

ORDINANCE 1185

CITY OF LACEY

AN ORDINANCE OF THE CITY OF LACEY, WASHINGTON, AMENDING CHAPTER 7 OF THE CITY'S DEVELOPMENT GUIDELINES & PUBLIC WORKS STANDARDS DESIGNATED BY SECTION 12.28.010 OF THE LACEY MUNICIPAL CODE AS THE CITY'S OFFICIAL DEVELOPMENT GUIDELINES & PUBLIC WORK STANDARDS AND ADOPTING A SUMMARY FOR PUBLICATION.

BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF LACEY, WASHINGTON, as follows:

Section 1. Chapter 7 of the Development Guidelines and Public Works Standards designated by Section 12.28.010 of the Lacey Municipal Code as the City's official Development Guidelines & Public Works Standards are hereby amended in the manner attached hereto.

Section 2. The Summary for Publication attached hereto is hereby approved for publication.

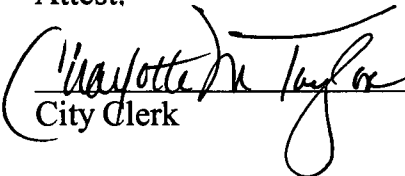
PASSED BY THE CITY COUNCIL OF THE CITY OF LACEY, WASHINGTON, this 22nd day of August, 2002.

CITY COUNCIL

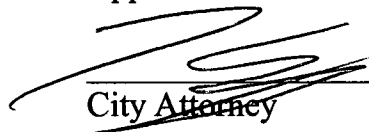
BY: 

Mayor

Attest:


City Clerk

Approved as to form:


City Attorney

Published: _____

Monday, August 26, 2002

SUMMARY FOR PUBLICATION

ORDINANCE 1185

CITY OF LACEY

The City Council of the City of Lacey, Washington, passed on August 22, 2002, Ordinance No. 1185, entitled "AN ORDINANCE OF THE CITY OF LACEY, WASHINGTON, AMENDING CHAPTER 7 OF THE CITY'S DEVELOPMENT GUIDELINES & PUBLIC WORKS STANDARDS DESIGNATED BY SECTION 12.28.010 OF THE LACEY MUNICIPAL CODE AS THE CITY'S OFFICIAL DEVELOPMENT GUIDELINES & PUBLIC WORK STANDARDS AND ADOPTING A SUMMARY FOR PUBLICATION."

The main points of the Ordinance are described as follows:

1. The City adopted and published in 1990 guidelines and standards for construction entitled "Development Guidelines and Public Works Standards." Section 12.28.010 of the Lacey Municipal Code provides that these Development Guidelines and Public Works Standards as originally adopted and as amended by specific action of the City Council constitute the City's Official Development Guidelines and Public Works Standards. These Guidelines and Standards have been amended from time to time by action of the Council.
2. This Ordinance amends Chapter 7 entitled "Sanitary Sewer" to update the material specifications, provide Community S.T.E.P. system standards, expand and provide specific standards for Lift Station construction, revise tank size requirements for individual S.T.E.P. installations and provide revisions to the requirements for sewer system installation and other miscellaneous Sanitary Sewer requirements. Some of the significant revisions include increasing the size for single family residential S.T.E.P. tanks from 1,000 gallons to 1,500 gallons, providing standards for allowing the installation of grinder S.T.E.P. systems and standards for fiberglass septic tanks as well as developing an entire section addressing Community S.T.E.P. standards and lift station construction.

A copy of the full text of this Ordinance will be mailed without charge to any person requesting the same from the City of Lacey.

Published: _____, 2002.

Monday, August 26, 2002

CHAPTER 7

7.000 SANITARY SEWER

7A GENERAL CONSIDERATIONS

7A.010 General

Sanitary sewerage refers to waste water derived from domestic, commercial and industrial pretreated waste to which storm, surface, and ground water are not intentionally admitted. Pretreatment shall follow all the requirements as set forth by LOTT.

Any extension of Lacey's sanitary sewer system shall be approved by the Department of Public Works and shall conform to the City of Lacey Comprehensive Sanitary Sewer Plan, Thurston County Health Department, Department of Ecology (DOE), and Department of Health (DOH) requirements. Specific site conditions may require variance from the comprehensive plan and require approval from the Director of Public Works.

All new homes and businesses constructed within the corporate City limits or the City of Lacey's urban growth management area shall connect to sewer provided that the sewage from the structure originates within 200 feet of A public sewer main. In the case of private residential or commercial development where the developed property abuts a right-of-way in which a public sewer is located or where a service connection is otherwise provided, all structures generating sewage shall be required to connect to the public sewer regardless of distance from the public sewer (LMC 13.08.020).

