

40

GENERAL SEWER SYSTEM DESIGN GOALS AND ACCEPTABLE PROCEDURES

40-1

GENERAL REQUIREMENTS

The design and construction of sanitary sewers in the City of Oxnard shall be in accordance with good engineering practice. The work shall comply with these design goals except where specific modifications have been approved by the Public Works Director in writing. The Director shall decide all questions of interpretation of " Good Engineering Practice ". All work on sewers and sewer service laterals outside of City right - of - way or sewer easements will be governed by the provisions of the Uniform Plumbing Code. Where City requirements and standards are more restrictive than U.P.C., the City requirements shall govern. Where purveyor's requirements are more restrictive than these standards, the purveyor's requirements shall govern.

40-2

SPECIFIC REQUIREMENTS

40-2.1

VELOCITY :

The velocity of flow (averaged over the wetted cross-section) for sanitary sewers flowing part-full or full should be between 2.0 f.p.s. and 10.0 f.p.s. The most commonly used formula is Manning's , which is :

$$V = \frac{1.486}{n} R^{2/3} S^{1/2} \text{ in f.p.s.}$$

Where n is roughness coefficient (see sect. 40-4)

R is hydraulic radius

S is energy gradient . For open channels, uniform flow condition it is equal to invert slope.

Discharge $Q = V A$ in c.f.s.

Where V = Velocity of flow in f.p.s.

A = Wetted cross-sectional area in sq.ft.

Also

$$Q \text{ g.p.m.} = (Qc.f.s.) \times (448.83)$$

40-2.2

FLOW DEPTH

a) For pipe 10" or less in diameter :


Design pipe so that peak flow rate will be carried when pipe is flowing at one-half (1/2) depth. Discharge at one-half depth equals one-half discharge when full and velocity equals velocity when full.

b) For pipe 12" and larger in diameter :

Design pipe so that peak flow rate will be carried when pipe is flowing at two-third (2/3) depth. Discharge at 2/3 depth equals 3/4 discharge when full and velocity equals 1.16 times velocity when full.

In no case gravity sewer lines will be designed to flow full or pressurize the system.

REV.	APPR. BY	DATE

 CITY OF Oxnard	GENERAL REQUIREMENTS - SEWER		STANDARD PLAN
	DRAWN: <u>SOHER</u> CKD. <u>Jay Patel</u> Public Works Department	APPR. BY <u>Benjamin J. Wong</u>	PLATE 40 SHEET OF

40-3 MINIMUM STREET SEWER SIZE

- 40-3.1 Minimum street sewer size shall be 8", except that 6" pipe may be used where all of the following conditions are met :
- (a) The minimum invert slope shall be 0.008.
 - (b) The length shall not exceed 200' with no possibility of future extension.
 - (c) No more than 10 house laterals contribute to the 6" diameter reach.
 - (d) Minimum cover of line shall be 5.0feet.

40-4 MINIMUM INVERT SLOPE :

Slope of sewer invert shall equal or exceed those set forth in the following table. For case of checking maximum flow capacity at these minimum slope is given for V.C.P. (n= 0.013) and P.V.C. (n=0.011) in c.f.s. and g.p.m.

TABLE - 1

PIPE DIAMETER	MINIMUM SEWER INVERT SLOPE	MAXIMUM FLOW CAPACITY IN c.f.s. (g.p.m.)	
		V.C.P.	P.V.C.
6"	0.0060	0.218 (97.7)	0.257 (115.5)
8"	0.0040	0.383 (171.8)	0.452 (203.0)
10"	0.0028	0.581 (260.6)	0.686 (308.0)
12"	0.0020	1.250 (561.0)	1.477 (663.0)
14"	0.0020	1.885 (846.2)	2.228 (1000.0)
15"	0.0016	2.027(909.8)	2.396 (1075.2)
16"	0.0016	2.408 (1080.6)	2.845 (1277.0)
18"	0.0016	3.296 (1479.4)	3.895 (1748.4)
20"	0.0012	3.781 (1696.8)	4.468 (2005.3)
21"	0.0012	4.306 (1932.6)	5.089 (2284.0)
24"	0.0012	6.148 (2759.2)	7.265 (3260.9)
27"	0.0012	8.416 (3777.4)	9.946 (4464.1)
30"	0.0012	11.146(5002.7)	13.173 (5912.3)
33"	0.0012	14.372(6450.4)	16.985 (7623.2)
36"	0.0012	18.125 (8135.0)	21.420 (9614.0)

REV. APPR. BY DATE



CITY OF

Exnard

GENERAL REQUIREMENTS - SEWER

DRAWN: SOHER CKD. *Jay Patel*

APPR. BY

Benjamin J. Woy
Public Works Department

STANDARD PLAN

PLATE 41

SHEET OF

Substandard slopes below the minimum slopes listed in table -1 may be used in order to avoid pumping only upon specific approval of the City Engineer . Such approval should be solicited well in advance of completion of design.

41

DESIGN CRITERIA

41-1

AVERAGE SEWAGE FLOW RATES

The average flow rate shall be determined by the developer's Engineer based on good engineering practice . Sewage flows shall be determined from the potential land use of the tributary area. Average sewage flow rates were developed for various land use and anticipated population density and given in term of G.P.M./Acre The currently accepted values are given in Table on Plate 44 These flow rates should be used for new development and determining effects of future land use per general plan. Acreage in table is gross acreage including roads , yards, parking , etc. For estimating the sewage flows for specific land use the flow rate value given in Table on Plate 43.

41-2

PEAK SEWAGE FLOW RATES

The rates between peak flow to average flow shall be determined by using following information

41-2.1

For average flow up to 1 C.F.S.
 (Peak flow , c.f.s.) = 2.0 × (Average flow , c.f.s.)^{0.822}

41-2.2

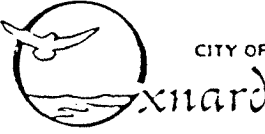
For average flow greater than 1 C.F.S.
 Peaking factor = 2.0 × (Average flow , c.f.s.)^{0.1}
 The graphical representation of above equations is given on plate 45 . This should be used in designing sewer system in the City of Oxnard.

