to water mains shall be reviewed with the California Department of Public Health.

Net sewers shall not be installed in the same trench as, and shall be at least 10 feet horizontally from and one foot vertically below, any parallel pipeline conveying potable water.

If crossing a pipeline conveying water, sewers shall be constructed no less than 45-degrees to and at least one foot below that pipeline. No connection joints shall be allowed in the water main within eight horizontal feet of the sewers.

In all cases the sewers shall be installed in a manner that minimizes the potential for contamination, including, but not limited to sleeving, and or utilizing upgraded piping materials.

(42) Adopt Section 64572 as follows:

Section 64572. Water Main Separation.

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

- (1) Untreated sewage,
- (2) Primary or secondary treated sewage,
- (3) Disinfected secondary-2.2 recycled water (defined in section 60301.220),
- (4) Disinfected secondary-23 recycled water (defined in section 60301.225), and
- (5) Hazardous fluids such as fuels, industrial wastes, and wastewater sludge.

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

- (1) Disinfected tertiary recycled water (defined in section 60301.230), and
- (2) Storm drainage.

(c) New supply lines conveying raw water to be treated for drinking purposes shall be installed at least 4 feet horizontally from, and one foot vertically below, any water main.

(d) If crossing a pipeline conveying a fluid listed in subsection (a) or (b), a new water main shall be constructed no less than 45-degrees to and at least one foot above that pipeline. No connection joints shall be made in the water main within eight horizontal feet of the fluid pipeline.

(e) The vertical separation specified in subsections (a), (b), and (c) is required only when the horizontal distance between a water main and pipeline is less than ten feet.

(f) New water mains shall not be installed within 100 horizontal feet of the nearest edge of any sanitary landfill, wastewater disposal pond, or hazardous waste disposal site, or within 25 horizontal feet of the nearest edge of any cesspool, septic tank, sewage leach field, seepage pit, underground hazardous material storage tank, or groundwater recharge project site.

(g) The minimum separation distances set forth in this section shall be measured from the nearest outside edge of each pipe barrel.

(h) With Department approval, newly installed water mains may be exempt from the separation distances in this section, except subsection (f), if the newly installed main is:

- (1) less than 1320 linear feet,
- (2) replacing an existing main, installed in the same location, and has a diameter no greater than six inches more than the diameter of the main it is replacing, and
- (3) installed in a manner that minimizes the potential for contamination, including, but not limited to:
 - (A) sleeving the newly installed main, or
 - (B) utilizing upgraded piping material

NOTE: Authority: Sections 116350, 116375 and 131200, Health and Safety Code.
Reference: Sections 116275, 116375 and 131051, Health and Safety Code.

TABLE OF CONTENTS

SECTION 2

STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

Sewers and Sanitation

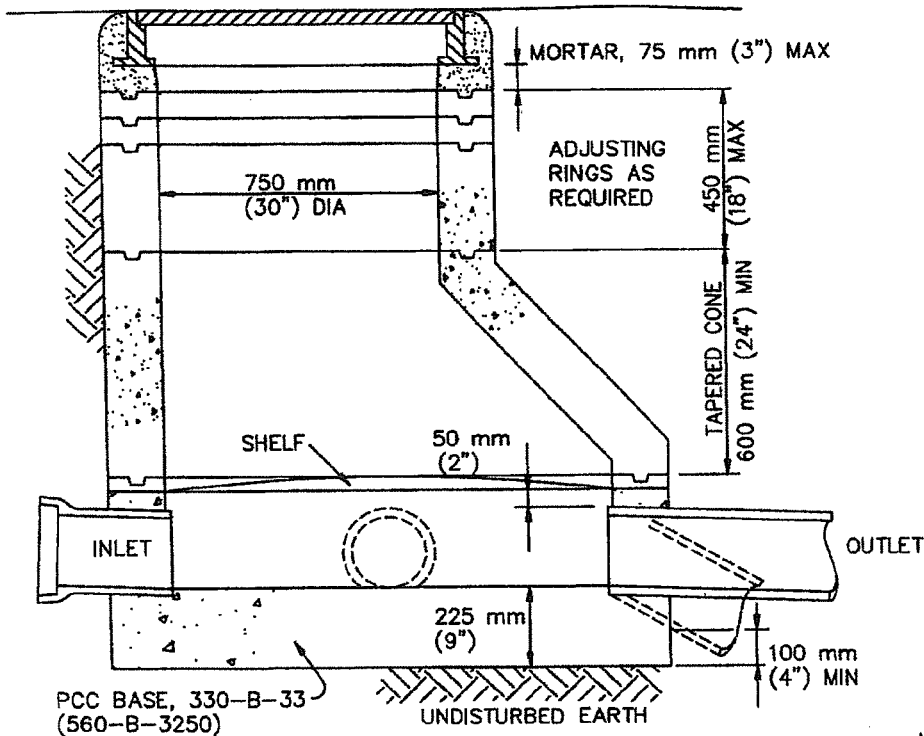
MANHOLES AND STRUCTURES

201-1	PRECAST CONCRETE SHALLOW MANHOLE
203-1	BRICK SEWER MANHOLE
205-1	SEWER MANHOLE ADJUSTMENT
206-1	MANHOLE RAISING RINGS
207-1	PRECAST REINFORCED CONCRETE MANHOLE BASE
208-1	BREAKING INTO EXISTING MANHOLES
210-2	610mm (24") MANHOLE FRAME AND COVER – LOCKING TYPE
211-1	MANHOLE FRAME AND COVER – PRESSURE TYPE
212-1	ANCHOR SYSTEM FOR PRESSURE COVER
	For other manholes see Section 6 – GENERAL FACILITIES

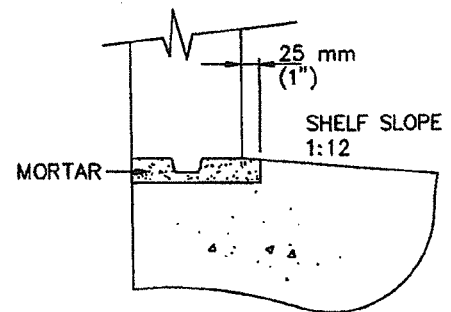
PIPE APPURTENANCES

220-2	CHIMNEYS
223-1	HOUSE CONNECTION REMODELING
224-1	SUPPORTS FOR CONDUITS ACROSS TRENCHES
225-1	BLANKET PROTECTION FOR PIPES

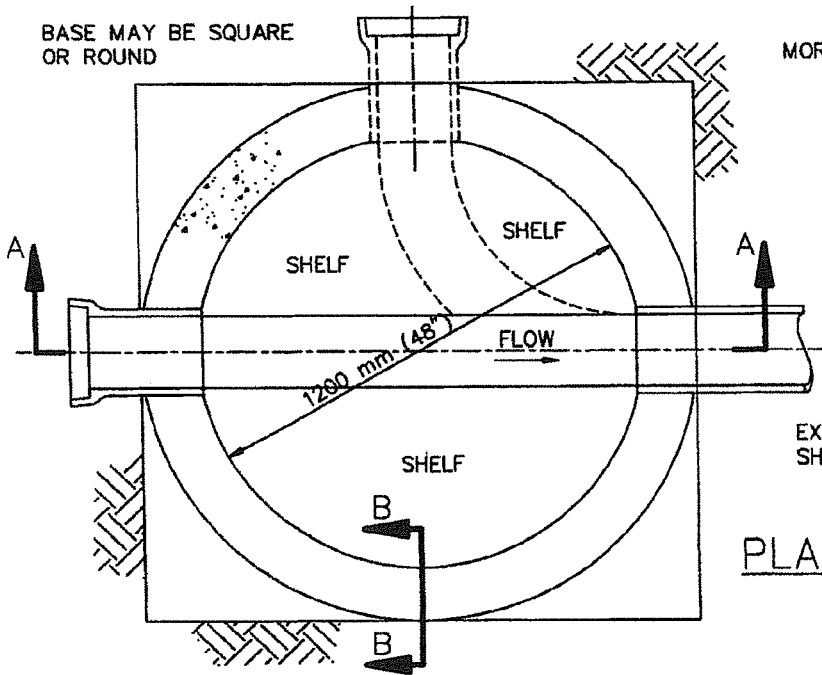
FRAME & COVER PER SPPWC 632



SECTION A-A



SECTION B-B



PLAN

EXCEPT AS SHOWN HEREON, MANHOLES SHALL CONFORM TO SPPWC 200.



City of Norwalk
12700 Norwalk Blvd
Norwalk, CA 90651
(562) 929-5700

PRECAST CONCRETE SHALLOW MANHOLE

Approved _____

Date _____

REVISIONS

BY

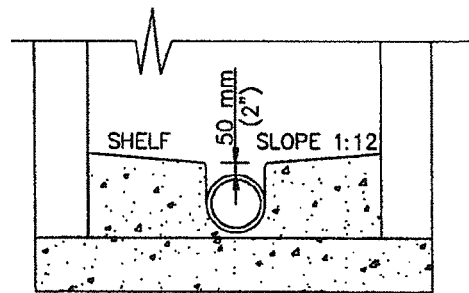
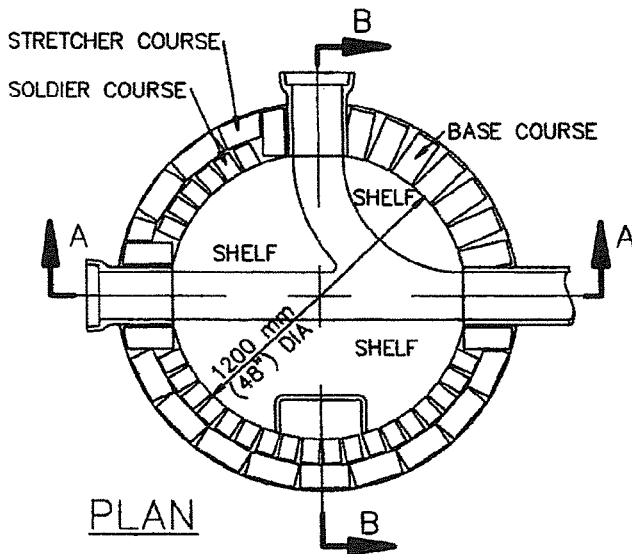
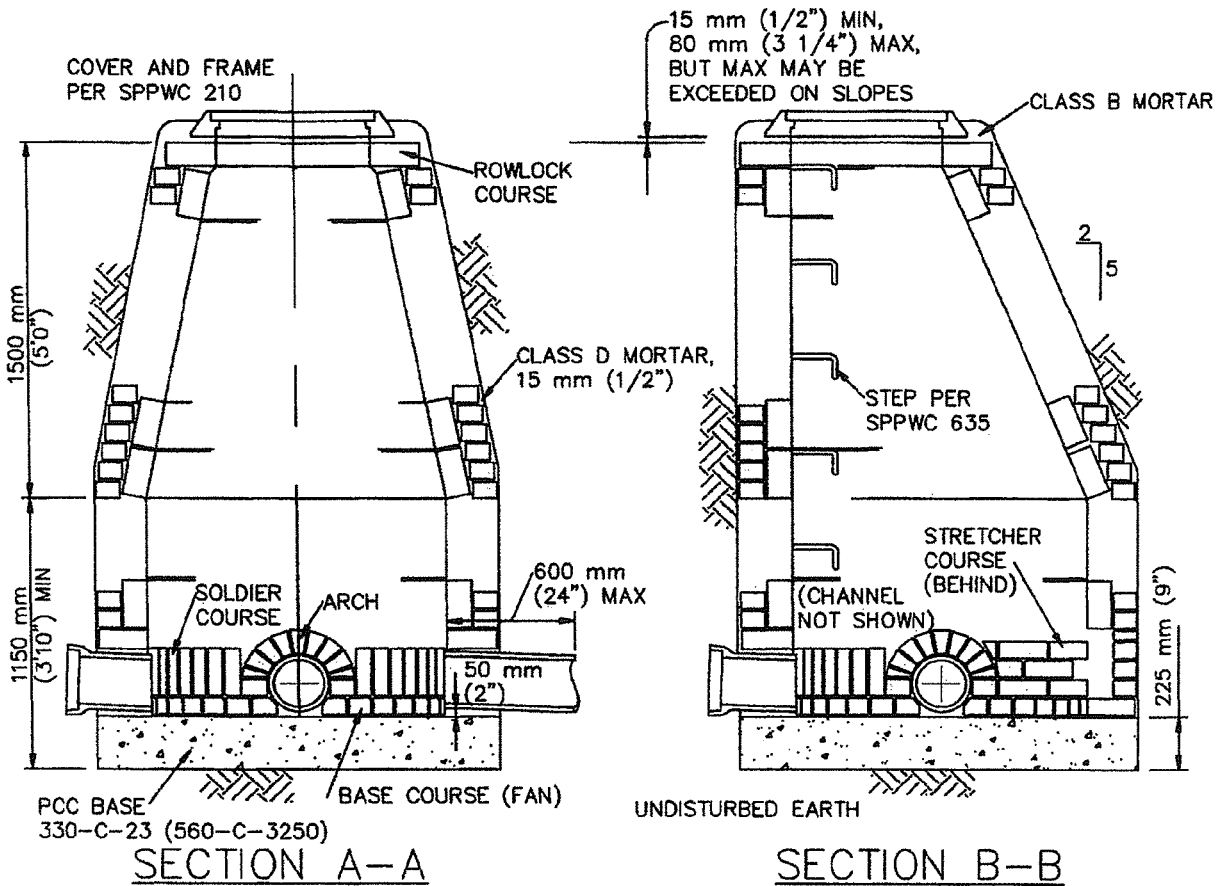
DATE

STD. PLAN NUMBER

201-1

City Engineer _____

Sheet 1 of 1



City of Norwalk
 12700 Norwalk Blvd
 Norwalk, CA 90651
 (562) 929-5700

BRICK SEWER MANHOLE

Approved _____

Date _____

REVISIONS

BY

DATE

STD. PLAN NUMBER

203-1

City Engineer _____

Sheet 1 of 2

NOTES:

1. CONCRETE BASE: DURING CONSTRUCTION, ALL PIPES SHALL BE RIGIDLY SUPPORTED BY BRICK PIERS 300 mm (12") DEEP, LOCATED JUST OUTSIDE THE STRUCTURE. CONSTRUCT TOP OF CONCRETE BASE 50 mm (2") BELOW INVERT OF LOWEST PIPE. FILL SPACE BENEATH PIPE WITH MORTAR AND SHOVE FROM BOTH SIDES WITH BASE COURSE BRICK TO FORM A WATER-TIGHT JOINT.
2. BASE OF FAN COURSE: LAY BRICK FLAT ON RADIAL LINES WITH TOPS TO SAME LEVEL.
3. ARCHES: LAY SPALLED BRICK ON EDGE TO FORM A TRUE RADIAL ARCH WITH FULL MORTAR JOINT AROUND ALL PIPE OPENINGS. TURN ARCH OF TWO SUCH COURSES OVER PIPES 375 mm (15") OR MORE IN DIAMETER.
4. SOLDIER COURSES: LAY INSIDE BRICK ON RADIAL LINES WITH FIRST FOUR COURSES VERTICAL. LAY SUCCEEDING COURSES WITH A UNIFORM BATTER TO OBTAIN AN INSIDE DIAMETER OF 600 mm (24") AT TOP OF LAST OR FRACTIONAL SOLDIER COURSE. USE SPLIT BRICK TO CLOSE SOLDIER COURSE.
5. STRETCHER COURSES: LAY OUTSIDE BRICK FLAT IN A DEEP BED OF MORTAR. SHOVE BRICK TOGETHER AGAINST ADJACENT SOLDIER COURSE.
6. ROWLOCK COURSE: LAY LAST COURSE OF BRICK ON EDGE ACROSS SOLDIER AND STRETCHER COURSES ON RADIAL LINES, WITH TOPS PARALLEL AND 120 mm (4 1/2") BELOW FINISHED GRADE.
7. JOINTS: INSIDE JOINTS SHALL BE NEATLY STRUCK AND SHALL NOT EXCEED 10 mm (3/8") IN THICKNESS.
8. STEPS: MANHOLE STEPS SHALL CONFORM WITH SPPWC 635 TYPE 3. THE TOP STEP SHALL BE PLACED JUST UNDER THE MANHOLE FRAME. THE LOWEST STEP SHALL BE PLACED BETWEEN 200 mm (8") AND 600 mm (24") ABOVE THE SHELF.
9. WALL THICKNESS: BRICKWORK SHALL BE 200 mm (8") THICK TO A DEPTH OF 6.5 m (22'). BRICKWORK BELOW 6.5 m (22') DEEP SHALL BE 300 mm (12") THICK.
10. A FLEXIBLE JOINT SHALL BE INSTALLED AT THE FIRST JOINT FROM MANHOLE FOR ALL CONNECTIONS EXCEPT THOSE WITH REINFORCED CONCRETE PIPE.



City of Norwalk

12700 Norwalk Blvd
Norwalk, CA 90651
(562) 929-5700

BRICK SEWER MANHOLE

Approved _____

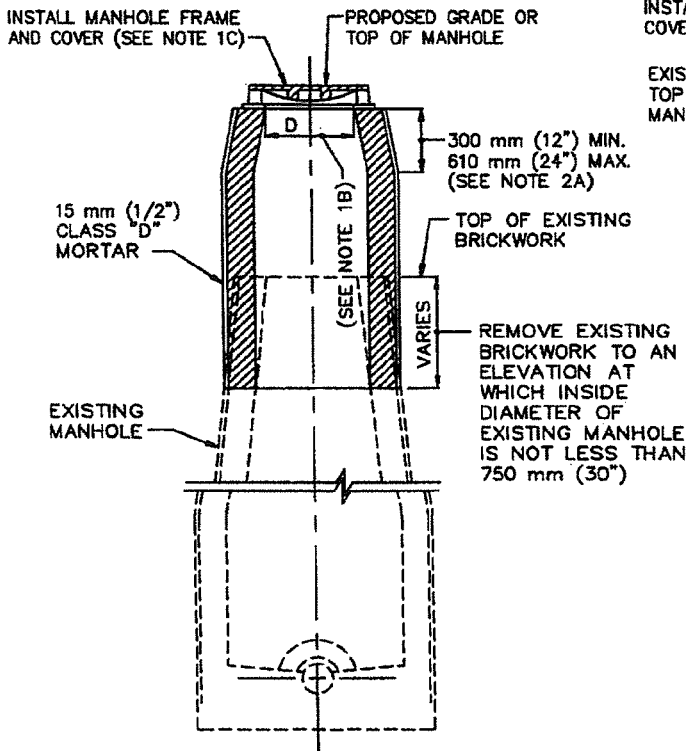
Date _____

City Engineer

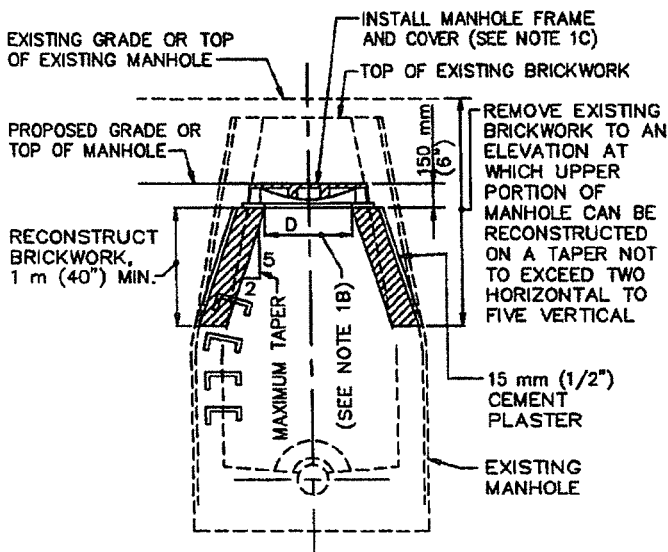
REVISIONS	BY	DATE	STD. PLAN NUMBER

203-1

Sheet 2 of 2

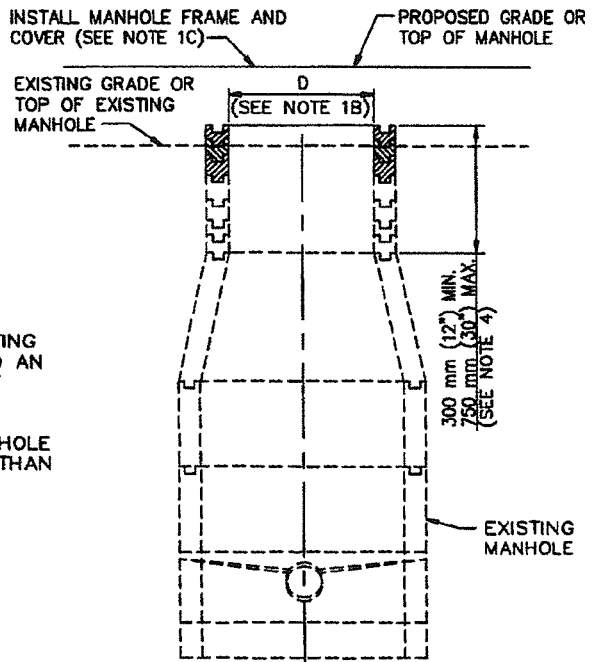


RAISING EXISTING BRICK MANHOLES

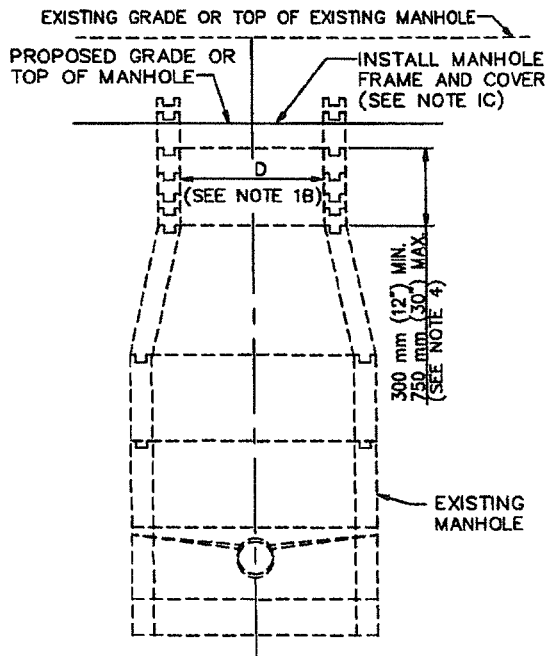


LOWERING EXISTING BRICK MANHOLES

BRICK MANHOLES



RAISING EXISTING PRECAST CONCRETE SEWER MANHOLES



LOWERING EXISTING PRECAST CONCRETE SEWER MANHOLES

PRECAST CONCRETE SEWER MANHOLES



City of Norwalk

12700 Norwalk Blvd
Norwalk, CA 90651
(562) 929-5700

SEWER MANHOLE ADJUSTMENT

Approved _____

Date _____

REVISIONS

BY

DATE

STD. PLAN NUMBER

City Engineer _____

205-1

Sheet 1 of 3

NOTES:

1. GENERAL

- A. EXCEPT AS INDICATED HEREON OR ON THE PLANS, MANHOLES SHALL CONFORM TO: SPPWC 200, PRECAST CONCRETE SEWER MANHOLE AND SPPWC 203, BRICK SEWER MANHOLE.
- B. DIMENSION "D" SHALL BE THE SAME AS THE SIZE OF MANHOLE FRAME AND COVER TO BE USED.
- C. THE CONTRACTOR MAY REUSE THE EXISTING MANHOLE FRAME AND COVER, UNLESS DAMAGED DURING THE WORK OR WHEN OTHERWISE SHOWN IN THE CONTRACT DOCUMENTS. ITEMS DAMAGED BY THE CONTRACTOR SHALL BE REPLACED WITH IDENTICAL NEW ITEMS AT NO EXPENSE TO THE AGENCY.
- D. EXISTING STEPS LOCATED WITHIN REMOVAL LIMITS SHALL BE REPLACED. WHEN REMOVAL OF EXISTING STEPS BEYOND THE MANHOLE REMOVAL LIMITS IS SHOWN ON THE PLANS, THE STEPS SHALL BE REMOVED TO A DEPTH OF 50 mm (2") BEYOND THE INSIDE FACE OF THE BRICK MANHOLE AND THE HOLES SHALL BE FILLED WITH CLASS "D" MORTAR.

2. RAISING EXISTING BRICK MANHOLES

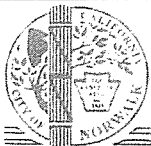
- A. BRICK MANHOLES TO BE RAISED LESS THAN 300 mm (1') MAY BE EXTEND VERTICALLY, PROVIDED THAT AT A DEPTH OF 750 mm (2 1/2') BELOW THE TOP OF THE MANHOLE AT ITS NEW ELEVATION, THE INSIDE DIAMETER OF THE MANHOLE IS 750 mm (30") OR GREATER.
- B. BRICK MANHOLES TO BE RAISED LESS THAN 90 mm (3 1/2") MAY BE RAISED BY APPLYING CLASS "D" MORTAR TO THE TOP OF THE EXISTING BRICKWORK. IF THE BRICK MANHOLE IS TO BE RAISED 90 mm (3 1/2") OR MORE, A NEW COURSE OR COURSES OF BRICKWORK SHALL BE PLACED ON TOP OF THE EXISTING BRICKWORK.

3. LOWERING EXISTING BRICK MANHOLES

- A. WHERE A BRICK MANHOLE IS TO BE LOWERED LESS THAN 300 mm (1'), THE FRAME MAY BE RESET ON THE EXISTING BRICKWORK AND THE 1 m (40") MINIMUM BRICKWORK RECONSTRUCTION OMITTED, PROVIDED THAT THE BASE OF THE FRAME DOES NOT OVERHANG THE BRICKWORK ON THE INSIDE SURFACE OF THE MANHOLE MORE THAN AN AVERAGE OF 35 mm (1 1/2") IN ANY QUADRANT NOR MORE THAN 50 mm (2") AT ANY POINT.