Anyone who wishes to extend or connect to the City's sewer system should contact the Department of Public Works for a sewer extension/connection fee estimate. The design of the proposed sewer shall start from the existing system. The manhole numbers shall start at the cast in place or from the first manhole at the connection point or existing manhole.

Prior to the release of any water meters, or operation of any S.T.E.P systems, all Public Works improvements must be completed and approved and all applicable fees must be paid. In the event that a sewer project has no new water meters to trigger payment of the connection fees, the sewer connection fees shall be paid prior to the start of construction.

See Section 3.025 for definitions of specific sewers. Maintenance of the building or side sewer shall be the responsibility of the property owner. Maintenance of the lateral shall be the responsibility of the property owner.

7A.015 Building Sewers

Lots created by plats, re-plats, short plats, or binding site plans shall have a sewer service installed as required below. All building sewers are private and shall be installed in accordance with these standards and the Plumbing Code.

In single family subdivisions, (including mobile home and manufactured home subdivisions) a service shall be provided to each lot or pad. In cases where this is not practical, exceptions may be granted by the City in accordance with the Plumbing Code.

Duplexes on a gravity sewer, regardless of the number of units on a lot, may have a single or dual service provided to each building. In the case where a S.T.E.P. system services a duplex, the duplex shall be served by one 3,000 gallon tank assembly. The tank servicing a duplex shall have a duplex electrical control box designed to operate if either side were to disconnect from the power source.

Services for multi-family and commercial complexes shall be as required in the Plumbing Code. Generally, this requires a minimum of one side sewer to each separate building. See section 7B.055 for more gravity side sewer requirements.

The location of all side sewers shall be marked on the face or top of the cement concrete curb with an "S" 1/4 inch into the concrete.

7A.020 Sanitary Sewer/Water Main Crossings

See Chapter 6.130 for requirements regarding sewer and water separation.

7A.030 Staking

All surveying and staking shall be performed by an engineering or surveying firm capable of performing such work. The engineer or surveyor directing such work shall be licensed as a Professional Engineer or Professional Land Surveyor by the State of Washington.

A pre-construction meeting shall be held with the City inspector prior to commencing staking. All construction staking shall be inspected by the City prior to construction.

The minimum staking of sewer lines shall be as directed by the City Engineer or as follows:

- A. Stake location of mainline pipe and laterals every 50 feet with cut or fill to invert of pipe.
- B. Stake location of all manholes for alignment and grade with cut or fill to rim and invert of pipes.

7A.040 Trench Excavation

See Chapter 6.160 for requirements regarding trench excavation.

7A.050 Back filling

See Chapter 6.170 for requirements regarding back filling.

7A.060 Street Patching and Restoration

See Chapter 4B.170 and 4B.180 for requirements regarding street patching and trench restoration.

7A.070 Testing

Prior to acceptance and approval of construction, the following tests shall apply to each type of construction.

A. Gravity Sewer

1. Prior to acceptance of the project, the gravity sewer pipe shall be subject to a low pressure air test per WSDOT/APWA Standards. The contractor shall furnish all equipment and personnel for conducting the test under the observation of the City inspector. The testing equipment shall be subject to the approval of the City.

The contractor shall make an air test for his own purposes prior to notifying the City to witness the test. The acceptance air test shall be made after trench is back filled and compacted and the roadway section is completed to sub grade.

All wyes, tees, and end of side sewer stubs shall be plugged with flexible joint caps, or acceptable alternates, securely fastened to withstand the internal test pressures. Such plugs or caps shall be readily removable and their removal shall provide a socket suitable for making a flexible jointed lateral connection or extension.

Immediately following the pipe cleaning, the pipe installation shall be tested with low-pressure air.

2. Testing of the sewer main shall include a television inspection by the contractor. The camera must be equipped with a rotating head to allow televising of the side sewers as mainline inspection is occurring. The camera unit shall be equipped with a measuring device that is in plain view ahead of the camera. The device shall be 1" in diameter and on a flexible shaft. Television inspection shall be done after the WSDOT air test # 7-17.3(2)F has passed and before the roadway is paved. Immediately prior to a television inspection enough water shall be run down the line so it comes out the lower manhole. A copy of the video tape and written report shall be submitted to the City. Acceptance of the line will be made after the tape has been reviewed and approved by the Inspector. Any tap to an existing system needs to be televised as well.