REV.	APPR. BY	DATE

AVERAGE SEWAGE FLOW RATES

<u>TYPE OF DEVELOPMENT</u>	<u>GALLONS/PERSON/DAY</u>
Airport	15 per employee 4 per passenger
Factories.... No showers	20 per employee
With showers	30 per employee
Cafeteria - Add industrial waste and BOD load	
Offices	20 per employee
Stores (Not including food & laundry waste) 100	per 1000 Sq.Ft. space
(Per shift)	400 per toilet 15 per employee
Laundries (Coin operated).....	300 per machine
Per customer....	50 per wash
Service Station	1000 for first bay
.....	500 for each additional
.....	10 per car served
Swimming Pools	10 per employee
.....	4 per swimmer
With hot water.....	8 per swimmer
Theaters.....	5 per seat
Drive in	5 per space
Assembly & Dance Halls....	2 per seat or customer
Church - Small	4 per seat
Large & with kitchen	6 per seat
Bowling Alleys - Pool Parlors	75 per lane or table
Country Clubs	75 per member
Add	25 per non-member
Camps - Resort (Limited Plumbing)....	50 per person
(Luxury)... ..	120 per person
Youth & Recreation	50 per camper
Tent Campground (toilets only)	25 per camper
Central stations w/showers..	35 per camper
Vacation cottages.. ..	200 per cottage
Picnic Parks (toilets only)...	10 per person
(w/bath house & flush toilets)	15 per person
Camper & Travel Trailers	
Without hook up.. ..	50 per space
w/water and sewer hook up...	120 per space
Camps - Summer and Seasonal	50 per person
Construction	50 per person
Day Camps no meal served	20 per person

REV. APPR. BY DATE



CITY OF Oxnard

GENERAL REQUIREMENTS - SEWER

DRAWN: SOHER CKD. *Jay Patel* APPR. BY *Benjamin W. Wong*

Public Works Department

STANDARD PLAN

PLATE 43

SHEET 1 OF 2

AVERAGE SEWAGE FLOW RATES

<u>TYPE OF DEVELOPMENT</u>	<u>GALLONS/PERSON/DAY</u>
Mobil Home Parks (Average)	180 per space
(Delux)..	225 per space
Overnight & Travel Trailer	150 per space
Restaurants - Cafeterias..	15 per employee
Add Kitchen Waste..	7 per meal served
Add Garbage Grinder	1 per meal served
Toilet & Kitchen Waste	10 per customer
Day time Operation	70 per seat space
24-hr. Operation...	100 per seat space
Curb Service	50 per car
With Tavern, add...	2 per customer
Schools and Colleges	
Staff and Office...	20 per person
Elementry students.	15 per student
Intermediate and High	20 per student
Day Schools w/cafeteria only....	15 per student
w/showers	20 per student
Boarding school....	80 per student
College Dormitories	85 per student
Hospitals	100 per bed
.....	150 per patient & Staff
Institutions (Resident)	100 per person
Nursing homes	100 per person
Rest homes	100 per person
Convalescent	85 per bed
Hotel/Motels - No private bath	100 per room (2 persons)
with Private bath	150 per room (2 persons)
Apartment Buildings:	
Bachelor or Single	
Dwelling units (Studio)	100 per dwelling unit
1 bedroom dwelling unit	150 per dwelling unit
2 bedroom dwelling unit	200 per dwelling unit
3 bedroom dwelling unit	250 per dwelling unit


REV.	APPR. BY	DATE

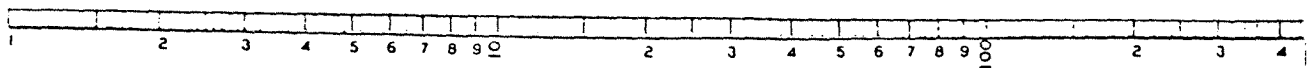
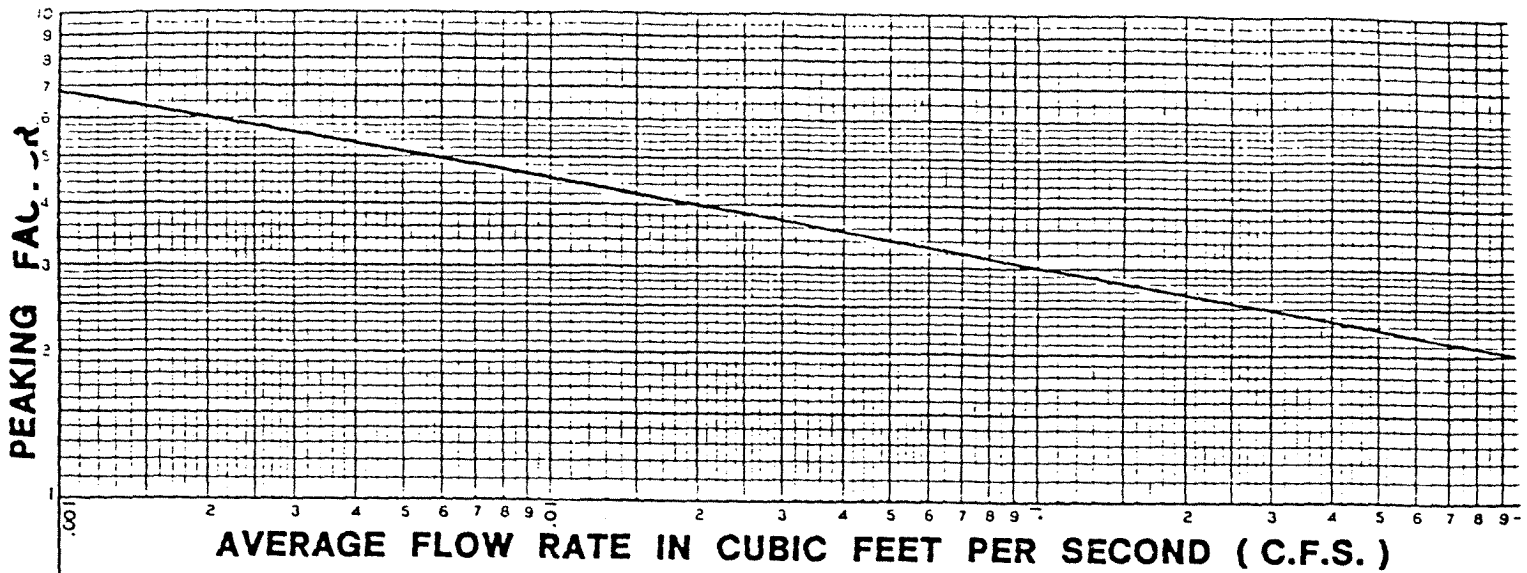
SEWAGE GENERATION FACTOR AND LAND USE