4. RAISING EXISTING PRECAST CONCRETE SEWER MANHOLES

- A. PRECAST CONCRETE MANHOLES TO BE RAISED LESS THAN 75 mm (3") MAY BE RAISED BY APPLYING CLASS "D" MORTAR TO THE TOP OF THE EXISTING MANHOLE, PROVIDED THE TOTAL HEIGHT OF MORTAR, EXISTING AND NEWLY APPLIED, DOES NOT EXCEED 75 mm (3").
- B. WHERE THE PRECAST CONCRETE MANHOLE IS TO BE RAISED 75 mm (3") OR MORE, OR WHERE THE TOTAL HEIGHT OF MORTAR, EXISTING AND NEWLY APPLIED, WOULD EXCEED 75 mm (3"), GRADE RINGS SHALL BE UTILIZED. CLASS "D" MORTAR MAY BE USED FOR FINAL ADJUSTMENT, BUT NOT MORE THAN 75 mm (3") IN HEIGHT. WHERE RAISING THE MANHOLE WOULD RESULT IN THE UPPER SEGMENT OF THE SHAFT BEING MORE THAN 750 mm (30") IN HEIGHT, REMOVE THE REDUCER AND THE UPPER SEGMENT OF THE SHAFT, INSTALL ADDITIONAL RINGS OR PIPE TO THE LOWER SEGMENT OF THE SHAFT, AND REINSTALL THE REDUCER AND GRADE RINGS AS REQUIRED.



City of Norwalk
12700 Norwalk Blvd
Norwalk, CA 90651
(562) 929-5700

SEWER MANHOLE ADJUSTMENT

Approved _____

Date _____

City Engineer _____

REVISIONS

BY

DATE

STD. PLAN NUMBER

205-1

Sheet 2 of 3

5. LOWERING EXISTING PRECAST CONCRETE SEWER MANHOLES

- A. REMOVE SUFFICIENT GRADE RINGS TO LOWER THE MANHOLES AS REQUIRED, APPLY CLASS "D" MORTAR TO A HEIGHT NOT EXCEEDING 75 mm (3") FOR ADJUSTMENT TO FINAL GRADE.
- B. WHERE REMOVAL OF GRADE RINGS WOULD RESULT IN THE UPPER SEGMENT OF THE SHAFT BEING LESS THAN 300 mm (12") IN HEIGHT, REMOVE THE REDUCER AND SUFFICIENT SECTIONS OF THE LOWER SEGMENT OF THE SHAFT AND REINSTALL ANY NECESSARY SEGMENT OF THE LOWER SHAFT, THE REDUCER, AND THE GRADE RINGS TO CONFORM TO THE REQUIREMENTS OF THIS PLAN.
- C. EXISTING GRADE RINGS NEED NOT BE REMOVED IF EXISTING MORTAR IS REMOVED, AND AT LEAST 35 mm (1 1/2") OF MORTAR MAY BE PLACED ON TOP OF THE EXISTING GRADE RINGS TO RESEAT THE FRAME.

6. REPLACEMENT OF BRICK REDUCER WITH PRECAST CONCRETE REDUCER AND SHAFT
UNLESS OTHERWISE INDICATED ON THE PLANS, THE CONTRACTOR MAY INSTALL A PRECAST CONCENTRIC CONCRETE REDUCER, CONCRETE GRADE RINGS, AND CONCRETE PIPE IN LIEU OF RECONSTRUCTING A BRICK REDUCER, PROVIDED:

- A. THE MAXIMUM ID OF SEWER PIPE CONNECTED TO THE MANHOLE DOES NOT EXCEED 200 mm (8").
- B. THE CONTRACTOR SECURES PRIOR APPROVAL FROM THE ENGINEER TO INSTALL THE CONCENTRIC REDUCER ONTO THE MANHOLE SHAFT. THE ENGINEER MAY, AS PART OF THE INSTALLATION REQUIREMENTS, REQUIRE THE CONTRACTOR TO COAT THE INSIDE OF THE REDUCER, RINGS, AND PIPE WITH AN APPROVED COATING.
- C. THE CONCRETE GRADE RINGS, THE CONCRETE REDUCER, AND ANY CONCRETE PIPE SHALL BE JOINED TOGETHER AND BEDDED ONTO THE EXISTING BRICK MANHOLE WITH CLASS "D" MORTAR. THE DEPTH, WIDTH, AND THICKNESS OF THE MORTAR SHALL BE OF SUFFICIENT DIMENSIONS TO PROPERLY AND ADEQUATELY JOIN AND BED THE COMPONENT PARTS.



City of Norwalk
12700 Norwalk Blvd
Norwalk, CA 90651
(562) 929-5700

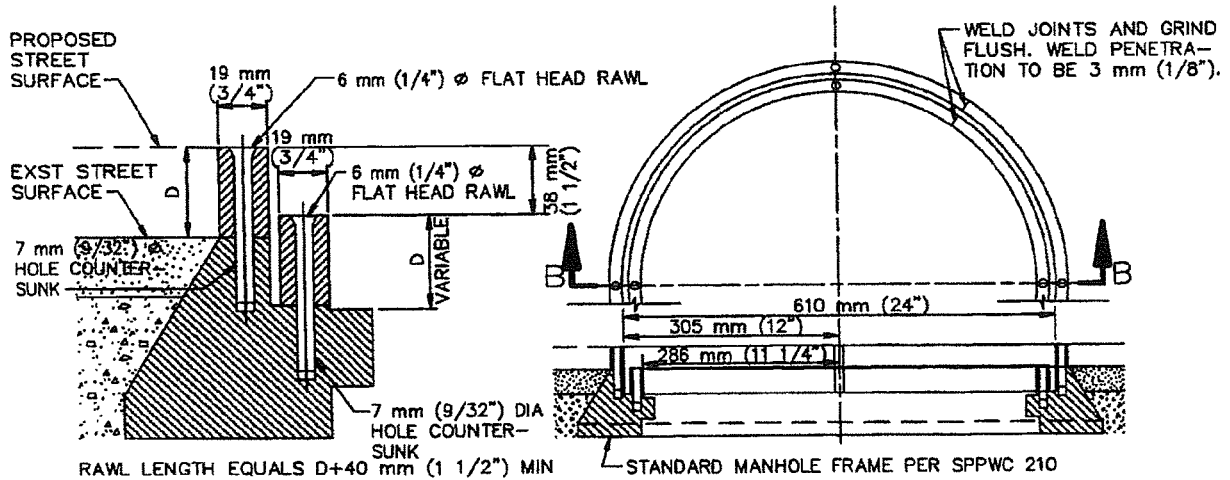
SEWER MANHOLE ADJUSTMENT

Approved _____ Date _____

City Engineer

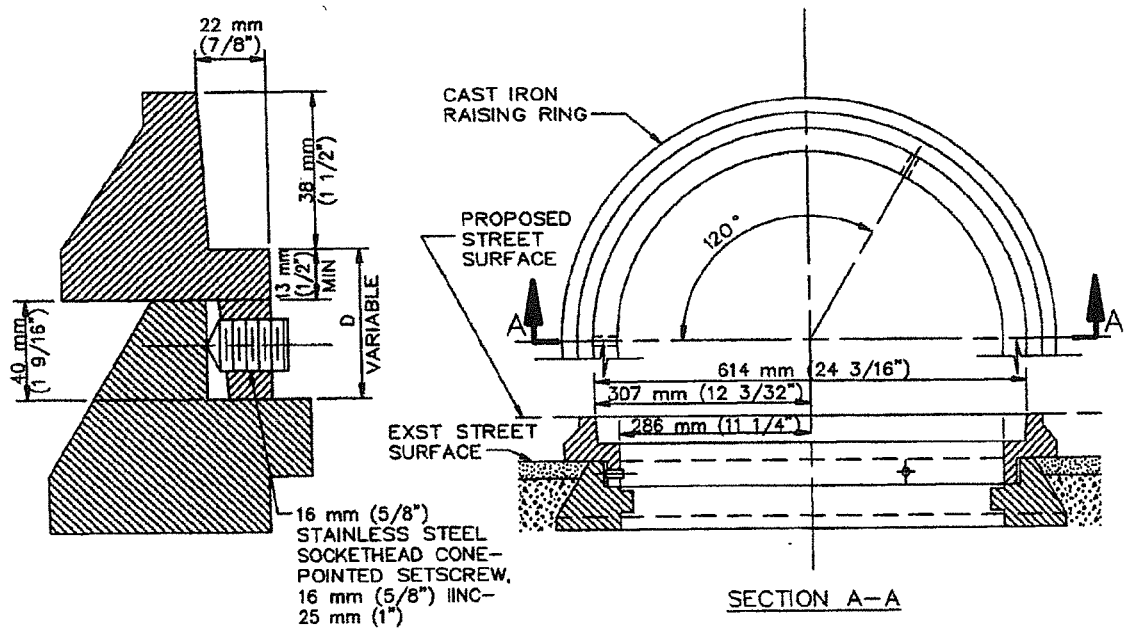
REVISIONS	BY	DATE	STD. PLAN NUMBER
			205-1

RAISING RINGS TO BE MADE OF STEEL, ASTM DESIGNATION AT MERCHANT QUALITY



SECTION B-B

STEEL RAISING RINGS



SECTION A-A

CAST IRON RAISING RINGS



City of Norwalk

12700 Norwalk Blvd
Norwalk, CA 90651
(562) 929-5700

MANHOLE RAISING RINGS

Approved _____

Date _____

REVISIONS

BY

DATE

STD. PLAN NUMBER

City Engineer _____

206-1

Sheet 1 of 2

NOTES:

1. MACHINE SEATS FROM CAST IRON RINGS.
2. THE CAST IRON USED SHALL CONFORM TO SSPWC 206-3.
3. THE METAL RAISING RINGS MAY BE USED IN LIEU OF THE REGULAR METHOD OF ADJUSTMENT UTILIZING MORTAR OR BRICK AND MORTAR UNDER THE FOLLOWING CONDITIONS.
 - A. ONLY ONE ADJUSTMENT WITH RAISING RINGS WILL BE ALLOWED ON ANY MANHOLE.
 - B. MAXIMUM "D" SHALL BE 75 mm (3").



City of Norwalk

12700 Norwalk Blvd
Norwalk, CA 90651
(562) 929-5700

MANHOLE RAISING RINGS

Approved _____

Date _____

City Engineer

REVISIONS

BY

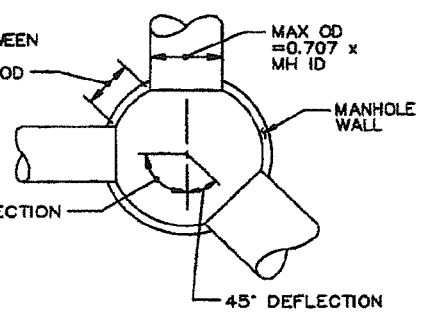
DATE

STD. PLAN NUMBER

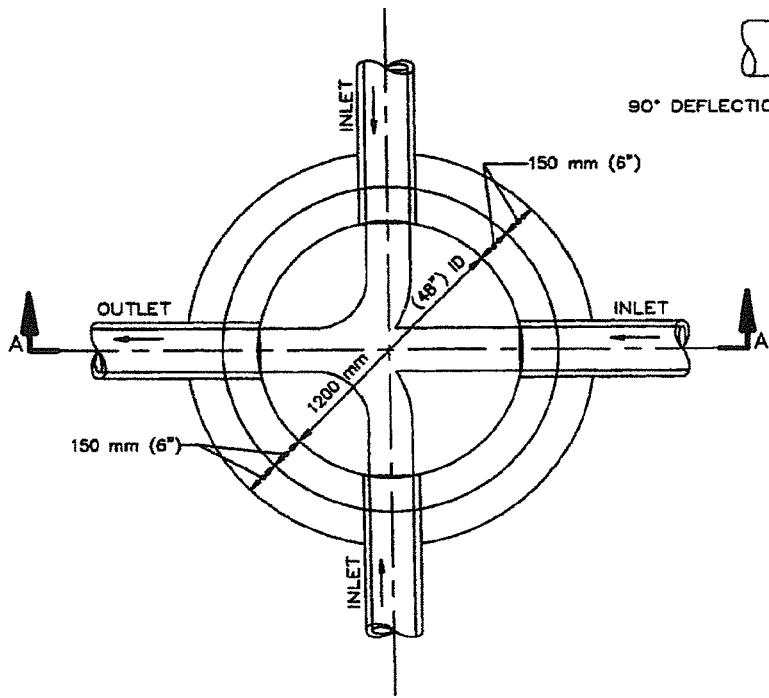
206-1

Sheet 2 of 2

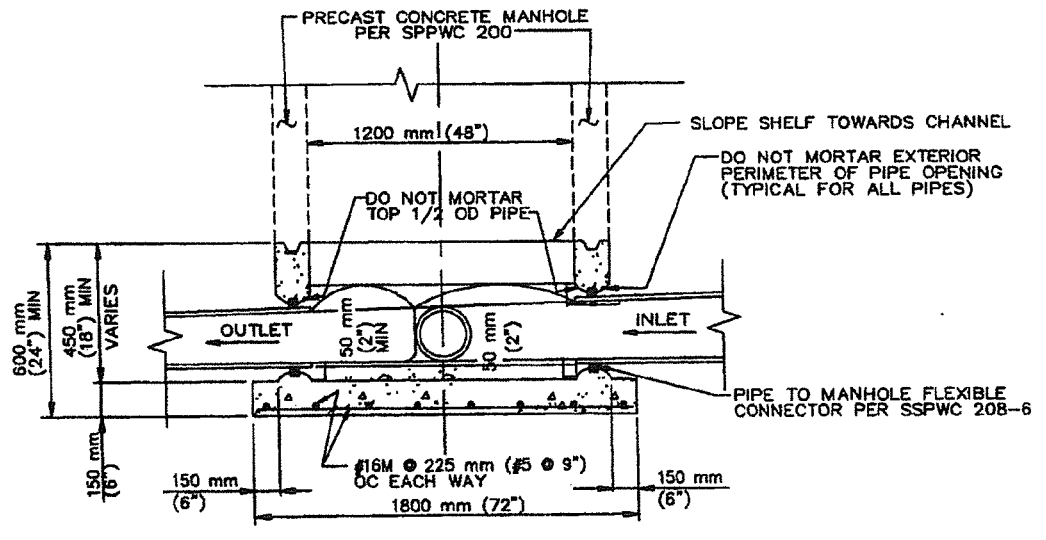
MIN. DISTANCE BETWEEN HOLES APPROX. 1/2 OF SMALLEST PIPE OD



PIPE SPACINGS



PLAN VIEW



SECTION A-A



City of Norwalk
 12700 Norwalk Blvd
 Norwalk, CA 90651
 (562) 929-5700

PRECAST REINFORCED CONCRETE MANHOLE BASE

Approved _____ City Engineer	Date _____	REVISIONS	BY	DATE	STD. PLAN NUMBER
					207-1
					Sheet 1 of 2

NOTES

1. CONCRETE BASE AND STUB WALLS SHALL BE POURED IN ONE OPERATION.
2. CONCRETE FOR ALL PRECAST UNITS SHALL BE COMPACTLY VIBRATED IN THE FORMS. IT SHALL BE CURED ACCORDING TO APPROVED PRACTICE EITHER BY STEAM. SPRINKLING, MEMBRANE SOLUTION, OR A COMBINATION OF THESE. IT SHALL DEVELOP 25 MPa (3500 PSI) OR GREATER STRENGTH IN 28 DAYS.
3. THE DEPTH OF CHANNEL SHALL EQUAL THE PIPE DIAMETER FOR ALL SIZES OF PIPE. FOR SPECIAL CHANNELS IN TRAP OR GAUGING MANHOLES, SEE SPECIAL PLANS.
4. CEMENT MORTAR INSIDE JOINTS SHALL BE NEATLY STRUCK AND POINTED AND SHALL NOT EXCEED 10 mm (3/8") IN THICKNESS.
5. STUB WALLS AND BASE SHALL CONFORM TO ASTM C 478 AND SHALL HAVE A MINIMUM OF 50 mm (2") COVER THE STEEL ON THE INSIDE FACE.
6. INVERT CHANNELS AND SHELF MAY BE POURED AT THE FACTORY OR IN THE FIELD AT THE OPTION OF THE CONTRACTOR.
7. BEDDING FOR PRECAST BASE SHALL BE EQUAL TO BEDDING FOR PIPE. IF PIPE IS PLACED ON NATIVE MATERIAL USE 150 mm (6") MINIMUM CRUSHED ROCK UNDER BASE.



City of Norwalk
 12700 Norwalk Blvd
 Norwalk, CA 90651
 (562) 929-5700

PRECAST REINFORCED CONCRETE MANHOLE BASE

Approved _____

Date _____

REVISIONS

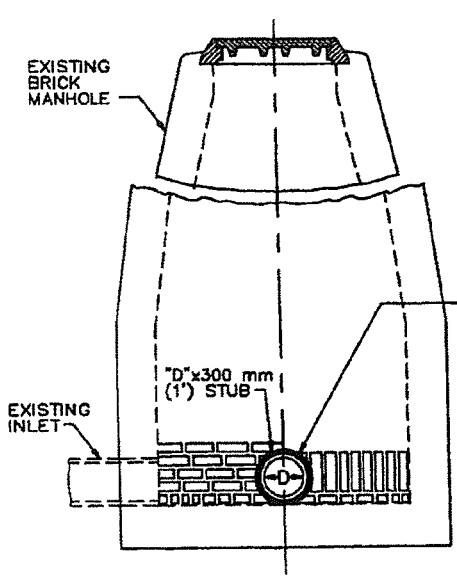
BY

DATE

STD. PLAN NUMBER

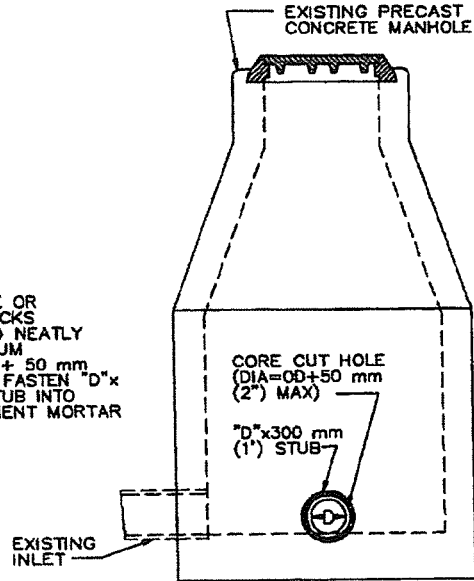
207-1

 City Engineer

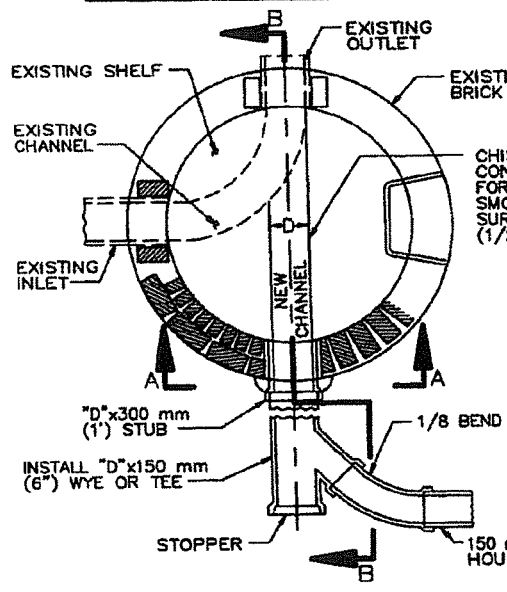


SECTIONAL ELEVATION A-A

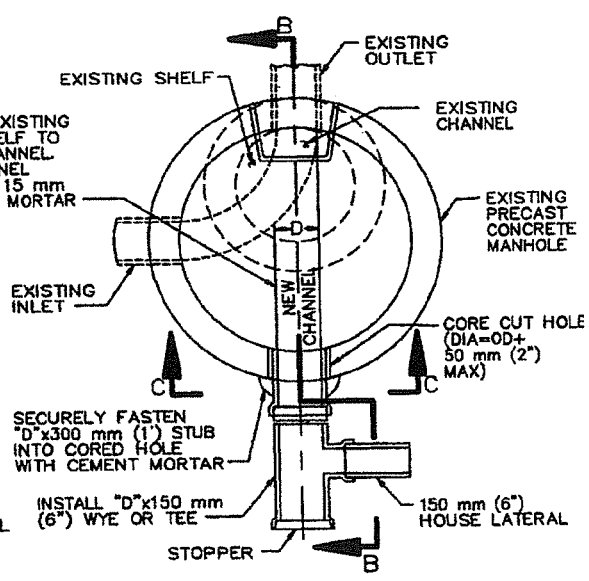
CORE CUT HOLE OR BREAK OUT BRICKS CAREFULLY AND NEATLY TO FORM MINIMUM OPENING OF OD + 50 mm (2"). SECURELY FASTEN "D"x 300 mm (1') STUB INTO HOLE WITH CEMENT MORTAR



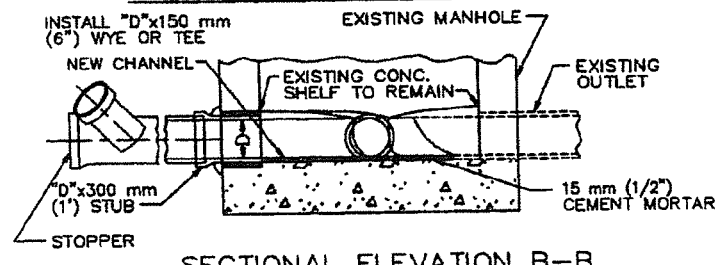
SECTIONAL ELEVATION C-C



SECTIONAL PLAN OF BASE



SECTIONAL PLAN OF BASE



SECTIONAL ELEVATION B-B CHANNEL BASE



City of Norwalk
 12700 Norwalk Blvd
 Norwalk, CA 90651
 (562) 929-5700

BREAKING INTO EXISTING MANHOLES

Approved _____ Date _____

City Engineer

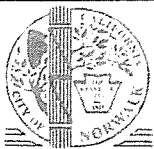
REVISIONS	BY	DATE	STD. PLAN NUMBER
			208-1

NOTES:

1. INVERT ELEVATION OF "D" x 300 mm (1') STUB AT THE INSIDE FACE OF MANHOLE TO BE 30 mm (0.10') HIGHER THAN EXISTING OUTLET INVERT ELEVATION.
2. THE CORE CUT HOLE SHALL BE MADE WITH EQUIPMENT SPECIALLY DESIGNED TO CUT A SMOOTH HOLE WITHOUT SPALLING OR DAMAGE TO THE REINFORCING STEEL OR STRUCTURE.
3. "D" TO BE 200 mm (8") MINIMUM.
4. ALL WORK SHALL BE UNCOVERED AND CONVENIENT FOR THE INSPECTION.
5. ALL CEMENT MORTAR SHALL BE CLASS "D" PER SSPWC 201-5.1.

HOUSE LATERAL NOTES:

1. WYE SHALL BE LAID WITH 3 mm (1/8") RISE PER 300 mm (1") AND 150 mm (6") SPUR AT 45° FROM HORIZONTAL UNLESS OTHERWISE NOTED ON PLANS.
2. "D" X 100 mm (4") WYE OR TEE AND 100 mm (4") HOUSE LATERAL MAY BE SUBSTITUTED FOR "D" x 150 mm (6") WYE OR TEE AND 150 mm (6") HOUSE LATERAL.
3. USE TYPE "D" OR "G" JOINTS PER SSPWC 208-2.