3. A water or a negative air pressure "vacuum" test of all manholes is also required.

The water test shall be made by the contractor first by filling the manhole up with water and letting it sit for 24 hours to allow the water to saturate the concrete. After 24 hours the manhole shall be filled to the top of the cone. The water cannot drop more than 0.05 gallons in 15 minutes per foot of head above invert to pass. Upon completion of the water test, the water shall be pumped out of the manhole and not allowed to be released to the system.

The negative air pressure "vacuum" test may be used for testing concrete manholes. The test shall be in accordance with ASTM C 1244-93 except that the duration shall be 5 seconds per foot as measured from the bottom of the manhole channel to the ring regardless of manhole diameter. A vacuum of 10 inches of mercury shall be drawn on the manhole, the valve on the vacuum line of the test head shall be closed, and the vacuum pump shall be shut off. The time shall be measured for the vacuum to drop to 9 inches of mercury. The manhole shall pass if the time for the vacuum reading to drop from 10 inches to 9 inches of mercury meets or exceeds the time calculated.

4. A mandrel test in accordance with Section 7-17.3(4)H of the Standard Specifications shall be required on all sewers except laterals as defined in Section 3.025 of these standards.

B. Lift Station Pressure Main

1. Prior to acceptance of the project, the pressure line and service lines shall be subjected to a hydrostatic pressure test of 200 pounds for 4 hours and any leaks or imperfections developing under said pressure shall be remedied by the contractor. No air will be allowed in the line. The main shall be tested between valves. Insofar as possible, no hydrostatic pressure shall be placed against the opposite side of the valve being tested. The 200 psi pressure test shall be maintained while the entire installation is inspected. The contractor shall provide all necessary equipment and shall perform all work connected with the tests. Tests shall be made after all connections have been made. This is to include any and all connections as shown on the plan. The contractor shall perform all tests to assure that the equipment to be used for the test is adequate and in good operating condition and the air in the line has been released before requesting the City to witness the test.

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2. A water test for all wet wells in accordance with the manhole water test for gravity sewer shall be required.
 3. A mandrel test in accordance with Section 7-17.3(4)H of the Standard Specifications is required.
 4. Pump operation, alarms, and electrical inspection of all lift stations is required.

C. S.T.E.P./Grinder Pressure Main System

1. Prior to acceptance of the project the pressure mainline and service lines shall be subject to a hydrostatic pressure test of 150 pounds for 15 minutes and any leaks or imperfections developing under said pressure shall be remedied by the contractor. No air will be allowed in the line. The main shall be tested between valves. Insofar as possible, no hydrostatic pressure shall be placed against the opposite side of the valve being tested. The pressure test shall be maintained while the entire installation is inspected.

The contractor shall provide all necessary equipment and shall perform all work connected with the tests. Tests shall be made after all connections have been made. The contractor shall perform all tests to assure that the equipment to be used for the test is adequate and in good operating condition and the air in the line has been released before requesting the City to witness the test.

2. A water test of the septic, S.T.E.P. or grinder tank at the factory and on site after installation is required in accordance with the criteria outlined in Chapter 7E.060.
3. Electrical inspection and testing of all electrical components of the system is required. All tested parts must pass before the City accepts the system. Additionally all electrical structures shall have a concrete base or floor.

7A.080 Effluent Spills

All discharges from the sewerage collection system and spills of any type that may affect human health or the environment must be immediately reported by the City of Lacey to the Department of Ecology. As soon as the spill information is known, The City will call the LOTT dispatcher at 753-8333 and request that they notify the Department of Ecology of the spill. Provide as much information as possible and be sure to give a detailed spill location description and the name of a person to contact for information.

A complete report on the nature, cause and extent of the spill and steps taken to clean up the spill and prevent future spills must be made to the Department of Ecology within 24 hours following the initial spill report call. Fill out all the information on the LOTT Wastewater Management Partnership Spill Incident Report located in Appendix G, contact the LOTT dispatcher again and relay the information within the 24 hour deadline. The local operations staff of Lacey, Olympia, Tumwater and Thurston County are responsible for providing timely and complete spill reports on incidents within their service areas. The LOTT dispatcher will serve only as the central contact point to receive spill reports and relay information to the Department of Ecology. LOTT staff cannot be responsible for the completeness, accuracy or timeliness of the spill reports, beyond relaying the information promptly to the Department of Ecology.