BASED ON CURRENT PLANNING DESIGNATION

SYMBOL	LAND USE DESCRIPTION	ASSUMED UNIT/ AC.	FLOW RATE		
			GPM / AC.	GPD / AC.	GPD/ UNIT
R1	SINGLE FAMILY RESIDENTIAL	4.0	0.853	1,228.32	307.1
R2	DUPLEX (MULTI FAMILY RESIDENTIAL)	11.2	1.751	2,521.44	225.2
R3	GARDEN APTS. (TRI & QUADPLEX)	20.0	3.143	4,525.92	226.3
R4	HIGH RISE RESIDENTIAL	38.3	6.000	8,640.00	225.6
RPD	RESIDENTIAL PLANNED DEVELOPMENT	11.2	1.751	2,521.44	225.2
MHP	MOBIL HOME PARK	4.0	----	612.00	153.0
		ASSUMED T.S.F./AC.			GPD/ T.S.F.
CO	COMMERCIAL OFFICE	10.0	2.083	3,000.00	300.0
C1	NEIGHBORHOOD COMMERCIAL	13.6	1.042	1,500.00	110.0
C2	GENERAL COMMERCIAL	19.8	1.042	1,500.00	76.0
C3	HEAVY COMMERCIAL	10.0	4.167	6,000.00	600.0
CB	CENTRAL BUSINESS DISTRICT	10.0	3.125	4,500.00	450.0
CPD	COMMERCIAL PLANNED DEVELOPMENT	11.0	2.083	3,000.00	300.0
TP	TRAILER PARK	13.0	1.391	2,003.00	153.0
M1	LIGHT MANUFACTURING	11.75	2.244	3,232.00	275.0
M2	HEAVY MANUFACTURING	19.38	2.065	2,974.00	153.5
M3	HEAVY MANUFACTURING AND GROUP HOUSING	19.38	2.065	2,974.00	153.5
MPD	MANUFACTURING PLANNED DEVELOPMENT	19.38	2.065	2,974.00	153.5
CR	COMMUNITY RESERVE	---	0.449	646.60	----
AO	AGRICULTURAL - OIL DRILLING	---	0.449	646.60	----

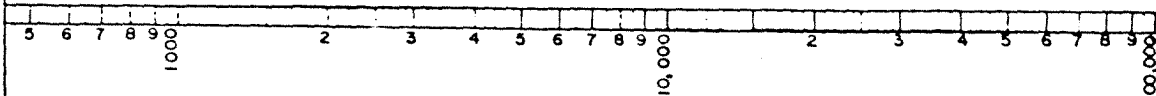
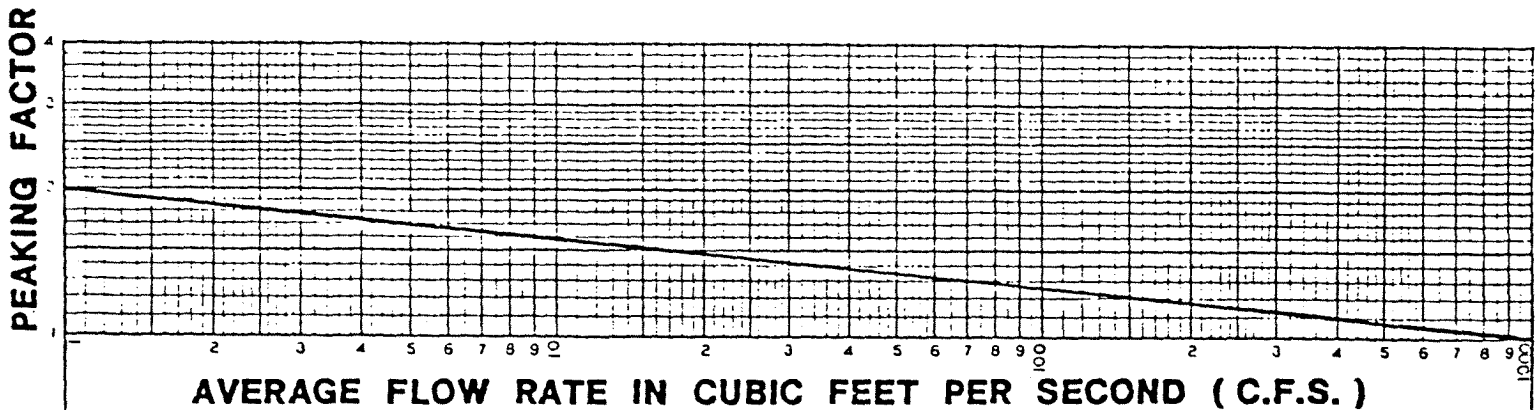
REV. APPR BY DATE

 CITY OF Oxnard	GENERAL REQUIREMENTS - SEWER		STANDARD PLAN
	DRAWN: SOHER CKD. <i>Jay Patel</i> APPR. BY <i>Benjamin J. Wong</i> Public Works Department		



$$(\text{PEAK FLOW, c.f.s.}) = 2.0 \times (\text{AVERAGE FLOW, c.f.s.})^{0.822}$$

A. FOR AVERAGE FLOW UP TO 1.0 C.F.S.



$$\text{PEAKING FACTOR} = 2.0 \times (\text{AVERAGE FLOW, c.f.s.})^{-0.10}$$

B. FOR AVERAGE FLOW GREATER THAN 1.0 C.F.S.



GENERAL REQUIREMENTS - SEWER

STANDARD PLAN

DRAWN: SOHER CKD. *Jay Patel*
Public Works Department

APPR. BY *Benjamin J. Wong*

PLATE **45**

SHEET OF

GENERAL REQUIREMENTS

42-1

SEWER CONNECTION PERMIT

No person shall connect any sewer system on private property, within or outside the City limits, to the City's Sewer System without first procuring a permit from the City of Oxnard to make such connection. Any person desiring to obtain such a permit shall submit to the City- Public Works Development section the following:

- 1) Completed application
- 2) Accurate estimate of quantity and quality of sewage flow to be discharged in the existing system.
- 3) Variation in sewage discharges on daily basis and seasonal basis.
- 4) Sewer connection fees as determined based on above facts.

42-2

ENCROACHMENT PERMIT

Oxnard City Code, Section 26, requires all persons to obtain an encroachment permit for all works within Public right-of-way within the City. Upon request by the contractor, the Public Works Department will issue the permit without charge on City project contracts.

42-3

PLANS AND CONSTRUCTION

Plans are required for the construction of main line sewers and service laterals. They shall conform to the City of Oxnard, Department of Public Works requirements. All design calcs. and field information pertaining to tie-in point shall be submitted for review and approval. All construction shall conform to the plans unless a change is approved in writing by the Public Works Director and noted on revision block.

△ All sewers shall be videotaped in VHS. Tapes to be delivered to the inspector at the time of taping.