City of Norwalk

12700 Norwalk Blvd
Norwalk, CA 90651
(562) 929-5700

BREAKING INTO EXISTING MANHOLES

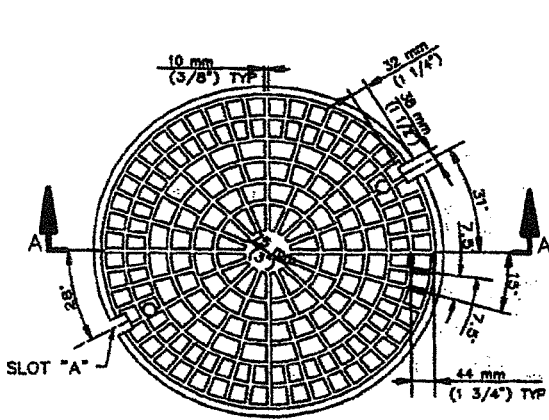
Approved _____

Date _____

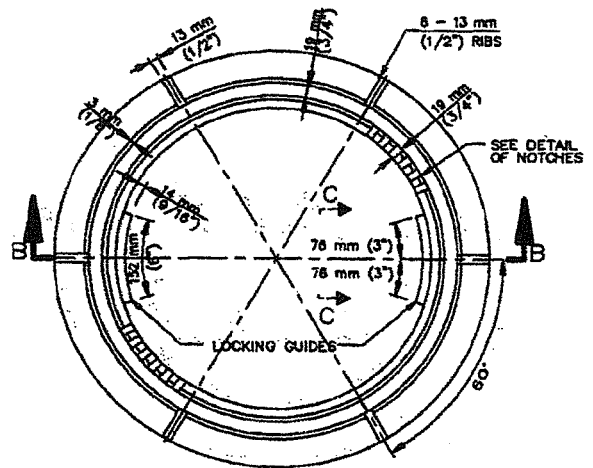
City Engineer

REVISIONS	BY	DATE	STD. PLAN NUMBER
			208-1

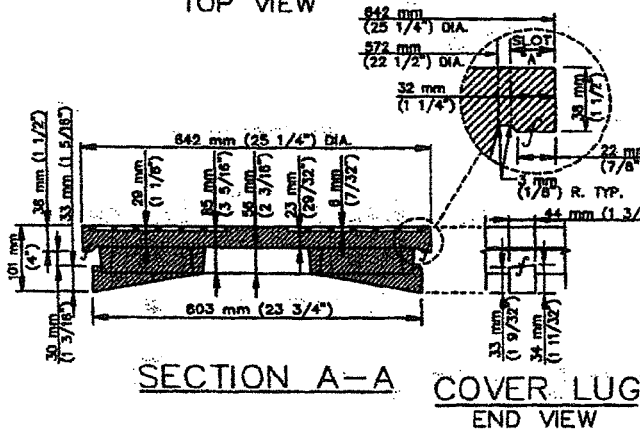
Sheet 2 of 2



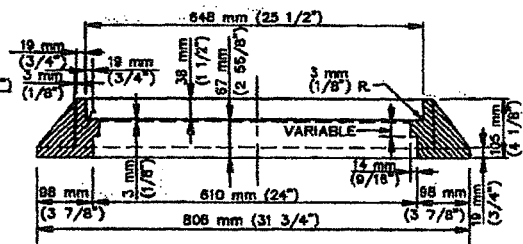
PLAN OF COVER
TOP VIEW



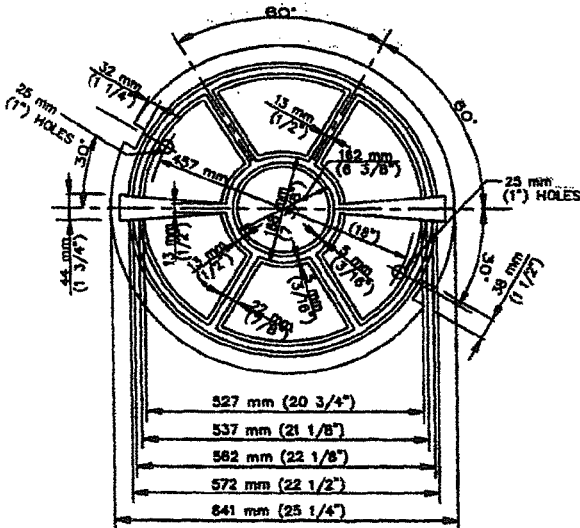
PLAN OF FRAME



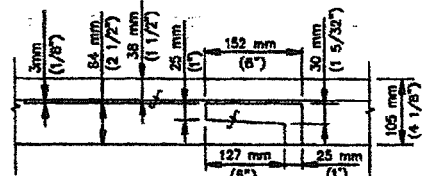
SECTION A-A COVER LUG
END VIEW



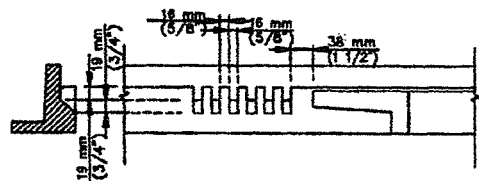
SECTION B-B



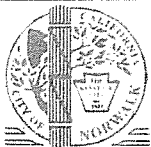
PLAN OF COVER
BOTTOM VIEW



LOCKING GUIDE
SIDE VIEW C-C



DETAIL OF NOTCHES



City of Norwalk
12700 Norwalk Blvd
Norwalk, CA 90651
(562) 929-5700

610 mm (24") MANHOLE FRAME AND COVER LOCKING TYPE

Approved _____

Date _____

REVISIONS

BY

DATE

STD. PLAN NUMBER

210-2

City Engineer _____

Sheet 1 of 2

NOTES:

1. THE CAST IRON USED SHALL CONFORM TO ASTM A-48 CLASS 35B.
2. THE FRAME AND COVER SHALL BE COATED WITH ASPHALTUM OR BITUMINOUS PAINT AFTER TESTING AND INSPECTION.
3. COVERS SHALL BE CAST WITH THE LETTER "D" FOR STORM DRAINS AND "S" FOR SEWERS AND THE AGENCY IDENTIFICATION IN ACCORDANCE WITH INSTRUCTIONS FURNISHED BY THE AGENCY. THE LETTER "D" OR "S" SHALL BE APPROXIMATELY 65 mm (2 1/2") HIGH WITH 13 mm (1/2") LINE WIDTH AND PLACED IN THE CENTER OF THE COVER. ALL LETTERS SHALL BE FLUSH WITH THE FINISHED SURFACE OF THE COVER.
4. FOUNDRY IDENTIFYING MARK, HEAT AND DATE SHALL BE CAST ON THE BOTTOM OF THE COVER AND ON THE INSIDE OF THE FRAME.
5. IMPORTED COVERS AND FRAMES SHALL HAVE THE COUNTRY OF ORIGIN MARKING IN COMPLIANCE WITH FEDERAL REGULATIONS.
6. WEIGHT OF FRAME SHALL BE 73 kg (160 POUNDS). WEIGHT OF COVER SHALL BE 91 kg (200 POUNDS). ACTUAL WEIGHTS SHALL BE WITHIN A RANGE OF 95% TO 110%.
7. THE MANHOLE FRAME AND COVER SHALL BE INSPECTED BY THE ENGINEER PRIOR TO SHIPMENT TO THE JOB SITE. ACCEPTANCE WILL BE INDICATED BY THE AGENCY'S MARK.
8. THE PROOF-LOAD FOR TEST METHOD B OF SSPWC 206-3.2 IS 228 kN (55,300 POUNDS).
9. COVERS FOR MANHOLES LOCATED IN EASEMENTS, ALLEYS, PARKWAYS AND ALL OTHER PLACES EXCEPT PAVED STREETS SHALL BE PROVIDED WITH SOCKET SET SCREW LOCKING DEVICES. DRILL AND TAP TWO HOLES TO A DEPTH OF 25 mm (1") AT 90 DEGREES TO PICK HOLE AND INSTALL 19 mm x 19 mm (3/4" x 3/4") STAINLESS STEEL SOCKET SET SCREWS WITH 10 mm (3/8") RECESSED HEX HEAD. ALL THREADS SHALL BE N.C.



City of Norwalk
 12700 Norwalk Blvd
 Norwalk, CA 90651
 (562) 929-5700

610 mm (24") MANHOLE FRAME
 AND COVER LOCKING TYPE

Approved _____

Date _____

 City Engineer

REVISIONS

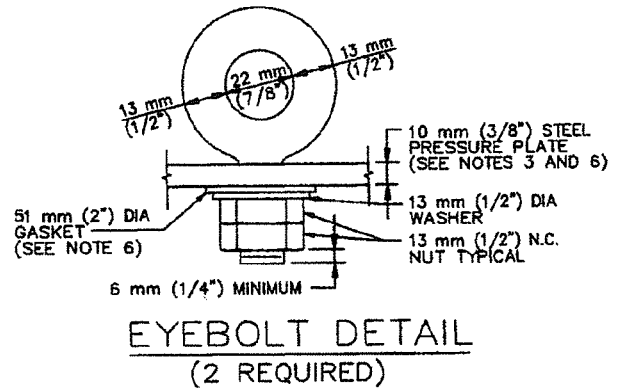
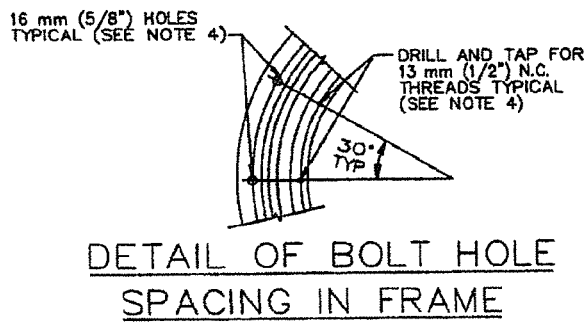
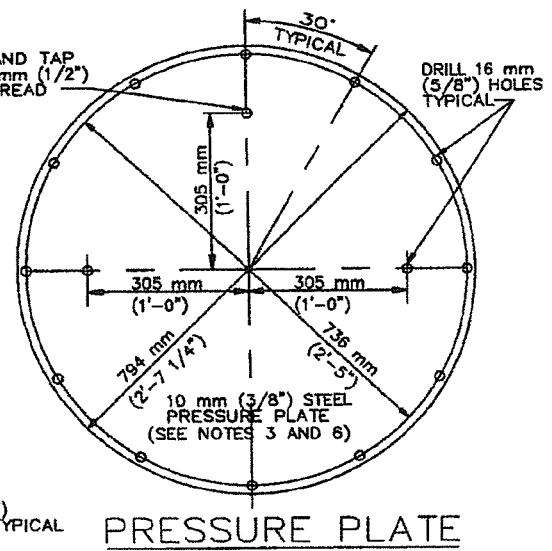
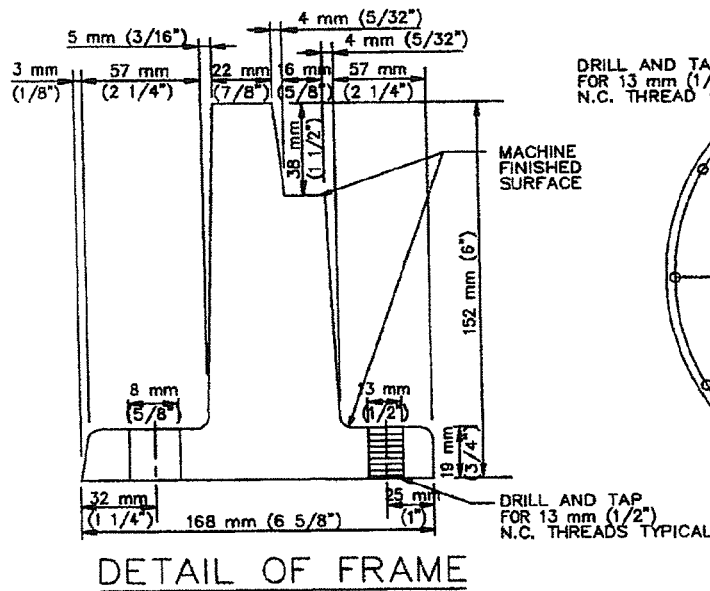
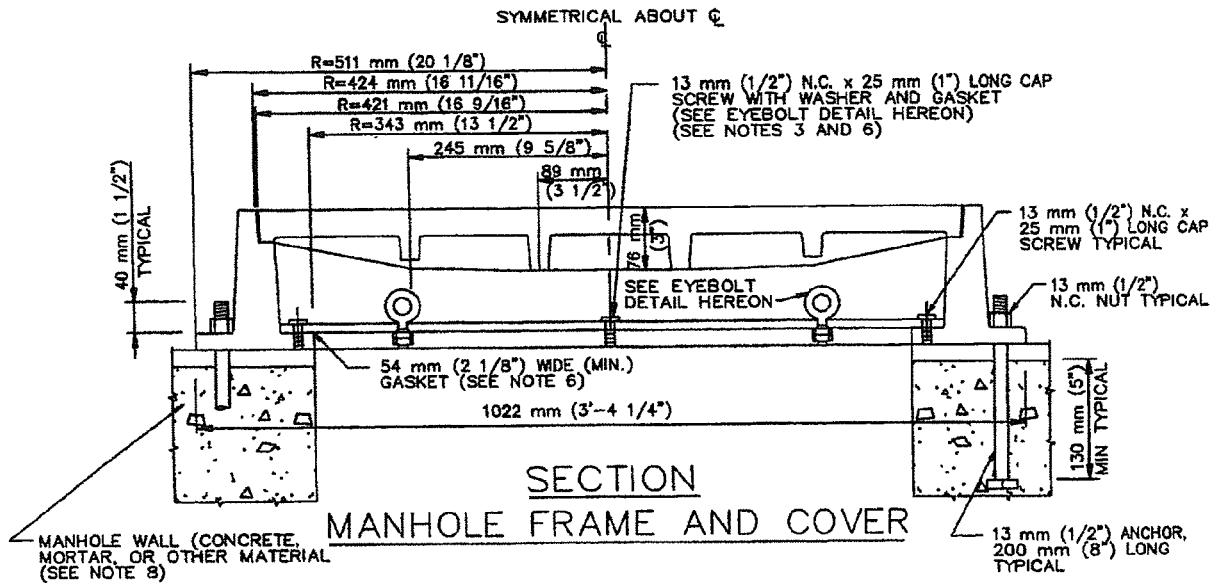
BY

DATE

STD. PLAN NUMBER

210-2

Sheet 2 of 2



City of Norwalk
12700 Norwalk Blvd
Norwalk, CA 90651
(562) 929-5700

MANHOLE FRAME AND COVER PRESSURE TYPE

Approved _____

Date _____

REVISIONS

BY

DATE

STD. PLAN NUMBER

City Engineer _____

211-1

Sheet 1 of 2

NOTES:

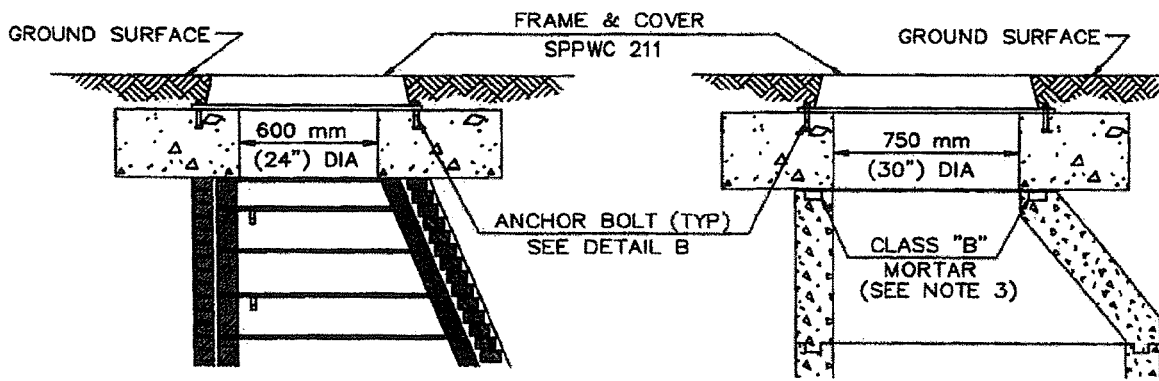
1. EXCEPT AS OTHERWISE INDICATED, THE MANHOLE FRAME AND COVER SHALL CONFORM TO SPPWC 632, 762 mm (30") MANHOLE FRAME AND COVER.
2. THE PRESSURE PLATE SHALL BE STEEL CONFORMING TO ASTM A36M (A 36), AND SHALL BE GALVANIZED AFTER FABRICATION, BUT BEFORE INSTALLATION OF SCREWS AND BOLTS.
3. CAP SCREWS AND EYEBOLTS, INCLUDING WASHERS AND NUTS ATTACHED THERETO, SHALL BE FABRICATED FROM ANY SERIES 300 STAINLESS STEEL.
4. ALL HOLES IN CAST IRON SHALL BE DRILLED AFTER CASTING, OR PLUGGED PRIOR TO CASTING. THEY SHALL NOT BE PUNCHED.
5. ALL IRON CASTING SHALL RECEIVE AN ASPHALTIC COATING AFTER FABRICATION.
6. GASKET MATERIAL SHALL BE 2 mm (1/16") THICK NEOPRENE RUBBER. PRESSURE PLATE GASKET SHALL BE 794 mm (2'-7 1/4") O.D.
7. ALL NUTS AND BOLTS SHALL BE TIGHTENED TO A MINIMUM TORQUE OF 34 Nm (25 FOOT-POUNDS).
8. FRAME SHALL BE SET ON 13 mm (1/2") THICK MINIMUM WET MORTAR BASE, CLASS "B" MORTAR.
9. MANHOLE FRAME AND COVER AND PRESSURE PLATE ASSEMBLY SHALL BE TESTED FOR ACCURATE FIT PRIOR TO DELIVERY TO JOBSITE AND MARKED IN SETS.



City of Norwalk
 12700 Norwalk Blvd
 Norwalk, CA 90651
 (562) 929-5700

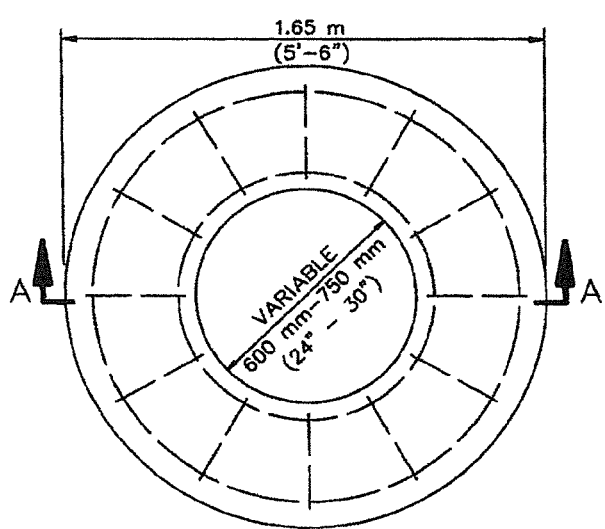
MANHOLE FRAME AND COVER PRESSURE TYPE

Approved _____ Date _____ _____ City Engineer	REVISIONS	BY	DATE	STD. PLAN NUMBER 211-1 Sheet 2 of 2

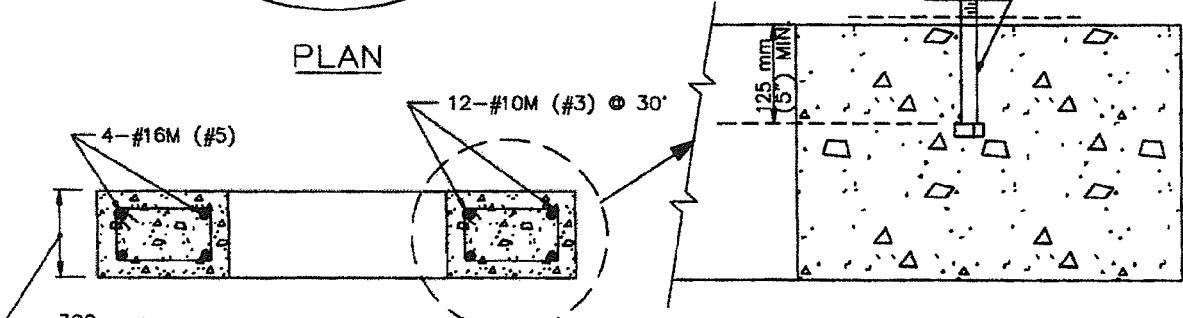


BRICK MANHOLE SHAFT

PRECAST CONCRETE CONE



PLAN



SECTION A-A

DETAIL B



City of Norwalk
 12700 Norwalk Blvd
 Norwalk, CA 90651
 (562) 929-5700

ANCHOR SYSTEM FOR PRESSURE COVER

Approved _____ Date _____

City Engineer _____

REVISIONS	BY	DATE	STD. PLAN NUMBER
			212-1
			Sheet 1 of 2

NOTES:

1. ANCHOR SYSTEM DESIGNED FOR LESS THAN 3 m (10') OF HEAD.
2. MINIMUM EMBEDMENT OF 13 mm (1/2") ϕ ANCHOR BOLT WITH HEAD SHALL BE 130 mm (5")
3. SET CONCRETE ANCHOR ON WET, CLASS "B" MORTAR ON TOP OF BRICK MANHOLE SHAFT OR PRECAST CONCRETE CONE.
4. UNLESS OTHERWISE NOTED, 13 mm (1/2") ϕ ANCHOR BOLTS AND NUTS ARE REQUIRED AND SHALL BE FABRICATED FROM ANY SERIES 300 STAINLESS STEEL.
5. NUTS ON ANCHOR BOLTS SHALL BE TIGHTENED TO A MINIMUM TORQUE OF 34 Nm (25 FOOT-POUNDS)



City of Norwalk
12700 Norwalk Blvd
Norwalk, CA 90651
(562) 929-5700

ANCHOR SYSTEM FOR PRESSURE COVER

Approved _____

Date _____

City Engineer

REVISIONS

BY

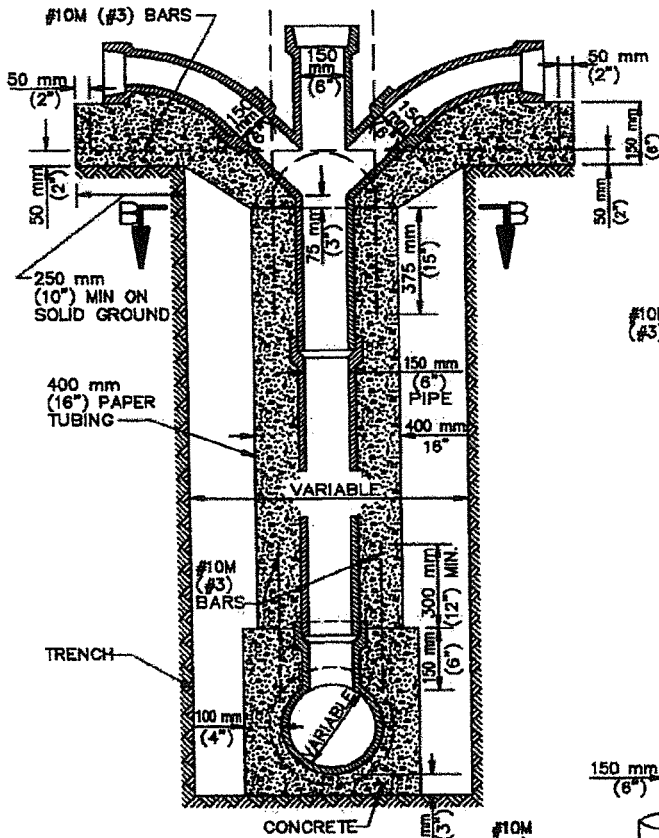
DATE

STD. PLAN NUMBER

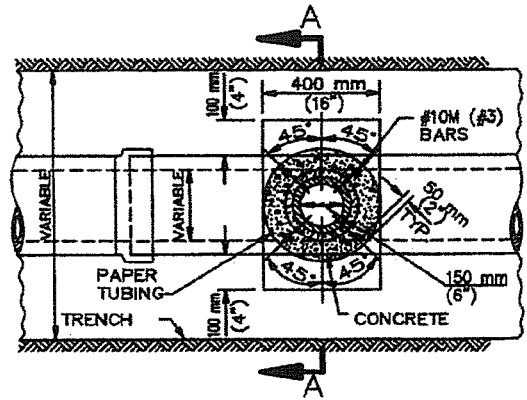
212-1

Sheet 2 of 2

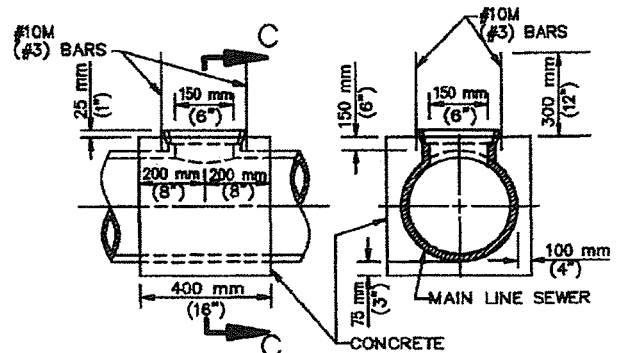
BARS ARE TO BE LEFT VERTICAL AND BENT IN PLACE WHEN BEAM IS FORMED



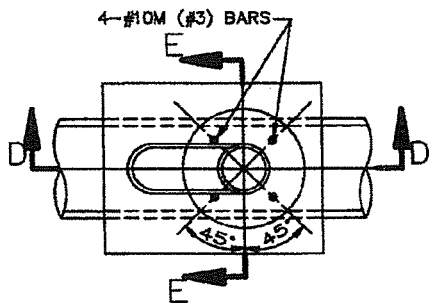
SECTION A-A



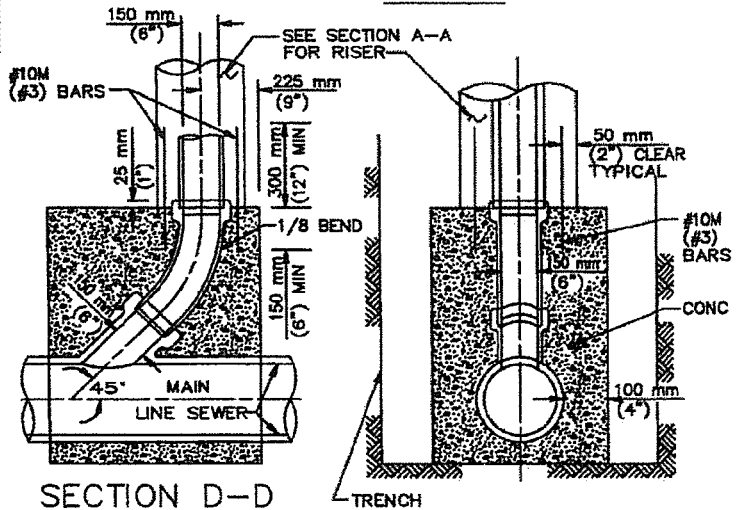
SECTION B-B



ELEVATION SECTION C-C
CHIMNEY BASE
CASE I



SECTION B-B



SECTION D-D

SECTION E-E

CHIMNEY BASE
CASE II



City of Norwalk

12700 Norwalk Blvd
Norwalk, CA 90651
(562) 929-5700

CHIMNEYS

Approved _____

Date _____

REVISIONS

BY

DATE

STD. PLAN NUMBER

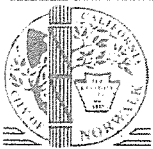
City Engineer _____

220-2

Sheet 1 of 2

NOTES

1. THE UPPER END OF THE CHIMNEY PIPE SHALL BE AT LEAST 2.5 m (8') BELOW THE GRADE OF THE LOWER CURB.
2. NO CONNECTION SHALL BE MADE DIRECTLY TO TOP OF CHIMNEY PIPE.
3. WHERE ONE HOUSE LATERAL IS TO BE JOINED TO THE CHIMNEY PIPE, USE A SINGLE WYE AND FACE WYE TOWARDS PROPERTY TO BE SERVED.
4. WHERE TWO OR MORE HOUSE LATERALS ARE TO BE JOINED TO THE CHIMNEY PIPE, INSTALL WYE BRANCHES AS FOLLOWS:
 - A. FOR TWO HOUSE LATERALS, ONE SERVING EACH SIDE OF STREET, USE A DOUBLE WYE BRANCH.
 - B. FOR TWO HOUSE LATERALS SERVING THE SAME SIDE OF THE STREET, USE TWO SINGLE WYE'S STACKED WITH BRANCHES FACING THE PROPERTIES SERVED.
 - C. FOR THREE OR FOUR HOUSE LATERALS, USE TWO DOUBLE WYE BRANCHES OR ONE DOUBLE AND ONE SINGLE WYE BRANCH STACKED.
5. EACH DOUBLE OR SINGLE WYE BRANCH AND EIGHTH BEND SHALL BE SUPPORTED BY A CONCRETE BEAM AS SHOWN.
6. FOR CHIMNEY BASE, 150 mm (6") TEE BRANCH OR WYE SHALL BE INSTALLED VERTICALLY ON TOP OF THE MAIN LINE SEWER AS SHOWN. THE CHIMNEY BASE MUST BE POURED AND SET WITH DOWELS AS SHOWN 24 HOURS BEFORE THE CHIMNEY CONCRETE IS POURED.
7. ALL CONCRETE SHOWN SHALL BE CLASS 310-C-17 (520-C-2500).
8. CASE I SHALL BE FOR VITRIFIED CLAY PIPE ONLY.
9. CASE II SHALL BE FOR ALL ALLOWABLE PIPE MATERIALS.
10. FOR ABS PIPE USE SOLVENT WELDED JOINTS ONLY.
11. A CAP SHALL BE INSTALLED AT THE OPENING OF THE PIPE RISER AND AT EACH UNCONNECTED BRANCH, SEALED AROUND ITS CIRCUMFERENCE WITH 25 mm (1") THICK TYPE "F" MORTAR.