7A.090 Effluent Pretreatment and Treatment

Effluent pretreatment and treatment shall comply with the document titled "LOTT Discharge and Industrial Pretreatment Regulations" as set forth in Lacey Municipal Code 13.10.010. The purpose and policy to this document is as follows. This document sets forth uniform requirements for direct and indirect contributors into the wastewater collection systems and the Regional Wastewater Treatment Facility for the Cities of Lacey, Olympia and Tumwater and for Thurston County. This adopted document enables Lacey, Olympia, Tumwater and Thurston County to comply with all applicable State and Federal laws required by the Clean Water Act of 1977 and the General Pretreatment Regulations (40 CFR, Part 403). The objectives of this document are as follows:

- To prevent the introduction of pollutants into the municipal wastewater system which will interfere with the operation of the system or contaminate the resulting sludge.
- To prevent the introduction of pollutants into the municipal wastewater system which will pass through the system,

inadequately treated, into receiving waters or the atmosphere or otherwise be incompatible with the system.

- To improve the opportunity to recycle and reclaim waste waters and sludge from the system; and
- To provide for equitable distribution of the cost of the municipal wastewater system.

This document provides for the regulation of direct and indirect contributors to the municipal wastewater system through the issuance of permits to certain non-domestic users and through enforcement of general requirements for the other users; authorizes monitoring and enforcement activities, requires user reporting, assumes that existing customer's capacity will not be preempted, and provides for the setting of fees for the equitable distribution of costs resulting from the program established.

Contact LOTT or the Lacey Public Works plan review staff for further information or a copy of this document. (Ordinance 957 and Resolution 714).

7B GRAVITY SEWER

7B.010 General

All sewers shall be designed as a gravity sewer whenever physically and/or economically feasible or as outlined in the Comprehensive Sanitary Sewer Plan.

7B.020 Design Standards

The design of any sewer extension/connection shall conform to City Standards, Department of Ecology's "Criteria of Sewage Works Design", and any applicable standards as set forth herein and in Sections 3.010 and 3.040.

The layout of extensions shall provide for the future continuation of the existing system as determined by the City. See Chapter 3.130 for utility extension information.

New gravity sewer systems shall be designed on the basis of an average daily per capita flow of sewage of not less than 100 gallons per day. See the following DOE table on Design Basis for Sewage. This figure is assumed to cover normal infiltration, but an additional allowance shall be made where conditions are unfavorable. Generally, laterals and sub main sewers should be designed to carry, when running full, not less than 400 gallons daily per capita contributions of sewage. When deviations from the foregoing per capita rates are used, a description of the procedure used for sewer design shall be submitted to the Department of Public Works for review and approval.

The General Notes on the following page shall be included on any plans dealing with sanitary sewer design.

GENERAL NOTES (SANITARY SEWER MAIN INSTALLATION)

1. All workmanship and materials shall be in accordance with City of Lacey standards and the most current copy of the *State of Washington Standard Specifications for Road, Bridge and Municipal Construction* (WSDOT/APWA). In cases of conflict, the most stringent standard shall apply.
2. All safety standards and requirements shall be complied with as set forth by OSHA, WISHA and Washington State Department of Labor and Industries.
3. All approvals and permits required by the City of Lacey shall be obtained by the contractor prior to the start of construction.
4. If construction is to take place in the County right-of-way, the contractor shall notify the County and obtain all the required approvals and permits.
5. A pre-construction meeting shall be held with the City of Lacey Construction Inspector prior to the start of construction.
6. The City of Lacey Construction Inspector shall be notified a minimum of 48 hours in advance of a tap connection to an existing main. The inspector shall be present at the time of the tap.
7. The contractor shall be fully responsible for the location and protection of all existing utilities. The contractor shall verify all utility locations prior to construction by calling the Underground Locate Line at 1-800-424-5555 a minimum of 48 hours prior to any excavation.
8. Gravity sewer main shall be PVC, ASTM D 3034 SDR 35 or ASTM F 789 with joints and rubber gaskets conforming to ASTM D 3212 and ASTM F 477.
9. Pre-cast manholes shall meet the requirements of ASTM C 478. Manholes shall be Type 1-48" manhole unless otherwise specified on the plans. Joints shall be rubber gasket conforming to ASTM C 443 and shall be grouted from the inside. Lift holes shall be grouted from the outside and inside of the manhole. (See Note 1.)
10. Manhole frames and covers shall be Ductile iron casting marked "Sewer" conforming to the requirements of ASTM A-30, Class 25 Manhole rings and covers shall be machine-finished or ground-on seating surfaces so as to assure a non-rocking, self seating (easily removed and replaced without the use of a sledge hammer) fit in any position and be interchangeable in other standard manhole frames. Lock-type covers shall be required in all multi-family complexes, on school grounds, on manholes containing odor control devices or as determined by the City.