42-4

CITY INSPECTION

All new construction shall be subject to inspection by the City - Public Works inspectors. Major projects are required to pay for such inspection as required by the Public Works department. Therefore, keep your field changes to a minimum by putting more efforts in the design phase and resolving utility conflicts at early stage.

42-5

OVERSIZING AND EXTRA DEPTH

Oversizing and extra depth of certain tract sewers may be required where such sewers can logically serve an upstream tributary area.

42-6

PROTECTION OF ACTIVE SEWERS

When new sewer lines are to be connected to an existing manhole which is in active use, the designer shall call for such protections as is necessary to prevent construction debris from being washed into the active sewers. Plugged inlets or other suitable protection shall be called for in the active manhole before beginning manhole modifications or tract sewer cleaning.

REV.	APPR. BY	DATE
△	<i>Lab</i>	7/17/89

43

SEWER LOCATION

43-1 STREETS AND ROADWAYS

Street sewer main shall be 5 feet north or west of and parallel to the centerline of undivided street (see plate 120). In divided roadways, it shall be 10 feet north or west of and parallel to the centerline of the roadways (see plate 121)*. Exception to these location requirements may be made only on approval of the Public Works Director.

* Sewer mains in public alleys shall be north or west of and parallel to centerline of the alleys per Plate 122.

43-2 EASEMENTS

43-2.1 Sewer easements shall be not less than 12 feet wide for 5' deep sewer line. The easement width shall be increased by one foot increment for every additional one foot depth . (i.e. for 10' deep sewer main , the easement width shall be 17' minimum).


43-2.2 Where easements follow common lot lines, the full easement width shall be on one lot, in such a manner that access to manholes will not be obstructed by walls, trees , or permanent improvements. Where this requirement can not be met without interfering with existing buildings, easements may straddle lot lines.

43-2.3 Deeds for easements shall provide for restrictions of permanent construction within easement to provide ingress and egress for maintenance.

43-3 FUTURE EXTENSIONS :

When an area outside the tract can be logically served by future extension of a tract sewer, the tract sewer shall extend to the tract boundary or to the end of a paved street or alley in a manner to facilitate the future extension without removing permanent facilities.

REV.	APPR. BY	DATE

 <p>CITY OF Xnard</p>	GENERAL REQUIREMENTS - SEWER		STANDARD PLAN
	DRAWN: SOHER CKD: <i>Jay Patel</i> Public Works Department	APPR. BY <i>Benjamin J. Worley</i>	PLATE 47

44

ALIGNMENT

44-1 Sewer mains shall be laid on a straight alignment and grade between manholes.

44-2 Minimum horizontal radius of curvature is as follows:

P.V.C. or V.C.P.	6" thru 12"	200' Radius
P.V.C. or V.C.P.	15" thru 24"	300' Radius
P.V.C. or V.C.P.	27" thru 36"	400' Radius
P.V.C. or V.C.P.	39" thru 42"	600' Radius

Minimum grade of horizontally curved sewer shall be at least same as straight sewers and preferably higher. Reverse curves are not permitted between manholes. All curved lines to be inspected by T.V. camera before acceptance by the City at Contractors expense.


44-3 Vertical curves may be used in combination with horizontal curves where invert slopes exceed 1.0% throughout the reach between the manholes.

44-4 The arithmetic sum of all horizontal and vertical deflection in curved sewers between adjacent manholes shall not exceed 60°.

44-5 **WATER-SEWER SEPARATION**

State Department of Health Requirements shall be met for Water-Sewer separation. (See Section 49)

REV.	APPR. BY	DATE

	GENERAL REQUIREMENTS - SEWER		STANDARD PLAN
	DRAWN: SOHER	CKD. <i>Jay Patel</i>	APPR. BY
	<i>Public Works Department</i>		<i>Benjamin J. Wong</i>
			SHEET OF

45 DEPTH OF SEWERS

45-1 BASIC REQUIREMENT

Sewers shall be installed at a depth which will provide suitable service to the properties connected and will allow subsequent installation of water lines in accordance with the Water Sewer Separation Ordinance with a minimum of special construction of the water lines other than joint spacing.

45-2 STANDARD DEPTHS

Compliance with Subsection 45-1 will usually be assured if :
The main sewer is located at a depth of 7' to top of pipe below the flow line of the existing or proposed gutter , or where no gutter exists , from the elevation of the outermost edge of the traveled way , and the house laterals are located either ,
(1) 6' to top of pipe below the ground surface at the property line, or
(2) at a depth below the ground surface at the property line that will provide for the construction of a straight run of private sewers at a slope of 0.02 from one foot below the surface at any point within the established building setback lines, excluding any areas steeper than 5 horizontally to one vertically , whichever depth is greater.

45-3 EXCEPTIONS

Designs not in accordance with Subsection 45-2 shall be submitted to the Engineer for approval together with evidence that it complies with subsection 45-1.

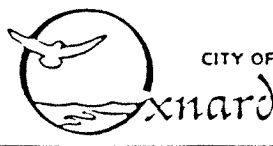
46 STRUCTURES

46-1 MANHOLES

46-1.1 LOCATIONS

- a. Manholes shall be located at all abrupt changes in alignment or grade and at all junctions.
- b. Manholes shall be located at least every 350 feet along lines smaller than 12" in diameter. Spacing of manholes on lines 15" in diameter and larger will usually be at 400 feet but may be extended subject to the approval of the Engineer.
- c. The center of upper most (last) manhole for sewers on "Thru" streets shall be a minimum of 8 feet upgrade from the sewer lateral of the last lot served (laterals to be perpendicular to sewer main). Manholes at the end of cul-de-sac streets shall end (depending on available space) 10' to 15' before the curb face at the end of the street.

REV.	APPR. BY	DATE



GENERAL REQUIREMENTS - SEWER

DRAWN: SOHER CKD. *Jay Patel*
Public Works Department

APPR. BY
Benjamin Y. Wong

STANDARD PLAN
PLATE 49
SHEET OF

46-1.2

DROP MANHOLES

Drop manholes shall be used wherever sewers enter manholes at more than 32 inches above the outlet elevation of the manhole. Vertical curves may be used to eliminate drop manholes in accordance with the requirements of section 44

46-1.3

DESIGN

Manholes shall be constructed generally in accordance with Plates 400, 408, 411 & 412.

Manhole designs, which, in the opinion of the Engineer, provide access to the sewers, a stable working platform and freedom from splash and turbulence, equivalent to or better than the design shown herein will be approved.