City of Norwalk

12700 Norwalk Blvd
 Norwalk, CA 90651
 (562) 929-5700

CHIMNEYS

Approved _____

Date _____

REVISIONS

BY

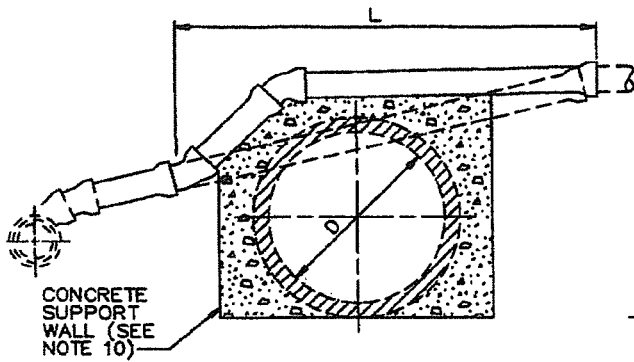
DATE

STD. PLAN NUMBER

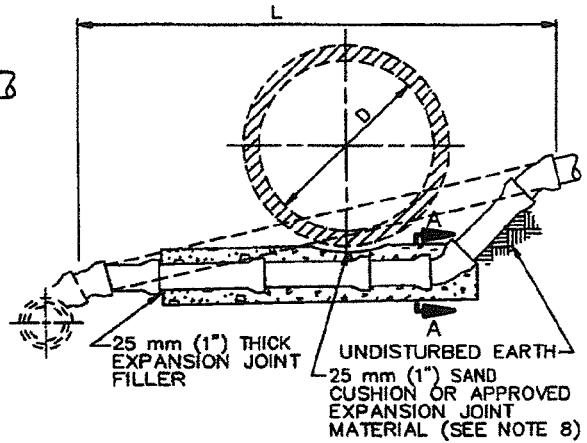
220-2

City Engineer _____

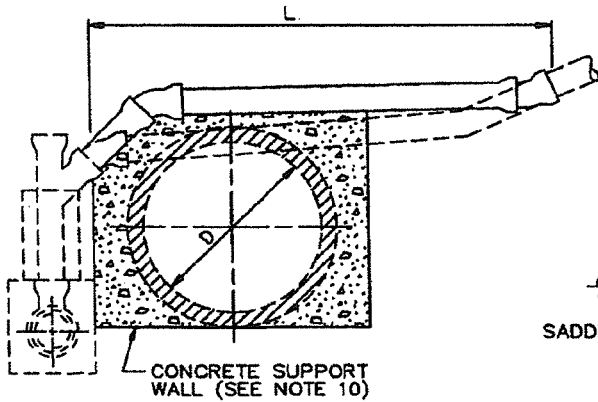
Sheet 2 of 2



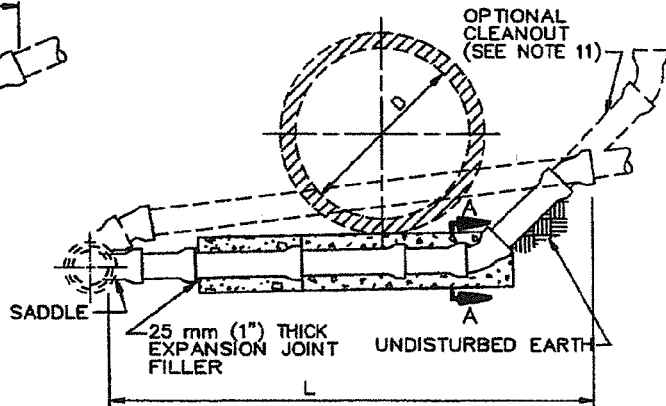
CASE A



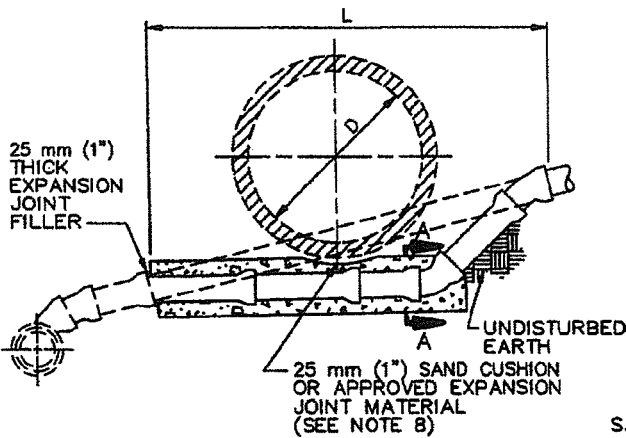
CASE D



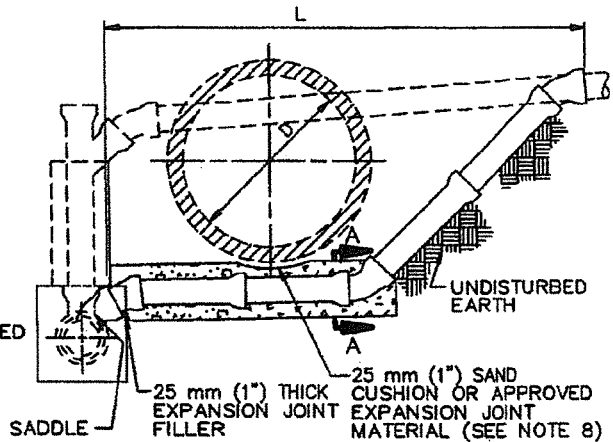
CASE B



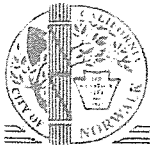
CASE E



CASE C



CASE F



City of Norwalk

12700 Norwalk Blvd
Norwalk, CA 90651
(562) 929-5700

HOUSE CONNECTION REMODELING

Approved _____

Date _____

REVISIONS

BY

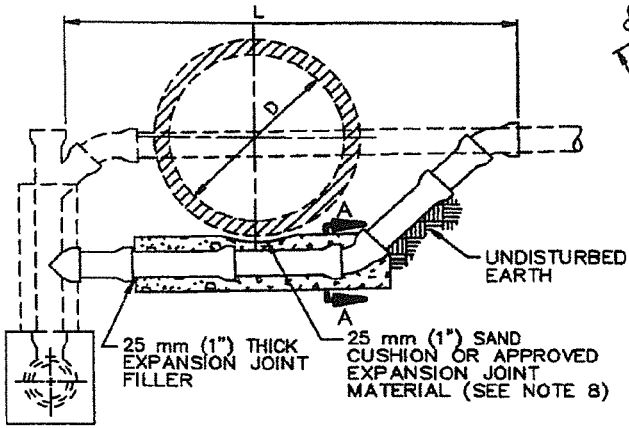
DATE

STD. PLAN NUMBER

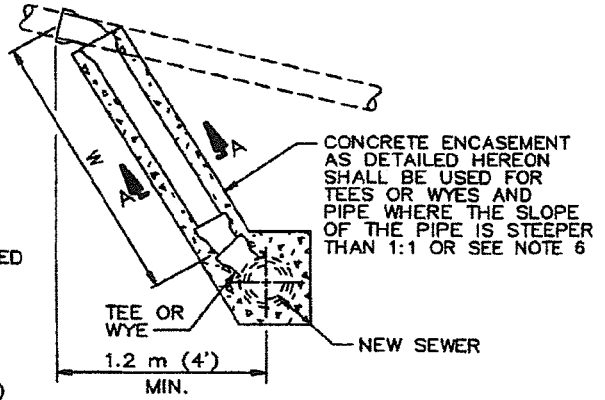
City Engineer _____

223-1

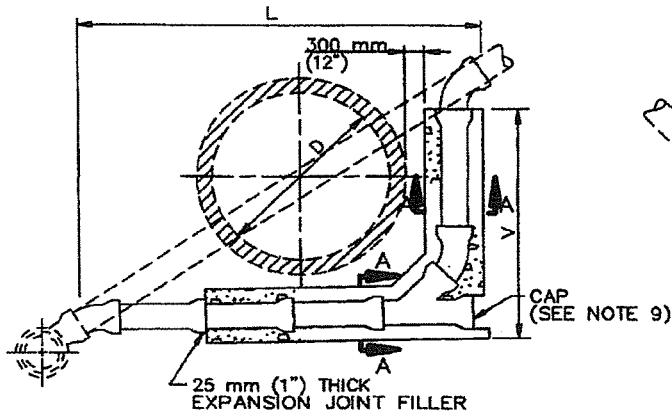
Sheet 1 of 3



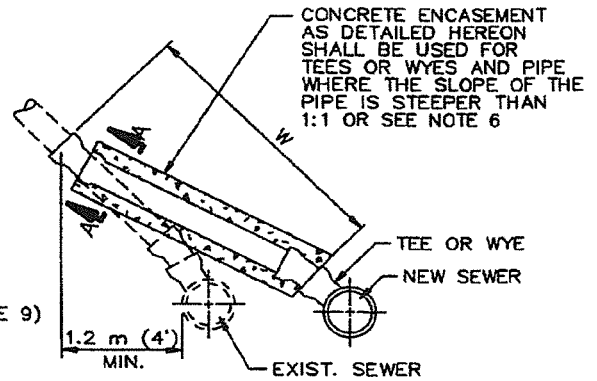
CASE G



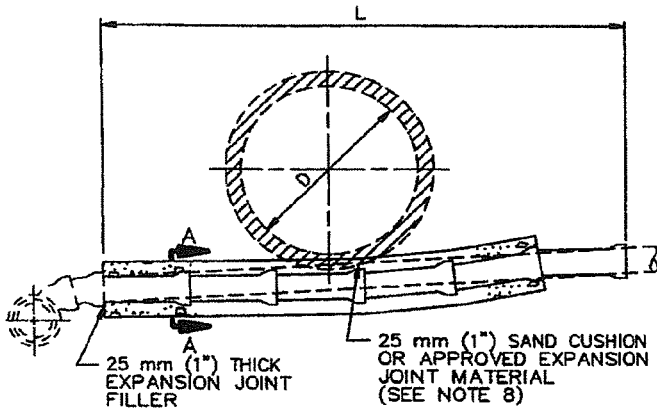
CASE R



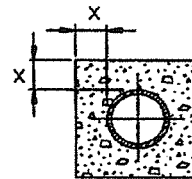
CASE H



CASE S



CASE K



NOMINAL DIAMETER OF PIPE mm (INCHES)	MINIMUM DIMENSIONS X mm (INCHES)
150 (6)	75 (3)
200 (8)	100 (4)
250 (10)	125 (5)
300 (12)	150 (6)

SECTION A-A
CONCRETE ENCASEMENT DETAIL
(SEE NOTE 5)



City of Norwalk

12700 Norwalk Blvd
Norwalk, CA 90651
(562) 929-5700

HOUSE CONNECTION REMODELING

Approved _____

Date _____

REVISIONS

BY

DATE

STD. PLAN NUMBER

City Engineer _____

223-1

Sheet 2 of 3

NOTES

1. EXCEPT AS OTHERWISE INDICATED HEREON OR ON THE PLANS, ALL HOUSE CONNECTION REMODELING SHALL CONFORM TO THE APPLICABLE PORTIONS OF SPPWC 222, HOUSE CONNECTION SEWER.
2. SEE PROJECT PLANS FOR VALUES OF D, L, V, AND W. (DIMENSION L IS THE HORIZONTAL LENGTH OF THE HOUSE CONNECTION REMODELING).
3. EXISTING SEWERS ARE INDICATED BY DASHED LINES. HOUSE CONNECTION SEWERS TO BE CONSTRUCTED ARE INDICATED BY SOLID LINES AND SHALL BE OF THE SAME MATERIAL AS THE EXISTING SEWER. THE CONTRACTOR MAY CONSTRUCT THE SEWER WITH OTHER MATERIALS ALLOWED BY SPPWC 222 PROVIDED APPROVED ADAPTORS ARE UTILIZED.
4. 1/16 (22.5') OR 1/8 (45') BENDS SHALL BE USED TO REMODEL OR CONSTRUCT ANY SEWER ON A CURVE OR AT ANY CHANGE IN ALIGNMENT. WHERE PHYSICAL OR GEOMETRIC LIMITATIONS PRECLUDE THE USE OF 1/16 (22.5') OR 1/8 (45') BENDS, THE CONTRACTOR SHALL SUBMIT TO THE ENGINEER FOR APPROVAL THE PROPOSED METHOD OF REMODELING OR CONSTRUCTION.
5. ALL HOUSE CONNECTION SEWERS TO BE CONSTRUCTED UNDER A PROPOSED CONDUIT SHALL BE ENCASED IN CONCRETE AS SHOWN HEREON. WHEN THE HOUSE CONNECTION SEWER SLOPE EXCEEDS 1:1 THE CONTRACTOR MAY, AT ITS OPTION, PLACE A CIRCULAR CROSS SECTION WITH MINIMUM COVER EQUAL TO DIMENSION "X" AS SHOWN ON SECTION A-A HEREON IN LIEU OF A SQUARE CROSS SECTION OF CONCRETE. CONCRETE BEDDING AND ENCASEMENT SHALL BE CLASS 250-C-14 (450-C-2000) AND SHALL EXTEND TO THE FIRST PIPE JOINT AT LEAST 300 mm (1') BEYOND THE OD OF EACH SIDE OF THE PROPOSED CONDUIT.
6. FOR CASE R AND S, WHEN THE SLOPE OF THE PIPE EXCEEDS 1:1, THE CONTRACTOR MAY, AT ITS OPTION, CONSTRUCT A CHIMNEY CONFORMING TO SPPWC 220 ON THE NEW SEWER IN LIEU OF CONSTRUCTING THE ENCASEMENT SHOWN HEREON.
7. FOR CASES E AND F, SADDLES SHALL BE CONNECTED EITHER TO THE LENGTH OF PIPE CONTAINING THE EXISTING TEE OR WYE OR TO THE ADJACENT DOWNSTREAM PIPE LENGTH.
8. CONDUITS TO BE INSTALLED OVER OR WITHIN 25 mm (1") OF ANY CONCRETE ENCASEMENT OR STRUCTURE, WHETHER EXISTING OR TO BE PLACED IN CONFORMITY WITH THE REQUIREMENTS HEREIN, SHALL BE INSTALLED ON A 25 mm (1") SAND CUSHION OR APPROVED EXPANSION JOINT MATERIAL. CONCRETE ENCASEMENT INSTALLED PURSUANT TO THIS STANDARD PLAN SHALL BE SEPARATED FROM EXISTING CONDUIT WITH 25 mm (1") THICK EXPANSION JOINT MATERIAL.
9. THOSE PORTIONS OF AN ABANDONED PIPE LOCATED BENEATH OR WITHIN 150 mm (6") OF A RELOCATED HOUSE CONNECTION SEWER SHALL BE REMOVED. THE EXCAVATION SHALL BE REFILLED TO THE GRADE OF THE NEW PIPE INVERT WITH CLASS 60-E-0.7 (100-E-100) CONCRETE. THE CONTRACTOR MAY, AT ITS OPTION, SUBSTITUTE MECHANICALLY COMPACTED BACKFILL IN LIEU OF THE CLASS 60-E-0.7 (100-E-100) CONCRETE. THOSE PORTIONS OF ABANDONED PIPE NOT REMOVED SHALL BE SEALED. WHERE CAPS ARE USED, THEY SHALL BE SEALED BY FILLING THE SPACE ABOVE THE CAP WITH SAND AND A 25 mm (1") THICK COATING OF TYPE "F" MORTAR.
10. SUPPORT WALLS SHALL CONFORM TO SPPWC 224.
11. WHEN INDICATED ON THE PLANS OR THE SPECIAL PROVISIONS, A CLEANOUT SHALL BE CONSTRUCTED IN CONJUNCTION WITH CASE E AS FOLLOWS:
 - A. SUBSTITUTE A "Y" FOR THE 45' BEND.
 - B. PLACE A 45' BEND ON THE UPPER END OF THE "Y".
 - C. CAP TOP OF 45' BEND WITH A CAP AND SEAL WITH 25 mm (1") THICK TYPE "F" MORTAR AROUND THE CIRCUMFERENCE OF THE CAP.



City of Norwalk
 12700 Norwalk Blvd
 Norwalk, CA 90651
 (562) 929-5700

HOUSE CONNECTION REMODELING

Approved _____

Date _____

REVISIONS

BY

DATE

STD. PLAN NUMBER

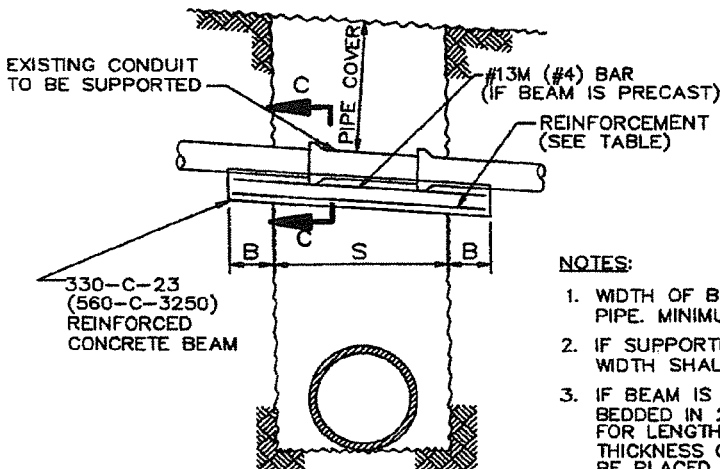
223-1

City Engineer _____

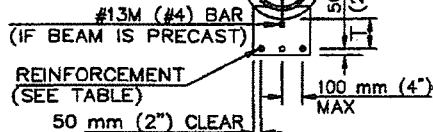
Sheet 3 of 3

CASE I REINFORCED CONCRETE BEAM

FOR 100 mm (4") TO 610 mm (24") ID PIPE



MIN. BEARING SHALL BE 0.5
O.D. OF SUPPORTED PIPE



SECTION C-C

NOTES:

1. WIDTH OF BEAM SHALL EQUAL OD OF SUPPORTED PIPE. MINIMUM WIDTH SHALL BE 150 mm (6").
2. IF SUPPORTED PIPE IS BEDDED IN CONCRETE, BEAM WIDTH SHALL EQUAL BEDDING WIDTH.
3. IF BEAM IS PRECAST, ENDS OF BEAM SHALL BE FULLY BEDDED IN 265-C-14 (450-C-2000) CONCRETE FOR LENGTH "B". THE BEDDING SHALL HAVE A MINIMUM THICKNESS OF 100 mm (4"). CLASS "C" MORTAR SHALL BE PLACED BETWEEN TOP OF BEAM AND SUPPORTED PIPE TO PROVIDE MINIMUM BEARING SHOWN.
4. THIS CASE IS PERMITTED ONLY IF THE TRENCH WALLS ARE FIRM AND UNYIELDING.
5. MAXIMUM SPACING OF BARS SHALL BE 100 mm (4") OC.

REINFORCED CONCRETE BEAM (DIMENSIONS AND REINFORCEMENT)

S	PIPE COVER														
	0 m TO 2.4 m			2.4 m TO 3.7 m			3.7 m TO 4.9 m			4.9 m TO 6.0 m			6.0 m TO 7.6 m		
	(0' TO 8'-0")			(8'-0" TO 12'-0")			(12'-0" TO 16'-0")			(16'-0" TO 20'-0")			(20'-0" TO 25'-0")		
	T	BARS	B	T	BARS	B	T	BARS	B	T	BARS	B	T	BARS	B
8m TO 1.2m (0' TO 4'-0")	200mm (8")	#13M (#4)	0.50m (1'-6")	200mm (8")	#13M (#4)	0.50m (1'-6")	230mm (9")	#13M (#4)	0.50m (1'-6")	255mm (10")	#13M (#4)	0.50m (1'-6")	270mm (10 1/2")	#13M (#4)	0.50m (1'-6")
1.2m TO 1.50m (4'-0" TO 5'-0")	200mm (8")	#13M (#4)	0.50m (1'-6")	250mm (9 1/2")	#13M (#4)	0.50m (1'-6")	280mm (11")	#13M (#4)	0.50m (1'-6")	305mm (12")	#13M (#4)	0.50m (1'-6")	320mm (12 1/2")	#16M (#5)	0.50m (1'-6")
1.5m TO 1.85m (5'-0" TO 6'-0")	230mm (9")	#13M (#4)	0.50m (1'-6")	280mm (11")	#16M (#5)	0.50m (1'-6")	320mm (12 1/2")	#16M (#5)	0.50m (1'-6")	340mm (13 1/2")	#16M (#5)	0.6m (2'-0")	370mm (14 1/2")	#16M (#5)	0.6m (3'-0")
1.85m TO 2.15m (6'-0" TO 7'-0")	255mm (10")	#16M (#5)	0.50m (1'-6")	320mm (12 1/2")	#16M (#5)	0.6m (2'-0")	370mm (14 1/2")	#16M (#5)	0.6m (2'-0")	395mm (15 1/2")	#16M (#5)	0.6m (2'-0")	420mm (16 1/2")	#19M (#6)	0.6m (2'-0")
2.15m TO 2.45m (7'-0" TO 8'-0")	280mm (11")	#16M (#5)	0.50m (1'-6")	355mm (14")	#16M (#5)	0.6m (2'-0")	410mm (16")	#16M (#5)	0.6m (2'-0")	445mm (17 1/2")	#16M (#5)	0.75m (2'-6")	485mm (19")	#19M (#6)	0.75m (2'-6")
2.45m TO 2.75m (8'-0" TO 9'-0")	320mm (12 1/2")	#16M (#5)	0.6m (2'-0")	395mm (15 1/2")	#19M (#6)	0.75m (2'-6")	445mm (17 1/2")	#19M (#6)	0.90m (3'-0")	495mm (19 1/2")	#19M (#6)	0.75m (2'-6")	535mm (21")	#19M (#6)	0.75m (2'-6")
2.75m TO 3.0m (9'-0" TO 10'-0")	340mm (13 1/2")	#19M (#6)	0.6m (2'-0")	430mm (17")	#19M (#6)	0.75m (2'-6")	495mm (19 1/2")	#19M (#6)	0.90m (3'-0")	545mm (21 1/2")	#19M (#6)	0.9m (3'-0")	585mm (23")	#19M (#6)	0.90m (3'-0")
3.0m TO 3.35m (10'-0" TO 10'-0")	370mm (14 1/2")	#19M (#6)	0.75m (2'-6")	470mm (18 1/2")	#19M (#6)	0.90m (3'-0")	535mm (21")	#19M (#6)	0.90m (3'-0")	595mm (23 1/2")	#22M (#7)	0.9m (3'-0")	635mm (25")	#22M (#7)	0.90m (3'-0")
3.35m TO 3.65m (11'-0" TO 12'-0")	395mm (15 1/2")	#19M (#6)	0.75m (2'-6")	510mm (20")	#19M (#6)	0.90m (3'-0")	585mm (23")	#22M (#7)	1.10m (3'-6")	650mm (25 1/2")	#22M (#7)	1.10m (3'-6")	685mm (27")	#22M (#7)	1.10m (3'-6")
3.65m TO 4.00m (12'-0" TO 13'-0")	430mm (17")	#19M (#6)	0.90m (3'-0")	545mm (21 1/2")	#22M (#7)	1.10m (3'-6")	625mm (24 1/2")	#22M (#7)	1.10m (3'-6")	700mm (27 1/2")	#22M (#7)	1.20m (4'-0")	740mm (29")	#22M (#7)	1.20m (4'-0")
4.00m TO 4.25m (13'-1" TO 14'-0")	455mm (18")	#22M (#7)	0.90m (3'-0")	585mm (23")	#22M (#7)	1.10m (3'-6")	675mm (26 1/2")	#22M (#7)	1.20m (4'-0")	750mm (29 1/2")	#22M (#7)	1.20m (4'-0")	800mm (31 1/2")	#22M (#7)	1.20m (4'-0")
4.25m TO 4.60m (14'-0" TO 15'-0")	485mm (19")	#22M (#7)	0.90m (3'-0")	635mm (25")	#22M (#7)	1.20m (4'-0")	710mm (28")	#22M (#7)	1.20m (4'-0")	800mm (31 1/2")	#22M (#7)	1.40m (4'-6")			
4.6m TO 4.90m (15'-0" TO 16'-0")	520mm (20 1/2")	#22M (#7)	1.10m (3'-6")	675mm (26 1/2")	#22M (#7)	1.20m (4'-0")	780mm (30")	#25M (#8)	1.40m (4'-6")						
4.90 TO 5.20m (16'-0" TO 17'-0")	545mm (21 1/2")	#22M (#7)	1.10m (3'-6")	710mm (28")	#25M (#8)	1.40m (4'-6")									
5.20m TO 5.50m (17'-0" TO 18'-0")	570mm (22 1/2")	#25M (#8)	1.40m (4'-6")	750mm (29 1/2")	#25M (#8)	1.40m (4'-6")									