11. Side sewer services shall be PVC, ASTM D 3034 SDR 35 with flexible gasket joints. Side sewer connections shall be made by a tap to an existing main or a wye branch from a new main connected above the spring line of the pipe.
12. All sewer mains shall be field staked for grades and alignment in accordance with section 7A.030 of the Development Guidelines.
13. All plastic pipe and services shall be installed with continuous tracer tape 12" to 18" under the proposed finished sub grade. The marker shall be plastic non-biodegradable, metal core or backing, marked "sewer" which can be detected by a standard metal detector. Tape shall be Terra Tape "D" or approved equal. The tape and wire shall be furnished by the contractor.
14. All side sewer locations shall be marked on the face of the curb with an embossed "S" 3" high and 1/4" into concrete.
15. Bedding of the sewer main shall be a minimum 6 inches of 3/8" minus pea gravel under the pipe and a minimum of 12 inches of 3/8" minus pea gravel over the pipe. When working in sensitive soils a barrier above the pea gravel may be required to prevent the fine soils from migrating into the pea gravel. Compaction of the backfill material shall be required in accordance with the above mentioned specification (See Note #1). The applicable Chapter 4-8 Trench Restoration detail shall be used.
16. A 4' x 4' square x 8" inch thick concrete pad with #4 rebar shall be installed around all clean outs that are not in a pavement area.
17. Temporary street patching shall be allowed for as approved by the City engineer. Temporary street patching shall be provided by placement and compaction of 1 inch maximum asphalt concrete cold mix. Contractor shall be responsible for maintenance as required.
18. Erosion control measures shall be taken by the contractor during construction to prevent infiltration of existing and proposed storm drainage facilities and roadways.
19. The contractor shall be responsible for all traffic control in accordance with the *Manual on Uniform Traffic Control Devices* (MUTCD) as required. Prior to disruption of any traffic, traffic control plans shall be prepared and submitted to the City for approval. No work shall commence until all approved traffic control is in place.
20. A copy of the approved plans must be on construction site whenever construction is in progress.
21. Any changes to the design shall first be reviewed and approved by the project engineer and the City of Lacey.

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22. All lines shall be high velocity cleaned and pressure tested prior to paving in conformance with the above referenced specifications, see note 1. Hydrant flushing of lines is not an acceptable cleaning method. Testing of the sanitary sewer main shall include videotaping of the main by the contractor. Immediately prior to videotaping, enough water shall be run down the line so it comes out the lower manhole. A copy of the video tape shall be submitted to the City of Lacey. Acceptance of the line will be made after the tape has been reviewed and approved by the inspector. A water or vacuum test of all manholes in accordance with Lacey standard is also required. Testing shall take place after all underground utilities are installed and compaction of the roadway sub grade is completed. After the paving and raising of manholes are complete, the Developer shall clean the sewer conveyance system again at the Developers expense. The method of cleaning shall be high velocity water pressure cleaning. All rocks and debris shall be removed and be disposed of at the Developer's expense.
 23. Contractors shall be responsible for cleanup of any debris in new or existing manholes and mains associated with the project after the new lines are cleaned as outlined above.
 24. Prior to backfill all mains and appurtenances shall be inspected and approved by the City of Lacey Construction Inspector. Approval shall not relieve the contractor for correction of any deficiencies and/or failures as determined by subsequent testing and inspections. It shall be the contractor's responsibility to notify the City of Lacey for the required inspections.
 25. When using steel plates over the trench, "Steel Plates Ahead" signs shall be required.