46-1.4

PROTECTION

Where new tract sewers are to be connected into a manhole which is in active use, the designer shall call for such protection as is necessary to prevent construction debris from being washed into the active sewers. Plugged inlets or other suitable protection shall be called for in the active manhole before beginning manhole modifications or tract sewer cleaning.

46-1.5

RIM ELEVATIONS

In paved areas, the manhole rim elevation shall match the finished grade. In other than paved areas or travelled ways, the height of the manhole rim will normally be 18" above the finished grade, high water mark, or above the top of future fill areas. In areas where the top of the manhole will need to be below the surface, such as fields that are being farmed, a water tight frame and cover will be required. The elevations shown for the tops of manholes on the design plans shall not relieve the contractor from making final adjustments to match street surfaces.

46-2

CLEANOUTS

46-2.1

REQUIREMENTS

Dead end sewers not over 200 feet in length shall terminate in standard manholes or cleanouts. Dead ends over 200 feet long shall terminate in standard manholes unless future extension of said dead end will include a manhole within 350 feet of the upper most manhole, in which case a temporary cleanout is permitted. Where dead ends are on a slope of 0.01 or greater, the length for use of a cleanout may be extended to 275 feet.

46-2.2

LOCATION

End structures shall be located Five (5) feet up grade from the down grade lot line of the last lot served unless greater length is necessary to serve the property. Cleanouts at the end of cul-de-sac streets shall end 10' to 15' (depending on available space) before the curb face at the end of the street.

46-2.3

DESIGN

Cleanouts shall be constructed generally in accordance with Plate 407.

REV.	APPR. BY	DATE



CITY OF

oxnard

GENERAL REQUIREMENTS - SEWER

DRAWN: SOHER

CHKD. *Jay Patel*

APPR. BY

Benjamin Young

STANDARD PLAN

PLATE 50

SHEET OF

Public Works Department

46-3 SERVICE LATERALS

46-3.1 REQUIREMENTS

Wherever it is known or can be reasonably assumed that a building sewer connection is required, a service lateral shall be shown on the plans and installed a minimum of 5' inside the property line as a part of the street sewer construction, prior to paving. Service laterals shall be installed whenever possible during construction of the sewer main using prefabricated fittings. All laterals shall be perpendicular to the sewer main, with the exception in cul-de-sac area and knuckle area. Sewer laterals shall not be located within driveways.

46-3.2 SIZE

Service laterals for single dwellings and small single stores or offices shall be 4" or larger provided the plumbing Code does not require the building sewer to be larger than 4". All other service laterals shall be 6" or larger and at least equal to the size of the building sewer.

46-3.3 DEPTH

Service laterals shall be at the minimum depths herein provided and in addition such depth shall be sufficient to provide a connection to any point on the lot within the established building setback lines (excluding any area steeper than 5 horizontally to one vertically) with a cover of one foot and a slope on not less than 0.02. Any exception to this requirement may be made only upon approval by the Director of Public Works.


46-3.4 FUTURE CONNECTIONS

Unused openings shall be tightly sealed and supported in a manner to facilitate their future location and use. Developer's engineer shall select appropriate service lateral locations and shall instruct contractor to locate laterals according to the design elevations and locations.

46-3.5

Sewers shall be designed to preclude the backflow of sewage into laterals except when this is economically infeasible. Backflow of sewage into laterals may occur in any building that has waste receiving inlets which are lower than the rim elevation of the next upstream manhole or other structure providing hydraulic relief. While the Plumbing Code provides for the customer to install check valves under certain conditions, the conditions stated do not cover all possibilities of backflow and check valves frequently fail to operate properly. Causes of sewer stoppage include the introduction of foreign objects into manholes, the buildup of grease in the sewer crown at locations where hydraulic jumps occur, high flow rates due to ground or surface water entering the sewer, difficulties while balling sewers, and undersized sewers.

REV.	APPR. BY	DATE

 CITY OF xnard	GENERAL REQUIREMENTS - SEWER		STANDARD PLAN
	DRAWN: SOHER CKD. <i>Jay Patel</i>	APPR. BY <i>Benjamin J. Wong</i>	PLATE 51
Public Works Department			SHEET OF

REV.	APPR. BY	DATE

46-3.6 CONNECTION TO CESSPOOLS OR SEPTIC TANKS
A person shall not connect or cause to be connected any cesspool seepage pit or septic tank to any main line sewer or to any service lateral leading thereto .

46-3.7 CURB MARKINGS
The location of all sewer service laterals shall be marked on the curb at completion of construction .

46-3.8 LATERAL ABANDONMENT
An inspection fee , of the amount approved by City Council , shall be collected and a written permit shall be issued. A public works inspector shall inspect the exposed sewer lateral to see that it has been plugged or capped to insure that any future infiltration shall be eliminated . The inspector shall determine whether the on-site lateral shall remain intact or be crushed in place or removed .

47 STRUCTURAL

47-1 ROADS
All structures and pipe placed under public roads shall be of sufficient strength to support with(an adequate factor of safety) the backfill , road surfacing and H-20 truck loading with impact.


47-2 OTHER PIPES AND STRUCTURES
Sewers under other pipes and structures shall be protected from damage and shall be constructed so as not to endanger the other pipe or structure . Minimum clearance between outside of pipes or between pipes and other structures is 6" unless approved by the Engineer.

47-3 FLEXIBLE JOINTS
Flexible joints which will allow for differential settlements or other movement of sewer pipe , sewer structures , adjacent pipe and adjacent structures shall be provided where sewer lines enter encasements , manholes or other structures. Flexible joints shall be within 4 feet of such structures.

47-4 STEEP GRADES
Sewers laid on grades steeper than 10%, which are not under pavements, shall be anchored in place and protected from erosion in a manner approved by the Engineer.

48 FORCE MAINS AND LIFT STATIONS

48-1 REQUIREMENTS
All sewage shall reach the system by gravity flow, in a fresh condition susceptible to conventional sewage treatment processes. Where extreme hardship conditions prevail, and a substantial area cannot be sewered by gravity sewers in accordance with these requirements, a sewage pumping station may be installed. No pumping facilities shall be incorporated in sewer plans without approval of the Engineer.

 <p>CITY OF Ukiah</p>	GENERAL REQUIREMENTS – SEWER		STANDARD PLAN
	DRAWN: SOHER CKD. <i>Jay Patel</i>	APPR. BY <i>Benjamin J. Wong</i>	PLATE 52
Public Works Department			

48-2

LIFT STATIONS DESIGN

Lift stations, where allowed, shall be of the dry-pit type incorporating the following features :

- a) Pumps or other devices shall be provided in duplicate, arranged for positive priming .
- b) Capacity shall be provided to handle ultimate peak flow from the tributary area with the largest pump out of service. Stage installation of pumps is allowed providing space is provided for future installations.
- c) Access shall be provided to site for removal and repair of equipment .
- d) A means for dewatering force mains shall be provided.
- e) An overflow to natural channel or storm drain shall be provided or an alternate method of protection approved by the Engineer.
- f) The lift station shall not be in CITY road right of way except with permission from the Engineer.