City of Norwalk
12700 Norwalk Blvd
Norwalk, CA 90651
(562) 929-5700

SUPPORTS FOR CONDUITS ACROSS TRENCHES

Approved _____

Date _____

REVISIONS

BY

DATE

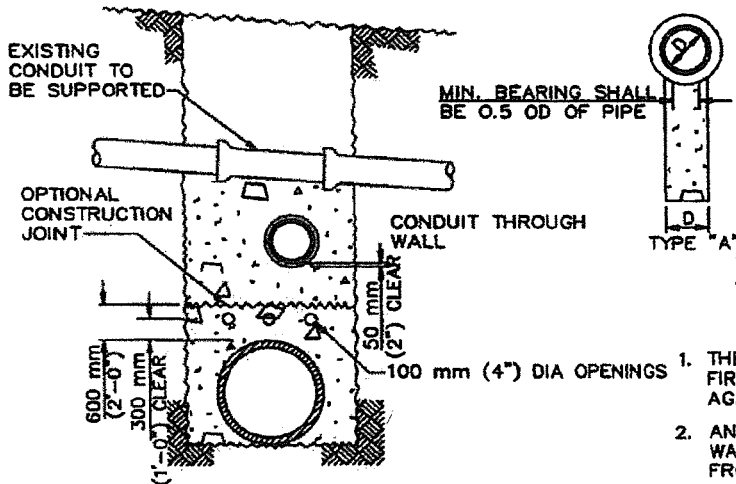
STD. PLAN NUMBER

224-1

City Engineer _____

Sheet 1 of 3

CASE 2 CONCRETE WALL

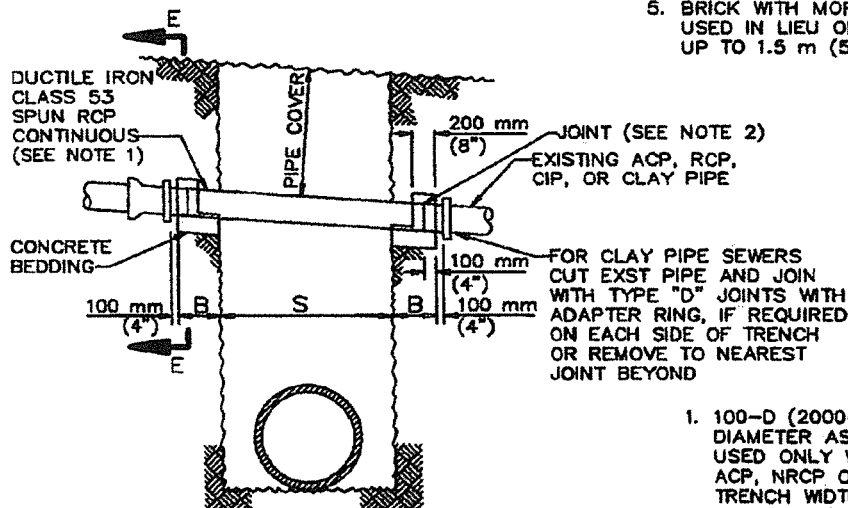


WALL SECTION

NOTES

1. THE SUPPORTING WALL SHALL HAVE A FIRM BEARING ON THE SUBGRADE AND AGAINST THE SLIDES OF THE EXCAVATION.
2. ANY CONDUIT PASSING THROUGH THE WALL SHALL HAVE 50 mm (2") CLEARANCE FROM THE WALL.
3. 100 mm (4") DIA OPENING THROUGH THE WALL AT 600 mm (2') OC HORIZONTALLY AND AT 1.5 m (5') OC VERTICALLY SHALL BE PROVIDED TO PREVENT UNEQUAL PRESSURE RESULTING FROM JETTED BACKFILL.
4. IF SUPPORTED PIPE IS BEDDED IN CONCRETE, MINIMUM THICKNESS OF WALL SHALL EQUAL BEDDING WIDTH.
5. BRICK WITH MORTAR JOINTS MAY BE USED IN LIEU OF CONCRETE FOR WALLS UP TO 1.5 m (5') IN HEIGHT OR LENGTH.

CASE 3 DUCTILE IRON PIPE

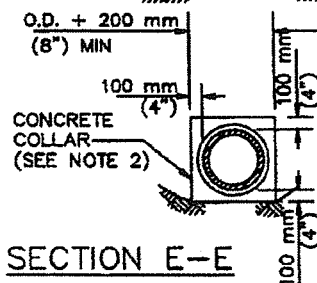


NOTES

1. 100-D (2000-D) SPUN RCP OF SAME DIAMETER AS THE EXISTING PIPE MAY BE USED ONLY WHEN THE EXISTING PIPE IS ACP, NRCP OR RCP AND THE TRENCH WIDTH IS 1.5 m (5') OR LESS.
2. THE CONCRETE COLLAR JOINT SHALL BE USED FOR JOINTS IN STORM DRAIN PIPE.

ALLOWABLE SPANS AND MIN. REQUIRED BEARING FOR DUCTILE IRON PIPE

DEPTH OF COVER	150 mm (6") PIPE		200 mm (8") PIPE		250 mm (10") PIPE	
	S (Max)	B (Min)	S (Max)	B (Min)	S (Max)	B (Min)
0 m TO 2.45 m (0" TO 8'-0")	3.35 m (11'-0")	0.5 m (1'-6")	4.10 m (13'-6")	0.5 m (1'-6")	5.03 m (16'-6")	0.6 m (2'-0")
2.45 m TO 4.90m (8'-0" TO 16'-0")	2.45 m (8'-0")	0.5 m (1'-6")	3.00 m (10'-0")	0.6 m (2'-0")	3.68 m (12'-0")	0.6 m (2'-0")
4.90 m TO 7.60m (16'-0" TO 25'-0")	2.15 m (7'-0")	0.5 m (1'-6")	2.75 m (9'-0")	0.6 m (2'-0")	3.20 m (10'-6")	0.75 m (2'-6")



SECTION E-E



City of Norwalk
12700 Norwalk Blvd
Norwalk, CA 90651
(562) 929-5700

SUPPORTS FOR CONDUITS ACROSS TRENCHES

Approved _____

Date _____

REVISIONS

BY

DATE

STD. PLAN NUMBER

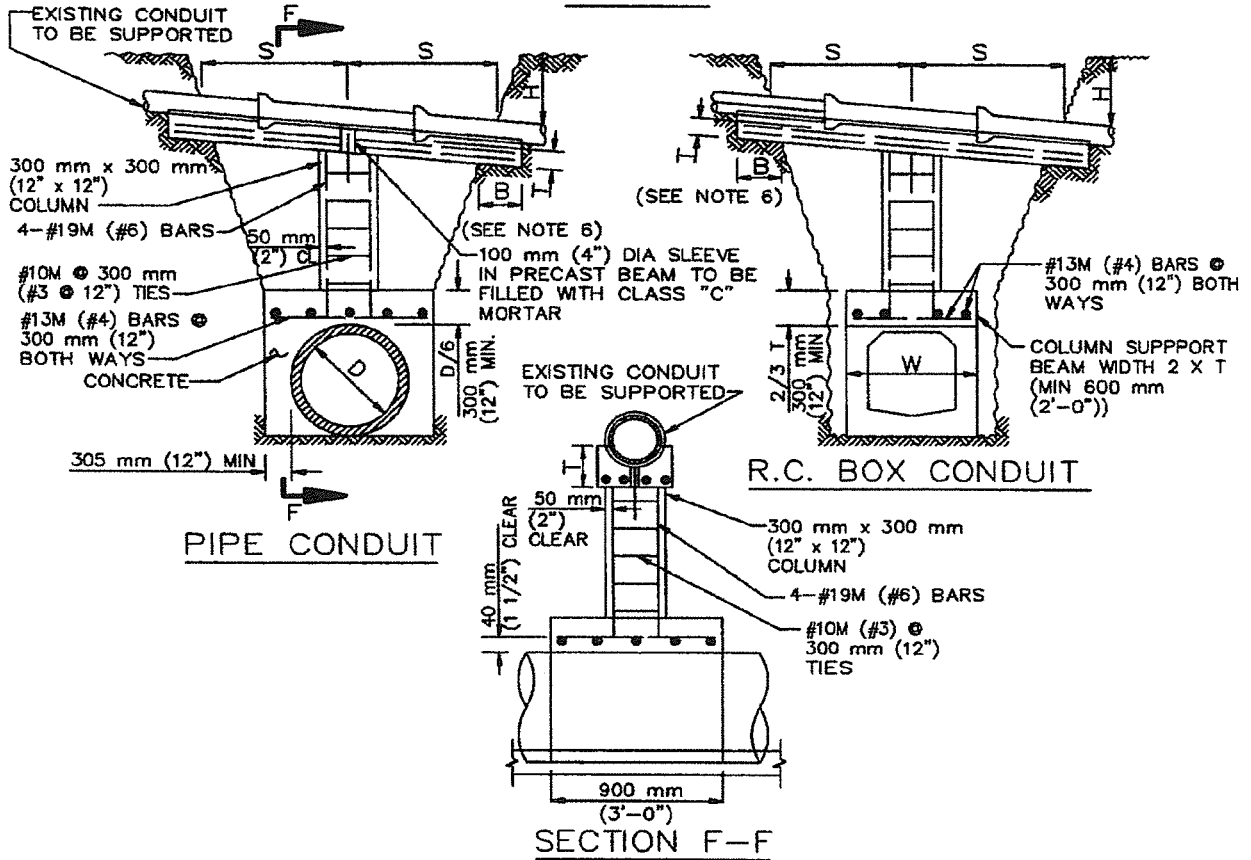
224-1

City Engineer

Sheet 2 of 3

COLUMN SUPPORT WITH REINFORCED CONCRETE BEAM

CASE 4

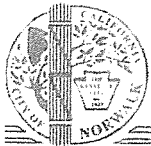


NOTES

1. SPAN "S" SHALL BE MAXIMUM 5.5 m (18') FOR EARTH COVER 2.45 m (8') OR LESS, 3.65 m (12') FOR EARTH COVER 4.9 m (16') OR LESS, AND 3.0 m (10') FOR OVER 4.9 m (16') EARTH COVER.
2. CONCRETE SHALL BE CLASS 330-C-23 (560-B-3250).
3. WHEN THE PIPE TO BE SUPPORTED CROSSES THE TRENCH ON A SKEW ANGLE, THE WALL OR BEAM WHICH SUPPORTS THE COLUMN SHALL BE CONSTRUCTED AT RIGHT ANGLE TO THE TRENCH.
4. SUPPORT SYSTEM MAY BE USED OVER CAST-IN-PLACE STRUCTURES.
5. BACKFILL ABOVE THE SUPPORT BEAM SHALL NOT BE PLACED UNTIL 72 HOURS AFTER THE SUPPORT IS POURED.
6. REINFORCED CONCRETE BEAM DIMENSIONED AND REINFORCED PER TABLE UNDER CASE 1.

GENERAL NOTES

1. "S" IS THE SPAN OF THE PIPE SUPPORT MEASURED ALONG ITS CENTERLINE.
2. "B" IS THE LENGTH OF BEARING OF THE SUPPORT AGAINST UNDISTURBED EARTH MEASURED ALONG THE PIPE CENTERLINE.
3. CASE 2 SHALL BE USED FOR PARTIAL CROSSINGS, EXCEPT THAT WHERE THE DISTANCE FROM A SEWER CHIMNEY TO UN-DISTURBED EARTH IS 450 mm (18") OR LESS, THE TRENCH BACKFILL MAY BE DENSIFIED TO 450 mm (18") ABOVE A HOUSE CONNECTION SEWER AND THEN RE-EXCAVATED FOR THE PIPE INSTALLATION.
4. ANY SEWER OR STORM DRAIN EXPOSED OR PARTIALLY EXPOSED IN A TUNNEL EXCAVATION SHALL BE SUPPORTED WITH A WALL, CASE 2.
5. IF BEDDING IS REMOVED FROM THE EXISTING PIPE THAT WILL REMAIN IN PLACE, THE PIPE SHALL BE EMBEDDED WITH CONCRETE AT NO EXTRA COST TO THE AGENCY.
6. UNLESS OTHERWISE INDICATED, CONCRETE SHALL BE CLASS 265-C-14 (450-C-2000).



City of Norwalk

12700 Norwalk Blvd
Norwalk, CA 90651
(562) 929-5700

SUPPORTS FOR CONDUITS ACROSS TRENCHES

Approved _____

Date _____

REVISIONS

BY

DATE

STD. PLAN NUMBER

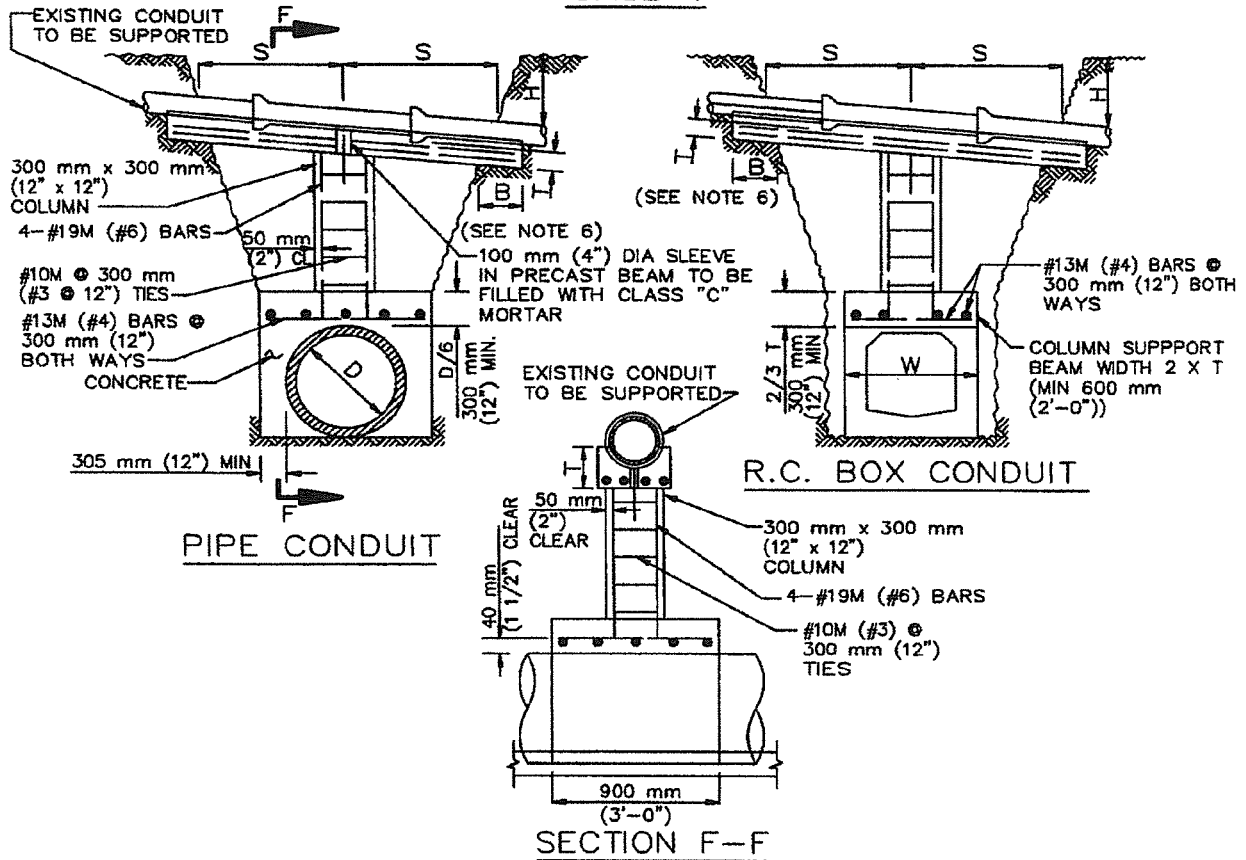
City Engineer _____

224-1

Sheet 3 of 3

COLUMN SUPPORT WITH REINFORCED CONCRETE BEAM

CASE 4



NOTES

1. SPAN "S" SHALL BE MAXIMUM 5.5 m (18') FOR EARTH COVER 2.45 m (8') OR LESS, 3.65 m (12') FOR EARTH COVER 4.9 m (16') OR LESS, AND 3.0 m (10') FOR OVER 4.9 m (16') EARTH COVER.
2. CONCRETE SHALL BE CLASS 330-C-23 (560-B-3250).
3. WHEN THE PIPE TO BE SUPPORTED CROSSES THE TRENCH ON A SKEW ANGLE, THE WALL OR BEAM WHICH SUPPORTS THE COLUMN SHALL BE CONSTRUCTED AT RIGHT ANGLE TO THE TRENCH.
4. SUPPORT SYSTEM MAY BE USED OVER CAST-IN-PLACE STRUCTURES.
5. BACKFILL ABOVE THE SUPPORT BEAM SHALL NOT BE PLACED UNTIL 72 HOURS AFTER THE SUPPORT IS POURED.
6. REINFORCED CONCRETE BEAM DIMENSIONED AND REINFORCED PER TABLE UNDER CASE 1.

GENERAL NOTES

1. "S" IS THE SPAN OF THE PIPE SUPPORT MEASURED ALONG ITS CENTERLINE.
2. "B" IS THE LENGTH OF BEARING OF THE SUPPORT AGAINST UNDISTURBED EARTH MEASURED ALONG THE PIPE CENTERLINE.
3. CASE 2 SHALL BE USED FOR PARTIAL CROSSINGS, EXCEPT THAT WHERE THE DISTANCE FROM A SEWER CHIMNEY TO UN-DISTURBED EARTH IS 450 mm (18") OR LESS, THE TRENCH BACKFILL MAY BE DENSIFIED TO 450 mm (18") ABOVE A HOUSE CONNECTION SEWER AND THEN RE-EXCAVATED FOR THE PIPE INSTALLATION.
4. ANY SEWER OR STORM DRAIN EXPOSED OR PARTIALLY EXPOSED IN A TUNNEL EXCAVATION SHALL BE SUPPORTED WITH A WALL, CASE 2.
5. IF BEDDING IS REMOVED FROM THE EXISTING PIPE THAT WILL REMAIN IN PLACE, THE PIPE SHALL BE EMBEDDED WITH CONCRETE AT NO EXTRA COST TO THE AGENCY.
6. UNLESS OTHERWISE INDICATED, CONCRETE SHALL BE CLASS 265-C-14 (450-C-2000).



City of Norwalk
12700 Norwalk Blvd
Norwalk, CA 90651
(562) 929-5700

BLANKET PROTECTION FOR PIPES

Approved _____

Date _____

REVISIONS

BY

DATE

STD. PLAN NUMBER

City Engineer _____

225-1

Sheet 1 of 1

**CITY OF NORWALK
DESIGN STANDARDS FOR SEWER FACILITIES**

**SECTION 3
TABLE OF CONTENTS**

<u>Section</u>	<u>Page</u>
1 Standard Requirements	1
2 Calculations Required.....	1
3 Size.....	1
4 Minimum and Maximum Slope	2
5 Design Flow Criteria.....	2
6 Standard Location and Alignment	3
7 Easements	4
8 Horizontal Curves.....	4
9 Stationing Procedure	4
10 Minimum Depth	4
11 Sewer Pipe Material.....	4
12 Manholes.....	5
12.1 Manhole Requirements.....	5
12.2 Manhole Type and Size	5
12.3 Manhole Covers.....	5
12.4 Manhole Linings and Coatings.....	6
12.5 Manhole Warning Signs.....	6
13 Clean-Outs	7
14 Separation Between Sewer and Water and Recycled Water Lines.....	7
15 House Laterals.....	7
16 Private Sewer System	8
17 Sewer Pump Station.....	8
17.1 General.....	8
17.2 Standards and Codes	9
17.3 Design Flows and Heads	9
17.4 Drivers	10
17.5 Wet Well.....	10
17.6 Emergency Storage	11
17.7 Dry Well.....	12
17.8 Standby Equipment.....	12
17.9 Pumps	13
17.10 Valves and Gates	15
17.11 Magnetic Flow Meters.....	19
17.12 Piping and Support System.....	20
17.13 Ancillary Equipment	22

TABLE OF CONTENTS
(Continued)

17.14	Electrical Equipment	29
17.15	Instrumentation and Controls	29
17.16	Supervisory Control and Data Acquisition (SCADA) System.....	33
17.17	Pressure Gauges.....	33
17.18	Pump Station Facility	34
17.19	Force Mains	34
17.20	Access Roads.....	35
17.21	Flood Control	35
17.22	Grading and Area Drainage	35
17.23	Soils Report	35
17.24	Surveying.....	35
17.25	Security.....	36
17.26	Water Supply System	36
17.27	Landscaping and Irrigation System.....	36
17.28	Construction.....	36
18	Inspection and Testing of Gravity Sewers	37
18.01	CCTV Inspection.....	37
18.02	Gravity Pipe Leakage Tests	38
18.03	Manhole Leakage Tests.....	38
18.04	Pipe Slope	39
19	Standard Sewer Notes	39

1. STANDARD REQUIREMENTS

The design and construction of all sanitary sewer system facilities to be operated and maintained by the City of Norwalk (City) shall be in accordance with these Design Criteria, and the latest edition of the following:

- The City of Norwalk Standard Plans, latest edition
- Standard Specifications for Public Works Construction (Greenbook),
- City of Norwalk Sewer System Management Plan,
- Statewide General Waste Discharge Requirements issued by the State Water Resources Control Board (Order No. 2006-0003)
- Requirements of the jurisdictional agencies where the work shall be performed
- Cal-OSHA requirements
- Los Angeles County Code

2. CALCULATIONS REQUIRED

Substantiating engineering calculations for design flows; pipe size; pump, motor, generator, wet well size and appurtenant equipment selection; structural design, and bedding/backfill designs shall accompany plan submittals to the City. All calculations shall be sealed and signed by a California registered professional engineer.

Where flow from a new development or redevelopment is added to an existing sewer, and where the new development or redevelopment is in an area of questionable sewer capacity, the existing sewer shall be flow monitored by a qualified company acceptable to City at the owner's cost for a minimum period of two weeks to verify the existing minimum, average, and peak dry weather flows. Two copies of the report shall be submitted to City in the City's required format. The City will determine the adequacy of capacity in all the facilities that will convey the subject flow.

3. SIZE

Gravity Sewers

The minimum size gravity sewer shall be 8-inches in diameter. The City of Norwalk may accept 6-inch diameter sewer lines if they must be used to provide adequate velocity. Sewer pipes shall not be constructed in a common trench with another utility. Adequate horizontal and vertical clearance shall be maintained in accordance with the State of California Department of Health Services "Criteria for the Separation of Water Mains and Sanitary Sewers".

Force Mains

The size of sewer force mains shall be determined during the design phase of the project based upon a comparative study of the construction cost and pumping costs for several alternative sizes. In no case shall a force main be less than 4 inches in diameter. The capacity of the force main shall be the design peak flow from the pump station. The minimum design velocity for a force main shall be 3.0 fps, and maximum allowed 5.0 fps. The discharge shall be into a manhole with a smooth flow transition to a gravity sewer. The force main terminal manhole shall be PVC lined.

All force mains shall have a tape attached to the pipe, identifying it as a sewer pipe.

4. MINIMUM AND MAXIMUM SLOPE

All sewers shall be designed and constructed to provide a mean velocity of not less than two (2) feet per second (fps) when flowing at the estimated average dry weather flow as calculated using Manning's formula with an "n" value of 0.013. Subject to the velocity limitations contained in this subsection, the slope shall be the maximum possible. Drop manholes shall not be used to reduce slopes to the minimum allowed.

The maximum allowable slope shall be the slope which generates a maximum flow velocity of 6 fps at the peak dry weather flow rate in vitrified clay pipe (VCP), and 5 fps in polyvinyl chloride pipe (PVC) as calculated using Manning's equation with an "n" value of 0.013.

The minimum slope on 6-inch sewer shall be 1% where the tributary area consists of less than 20 dwelling units (d.u.) or its flow equivalent.

Sewer pipes shall have a constant slope between the upstream and downstream manhole of each reach. Any reach of sewer containing sags of any amount shall be removed and reconstructed at the design slope at no cost to the City of Norwalk. The total cost of inspection, administration, and retesting of improperly installed sewers shall be borne by the contractor. The City of Norwalk shall not accept any sewer that does not meet these requirements. There shall be no exception to the proper slope requirement.

5. DESIGN FLOW CRITERIA

The average dry weather flow (Q_{adw}) rates for sewers shall be calculated using the unit flow factors contained in Table 1 and the tributary land uses.

Where appropriate, and when required by the City of Norwalk, the unit flow factors shall be evaluated by the design engineer based upon the specific land uses and densities proposed for new development or redevelopment.