Revised: August 6, 2002

ww/dev07

PROCESS TO OBTAIN SEWER SERVICE

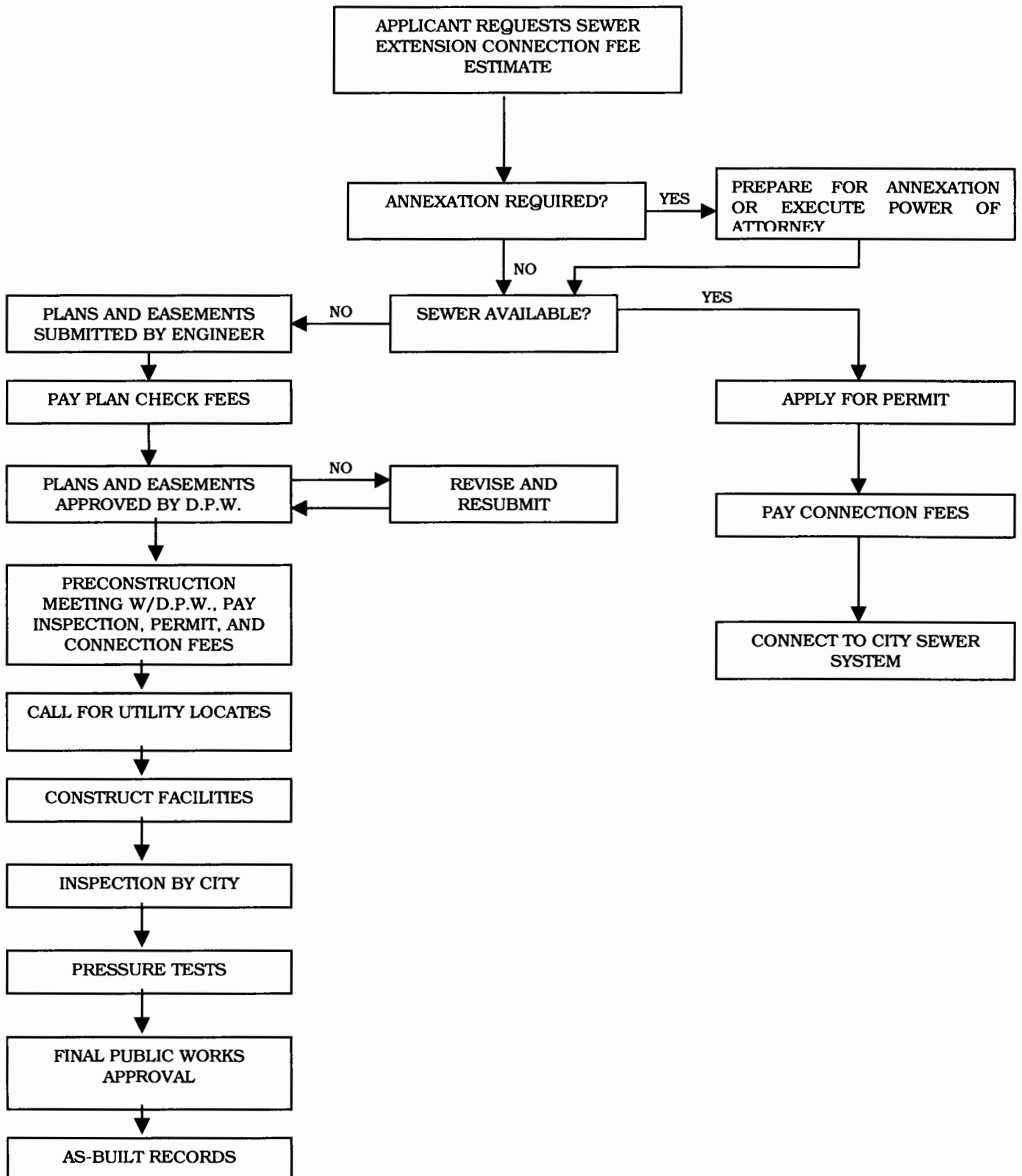


Table 2. DESIGN BASIS FOR NEW SEWAGE WORKS

Discharge Facility	Design Units	Flow* (gpd)	BOD (lb/day)	SS (lb/day)	Flow Duration (hr)
Dwellings	Per person	100	0.2	0.2	24
Schools w/showers and cafeteria	Per person	16	0.04	0.04	8
Schools w/o showers and cafeteria	Per person	10	0.025	0.025	8
Boarding schools	Per person	75	0.2	0.2	16
Motels at 65 gal/person (rooms only)	Per room	130	0.26	0.26	24
Trailer courts at 3 persons/trailer	Per trailer	300	0.6	0.6	24
Restaurants	Per seat	50	0.2	0.2	16
Interstate or through highway restaurants	Per seat	180	0.7	0.7	16
Interstate rest areas	Per person	5	0.01	0.01	24
Service stations	Per vehicle serviced	10	0.01	0.01	16
Factories	Per person per 8-hr. shift	15-35	0.03-0.07	0.03-0.07	Operating Period
Shopping centers	Per 1,000 sq. ft. of ultimate floor space	200-300	0.01	0.01	12
Hospitals	Per bed	300	0.6	0.6	24
Nursing homes	Per bed	200	0.3	0.3	24
Homes for the aged	Per bed	100	0.2	0.2	24
Doctor's office in medical center	Per 1,000 sq. ft.	500	0.1	0.1	12
Laundromats, 9 to 12 machines	Per machine	500	0.3	0.3	16
Community colleges	Per student and faculty	15	0.03	0.03	12
Swimming pools	Per swimmer	10	0.001	0.001	12
Theaters, drive-in type	Per car	5	0.01	0.01	4
Theaters, auditorium type	Per seat	5	0.01	0.01	12
Picnic areas	Per person	5	0.01	0.01	12
Resort camps, day & night, w/limited plumbing	Per campsite	50	0.05	0.05	24
Luxury camps w/flush toilets	Per campsite	100	0.1	0.1	24

* Includes normal filtration

Taken from. "Criteria for Sewage Works Design"
 By: State of Washington Department of Ecology
 December 1998

7B.040 Main Line - Gravity

- A. **Size.** Sewer mains shall be sized for the ultimate development of the tributary area. Nothing shall preclude the City from requiring the installation of a larger sized main if the City determines a larger size is needed to meet the requirements for future service.