48-3

FORCE MAIN DESIGN

Force mains need not comply with the requirements for gravity sewers. Force mains shall be designed in accordance with good engineering practice.

49

WATER - SEWER SEPARATION - HEALTH REQUIREMENTS

See plate 53 sheet 2 thru 10.

REV. APPR. BY DATE



GENERAL REQUIREMENTS - SEWER

DRAWN: SOHER CKD. *Jay Patel*
Public Works Department

APPR. BY
Benjamin J. Wong

STANDARD PLAN

PLATE 53

SHEET 1 OF 10

CRITERIA FOR THE SEPARATION
OF WATER MAINS AND SANITARY SEWERS

A. PUBLIC HEALTH CONSIDERATIONS

Waterborne disease outbreaks attributed to the entry of sewage-contaminated groundwater into the distribution systems of public water supplies continue to be a problem in the United States. A community with its buried water mains in close proximity to sanitary sewers is vulnerable to waterborne disease outbreaks.

Sanitary sewers frequently leak and saturate the surrounding soil with sewage. This is caused primarily by structural failure of the sewer line, improperly constructed joints, and subsidence or upheaval of the soil encasing the conduit. A serious public health hazard exists when the water mains are depressurized and no pressure or negative pressures occur. The hazard is further compounded when, in the course of installing or repairing a water main, existing sewer lines are broken. Sewage spills into the excavation and, hence, enters into the water itself. Additionally, if a water main fails in close proximity to a sewer line, the resultant failure may disturb the bedding of the sewer line and cause it to fail. In the event of an earthquake or man-made disaster, simultaneous failure of both conduits often occurs.


The water supplier is responsible for the quality of the water delivered to consumers and must take all practical steps to minimize the hazard of sewage contamination to the public water supply. Protection of the quality of the water in the public water system is best achieved by the barrier provided by the physical separation of the water mains and sewer lines.

The document sets forth the construction criteria for the installation of water mains and sewer lines to prevent contamination of the public water supplies from nearby sanitary sewers.

B. BASIC SEPARATION STANDARDS

The "California Waterworks Standards" set forth the minimum separation requirements for water mains and sewer lines. These Standards, contained in Section 64630, Title 22, California Administrative Code, specify:

REV.	APPR. BY	DATE

 CITY OF San Bernardino	GENERAL REQUIREMENTS - SEWER		STANDARD PLAN
	DRAWN: SOHER	CHKD: <i>Jay Patel</i>	APPR. BY: <i>Benjamin Y. Wong</i>
Public Works Department			PLATE 53 SHEET 2 OF 10

- (a)
- (b)
- (c) (1) Parallel Construction: The horizontal distance between pressure water mains and sewer lines shall be at least 10 feet.
- (2) Perpendicular Construction (Crossing): Pressure water mains shall be at least one foot above sanitary sewer lines where these lines must cross.
- (d) Separation distances specified in (c) shall be measured from the nearest edges of the facilities.
- (e) (2) Common Trench: Water mains and sewer lines must not be installed in the same trench.

C. EXCEPTIONS TO BASIC SEPARATION STANDARDS


Local conditions, such as available space, limited slope, existing structures, etc., may create a situation where there is no alternative but to install water mains or sewer lines at a distance less than that required by the Basic Separation Standards. In such cases, alternative construction criteria as specified in Section B should be followed, subject to the special provisions in Section D.

Water mains and sewers of 24 inches diameter or greater may create special hazards because of the large volumes of flow. Therefore, installations of water mains and sewer lines 24 inches diameter or larger should be reviewed and approved by the health agency prior to construction.

D. SPECIAL PROVISIONS

1. The Basic Separation Standards are applicable under normal conditions for sewage collection lines and water distribution mains. More stringent requirements may be necessary if conditions, such as, higher groundwater exist.
2. Sewer lines shall not be installed within 25 feet horizontally of a low head (5 psi or less pressure) water main.
3. New water mains and sewers shall be pressure tested where the conduits are located ten feet apart or less.

REV. APPR BY DATE

 <p>CITY OF San Bernardino</p>	GENERAL REQUIREMENTS - SEWER		STANDARD PLAN
	DRAWN: <u>SCHER</u> CKD. <u>Jay Patel</u>	APPR. BY <u>Benjamin J. Wong</u>	PLATE 53
Public Works Department		SHEET 3 OF 10	

4. In the installation of water mains or sewer lines, measures should be taken to prevent or minimize disturbances of the existing line. Disturbance of the supporting base of this line could eventually result in failure of this existing pipeline.
5. Special consideration shall be given to the selection of pipe materials if corrosive conditions are likely to exist. These conditions may be due to soil type and/or the nature of the fluid conveyed in the conduit, such as septic sewage which produces corrosive hydrogen sulfide.
6. Sewer Force Mains
 - a. Sewer force mains shall not be installed within ten feet (horizontally) of a water main.
 - b. When a sewer force main must cross a water line, the crossing should be as close as practical to the perpendicular. The sewer force main should be at least one foot below the water line.
 - c. When a new sewer force main crosses under an existing water main, all portions of the sewer force main within ten feet (horizontally) of the water main shall be enclosed in a continuous sleeve.
 - d. When a new water main crosses over an existing sewer force main, the water main shall be constructed of pipe materials with a minimum rated working pressure of 200 psi or equivalent pressure rating.

E. ALTERNATE CRITERIA FOR CONSTRUCTION

The construction criteria for sewer lines or water mains where the Basic Separation Standards cannot be attained are shown in Figures 1 and 2. There are two situations encountered:

Case 1 -- New sewer line -- new or existing water main.

Case 2 -- New water main -- existing sewer line.

For Case 1, the alternate construction criteria apply to the sewer line.

For Case 2, the alternate construction criteria may apply to either or both the water main and sewer line.