The peak dry weather flow (Q_{pdw}) in cubic feet per second (cfs) shall be determined from Q_{adw} in cfs based upon the following equation:

$$Q_{pdw} = a \times Q_{adw}^b$$

Coefficients a and b shall be based upon a minimum of two weeks of flow monitoring where the tributary flow from a new development or redevelopment is added to an existing sewer. Where such information is not available, the following equation shall be used to determine the peak dry weather flow:

$$Q_{pdw} = 1.66 \times Q_{adw}^{0.92}$$

The determination of the peak dry weather flow shall also consider other factors such as pumped flows and large sewer flow generators.

The peak wet weather flow (Q_{pww}) shall be based upon recorded historical information where available and applicable. Otherwise, the peak wet weather flow shall be calculated utilizing the following formula:

$$Q_{pww}=1.35 \times Q_{pdw}$$

The peak dry weather flow rate in pipes 15-inches and smaller will be limited by the calculated depth to pipe diameter ratio of $d/D = 0.50$; and 18-inches and larger $d/D = 0.64$.

The pipe shall flow at a calculated depth to pipe diameter ratio of no more than 0.82 with the peak wet weather flow.

**Table 1
Unit Flow Factors**

Land Use Designation	Land Use	Unit Flow Factor	Units
LDR	Low Density Residential	1,870	gpd/ac
MDR	Medium Density Residential	2,080	gpd/ac
HDR	High Density Residential	3,330	gpd/ac
NC	Neighborhood Commercial	1,050	gpd/ac
PO	Professional Offices	1,050	gpd/ac
GC	General Commercial	1,050	gpd/ac
LI	Light Industrial	420	gpd/ac
HI	Heavy Industrial	840	gpd/ac
SCH	Schools	630	gpd/ac
PARK	Open Space	200	gpd/ac
INS	Institutional	1,050	gpd/ac

6. STANDARD LOCATION AND ALIGNMENT

In local residential and industrial streets, sewer pipes shall be located six (6) feet from the centerline of the street in the center of the driving lane. In major, primary, and secondary highways, the sewer pipes shall be located in the center of the driving lane nearest to the center of the street, but will **not** be located in the median strip or parking lanes. Any deviation from the standard location and alignment shall only be done with prior written approval of City.

All-weather access roads capable of accommodating all required construction and maintenance equipment shall be provided for all sewers not located within a paved street.

In curved streets, gravity sewer mains shall be constructed in straight reaches between manholes. In no case shall the outside of the sewer main be closer than four feet to the closest curb face.

A maximum horizontal separation between sewer and domestic water mains shall be achieved by aligning the sewer on the opposite side of the street centerline from the domestic water main.

7. EASEMENTS

Permanent easements, where absolutely necessary, shall be a minimum of 30 feet in width and shall be shown on the plans. Temporary easements for construction only shall be shown on the plans including date of termination.

Where applicable, permanent public utility easements shall be recorded on the tract map, and granted to the City of Norwalk. When applicable, separate easement documents for both permanent and temporary easements shall be prepared (on standard title company forms) and presented to the City of Norwalk for acceptance and recording.

The City will accept sewers on private streets upon granting of a public utility easement to the City.

The City will not accept any easement for sewers if said easement cannot be accessed with a flush truck through its entire length.

Sewer easement shall be located entirely on one lot. Building set backs shall be minimum 20 feet from easement edges.

8. HORIZONTAL CURVES

Gravity sewer mains shall **not** be designed with horizontal curves.

9. STATIONING PROCEDURE

Centerline stations for sewers shall be shown on the plans. Sewer centerline stations shall be independent of street stationing. All manholes shall be numbered and the numbers noted on the plans (example: MH #1). Sewer stations shall start at 1+00.00 at the downstream point of connection and increase upstream to the last manhole on a sewer line. Intersecting sewer lines will be independently stationing from their downstream point of connection and increase upstream to the last manhole. Each line shall be independently labeled for identification as "Sewer Line A", "Sewer Line B", etc.

10. MINIMUM DEPTH

Minimum depth of cover from finish street grade to the top of sewer main pipe shall be seven (7) feet unless otherwise approved by the City Engineer.

Unless dictated otherwise by the elevation of an existing mainline sewer, house connections shall be installed so that there is a minimum of six (6) feet of cover from the top of the curb to the top of the pipe at the curb line. At the time of construction, stakes shall be provided for location and grade of each house connection.

11. SEWER PIPE MATERIAL

All gravity sewers shall be either extra strength VCP or SDR-26 PVC. Imperfections of any kind **shall not be allowed** in either type of pipe. Sewer service laterals shall be of the same material as the main line sewer-either extra strength VCP or SDR-26 PVC pipe.

All sewer force mains carrying domestic sewage and operating at pressures of less than 40 psi shall be PVC pipe meeting AWWA C-900 Class 200 pipe standards. All other force mains shall be 40 mil ceramic epoxy-lined and properly coated ductile iron pipe.

All gravity sewers in industrially zoned areas or major commercial areas shall be extra strength VCP.

12. MANHOLES

12.1 Manhole Requirements

A manhole will be required at:

- A. The upstream end of each line, change in grade or size, change in alignment, or intersection of two (2) or more sewers
- B. At a lateral when it is the same size as the main line sewer
- C. Along the sewer main at maximum distances of 300 feet for 6-inch sewers, 400 feet for 8-inch and larger sewers.

12.2 Manhole Type and Size

Manholes shall be precast reinforced concrete with eccentric cone in accordance with City of City of Norwalk Standard Plans S-100 through S-104. The summit manholes shall be precast reinforced concrete with concentric cone. Minimum diameter shall be 48 inches and larger sizes shall be required as shown in the following table:

Manhole Sizes

Sewer Main (inches)	Maximum Branch Size (inches)	Manhole Size (inches)	Frame and Cover (inches)
8-15	10	48	30
18-21	12	60	30
24-36	15	72	36

Extra Depth Requirements

Depth of Cover (feet)	Manhole Size (inches)
6 or less	60
6.5-12	48
12.5-16	60
16.5 and greater	72

All manholes shall be provided with at least all-weather vehicular access.

Manholes constructed at a Los Angeles County Sanitation District (LACSD) facility must be in accordance with the LACSD standard drawings.

12.3 Manhole Covers

Manhole covers shall be cast iron in accordance with City of Norwalk Standard Plan S-103. The size shall be determined from the table in Section 12.2. Manhole covers shall have one (1) vent hole and one (1) pick hole.

Temporary covers may be necessary in new streets. In these cases, the manhole shaft shall be left six (6) inches, minimum, below subgrade. A heavy metal plate acceptable to the City Engineer shall be provided to cover the manhole opening. Cleats shall be provided in at least four (4) points for the underside of the temporary cover to prevent the temporary cover from moving. These cleats shall extend a minimum of 3 inches from the cover plate and shall be welded to the plate.

Plywood shall be cut to the shape and size of the manhole base and placed in the base before the temporary cover is placed on the shaft. At the completion of final paving, each manhole shall be raised to final grade by the installation of grade rings, as necessary, and the installation of the permanent frame and cover assembly. Plywood shall be removed from the manhole when the permanent frame and cover assembly is installed.

12.4 Manhole Linings and Coatings

The following manholes will be lined with PVC:

- A. If the sewer has a slope of 5% or greater, all the manholes on the sewer
- B. Where there is a change in slope, from steep to flat, of 3% or greater, the manhole at the grade change and the next manhole upstream
- C. All force main terminal manholes
- E. As required by the City Engineer

The approved PVC liners are Ameron T-Lock liner and Koroseal Lok-Rib by B. F. Goodrich. Refer to Orange County Sanitation District Standard Drawing S-065 for PVC liner details.

All other manholes shall be lined with Sancon 100 or equal.

Outer surfaces of precast and cast-in-place manholes and structures shall be given two coats of bituminous dampproofing applied at a rate in accordance with manufacturer's instructions. In no case shall the total bituminous coating be less than 16 mil dry film thickness.

12.5 Manhole Warning Signs

The entrance to every new manhole shall be fitted with a plastic warning sign, located 12 inches below the top of the manhole frame, with the inscription "CAUTION – VENTILATE BEFORE ENTERING" in letters no smaller than ½-inch in height. The sign shall be attached to the concrete with four Type 316 stainless steel screws and anchors. Signs shall be manufactured by W.H. Brady Company; Seton Nameplate Corporation, or equal.

13. CLEAN-OUTS

Use of clean-outs as shown in the City of Norwalk Standard Plan S-105 shall be limited to the following instances unless approved otherwise by the City Engineer.

- A. At the upstream end of short sections of sewer, less than 250 feet which will be extended within three months.
- B. All sewer laterals at the property owner's side of the property line.
- C. Special instances such as on a sewer lateral to a single family residential lot where the dwelling unit is set back more than 100 feet from the property line, where there is a large slope up to the building pad from the property line and a grade change in the lateral is necessary, or where the sewer lateral enters the rear of the lot from a public right-of-way.
- D. On a lateral where the overflow level of the lowest wastewater fixture in the building is below the rim elevation of the uphill sewer manhole on the main line. In this situation the rim elevation of the clean-out installed at the property line shall be at least 6-inches below the overflow elevation of the lowest wastewater fixture on the lateral. A backflow prevention device is required on the lateral.

14. SEPARATION BETWEEN SEWER AND WATER AND RECYCLED WATER LINES

Horizontal and vertical separation between sewer mains and water and reclaimed water lines will be provided in accordance with the State of California Department of Health Services "Criteria for Separation of Water Mains and Sanitary Sewers".

15. HOUSE LATERALS

Sewer laterals shall be constructed to the property line from the main line and there shall be a separate lateral for each individually owned building.

Sewer laterals shall have a minimum 4-inch diameter. Apartment and condominium developments shall have at least one (1) 6-inch, or one (1) 8-inch lateral to serve each building in the development which contains more than one dwelling unit.

Laterals shall have a minimum slope of 2%.

Laterals shall be located at the center of each lot and shall be constructed perpendicular or radial to the property line. If the developer must install a sewer lateral at a location other than in the center of a lot due to unavoidable interference, the improvement plans shall indicate the centerline station of the lateral on the sewer and show the distance from a property corner. In no case shall a sewer lateral be located within 12 feet of a property corner. Refer to Section 13 and City of Norwalk Standard Plan S-105 for cleanouts on laterals.

Permanent visible monuments shall be set to indicate the locations of all sewer laterals. A 1½-inch high "S" shall be chiseled in face of curb where the lateral crosses under the curb or

on the edge of alleys without curbs. The method used shall be indicated on the plans. A licensed Civil Engineer or Land Surveyor shall verify locations of set monuments.

The sewer laterals from the main to the building, and inside the buildings are governed by the Uniform Plumbing Code and enforced by the City of Norwalk Building Official.

The sewer house laterals between the main sewer line and the property being served by the lateral are owned by the property owner, and **NOT** by the City of Norwalk.

16. PRIVATE SEWER SYSTEMS

All plans submitted for review and approval for commercial/industrial developments and residential developments with private sewer systems shall show the plans, profiles, and details of private onsite sewer systems. The private sewer systems shall be planned, designed, and constructed to the same standards as the City of Norwalk's public sewer system.

Sewer pump stations on private property shall be designed, administered, and inspected by the City of Norwalk or its designated representative. The private property owner shall be responsible for all costs associated with such design, administration, and inspection.

Each site shall be reviewed on an individual basis at the time plans are submitted. As a condition of service, the City of Norwalk shall require the property owner to enter into an agreement with the City acknowledging that the onsite facilities are private and shall be properly maintained according to industry standards and the State Water Resources Control Board's General Waste Discharge Requirements 2006-0003. The property owner shall further agree to hold the City harmless from any claims on the design, maintenance and operation of the private onsite systems. The property owner shall prepare an Overflow Emergency Response Plan and a Preventative Maintenance Plan as required by Order No. 2006-0003 and submit it to the City for approval.

All onsite sewer collection systems for commercial/industrial developments shall be private and shall be owned, operated and maintained by the property owner up to the City's sewer line in a public street. A cleanout or manhole shall be installed at the owner's side of the property line in accordance with City of Norwalk Standard Plans S-105 or S-100 through S-104. Each building onsite shall have an individual sewer lateral with a monitoring manhole. Monitoring manholes shall be installed in accordance with City criteria. All laterals from a building shall be connected to the main lateral upstream of the monitoring manhole for that building. No lateral connections are to be made downstream of the monitoring manhole.

17. SEWER PUMP STATIONS

17.1 General

All sewer pump stations conveying wastewater flows to the City of Norwalk's collection system, including those from private systems, shall be designed, administered, and inspected by the City of Norwalk, or its authorized representative.

The general criteria outlined herein shall apply to all sewer pump stations. The detailed design criteria for each sewer pump station will be established based upon the specific

conditions of each installation on a case-by-case basis and documented in a preliminary design report. Sewer pump stations shall be designed according to the following criteria:

Small sewer pump stations, where the peak wet weather flow can be pumped with a maximum of two duty pumps of 1,500 gpm capacity, shall be the stainless steel slide-rail submersible type with a minimum of two recessed impeller or enclosed screw impeller centrifugal pumps, permanent standby generator/automatic transfer switch, and peak flow storage.

Larger sewer pump stations shall be wet well-dry well type with permanent standby generator/automatic transfer switch, and peak flow storage. The City Engineer may allow slide rail submersible pump stations if project conditions warrant it. Pumps shall be either the recessed impeller, or enclosed screw impeller type, as determined by the City Engineer.

17.2 Standards and Codes

Sewer pump station designs shall be based upon current codes and standards, including but not limited to:

- Statewide General Waste Discharge Requirements covered under Order No. 2006-0003 issued by the State Water Resources Control Board on May 2, 2006
- Hydraulic Institute Standards
- California Administrative Code, Title 8, Article 59-Electrical Safety Orders
- National Electrical Code
- NFPA 820 Fire Protection in Wastewater Treatment Plant and Collection System Facilities
- Uniform Building Code
- Uniform Plumbing Code
- Uniform Mechanical Code
- California Fire Code
- National Electrical Manufacturers Association (NEMA)
- American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE)
- Standard Specifications for Public Works Construction
- Standard Plans for Public Works Construction
- OSHA Construction Safety Orders
- American Water Works Association
- American Society for Testing Materials

17.3 Design Flows and Heads

The pump stations shall be designed with a firm pumping capacity equaling the greater of:

- Tributary peak wet weather flow

- Flow that will provide a minimum velocity of 3 fps in the force main.

The standby pump will have the same capacity as the largest pump in the pump station.

In selecting the number, capacity, and operating characteristics of the pumps, the minimum, average, peak dry weather and peak wet weather flows, as well as wet well size and operating band shall be considered. The selected design shall minimize pump cycling and odors.

The total dynamic head (the sum of static lift, velocity head, and frictional losses in the station piping/ valving and force main) shall be determined for all operating conditions, wet well and discharge point water surface elevations, and a range of frictional coefficients (Hazen Williams C factor of 80 to 150).

Calculations documenting the determination of flows and head calculations shall be submitted along with pump curves and catalog information for the recommended pumps. Prior to final acceptance, the design engineer shall obtain written verification from the recommended pump manufacturers that the selected pumps shall perform throughout their operating range as designed at the published efficiencies free from cavitation, vibration, and premature failure.

17.4 Drivers

The pumps shall be driven by submersible or vertical dry pit immersible motors. All motors shall be Factory Mutual (FM) or Underwriters Laboratories, Inc. (UL) listed explosion proof type. Variable frequency drives shall not be allowed if the velocity in the force main drops to below 3 feet per second at any operating condition. Motors operated by variable frequency drives shall be inverter duty motors. Nameplate horsepower shall be at least 20 percent greater than the maximum brake horsepower needed within the operating range of the pump.

Variable frequency drives shall be provided with bypass contactors to operate the pumps at full speed.

Small pump stations may be designed with constant speed pumps. Larger pump stations may require the use of variable speed drives. The decision of the City Engineer of the City of Norwalk shall be final as to the type of driver to be used.

17.5 Wet Well

The wet well shall be sized to

- Provide adequate submergence
- Provide adequate net positive suction head available (NPSHA)
- Prevent frequent pump cycling
- Provide emergency storage

Submergence provided shall prevent formation of vortices and air being drawn into the pump. It shall also prevent cavitation. The minimum submergence shall be at least one foot greater than that required by the pump manufacturer.

The net positive suction head available shall be calculated as:

$$NPSHA=2.24 (P_a-P_v)-H_f\pm Z$$

Where

P_a = Atmospheric pressure (psia)

P_v = Vapor Pressure of liquid at the maximum expected temperature (use 0.59 psia)

H_f = Friction and minor losses between the wet well and the pump suction flange in feet of liquid

Z = Difference in elevation between the minimum wet well water level and pump datum, in feet. Use – when the pump datum is higher than the minimum wet well water level.

The minimum NPSHA shall be at least eight feet greater than the net positive suction head required (NPSHR) by the selected pump for the maximum expected flow through the pump.

The wet well shall be sized to provide the storage capacity which will preclude exceeding the following number of pump starts per hour:

Motor Horsepower	Maximum Starts per Hour	Minimum Cycling Time (Minutes)
Up to 20	6	10
25 to 50	4	15
60 to 75	3	20
100 and larger	2	30

Wet well bottom corners shall be sloped at 1:1 and slope to the suction pipe inlet to prevent the accumulation of debris on the wet well floor.

Influent pipe(s) shall not enter the wet well in a position which may cause pre-rotation of the flow into the pump suction, and turbulence in the wet well. The influent velocity into the wet well shall be no greater than three (3) feet per second.

For large pump stations, a partition wall(s) with sluice gates may be required to isolate a portion of the wet well for cleaning.

17.6 Emergency Storage

Emergency storage volume needed shall be evaluated for each pump station based upon the tributary area and expected ultimate wastewater flows. The minimum volume of emergency storage shall be 30 minutes of ultimate peak wet weather flow without surcharging the tributary collection system. The emergency storage volume may be provided in the wet well or in separate adjacent PVC lined overflow structure.

Where possible, the invert of the overflow structure shall be higher than the low water elevation of the pump station wet well to allow gravity drainage of the stored sewage to the wet well. There shall be a minimum of two connecting pipes between the overflow structure and the wet well. The connecting pipes shall be equipped with flap gates or Tide-Flex check valves on the wet well side. The floor of the overflow structure shall slope to the connecting pipes.

All overflow structures shall be equipped with an access hatch, and three 30-inch diameter maintenance access holes. A 2-1/2 inch hydrant water connection shall be provided near the overflow structure for use in periodic cleaning. The water supply to the hydrant water connection shall have a reduced pressure backflow preventer.

The higher of the maximum storage level and overflow level shall be set at least one foot (1-ft) lower than the top of the lowest manhole in the system, basement or p-trap of the plumbing fixture connected to the system.

17.7 Dry Well

The dry well shall meet the following criteria:

- A. Pumps shall be placed to provide minimum clear space of 3'-6"
- B. The lowest level of the pump station dry well shall have a sump pit with duplex explosion proof submersible pumps controlled by float switches. The sump pumps shall discharge to the wet well above the maximum water level.
- C. Discharge piping and the force main shall be placed in the dry well along the common wall with the wet well. The flow meter shall be placed inside the dry well sufficiently downstream of the last pump discharge pipe. If there is not sufficient room, the flow meter shall be placed in a below grade vault adjacent to the pump station structure.
- D. Catwalks or mezzanine levels shall be provided to access the flow meters, valves, and other portions of the equipment

17.8 Standby Equipment

All pump stations shall have standby equipment capable of handling the ultimate peak wet weather flow during a commercial power outage and/or with the largest unit out of service. This criterion shall apply to all essential electrical and mechanical equipment including pumps/motors, fans, air compressors and sump pumps.

There shall be a minimum of one **standby main sewage pump** equal in size to the largest duty main sewage pump in the station.

All pump stations shall have a **permanent standby generator** and an **automatic transfer switch** sized to start and operate all the sewage pumps needed for ultimate peak wet weather flow, sump pump, ventilation fans, lighting, instrumentation, controls, and telemetry, with voltage dip not to exceed 16% when starting any motor.

Generators shall be skid mounted, permanently anchored to the foundation, and housed in an acoustically insulated enclosure. Exhaust mufflers shall be super critical grade designed for noise level not to exceed the noise level allowed within each particular area.

Load banks sized for 80% of the generator capacity shall be provided. Load banks shall be mounted in the vicinity of the generator and protected with adequate enclosure suitable for the location as required by NEMA Standards.

Portable trailer mounted generators are acceptable only for locations where installation of a permanent skid-mounted generator is not feasible. When a portable trailer mounted generator is furnished, a power receptacle shall be permanently installed for quick connection.

Standby generators shall be furnished with battery chargers and block heaters.

The standby generator shall be a diesel or natural gas powered generator. The diesel fuel powered generators shall be equipped with a sub-base fuel tank sized for a minimum of 12 hours of continuous full load operation. Standby generators shall be units pre-approved by the South Coast Air Quality Management District.

17.9 Pumps

Pumps shall be the enclosed screw-centrifugal or recessed impeller type. Wet well-dry well pumps shall be suitable for operation when the dry well is flooded. Pumping capacity and head shall be considered in the selection of the type of pump for the wet well-dry well pump stations.

RECESSED IMPELLER CENTRIFUGAL PUMPS

Recessed impeller centrifugal pumps are designed to handle stringy materials and up to 25 times the amount of solids of conventional non-clog pumps. Some recessed impellers are labeled by pump manufacturers as torque-flow, bladeless and sphere flow. However, all of these pump models follow the general design of placing the impeller away from the fluid stream in order to pass stringy material without clogging the hydraulic passages.

The recommended minimum design criteria in the selection of recessed impeller centrifugal pumps are as follows:

- a. Pump impeller shall be selected with the best possible efficiency at design point or at the operating range of the pump.
- b. Maximum Speed 1750 rpm or shall not exceed the limitation as recommended by the Hydraulic Institute Standards for Centrifugal Pump application
- c. Materials of Construction
 - NiHard (minimum of 550 Brinnell hardness) or stainless steel Type 316 impeller with a removable wear plate of the same material as the impeller
 - NiHard (minimum of 550 Brinnell hardness) or cast iron casing, as determined by the City Engineer.
 - Stainless steel Type 316 shaft.
 - Tandem mechanical shaft seal system for the motor with two totally independent seal assemblies and Tungsten-Carbide seal faces

- d. Upper and Lower Bearings Radial and thrust bearings, grease lubricated with minimum B-10 bearing life of 60,000 hours for the operating range of the pump.
- e. Slide Away Coupling Foot mounted discharge elbow and adaptor, base plate, upper and lower rail supports, lifting yoke, and cable. All metal to metal interfaces where movement may occur shall be non-sparking.
- f. Electric Motor
- For wet well installation, motors shall be FM or UL listed, and be designed for Class I, Group D, Division 1 explosion proof.
 - NEMA Design B, heavy duty, high efficiency, non-overloading, with a nameplate horsepower at least 20% greater than the maximum horsepower required over the entire operating range.
 - Thermal overload protectors imbedded in the motor windings.
 - Dual moisture or leak sensors on the sealing chamber.
 - Motors shall be immersible capable of operating continuously in air without the use of sewage pumped for cooling if installed in a dry well.
 - Motors in damp locations and dry pits shall have two cycles of solid baked epoxy vacuum impregnation.
 - Motors shall be inverter duty if operated by variable frequency drives.
- g. Painting and Coating All non-stainless steel wetted surfaces in contact with wastewater shall be coated with coal tar epoxy enamel. Surface preparation shall be in accordance with SSPC-SP5, white metal blast cleaning. Prime coat to DFT=1.5 mils, Amercoat 71, Engard 422 or equal. Two or more coats, DFT=16 mils, Amercoat 78HB, Engard 464 or equal. Total system DFT=17.5 mils.
- All non-stainless steel external surfaces exposed to corrosive environment shall be coated and painted by amine-cured epoxy. Surface preparation shall be in accordance with alkaline cleaned, SSPC-SP1. Prime coat and finish coat shall be three or more, DFT=16 mils. Amercoat 395, Engard 480 or equal.

SCREW-CENTRIFUGAL PUMPS

The recommended minimum design criteria in the selection of the screw-centrifugal pumps are as follows:

- a. Pump impeller shall be selected with the best possible efficiency at design point or at the operating range of the pump.
- b. Maximum Speed
- 1750 rpm for pumps with discharge nozzle diameter up to 12-inch,
 - 1175 rpm for pumps with discharge nozzle diameter from 14 to 16-inch,
 - Shall not exceed the speed limitation recommended by the Hydraulic Institute Standards for Centrifugal Pumps.
 -

- c. Materials of Construction
 - Cast iron with Hi Chrome suction liner or 316 Stainless steel where available
 - Stainless steel Type 316 impeller and shaft.
 - Tandem mechanical shaft seal system for the motor with two totally independent seal assemblies and Tungsten-Carbide seal faces and silicone carbide lower seal
 - Minimum B-10 bearing life of 60,000 hours for the operating range of the pump.

- d. Electric Motor
 - For wet well installation, motors shall be FM or UL listed, and be designed for Class I, Group D, Division 1 explosion proof.
 - Thermal overload protectors imbedded in the motor windings.
 - Dual moisture or leak sensors on the sealing chamber.
 - Motors shall be NEMA Design B, heavy-duty, high efficiency with Class B or F insulation. Motors shall be non-overloading over the entire operating range, with a nameplate horsepower rating a minimum of 20 percent greater than the maximum horsepower required over the operating range.
 - Motors located in a damp environment and in a dry pit shall have 2 cycles of solid baked epoxy vacuum impregnation.
 - Motors shall be inverter duty if operated by variable frequency drives.
 - Motors shall be immersible, capable of operating continuously in air without the use of sewage pumped for cooling if installed in a dry well.

- e. Painting and Coating

All non-stainless steel wetted surfaces in contact with wastewater shall be coated with coal tar epoxy enamel. Surface preparation shall be in accordance with SSPC-SP5, white metal blast cleaning. Prime coat to DFT=1.5 mils, Amercoat 71, Engard 422 or equal. Two or more coats, DFT=16 mils, Amercoat 78HB, Engard 464 or equal. Total system DFT=17.5 mils.