The minimum size for sub mains and mains shall be 8 inch inside diameter. The minimum size for a lateral shall be 4 inches. See definitions in Chapter 3.025.

- B. **Material.** Sewer main shall be PVC, ASTM D 3034, SDR 35 or ASTM F 789 with joints and rubber gaskets conforming to ASTM D 3212 and ASTM F 477.
- C. **Depth.** Gravity sewer will typically have a minimum depth of 7 feet to provide gravity service to adjoining parcels. Actual depth will be determined by slope, flow, velocity and elevation of existing system.
- D. **Connections.** All building sewer connections to the main shall be made with a wye connection. All new mains connecting to existing mains shall require the installation of a new manhole if not made at an existing manhole.
- E. At no time shall a gravity sewer be installed with a reverse direction of flow. The maximum deflection angle through a manhole shall not exceed 90 degrees.

7B.050 Connection to Existing System

1. At connection to existing system, all new sewer connections shall be physically plugged until all tests have been completed and the City approves the removal of the plug.
 - B. Connection of new pipe lines to existing manholes shall be accomplished by using provided knock-outs. Where knock-outs are not available, the manhole shall be core drilled for connection. The transition of connecting channels shall be constructed so as not to interrupt existing flow patterns.
 - C. Connection of a pipe line to a system where a manhole is not available shall be accomplished by pouring a concrete base and setting manhole sections. The existing pipe shall not be cut into until approval is received from the City.
 - D. Connections to manholes requiring a drop shall follow the criteria as outlined in Section 7B.100
 - E. All multi family, commercial and industrial sewer lateral connections shall be made at the manhole. A manhole shall be installed for lateral connections if one is not available. All new connections to existing manholes shall be channeled to meet existing flow line.
 - F. Taps shall not be allowed to protrude into the existing main. A City inspector shall be notified 48 hours prior to any tap of a City sewer. A City Inspector shall be present to witness the tap. The mainline at the tap location shall be televised from the nearest manhole a minimum of 10 feet beyond the tap after tapping and prior to approval to insure compliance. Taps shall be Romac's style CB sewer saddle with Ductile+Plus saddle, stainless steel strap and rubber gasket meeting ASTM D-2000 3 BA715 or City approved equal. The manufactured bevel on the pipe to be inserted into the saddle shall be cut off to avoid pushing the pipe into the main.

7B.055 Building Sewer (lateral)

- A. A building or side sewer refers to the extension from a building sewer beginning two feet outside the outer foundation wall at the structure to the sanitary sewer main (LMC 13.04.160 and 14.06.015). Building sewers from the main to the right-of-way line shall be minimum 4-inch diameter. Maintenance of the building sewer is the responsibility of the property owner. Prior to connection of a building sewer to the public sewer a connection permit must be obtained. Materials and design criteria for a building sewer are covered by the Plumbing Code as adopted by LMC 14.06. Inspection of the building sewer is the responsibility of the Community Development Department.
- B. Each separate building shall have its own separate side sewer connection to the system, see 7A.015 for more information. Side sewers for single family residential properties shall not be connected to the system at the manhole. Manhole sizing where side sewers are connected shall be the same as designated in section 7B.060 of this manual.
- B. Location of clean out for building sewer is governed by the Plumbing Code as adopted by LMC 14.06.010.

7B.060 Manholes

Precast manholes shall meet the requirements of ASTM C 478 with either a precast base or a cast-in-place base made from 3000 psi structural concrete. Manholes shall be Type 1, 48 inch diameter minimum. The minimum clear opening in the manhole frame shall be 24 inches. Joints shall be rubber gasketed conforming to ASTM C 443 and shall be grouted from the inside. Lift holes shall be grouted from the outside and inside of the manhole. Manholes constructed of other materials may be approved by the Director of Public Works, provided they meet the requirements of 2.318 of Department of Ecology's "Criteria for Sewage Works Design". Material specifications need to be submitted for review before an alternate material will be considered. See drawing numbers 7-1 and 7-2 for details.

Eccentric manhole cone shall be offset so as not to be located in the tire track of a traveled lane.

Manhole frames and covers shall be Ductile iron casting marked "Sewer" conforming to the requirements of ASTM A-30, Class 25, and shall be free of porosity, shrink cavities, cold shuts or cracks, or any surface defects which would impair serviceability.