REV.	APPR. BY	DATE



CITY OF

Oxnard

GENERAL REQUIREMENTS - SEWER

DRAWN: SOHER CKD *Jay Patel*
Public Works Department

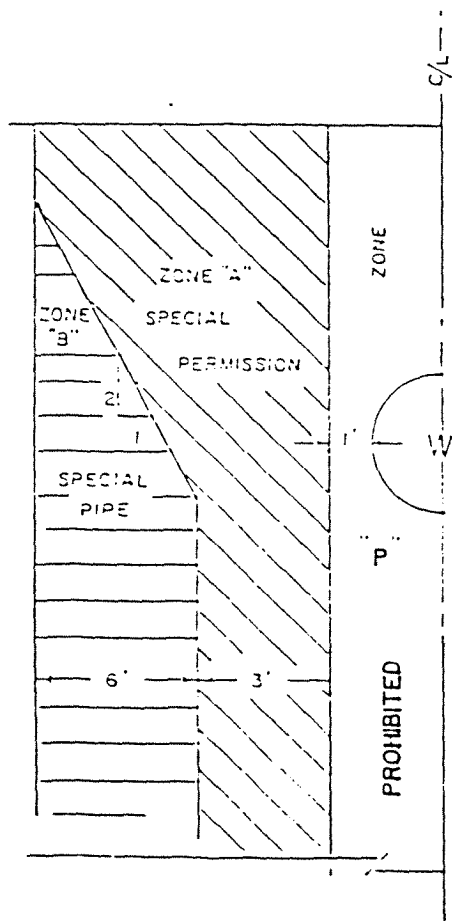
APPR. BY *Benjamin Y. Wong*

STANDARD PLAN
PLATE 53
SHEET 4 OF 10

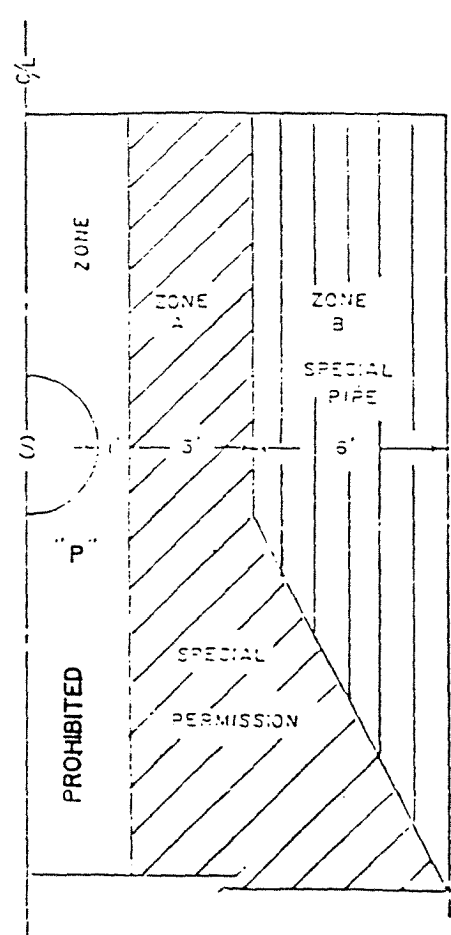
The construction criteria should apply to the house laterals that cross above a pressure water main but not to those house laterals that cross below a pressure water main.

FIGURE 1

PARALLEL CONSTRUCTION



CASE 1
NEW SEWER



CASE 2
NEW WATER MAIN

NOTE :

ZONES IDENTICAL ON EITHER SIDE OF CENTER LINES.

ZONES "P" IS A PROHIBITED ZONE SECTION 64630 (E) (2) CALIFORNIA ADMINISTRATIVE CODE , TITLE 22.

REV. APPR BY DATE



CITY OF

Oxnard

GENERAL REQUIREMENTS - SEWER

DRAWN: SOHER CKD. *Jay Patel*
Public Works Department

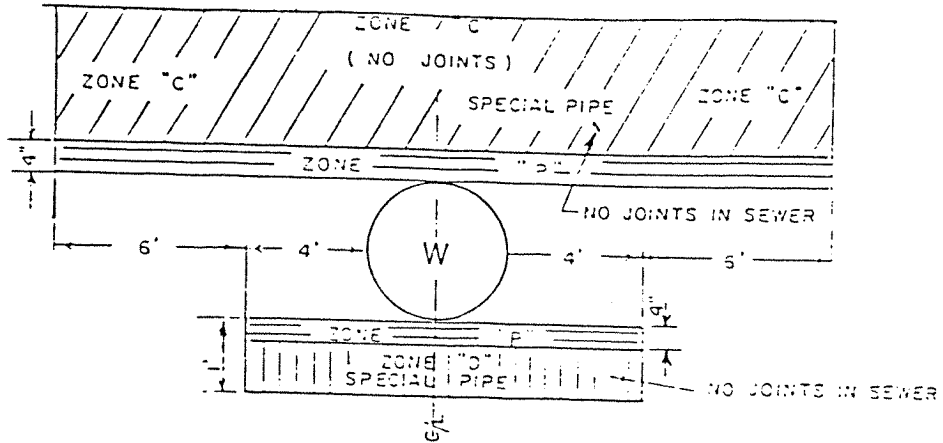
APPR. BY
Benjamin Y. Wong

STANDARD PLAN

PLATE 53

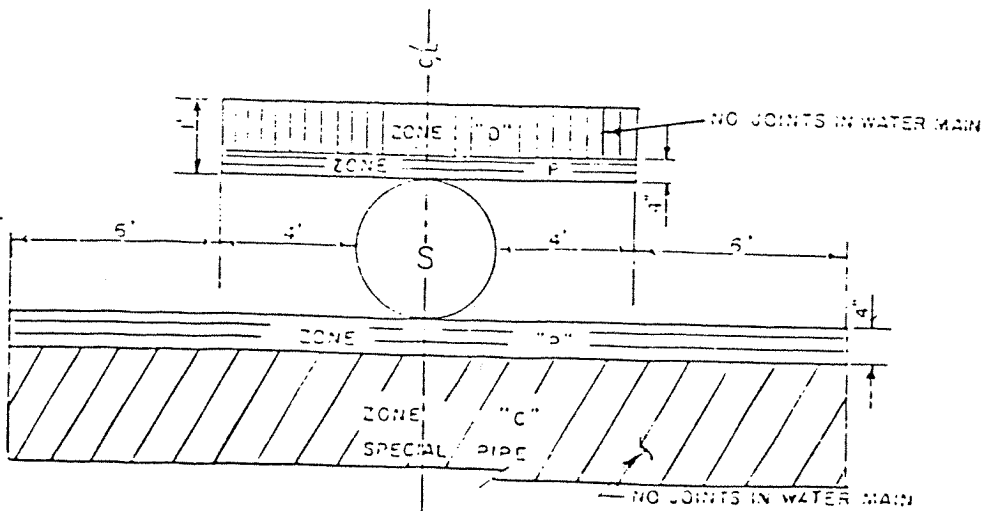
SHEET 5 OF 10

FIGURE 2
CROSSINGS



CASE 1
NEW SEWER

NOTE
"B" IS A PROHIBITED
CONSTRUCTION ZONE.