Non-stainless steel external surface exposed to corrosive environment shall be coated and painted by amine cured epoxy. Surface preparation shall be in accordance with alkaline cleaned, SSPC-SP1. Prime coat and finish coat shall be three or more, DFT=16 mils. Amercoat 395, Engard 480 or equal.

17.10 Valves and Gates

Pump stations are equipped with various types of valves to prevent backflow, to isolate the equipment from the system, to control hydraulic surges and to drain the piping system during scheduled repair and maintenance. Each valve type differs in construction, materials, and operation depending on the service and application. All valves shall be suitable for wastewater service.

All interior surfaces of valves in contact with wastewater shall be epoxy coated. All valves 10-inch diameter and larger shall be provided with motor operators. Manually operated valves located more than six feet above the operating floor shall be equipped with chain wheel operators, with the chain extended 36 inches above finish floor. Motor operated

valves shall be provided with a manual hand wheel and manual push button station conveniently located below the valve, 5 feet above finished floor.

SLUICE GATES

Sluice gates shall be furnished with stainless steel frames and slides with embedded bronze seats, Type 316 stainless steel stem, and adjustable bronze bushed stem guides. Sluice gate manual operator shall have AWWA square nut; manual crank operator with floor stand and 2-speed gear reducer designed for opening time of not to exceed six minutes. Motor operator shall be provided when required by the City Engineer. Motor operated gates shall be designed for opening and closing times of one foot per minute.

Sluice gates shall be specified to be furnished with pattern wall thimbles to match the concrete thickness where the gate is to be installed.

Sluice gates shall be Rodney Hunt or approved equal.

ECCENTRIC PLUG VALVES

Non-lubricated eccentric plug valves shall be used as isolation valves. Valves shall have hard rubber (suitable for sewage service) resilient faced plugs and flanged ends. Valve seats and discs shall be stainless steel, Type 316. Bodies shall be semi-steel with raised seats. Valves shall be of the bolted bonnet design. Valve design shall allow repacking without removing the bonnet, and the packing shall be adjustable. All exposed nuts, bolts, springs, and washers shall be stainless steel, Type 316. Valves shall have permanently lubricated stainless steel bearings in the upper and lower plugstem journals.

Manual valves shall have a 2-inch square nut and lever actuator. Levers shall be field cut as required to be operable in their installed locations.

Eccentric plug valves may be used as pump control valve to alleviate hydraulic surges during normal starting and stopping of the pumps and as surge anticipators when required. These valves shall have hydraulic cylinder type operators with adjustable opening and closing times. Where the valve is used as a surge relief valve, emergency (upon failure of power supply) opening and closing times shall be specified.

Where space permits, all eccentric plug valves shall be installed with the shaft in the horizontal position. The orientation of the plug with respect to the fluid flow direction shall be as recommended by the manufacturer. The valve manufacturer's recommended installation instructions to prevent clogging of the valves during extended shutdown periods shall be strictly followed.

Valves shall have unobstructed port area of not less than 80-percent of total pipe area.

Eccentric plug valves shall be as manufactured by DeZurik Corporation, Keystone, Drum-Owens (Homestead), Milliken, or approved equal.

BALL VALVES

When required by the City Engineer, ball valves shall be used as pump control valves or for surge relief where flow characteristics require the valve trim that would match that of the ball valves.

Small diameter ball valves (3/4 inch to 2-1/2 inch diameter) shall be used as isolation shut off valves for potable or pump station water system.

All ball valves shall be in accordance with ANSI/AWWA C 507, with cast iron, ductile iron, cast steel, or stainless steel bodies, support legs or pads, flange ends, suitable for velocities up to 35 fps, temperatures up to 125 degrees F, and design pressures to 150, or 250 psi depending on the pressure range required by the system. The balls shall be cast iron, ductile iron, cast steel or stainless steel, shaft or trunion-mounted, with tight shut-off, single or double seat, and full bore. The valves shall be rubber, with stainless steel or monel shafts, and at least one thrust bearing. Except for stainless steel, ferrous surfaces of valves in contact with wastewater shall be minimum 16 mil epoxy-coated.

Ball valves shall be as manufactured by Jamesbury Corporation, Wm. Powell Company, or approved equal.

CHECK VALVES

Check valves shall be installed at each pump discharge piping to prevent backflow of wastewater which can cause severe damage to the pump impeller and shaft, and recirculation of flows back to the wet well in stations with multiple pumps. Valves shall comply with the requirements of AWWA C508.

Check valves shall be the outside lever and weight type swing check valves. They shall be installed in the horizontal position to prevent accumulation of solids downstream of the valve which can cause clogging of the valves.

Swing check valves shall have a flanged cover piece to provide access to the disc. The valve body, cover, and disk shall be cast iron conforming to ASTM A 126 Grade B. Disc facing shall be rubber conforming to ASTM D2000 2BG715. Seat ring and clapper arm shall be cast bronze conforming to ASTM B584 Alloy C 84400. Clapper arm shall be clamped to the hinge pin with stainless steel screws and jam nuts.

Ferrous surfaces of valves in contact with wastewater shall be minimum 16 mil epoxy coated.

Swing check valves shall be as manufactured by APCO (Valve and Primer Corp.), Kennedy, Crane Company, or approved equal.

SEWAGE SURGE RELIEF VALVES

The necessity for surge control devices shall be determined through a complete surge analysis of the pumping system. Although surge tanks are the most reliable means to alleviate damaging surges in the force mains, sewage surge relief valves may be required by the system. Where surge relief valves are required, the valve shall be installed in the discharge piping manifold and connected to the wet well. The valve shall be designed to

open immediately when the system pressure exceeds the load setting of the counterweights and shall close slowly at an adjustable speed upon return of system pressure to normal.

The surge relief valve body shall be constructed of a heavy cast-iron or cast steel disc having rubber seating face; and corrosion resistant shaft and cushion chamber.

Sewage surge relief valves shall be as manufactured by APCO (Valve and Primer Corporation), Empire Specialty Co., Inc, or approved equal.

SEWAGE AIR RELEASE VALVES

Sewage air release valves shall **not** be used unless **absolutely necessary**. The design engineer shall endeavor to provide a system which rises continuously from the pump station to the discharge point. Where absolutely necessary, sewage air release valves shall be provided to vent accumulating air or gas during pumping operation or entrapped during initial operation. Air release valves shall be installed at high points of the piping systems. Entrapped air or gases can reduce pumping capacity of the pumping system or cause corrosion of the piping system with gases containing hydrogen sulfide. The air or gas vent located at the pump station plant shall be discharged to the wet well.

The valves shall have long float stems and bodies to minimize clogging. Each valve shall be furnished with backwashing accessories to remove solids accumulated inside the valve. Water supply and connection shall be provided with appropriate reduced pressure backflow preventer near the valve for backwashing.

Sewage air release valves shall be as manufactured by APCO (Valve and Primer Corporation), Val-Matic (Valve Manufacturing Corporation), or approved equal.

REDUCED PRESSURE BACKFLOW PREVENTERS

Backflow preventers shall be installed where utility water or plant water is connected to the potable water supply to prevent contamination of the potable water system. The valves shall be designed to operate on the reduced pressure principle. The valve assembly shall consist of two spring loaded check valves, automatic differential pressure relief valve, drain valves and shut-off valves. The body materials shall be bronze for working pressure of not less than 150 psi, with bronze and stainless steel trim. Drain lines and air gaps shall be provided. All backflow preventers shall be registered with County Health Department and must be approved for use in the City of Norwalk.

Backflow prevention valves shall be as manufactured by Cla-Val Company or Febco.

PUMP CONTROL VALVES

The pump control valves shall be installed in the pump discharge pipe to minimize hydraulic surges during normal starting, stopping and emergency stopping of the pump during power failure or emergency stopping caused by system failures.

The pump control valve shall be operated by hydraulic (oil) or pneumatic operator with a reserve accumulator system as back-up energy source to operate the valve during power failure. The pump control system shall be designed to start the pump against a closed valve. Once the pump has developed pressure, the pump control valve shall start to open until it

reaches the maximum open position. Stopping sequence shall cause the pump control valve to close. Complete closure of the valve shall signal the pump to stop. Emergency power failure shall cause the pump control valve to close.

The normal opening, closing, and emergency closing times of the pump control valve shall be independently adjustable. Range of adjustment shall be determined based upon the results of surge analysis. Final settings of closing and opening times shall be verified during pump station start-up. Settings shall be included in the Operation and Maintenance Manual.

17.11 Magnetic Flow Meters

Each pump station shall be equipped with metering equipment to measure outlet flow and provide flow signal for recording, totalizing and control of other equipment. In addition, the flow meter shall be used for pump field performance test to measure capacity and efficiency. The meter shall be magnetic type suitable for wastewater service.

Magnetic flow meters shall be provided at the pump station discharge manifold capable of metering the full range of flow with an accuracy of ± 1 percent of flow rate from 10 to 100 percent of scale. At a velocity below 1 foot per second, the accuracy shall be ± 0.1 percent of the full scale. The meter shall be installed in the piping manifold with minimum straight approach of 4 and 2 diameters upstream and downstream respectively.

The size of the flow meter shall be selected to cover the entire velocity range expected.

The magnetic flow meter shall utilize characterized electromagnetic induction to produce a voltage linearly proportional to the average flow rate. The metering system shall consist of a sensor with field coils, transmitter and interconnecting cables to make a complete operating flow metering system. The meter shall be bipolar pulsed dc type with continuous automatic zeroing.

The sensor shall be flange tube with non-conductive liner. The tube shall be constructed of Type 316 stainless steel with carbon steel flanges AWWA Class D if the coils are external to the tube. The sensor rating shall be NEMA 4, and capable of withstanding accidental submergence in water to a depth of 30 feet for 48 hours. The meter shall include a positive zero feature for periods when the metering portion of the process pipe is not full.

Liner material shall be neoprene, except for liquids which may deposit non-conductive coatings, which shall have Teflon linings. The specific conductivity of the liquid shall not preclude meter operation.

Grounding electrodes shall be of the same material as the sensing electrodes and shall be furnished mounted on each end of all flanges.

Transmitters shall be provided for either local or remote indication as required for each particular project. Remote transmitters shall be NEMA-4X enclosures suitable for wall mounting. Transmitters shall produce a 4-20 ma-dc output signal into a minimum load of 800 ohms linear flow, and a scaled pulse for totalization. All electrical equipment furnished with the magnetic flow meter shall carry a UL label.

Magnetic flow meters shall be Tigermag manufactured by Sparling Instrument Co., Inc. or approved equal.

The accuracy of the installed meters shall be verified by wet well level, volume, and time measurements prior to startup testing. Meters not meeting the accuracy requirements shall be replaced at no cost to the City.

17.12 Piping and Support System

The pump station piping and supports system consists of the gravity sewer, pump suction and discharge piping, station water or utility water piping, potable water piping, air piping, sanitary drainage piping, fire protection, and sprinkler piping systems. Most of these piping systems are adequately specified by the applicable sections of the Uniform Plumbing Code, Fire Codes and the Standard Specifications for Public Works Construction.

This Section includes special requirements and recommended practices involving the design of piping and the support system.

A. Piping

1. Materials

Ductile iron pipe shall be used in pump station main piping, consisting of suction and discharge piping, discharge manifolds, force mains as specified in Section 11, and water piping 2-1/2 inch and larger. Ductile iron pipe shall be in accordance with SSPWC, and ANSI A21.51 (AWWA C151). All internal surfaces of ductile iron pipe and fittings for water service shall be cement mortar lined and sealed with bituminous coating in conformance with AWWA C104. Internal surfaces of ductile iron pipe for sewer service shall be lined with polyurethane or glass.

Unless otherwise specified, all joints of ductile iron pipe shall be 125-lb flange in conformance with ANSI B16.1, B16.2 and A21.10 (AWWA C110). Sleeve or mechanical grooved type couplings shall be provided at the suction and discharge piping of the pump, and between the magnetic flow meter and the isolation valves to allow removal of the equipment for maintenance.

All bolts shall be of Type 316 stainless steel with bronze nuts or cap screws of copper—copper silicon alloy, conforming to ASTM B 98, Alloy C 65100, designation H04, or alloy C 65500, designation H04. Where anaerobic conditions are anticipated, Type 304 stainless steel shall be used.

Mechanical-type couplings (grooved) shall be used between the valves, pumps, meters and the piping system for the above ground installation. Groove type couplings shall not be used for underground installation. Mechanical-type couplings shall be cast as manufactured by Victaulic, Gustin Bacon or equal.

Sleeve-type couplings shall be of fabricated steel with steel bolts and with sizes to fit outside diameter of the ductile iron pipe. The middle ring shall not be less than 1/4-inch in thickness and minimum of 5 to 7-inches long. The follower shall be single piece contoured mill section welded and cold-expanded as required for the middle rings. The coupling shall be equipped

with a gasket to make the joint water-tight. The coupling shall be factory epoxy coated suitable for sewer service.

Sleeve couplings shall be installed in the piping systems subject to differential settlement as in the force main that connects the piping inside the pump station building to the yard piping. Two sets of sleeve couplings shall be installed with spacing as recommended by the coupling manufacturer.

Where sleeve couplings are installed in the piping system subject to thrust loads, the coupling shall be provided with restraining bolts. The bolts shall be designed in conformance with AWWA Design Manual M-11.

Sleeve-type couplings shall be as manufactured by Rockwell (Smith-Blair), or Dresser.

2. Suction Pipe

The suction pipe shall meet the following requirements:

- a. The suction pipe shall be sized to provide a minimum velocity of 3 feet per second, and a maximum velocity of 6 feet per second throughout the operational range of the pump.
- b. The inlet velocity to the eye of the impeller shall meet the pump manufacturer's requirements. The largest suction inlet available shall be selected.
- c. The suction pipe shall be flat, or slope up to the pump to eliminate the formation of air pockets. Reducers shall be the eccentric type, with flat top, matching the crown of the suction pipe.
- d. There shall be a straight length of pipe of minimum 5 diameters before the suction elbow to provide uniform flow to the pump.
- e. The inlet of the suction pipe shall be a long radius elbow with a flared bell. The inlet location shall be in accordance with the hydraulic institute standards. The velocity at the inlet to the suction bell shall be less than 2.5 feet per second.
- f. The suction line isolation valve shall be full port eccentric plug valve located close to the wet well wall, allowing sufficient room for removal of the bolts and servicing of the valve.
- g. A pressure gauge capable of measuring the entire range of pressures expected at the entrance to the pump shall be provided as close to the pump as possible. The gauge shall be installed on a ½ inch NPT pipe tap with a ball isolation valve and chem seal with snubber.

3. Discharge Pipe

The discharge pipe shall meet the following requirements:

- a. Discharge pipes shall be sized for a minimum velocity of 3 feet per second and a maximum velocity of 6 feet per second.
- b. The discharge nozzle for dry well installed pumps shall be directed towards the wet well and rotated 45 degrees from the suction line.
- c. The discharge pipe shall be connected to the discharge header at an angle of 45 degrees.
- d. A pressure gauge shall be installed on the discharge nozzle or as close to the pump as possible. The gauge shall be installed on a ½ inch NPT diameter pipe tap with a ball isolation valve and chem seal with snubber.
- e. A 1-1/2 inch diameter pipe with a ball isolation valve shall be installed between the top of the pump casing and the wet well.

B. Pipe Support Systems

All piping systems, including connections to equipment, shall be designed with proper support to prevent undue deflection, vibration, and stresses on piping, equipment, and structures resulting from normal operation and seismic events. All supports and parts thereof shall conform to the requirements of ANSI/ASME B 31.1 except as specified herein.

Ductile iron pipe of any size shall have a minimum of 2 supports per straight length not to exceed 10 feet of unsupported span. One of the supports shall be located at the joint.

Where the piping system is subject to thrust as a result of hydraulic surge or actuation of a surge relief valve, a thrust support or a hydraulic shock suppressor shall be provided.

All pipe supports shall be galvanized after fabrication. Pipe supports shall have a minimum of 1-1/2 inch thick dry pack between the floor and the support base.

17.13 Ancillary Equipment

Each pump station shall be designed to provide the necessary ancillary equipment to support the operation and maintenance of the facility. This equipment is essential to the operation and maintenance of the system. Ancillary equipment or systems that are discussed herein are commonly required equipment or systems in a wet well-dry well pump station.

A. Hoisting Equipment

Most pump stations are located underground to provide adequate submergence for the pumps. Therefore, the substructure and superstructure need to be designed to allow for installation and removal of equipment. The provisions for access hatches, lifting hooks, hoisting systems, roll-up doors and other means to provide ease of maintenance shall be carefully investigated and designed as required.

For wet well-dry well type pump stations equipped with either vertical non-clog dry well pumps or submersible pumps mounted in the dry well, a traveling bridge crane shall be provided. The bridge crane shall be designed to have a travel and span capable of reaching the pumps, meters and valves. Where the valves are located in areas which are inaccessible to the crane, lifting eyes attached to the ceiling shall be provided directly above the valve or equipment. A floor access hatch shall be provided when required.

Bridge cranes shall have a manually or electrically operated hoist, trolley and end trucks, all designed to conform to all applicable codes, and OSHA safety requirements. Where possible, monorail hoists may be used in lieu of the traveling bridge cranes.

Where space permits, a hoisting system shall be designed to allow direct transfer of equipment from the dry well to a flat bed truck. Traffic into the pump station building shall be given special consideration and necessary turning radius shall be provided.

B. HVAC and Odor Control Systems

A typical pump station consists of the wet well, dry well or the pump room, motor room, electrical and control room, and ancillary equipment rooms. Each of these rooms requires different methods and degrees of heating, air conditioning and ventilation to provide the following conditions:

1. A safe and comfortable working environment for personnel;
2. To facilitate proper operation of equipment;
3. To minimize corrosion of equipment and building materials; and
4. To prevent accumulation of explosive and hazardous gases.

The heating, ventilating and air conditioning (HVAC) system and odor control systems shall be designed and controlled as one integrated system. Air distribution, building enclosures, wall penetrations, wind directions, building occupancies, and area classifications shall be carefully investigated. HVAC systems shall be designed in accordance with the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE), State of California Energy Conservation Standards Title 24 and the NFPA 820 Fire Protection in Wastewater Treatment Plants.

Equipment conveying corrosives shall be of material that is corrosion resistant, such as fiberglass reinforced plastic (FRP) or stainless steel. If FRP ductwork is used, it

shall have flame spread of less than 25, and a smoke propagation of less than 400, and be of fire resistant rating. Air containing flammable and explosive vapors or toxic gases shall not be recirculated.

Air conditioning may be required for pump stations with VFD's.

Depending upon classification, motors for supply and exhaust fans shall be explosion proof, totally enclosed fan cooled (TEFC) units.

C. Wet Well Ventilation

The pump station wet well receives and stores wastewater before it is pumped to the force main. Corrosive and hazardous gases are normally present in the wet well. These gases can become a safety hazard to operating personnel or can cause corrosion of building materials and equipment in the wet well. In order to minimize accumulation of gases inside the wet well, the wet well shall be flushed with fresh air by an adequately sized ventilation system.

Ventilation rates shall be in accordance with:

1. NFPA 820 Fire Protection in Wastewater Treatment Plants
2. Occupational Health and Safety Act (OSHA)

Pump station wet wells are classified into two types depending on their use;

1. Accessible Wet Well.
2. Sealed Wet Well.

ACCESSIBLE WET WELLS

Wet wells which require routine access for maintenance shall be provided with adequate fresh air ventilation in order to provide a safe environment for maintenance personnel, to prevent accumulation of explosive gases, and to minimize corrosion of equipment installed in the wet well. The internal surfaces of the wet well shall be lined with PVC for corrosion protection.

The following minimum ventilation criteria shall be used:

1. All accessible wet wells shall be provided with continuous ventilation of a minimum of 15 air changes per hour.
2. Where intermittent ventilation is required, the ventilation rate shall be at least 30 air changes per hour.

All electrical equipment and fans inside the accessible wet well shall be explosion-proof designed and manufactured for Class I, Division I, Group D. All other design criteria shall be in accordance with NFPA 820 Fire Protection in Wastewater Treatment Plants.

SEALED WET WELLS

Sealed wet wells shall be designed to be low maintenance. The internal surfaces of the wet well shall be lined with PVC for corrosion protection.

Sealed wet wells shall be provided with static vents to accommodate air displacement due to the rise and fall of the water level in the wet well. The vent shall have a minimum diameter of one-half the diameter of the incoming sewer. The vent pipe shall be connected to the nearest sewer maintenance hole where possible. Where the pump station is located away from any sensitive area, vent pipe could be extended above the roof line with a minimum of 15 feet from any window or fresh air inlet.

All electrical equipment inside the sealed wet well shall be classified in accordance with NFPA 820, Fire Protection in Wastewater Treatment and Collection System Facilities.

C. Odor Control

The need for odor control systems shall be evaluated for each project. Such evaluation shall be based on a life cycle cost of 20 years with major consideration of the power and chemical consumption, first cost, maintenance cost, reliability and efficiency of the system.

Wet well odor control shall consist of a water misting system. Activated carbon scrubbers, chemical scrubbers utilizing a chemical absorption process for removal of odors, or chemical or air injection systems may be necessary for odor control in other parts of a pump station.

For the chemical scrubbing systems, foul air from the plant process facility is introduced into the scrubber vessel with an atomized mist chemical solution containing sodium hypochlorite. Oxidation of odorous compounds occurs upon contact with the scrubbing mist, and is removed in the condensate. The scrubber shall be designed to remove a minimum of 99 percent of hydrogen sulfide in the foul stream. Acceptable chemical scrubber manufacturers are Calvert Environmental Co., San Diego, CA, and Quad Environmental Technologies, Corp., Highland Park, IL.

All odor control and ventilation equipment shall be suitable for continuous exposure to saturated hydrogen sulfide gas, sodium hypochlorite mist, sodium hydroxide mist and sulfuric acid. Electrical equipment shall have explosion proof enclosure designed for hazardous condition for Class 1, Division 1, locations.

For air pollution permits, consult South Coast Air Quality Management District.

D. Dry Well Ventilation

The pump station dry well is normally located adjacent to the wet well to house the pumps, valves, meters and other ancillary equipment.

The dry well and equipment rooms shall be designed for a ventilation rate of at least 15 air changes per hour or ventilation rate equivalent to cool internal heat load from

the equipment whichever is greater or not greater than 60 air changes per hour. The sensible cooling ventilation rate shall be calculated as follows:

$$H = \text{cfm} \times 1.09 \times t$$

where:

H = Internal heat gain from equipment, Btu per hour

cfm = Air flow, cu ft per minute

t = Change in internal temperature, degree F. Use 10 degrees F for change in internal temperature as adequate for sensible cooling.

Where a pump station is equipped with variable frequency drives (VFD), the VFD shall be installed in an air conditioned room with 90 percent efficient outside air filters. VFD units are inherently sensitive to temperature, dust, moisture and other corrosive elements in the air. For constant speed pump stations, the motor control center (MCC) and control rooms shall be equipped with a ventilation fan and 90 percent efficient outside air filters. Pump and equipment room air inlets shall be provided with 30 percent efficient outside air filters. All air filters shall be provided with differential pressure gages to indicate when the filters are clogged, and flow detection devices connected to alarm signaling systems to indicate ventilation system failure.

E. Fire Protection System

Where required by NFPA or by the Fire Department, necessary fire protection systems shall be provided in required areas. For areas housing electrical equipment such as the motor control centers, computer rooms and control rooms, an approved type fire protection systems shall be provided.

F. Gas Detection System

Combustible gas detection equipment shall be provided in the wet well and dry well, and other areas where hazardous gas may be present, to record, activate alarms and/or to operate the ventilation system. The stationary gas detection system shall be capable of measuring concentrations of hydrogen sulfide, methane gas and/or petroleum vapor in the air.

The combustible gas sensor shall be DET-TRONICS Point Watch Infrared Hydrocarbon Gas Detector Model PIR9400 or approved equal. The sensor shall be mounted in the wet well such that it can be removable externally for maintenance and calibration. It shall be connected to the programmable logic controller (PLC). The PLC shall monitor the combustible gas sensor through the 4-20 mA signal which shall be proportional to combustible gas concentrations of zero to 100%. Two (2) PLC adjustable alarms shall be provided. 6% lower explosion level (LEL) shall indicate a warning, and 10% LEL shall indicate an alarm. Alarm beacons shall be installed in the dry well and the electrical room.

An entry control station shall be provided in a NEMA 4X stainless steel enclosure with vandal resistant hardware, and amber and green NEMA 4 vandal resistant pilot lights at or near each entry. They shall indicate a potentially dangerous condition in

the pump station based on the loss of the ventilation system, combustible gas, loss of positive pressure in the electrical room, or loss of negative pressure in the dry well. Both lights shall be dark if there is a component or power failure. A lamp test switch shall be provided, which will activate all entry control system lights for ten seconds for testing.

G. Compressed Air System

For pump stations using surge tanks, air operated valves; pneumatic tools for maintenance purposes, and instrument air, a compressed air system shall be provided. The air system for pneumatic tools shall consist of a lubricated type air compressor, receivers, air dryers and necessary piping system. For an instrument air system, a dedicated non-lubricated type air compressor, receiver, dryer and necessary piping system shall be provided. Where the valve operators are designed as pump control valves with the option to have controlled closing during power failure, the air receivers shall be sized to store compressed air capable of stroking the air cylinders three (3) complete cycles between the specified operating pressures during power outages.

H. Hydraulic System

Pump stations equipped with hydraulic operated valves shall be provided with hydraulic systems. The hydraulic system shall be either a package system supplied with each valve, or one complete package to operate multiple valves. The system shall consist of an oil reservoir, hydraulic pumps, control valves, hydraulic cylinders, limit switches and nitrogen gas-filled accumulators where the valves are required to operate during power outages. The valve opening and closing ranges shall be specified. Final field adjustments shall be made during pump station start-up.