CASE 2

REV. APPR. BY DATE


	GENERAL REQUIREMENTS - SEWER		STANDARD PLAN
	DRAWN SOHER	BY <i>Jay Patel</i>	APPR. BY
	Public Works Department		<i>Benjamin J. Wong</i>
PLATE 53			SHEET 6 OF 10

Case 1: New Sewer Being Installed (Figures 1 and 2)

Zone Special Construction Required for Sewer


- A Sewer lines parallel to water mains shall not be permitted in this zone without approval from the responsible health agency and water supplier.
- B A sewer line placed parallel to a water line shall be constructed of:
1. Extra strength vitrified clay pipe with compression joints.
 2. Class 4000, Type II, asbestos-cement pipe with rubber basket joints.
 3. Rubber gasketed pressure rated plastic pipe (per ASTM 2241), class rated plastic water pipe (per AWWA C900) or equivalent.
 4. Plastic sewer pipe with fused joints (per ASTM D3034) or equivalent.
 5. Cast or ductile iron pipe with compression joints.
 6. Reinforced concrete pressure pipe with compression joints (per AWWA C302-74).
- C A sewer line crossing a water main shall be constructed of:
1. Ductile iron pipe with hot dip bituminous coating and mechanical joints.
 2. A continuous section of Class 200 (DR 14 per AWWA C900) plastic pipe or equivalent, centered over the pipe being crossing.
 3. A continuous section of reinforced concrete pressure pipe (per AWWA C302-74) centered over the pipe being crossed.
 4. Any sewer pipe within a continuous sleeve.
- D A sewer line crossing a water main shall be constructed of:
1. A continuous section of ductile iron pipe with hot dip bituminous coating.

REV.	APPR BY	DATE

	GENERAL REQUIREMENTS - SEWER		STANDARD PLAN
	DRAWN: SOHER CKD. <i>Jay Patel</i> Public Works Department	APPR. BY <i>Benjamin Y. Wong</i>	PLATE 53 SHEET 7 OF 10

2. A continuous section of Class 200 (DR 14 per AWWA C900) plastic pipe or equivalent, centered on the pipe being crossed.
3. A continuous section of reinforced concrete pressure pipe (per AWWA C302-74) centered on the pipe being crossed.
4. Any sewer pipe within a continuous sleeve.
5. Any sewer pipe separated by a ten-foot by ten-foot, four-inch-thick reinforced concrete slab.

REV.	APPR. BY	DATE

 CITY OF Oxnard	GENERAL REQUIREMENTS - SEWER	STANDARD PLAN
	DRAWN: <u>SOHER</u> CKD. <u>Jay Patel</u> Public Works Department	APPR. BY <u>Benjamin Y. Wong</u>

Case 2: New Water Mains Being Installed (Figures 1 and 2)

Zone

- A No water mains parallel to sewers shall be constructed without approval from the health agency.
- B If the sewer paralleling the water main does not meet the Case 1, Zone B, requirements, the water main shall be constructed of:
1. Ductile iron pipe with hot dip bituminous coating.
 2. Dipped and wrapped one-fourth-inch-thick welded steel pipe.
 3. Class 200, Type II, asbestos-cement pressure pipe.
 4. Class 200 pressure rated plastic water pipe (DR 14 per AWWA C900) or equivalent.
 5. Reinforced concrete pressure pipe, steel cylinder type, per AWWA (C300-74 or C301-79 or C303-70).
- C If the sewer crossing the water main does not meet the Case 1, Zone C, requirements, the water main shall have no joints in Zone C and be constructed of:
1. Ductile iron pipe with hot dip bituminous coating.
 2. Dipped and wrapped one-fourth-inch-thick welded steel pipe.
 3. Class 200 pressure rated plastic water pipe (DR 14 per AWWA C900) or equivalent.
 4. Reinforced concrete pressure pipe, steel cylinder type, per AWWA (C300-74 or C301-79 or C303-70).
- D If the sewer crossing the water main does not meet the requirements for Zone D, Case 1, the water main shall have no joints within four feet from either side of the sewer and shall be constructed of:
1. Ductile iron pipe with hot dip butuminous coating.
 2. Dipped and wrapped one-fourth-inch-thick welded steel pipe.
 3. Class 200 pressure rated plastic water pipe (DR 14 per AWWA C900) or equivalent.

REV	APPR BY	DATE



CITY OF

GENERAL REQUIREMENTS - SEWER		STANDARD PLAN
CRAWN SOHER JCKD <i>Jay Patel</i>	APPR. BY <i>Benjamin J. Worley</i>	PLATE 53
Public Works Department		SHEET 9 OF 10

4. Reinforced concrete pressure pipe, steel cylinder type, per AWWA (C300-74 or C301-79 or C303-70).

NOTES AND DEFINITIONS

1. HEALTH AGENCY -- The Department of Health Services. For those water systems supplying fewer than 200 service connections, the local health officer shall act for the Department of Health Services.
2. WATER SUPPLIER -- "Person operating a public water system" or "supplier of water" means any person who owns or operates a public water system.
3. LOW HEAD WATER MAIN -- Any water main which has a pressure of five psi or less at any time at any point in the main.
4. Dimensions are from outside of water main to outside of sewer line or manhole.
5. COMPRESSION JOINT -- A push-on joint that seals by means of the compression of a rubber ring or gasket between the pipe and a bell or coupling.
6. MECHANICAL JOINTS -- Bolted joints.
7. RATED WORKING WATER PRESSURE OR PRESSURE CLASS -- A pipe classification system based upon internal working pressure of the fluid in the pipe, type of pipe material, and the thickness of the pipe wall.
8. FUSED JOINT -- The jointing of sections of pipe using thermal or chemical bonding processes.
9. SLEEVE -- A protective tube of steel with a wall thickness of not less than one-fourth inch into which a pipe is inserted.
10. GROUND WATER -- Subsurface water found in the saturation zone.
11. HOUSE LATERAL -- A sewer connecting the building drain and the main sewer line.

REV. APPR. BY DATE



CITY OF

Xnard

GENERAL REQUIREMENTS - SEWER

DRAWN: SOHER CKD. *Jay Patel*
Public Works Department

APPR. BY
Benjamin Y. Wong

STANDARD PLAN

PLATE 53

SHEET 10 OF 10