I. Noise Control

The pump station shall be designed to meet the minimum noise level requirement of the Municipal Code of the local jurisdictional agency and the Occupational Safety and Health Administration (CAL/OSHA). All mechanical equipment and enclosures shall be acoustically treated to bring the noise level down to an acceptable limit. These attenuation devices may consist of exhaust mufflers, sound isolators or acoustical panels.

The pump stations shall be designed with noise levels not more than 5 dBA above the ambient noise level as measured at the property line of the nearest recipient (neighbor). A 24 hour noise level reading shall be measured at the pump station site as basis of the design.

In the absence of actual field measurements, the presumed ambient noise level shall be deemed to be the minimum ambient noise level for each zone as follows:

Sound Level "A" Decibels

(In this chart, daytime levels are to be used from 7:00 A.M. to 10:00 P.M. and nighttime levels from 10:00 P.M. to 7:00 A.M.)

Presumed Ambient Noise Level (dBA)

<u>Zone</u>	<u>Day</u>	<u>Night</u>
Residential	50	40
Public Facility, Commercial, Recreational	60	55
Industrial	65	65

At the boundary line between two zones, the presumed ambient noise level of the quieter zone shall be used.

J. Sump Pumps

A sump pit shall be provided in all underground structures such as dry wells, valve and electrical vaults. The sump pit shall be equipped with an adequately sized plus a standby unit, each having a minimum capacity of 50 gpm. Submersible sump pumps shall be used and controlled by a duplex type control, an automatic alternator and a float switch level control. The control system shall be designed to start the standby pump when the lead pump fails to start or when the water level continues to rise while the lead pump is operating. Both pumps are to stop at low water level.

Sump pump discharge pipe, fittings and valves shall be Schedule 80 PVC pipe, with minimum diameter of 2-inches. Each sump pump discharge pipe shall be provided with a swing check valve and isolation gate valve mounted above, both in the vertical position. A common discharge manifold shall terminate inside the wet well with the wall penetration above the highest surcharge elevation of the wet well.

K. Spare Parts

Pump station electro-mechanical equipment shall be provided with spare parts necessary to ensure continuous operation. The recommended spare parts shall be determined by the project design engineer with assistance from the City Engineer. The following shall be the minimum list of spare parts:

1. One set of pump and motor bearings for each size and model of pump unit.
2. One set of pump seals for each size and model of pump unit.
3. One set of pump and casing wear rings for each size and model of pump unit.
4. One set of pump and motor for each size and model of pumping unit.
5. One dozen fuses for each size of fuse.
6. A printed circuit board for each size and model of the variable frequency drives.

The spare parts shall be delivered to the project site no later than two (2) months prior to pump station start up. Spare parts required during testing and start-up shall be provided by the contractor.

17.14 Electrical Equipment

Electrical systems in the pump station consist of the power supply, power transformers, motor control centers, electric motors, electric variable speed drives, electrical wires and conduits, lighting fixtures, and other associated interface with the instrumentation and control systems.

A. Power Supply

The standard power supply to the pump station shall be 480 volts.

B. Motor Control Centers (MCC)

All motor starters and disconnect switches shall be installed in NEMA 3R Motor Control Centers (MCC). MCC rooms shall be located away from hazardous gas or other corrosive environments. Mechanical ventilation equipment shall be provided to maintain air circulation. All fresh air inlets to the MCC rooms shall be provided with 90 percent efficient inlet filters.

Where environmental problems exist in the pump station location, such as the presence of dust, moisture from sea water, or corrosive gas, the MCC room shall be designed to have adequate ventilation and provided with air cleaning equipment such as de-humidifiers, filters or carbon absorbers.

The MCC circuit breaker handles must be provided with safety interlocks.

C. Electrical Cables and Conduits

All electrical cables and conduits shall be designed in accordance with the NEMA Area Classification as required by the service area. All electrical conduits shall be PVC coated galvanized rigid metallic conduits or Schedule 80 PVC. All conduits shall be sized for 100 year service. Spare conduits may be required. The minimum size conduit shall be 1-inch.

17.15 Instrumentation and Controls

The instrumentation and control system shall be designed to operate the pump station to match the flow characteristics of the service area. The control system shall consist of the wet well level control, flow metering equipment, pressure gages and switches, fire alarms and gas detection instruments.

A. Pump Control System

1. General

The pump control panel (PCP) provides manual or automatic control of the pumps, as well as visual indication of the pump station status and alarm conditions. The following status and alarm indicators are to be provided as a minimum:

Status

Power ON Light
Running Time Meter
Pump RUN
HAND-OFF-AUTO selector switch
Lights Test Pushbutton
Seal Test Pushbutton (for submersible pumps)
Flow Rate Indicator
Wet Well Level Indicator
Discharge Pressure Indicators

Alarms

Wet Well HIGH LEVEL Alarm Light (from Ultrasonic)
Wet Well High High Level Alarm Light
Pump FAIL Alarm Light
Motor winding HIGH TEMP Alarm Light
Seal FAIL Alarm Light (for submersible pumps)
FAIL RESET pushbutton

The pump(s) may be controlled either manually, or automatically, depending upon the position of the pump hand-off-auto selector switch. In the MANUAL mode, a pump is started by placing its hand-off-auto selector switch in the HAND position. In this mode, the pump will run continuously unless shut down by the “fail” interlocks.

In the AUTO mode, the pump is started and stopped by the wet well level, as measured by an ultrasonic level sensor. In the “Auto” mode, the pump will run until called to stop by wet well level, unless shut down by the “fail” interlocks.

In the AUTO mode, the pumps will alternate operation automatically after each pump down cycle. If the operating pump should fail, the next pump in the call sequence will start and operate each time the wet well level calls for a pump operation until the failed condition is cleared.

The pump controller shall be a solid state device, which provides operational set points, high level alarm, outputs to start and stop the pumps, and perform pump alternation. The controller shall be a U.S. Filter D153U triplex controller/alternator or approved equal.

Float switches shall be installed in the wet well to provide an emergency high level alarm and a back up pump control system for the station. The emergency high level is to be indicated on the pump control panel and through the dialer. In this condition, the pump will operate for an adjustable time (0-5 minutes after emergency high level initiation), as set by the operator, and then will shut down. If the wet well level again rises to the emergency high level, the cycle will be repeated. The station can run indefinitely in this mode if necessary.

A “pump fail” alarm (for each pump) will be indicated at the pump control panel and transmitted to the automatic dialer system should any of the following conditions occur:

- Pump motor winding high temperature detected by sensors in the motor winding.
- Motor overload detected by the overload relay.

Each of the above “fail” conditions will lock-out the pump from operation. To reset a pump, the operator must visit the station, determine the cause of failure, correct the condition, and depress the “fail reset” pushbutton on the pump control panel.

For submersible pumps, a motor seal failure will also be detected and alarmed but will not stop pump operation.

2. Constant Speed Pump Control System

The operating sequence is applicable for multiple pump units installed in a smaller wet well. The pump station will start in sequence, pumps start and stop in the reverse order.

This sequence is recommended for the following reasons:

- a. To maintain uniform flow into the receiving system
- b. To provide smaller wet well storage volume and less number of motor starts per hour;
- c. To reduce sewer gas emission to the atmosphere by maintaining a constant water level in the wet well.

3. Variable Speed Drives.

Variable speed (matched-flow) pumps shall be used for the following conditions;

- a. Where more uniform discharge to the receiving system is required;
- b. Where there is not enough space in the pump station to accommodate installation of multiple smaller unit constant speed pumps;
- c. Where the wet well volume is limited to satisfy maximum starts per hour;
- d. Where sewer gas emissions to the atmosphere should be limited;

The minimum force main velocity requirements will not be violated due to operation with variable frequency drives.

The variable speed drive pumps shall be controlled as follows:

- a. When the wet well level reaches the first set level, the lead pump will start and ramp to a minimum preset speed. As the flow increases, the pump speed will increase in proportion to the increase in flow in order to maintain the level in the wet well until the pump has reached its maximum speed.

- b. When the inflow to the wet well exceeds the maximum capacity of the lead pump, the control system will then start the lag pump. The lag pump will increase its speed while the lead pump will decrease its speed up to the point where the two pumps share the flow, both at the same speed. As the inflow increases, the two pumps will increase their speeds in proportion to the inflow until the pumps have reached the maximum pump design flow, in the case of two pump combination.
- c. A drop in wet well level equivalent to a decrease in pump station inflow will signal the pumps to slow down until a preset speed is reached. Then the lag pump will stop, and the lead pump will increase its speed in proportion to the inflow.
- d. Further drop in wet well level will signal the lead pump to slow down until the minimum level is reached, at which level, the lead pump will stop.
- e. In the event that either the lead pump or the lag pump fails, the wet well level will rise and the standby pump will be started at the same time the failure alarm is activated. The standby pump will be provided with a variable speed drive.

For pump stations equipped with more than two variable speed pumps, the same operating sequence will be followed.

Under no conditions will a force main velocity of less than 3 feet per second shall be allowed.

The variable speed drives shall be provided with bypass contactors to operate the pump at full speed when the VFD is not available.

4. Float Level Switch

The float level switches shall be used to detect the low-low level cut-off and the high-high water level alarm, and as an auxiliary system in the event of failure of the ultrasonic level control systems. When the water level in the wet well reaches the high-high level, the control system (US Filter CBIT B300 single stage controller or approved equal) shall initiate a timed pump down using all pumps. The pump station shall be capable of operating indefinitely in this mode. The float switch shall be direct acting with a single pole mercury switch which activates when the longitudinal axis of the float is horizontal and de-actuates when the liquid level falls 1-inch below the actuation level. The switch shall be encapsulated in a chemical resistant polypropylene casing with a firmly bonded electrical cable protruding. The entire assembly shall be watertight and impact resistant designed and manufactured for Class 1 Division 1, Hazardous Conditions. Float switches shall be Roto-Float as manufactured by Anchor Scientific or approved equal.

Submersible dewatering sump pumps located in dry wells and valve structures shall be controlled by float switches. Float switches shall be designed and manufactured suitable for the area classification of the sump pit.

5. Ultrasonic Level Control

The pump station's primary level controller shall be the ultrasonic level sensor. The transducers shall be hermetically sealed, self cleaning with built-in temperature compensation 6° beam angle, suitable for installation in a sewage pump station wet well.

Ultrasonic measuring systems shall be the Hydroranger with XPS-15 transducer as manufactured by Milltronics, or approved equal.

17.16 Supervisory Control and Data Acquisition (SCADA) System

To monitor and control the operation of the pump station remotely at a central station, SCADA system equipment shall be provided. The system shall consist of the Remote Telemetry Unit (RTU) located in the pump station connected to a computer at a designated central station. The signal to the central station shall be transmitted over spread spectrum radio.

The pump operation is initiated by a motor starter mounted in the Motor Control Center (MCC). The starter is controlled by a signal from the level sensor or push buttons or by local control automation, such as the remote telemetry unit.

The Central Computer System displays information such as graphics and tables; gathers historical data such as trends of pumping cycles, measurement of flows and pressures, equipment running time, number of pump starts per hour; and can remotely control the operation of the pump stations.

17.17 Pressure Gauges

In a wet well-dry well type pump station, pressure gauges shall be installed at the suction and discharge sides of each pump to measure the pump total dynamic head. The pressure gauges shall be at least 4-1/2 inches in diameter. Where seal flushing water is required, a pressure gauge and low pressure switch shall be provided to activate an alarm in case of loss of flushing water. A low flow alarm switch may be used in lieu of the pressure switch.

A pressure switch shall be provided between the pump and the check valve or pump control valve to activate an alarm in the event of failure of the valve to open or accidental closure of any isolation valve located at the pump discharge piping. A micro-switch attached to the valve shaft may be provided in lieu of the pressure switch.

All, pressure gauges and switches installed in a piping system carrying solids bearing fluids such as wastewater, sump pump discharge or chemical lines shall be provided with diaphragm seals and snubbers where pulsating flow is expected. The assembly shall be provided with an isolation ball valve for maintenance. Diaphragm seal material shall be compatible with the pressure and fluid being handled.

In a submersible pump station, a pressure gauge/switch shall be installed in the discharge pipe of each pump in the valve vault upstream of the check valve. The discharge pressures shall be indicated in the pump control panel.

17.18 Pump Station Facility

The pump station facility includes the pump station structure, buildings, electrical substation or transformer, access roads and other appurtenant equipment inside the property. The facility design shall incorporate access road and security. The architectural treatment shall blend with the surrounding area.

A. Building Design and Materials of Construction

The pump station usually consists of an underground concrete structure to house the wet well and the dry well. Where the pump station requires an above ground structure to house the electrical room, generator room, office area and maintenance shop, the above ground building shall be designed in accordance with the requirements of the Uniform Building Code and California Fire Code. In general, all buildings shall be cast-in-place concrete or masonry block wall construction.

Wet Well and Dry Well. The wet well and dry well shall be reinforced cast-in-place concrete with wall thickness to withstand the earth and seismic loads, and shall be heavy enough to resist floatation without earth skin friction resisting the outside surfaces when the wet well is empty.

The size and configuration of the wet well shall be designed in accordance with Section 17.5. The bottom of the wet well shall be sloped to at least 15 degrees and corners grouted to prevent accumulation of solids during operation.

The dry well shall be designed to provide the following:

1. Minimum of 42-inch clear working clearance between pumps and piping;
2. Access doors, stairways and landing;
3. Access opening for equipment installation, maintenance and removal;
4. Hoisting equipment or lifting hooks;
5. Adequate ventilation
6. Fire protection equipment where required.

17.19 Force Mains

The minimum diameter for a force main shall be 4 inches. The capacity of the force main shall be the design peak flow from the pump station. The minimum design velocity for a force main shall be 3.0 fps, and maximum allowed 5.0 fps for PVC and 6.0 fps for ceramic epoxy lined DIP.

Force mains shall continuously rise from the pump station to the terminal manhole to eliminate the need for air and vacuum release valves.

For new pump stations with phased development of the tributary area, dual force mains may be required. The City Engineer shall select the number of force mains that will be installed at each pump station.

17.20 Access Roads

Pump stations shall be designed with access roads for construction, operation and maintenance of the equipment. The roads shall have turning radii suitable for the size of vehicle, or heavy hoisting equipment necessary for installation, removal or delivery of equipment or supplies into the station. Pavement sections shall be able to support the load of the heaviest anticipated equipment to be used in the station. Where monorail hoists or traveling cranes are required, adequate headroom clearance shall be provided or loading docks can be used to limit the height of the building.

17.21 Flood Control

The pump stations shall be designed with pad elevation one foot above the expected value 100-year flood elevation or the elevations indicated on the Flood Insurance Rate Maps in areas where detailed studies have been conducted, whichever is higher. Where available and current, information contained in the Orange County Public Facilities and Resources Department documents can be used to determine the expected value 100-year flood elevation.

All hydrologic and hydraulic calculations and design shall be in accordance with the standards of the jurisdictional flood control agency standards.

17.22 Grading and Area Drainage

The site drainage shall be designed to prevent standing water or the erosive effects of storm runoff. Pavement areas shall have a positive drain of up to 3%. Flow lines shall have a minimum of 1% slope. Underground structures shall not be constructed in partially cut and partially fill. Where this condition exists, the site shall be over-excavated and re-stabilized. The pump station shall be designed not to float where high groundwater exists.

17.23 Soils Report

A geotechnical investigation shall be conducted to determine the underground soils conditions. The Soils report shall show the foundation design criteria, corrosiveness of soils and ground water, groundwater elevations if it exists, and possible hazardous materials underground. Cleaning of such materials shall be addressed in the construction contract, or can be awarded to a separate hazardous materials contractor as determined by the City Engineer.

17.24 Surveying

The control bench marks shall be referenced from the County of Orange records. Where existing survey and reference plans are available, field check existing data with the current

datum and adjust all elevations to current datum where required.. The location of the pump station shall be tied to a nearby street and to an existing property line. Basis of survey bearings and control shall be given if the local coordinate are established.

17.25 Security

The pump station site shall be provided with an 8 foot high chain link fence or masonry block wall fence, as directed by the City Engineer. The fence or wall shall be designed in accordance with applicable American Public Works Association Standards. The entrance gate shall be secured with a padlock. Where the pump station has a superstructure housing the motor control center and the generator, the building shall be equipped with intrusion alarms. Where there is no superstructure, the NEMA 3R enclosure housing the motor control center shall be equipped with an intrusion alarm. The alarms shall be connected to a horn mounted in the building, a red beacon light mounted outside the building or above the NEMA 3R enclosure, and remoted via telemetry to the main control system.

17.26 Water Supply System

The pump station water supply system shall be provided for pump seal water system, irrigation system, rest rooms and housekeeping hose downs. A backflow preventer shall be installed in the pipeline connecting the hose bibs, seal water and irrigation system. Seal water systems shall utilize air gap tanks, and not be directly connected to the water supply system. All piping shall be designed in conformance with the Uniform Plumbing Code.

17.27 Landscaping and Irrigation System

Plants selected shall be drought resistant and approved by the City Engineer. Irrigation system equipment shall utilize water saving kits that are controlled by automatic timers.

17.28 Construction

The pump station shall be constructed in conformance with the specifications and drawings. The pump station construction shall be administered and inspected by the City of Norwalk, or its designated representative.

A. Shop Drawing Submittal and Shop Drawing Review

The Technical Specifications shall specify the requirements for shop drawing submittal and review process.

Once the project is awarded, shop drawing submittals shall be reviewed and accepted. The shop drawing review is one way to check compliance with the specifications. It also serves as a mechanism to get from the contractor the equipment as specified. Where a substitution to specified equipment is proposed to the construction project Design Engineer for review, the design project engineer shall be consulted.

B. Equipment Installation and Testing

The equipment installation and testing shall be specified in each equipment specification. Normally, the equipment shall be specified to be installed by the Contractor under the supervision of a certified factory representative. After installation, the Contractor shall conduct trial operation of the equipment, and make the necessary adjustments as required. When the equipment becomes operational, the Contractor shall test the equipment in the presence of the City's representative. The test shall include a performance test, simulating the manual and automatic operation, and checking of other components in compliance with the specifications. The test shall also include verification of all alarm functions. A continuous test using the actual process material shall be conducted without any Norwalk shutdown prior to final acceptance.

C. Operation and Maintenance Manuals

The Operation and Maintenance Manual shall be prepared by the construction contractor based upon the plans and specifications, and assistance from equipment manufacturers, to clearly describe how the pump station shall operate under normal and emergency conditions, and how it should be maintained.

Final payment shall not be made to the Contractor until the Operation and Maintenance Manual is approved by the City Engineer.

D. Operator Training

Each pump station has unique operational requirements and some have equipment that requires familiarization by the station operators. The Contractor shall provide training, through respective authorized equipment representatives, to the station operators as specified in the Contract Documents.

18. INSPECTION AND TESTING OF GRAVITY SEWERS

18.01 CCTV Inspection

The Contractor shall perform Closed Circuit Television inspection (CCTV) of all gravity sewers to determine alignment, grade and damaged or defective pipe in place; after the pipe has been installed, backfilled and compacted to grade, tested for leakage, manholes raised to grade, but prior to final resurfacing, from manhole to manhole. CCTV inspection shall be recorded on DVD, and recording procedures shall conform to the requirements of Standard Specifications for Public Works Construction Section 500-1.1.5, Television Inspection, except that the maximum speed shall be 15 feet per minute. The recording shall continuously display the following on-screen data: contract number, project name, date, time, distance (in feet) from the insertion manhole, and manhole identification codes.

Two copies of the recording shall be submitted to the City for approval within two days of the CCTV inspection. CCTV recording shall be performed first with the pipe dry, and then immediately following clean water flowing in the pipe to clearly indicate vertical misalignments, sags or other defects. Should CCTV inspection indicate any faulty installation of the pipe, repairs or replacement shall be made at the Contractor's expense by

a method approved by the City. Repaired and or replaced pipe and/or segments shall be retested and reinspected through CCTV at no additional cost to the City, until final acceptance is granted. Any sag greater than one (1) 0.25 inch in 100 feet of pipe reach shall be considered excessive, and the pipe shall be removed and reinstalled to proper grade.

18.02 Gravity Pipe Leakage Tests

All gravity sewer pipes and service laterals shall be tested for exfiltration and/or infiltration and deflection. All leakage tests shall be in conformance with Standard Specifications for Public Works Construction (SSPWC), "GREENBOOK" Section 306-1.4.1. Water exfiltration test shall be in conformance with SSPWC Section 306-1-4.2. Air pressure test shall be in conformance with SSPWC 306-1.4.4. All testing shall be performed in the presence of the City Inspector.

18.03 Manhole Leakage Tests

1. Leakage tests shall be made and observed by the City Inspector on each manhole. The test shall be the exfiltration test made as described below:
2. After the manhole has been assembled in place, all lifting holes and those exterior joints within 6 feet of the ground surface shall be filled and pointed with an approved non-shrinking mortar and the lining joints completed. The test shall be made prior to placing the shelf and invert. If the groundwater table has been allowed to rise above the bottom of the manhole, it shall be lowered for the duration of the test. All pipes and other openings into the manhole shall be suitably plugged and the plugs braced to prevent blow out.
3. The manhole shall then be filled with water to the top of the cone section. If the excavation has not been backfilled and observation indicates no visible leakage, that is, no water visibly moving down the surface of the manhole, the manhole may be considered to be satisfactorily water-tight. If the test, as described above is unsatisfactory as determined by the City Inspector, or if the manhole excavation has been backfilled, the test shall be continued. A period of time may be permitted if the Contractor so wishes, to allow for absorption. At the end of this period, the manhole shall be refilled at the top of the cone, if necessary and the measuring time of at least 8 hours begun. At the end of the test period, the manhole shall be refilled to the top of the cone, measuring the volume of water added. This amount shall be extrapolated to a 24-hour rate and the leakage determined on the basis of depth. The leakage for each manhole shall not exceed 1 gallon per vertical foot for a 24-hour period. If the manhole fails this requirement, but the leakage does not exceed 3 gallons per vertical foot per day, repairs by approved methods may be made as directed by the City to bring the leakage within the allowable rate of 1 gallon per foot per day. Leakage due to a defective section or joint or exceeding the 3 gallon per vertical foot per day shall be the cause for the rejection of the manhole. It shall be the Contractor's responsibility to uncover the manhole as necessary and to disassemble, reconstruct or replace it as directed by the City Engineer. The manhole shall then be retested and, if satisfactory, interior joints shall be filled and pointed.

4. No adjustment in the leakage allowance will be made for unknown causes such as leaking plugs, absorptions, etc., i.e., it will be assumed that all loss of water during the test is a result of leaks through the joints or through the concrete. Furthermore, the Contractor shall take all steps necessary to assure the City Inspector that the water table is below the bottom of the manhole throughout the test.
5. If the groundwater table is above the highest joint in the manhole, and if there is no leakage into the manhole as determined by the Engineer, such a test can be used to evaluate the water-tightness of the manhole. However, if the City Engineer is not satisfied, the Contractor shall lower the water table and carry out the test as described herein before.

18.04 Pipe Slope

All gravity sewer pipe shall be laid to the line and grade shown on the plans and per Section 306.1.2 of "GREENBOOK," with a maximum allowable tolerance of 0.125 inch at the invert. The Contractor shall continuously check the grade of the pipe being installed through the use of laser line.

19. STANDARD SEWER NOTES

The following notes must appear on the plans under Standard Sewer Notes.

- A. The sewer Contractor shall have a copy of the Project Plans and Specifications, as well as the City of Norwalk Design Standards for Sewer Facilities on the job site.
- B. The Contractor shall obtain a City and/or County permit for work done on public right-of-way.
- C. The City of Norwalk Engineering Office shall be called for inspection five (5) working days before start of work at (562) 929-5723.
- D. A pre-construction conference shall be held 48 hours before starting construction work.
- E. The Contractor shall expose all join points to the existing sewer system for verification of location and elevation before construction.
- F. Stations shown as 1+00.00 are sewer stations and are independent of all other stations.
- G. All laterals shall be staked by a surveyor before trenching and a complete set of cut sheets shall be supplied to the Contractor and the City Inspector.
- H. The City will inspect and test the sewer collection system and lateral sewers to the property clean-out. Privately owned sewer laterals from the property line clean-out will be inspected and tested by an approved contractor subject to the City of Norwalk Building Department approval.
- J. All sewer lines shall be balled in the presence of the City Inspector before completion of all leakage tests.

- K. Pipeline leakage tests shall be made in the presence of the City Inspector, only after backfill has been completed, compaction tests on backfill have been made, and the backfill has been accepted by the City Inspector.
- L. All sewer main lines shall be inspected using a closed circuit television system. Two recordings shall be made of the inspection on a DVD disk in accordance with Subsection 18.1 of the City of Norwalk Design Standards for Sewer Facilities. One recording shall inspect the system constructed with no flow, and one shall conduct the inspection 15 minutes after flowing water in the sewer.
- M. The Contractor shall provide the City of Norwalk with an as-built set of job prints with tie-down measurements for all laterals and manholes.
- N. Before final acceptance, the developer's engineer signing the plans shall furnish the City of Norwalk with a set of as-built mylars of the sewer plan.
- O. Curbs or pavement surfaces in alleys where sewer laterals exist shall be inscribed with an "S" indicating locations of all sewer laterals.
- P. Curbs shall be inscribed with ties for all manhole locations.

Add the following notes to plans having on-site work which will be dedicated to the City:

- Q. Trench backfill, on all sewer lines to be dedicated to the City, shall be compacted to a minimum of 90% relative density as determined by the five-layer test method (California 216G). Tests will be required every 300-feet of trench or as determined by the City Inspector. The developer shall submit written results of compaction testing to the City before acceptance. If in a dedicated street or a future street, compaction will be as required by governmental agency having jurisdiction, but no less than 90 percent relative compaction.