Repairs of defects by welding or by the use of smooth-on or similar material will not be permitted. Manhole rings and covers shall be machine-finished or ground-on seating surfaces so as to assure a non-rocking, self seating (easily removed and replaced without the use of a sledge hammer) fit in any position and be interchangeable in other standard manhole frames.

Where lock-type castings are called for, the casting device shall be such that the cover may be readily released from the ring and all movable parts shall be made of non-corrosive materials and otherwise arranged to avoid possible binding. Lock-type covers shall be required in all multi-family complexes, on school grounds, on manholes containing odor control devices and as determined by the City.

All casting shall be coated with a bituminous coating prior to delivery to the job site.

Safety steps shall be fabricated of polypropylene conforming to an ASTM D-4101 specification, injection molded around a 1/2 inch ASTM A-615 grade 60 steel reinforcing bar with anti-slip tread. Steps shall project uniformly from the inside wall of the manhole. Steps shall be installed to form a continuous vertical ladder with rungs equally spaced on 12 inch centers. The top two safety steps (hand holds) shall not be installed in the manhole.

Gravity sewers shall be designed with straight alignment between manholes. Curved alignment of the sewer will not be permitted.

Manholes shall be provided at a maximum of 400 foot intervals for 8 inch to 15 inch sewers, 500 foot intervals for 18 inch to 30 inch sewers, at intersections, and at changes in direction, grade or pipe size. (See also Section 7B.080.) Greater spacing may be permitted in larger sewers.

Minimum slope through the manhole shall be 1/10th of one foot from invert in to invert out.

Manhole Sizing shall be determined by the following criteria:

- A. 48" Manhole
 - 1. 2 connecting pipes, 8 inch to 12 inch diameter.
 - 2. 3 connecting pipes, 8 inch to 10 inch diameter, perpendicular.
 - 3. 4 connecting pipes, 8 inch diameter, perpendicular.

B. 54" Manhole

1. 2 connecting pipes, 8 inch to 12 inch with less than 45° deflection
2. 3 connecting pipes, 10 inch to 12 inch diameter, perpendicular
3. 4 connecting pipes, 10 inch to 12 inch diameter, perpendicular

C. 72" Manhole

1. 2 connecting pipes, 15 inch to 18 inch diameter with less than 45° deflection
2. 3 connecting pipes, 15 inch diameter, perpendicular
3. 4 connecting pipes, 15 inch diameter, perpendicular

In the above criteria "deflection" refers to the angle between any 2 pipe channels in the manhole.

For other pipe configurations, the size of the manhole shall be approved by the City.

The above configurations will provide adequate shelves and room for maintenance and televising mains.

7B.070 Slope

All sewers shall be designed and constructed to give mean velocities, when flowing full, of not less than 2.0 feet per second based on Manning's formula using an "n" value of 0.013. Use of other practical "n" values may be permitted by the City if deemed justifiable on the basis of research or field data submitted. The following minimum slopes should be provided; however, slopes greater than these are desirable.

Sewer Size (Inches)	Minimum % Slope % (Feet per 100')
8	0.40 (0.0040 Ft/Ft)
10	0.28 (0.0028 Ft/Ft)
12	0.22 (0.0022 Ft/Ft)
14	0.17 (0.0017 Ft/Ft)
15	0.15 (0.0015 Ft/Ft)
16	0.14 (0.0014 Ft/Ft)
18	0.12 (0.0012 Ft/Ft)
21	0.10 (0.0010 Ft/Ft)
24	0.08 (0.0008 Ft/Ft)
27	0.07 (0.0007 Ft/Ft)
30	0.06 (0.0006 Ft/Ft)
36	0.05 (0.0005 Ft/Ft)

Under special conditions, slopes slightly less than those required for the 2.0 feet per second velocity may be permitted by the Director of Public Works. Such decreased slopes will only be considered where the depth of flow will be 0.3 of the diameter or greater for design average flow. Whenever such decreased slopes are proposed, the design engineer shall furnish with the plans his computations of the depths of flow in such pipes at minimum, average, and daily or hourly rates of flow. Larger pipe size shall not be allowed to achieve lesser slopes.

Sewers shall be laid with uniform slope between manholes.

7B.080 Increasing Size

Manholes shall be provided where pipe size changes occur.

Where a smaller sewer joins a larger one, the invert of the larger sewer should be lowered sufficiently to maintain the same energy gradient. An approximate method for securing these results is to place the 0.8 depth point of both sewers at the same elevation.

7B.090 High Velocity Protection

Where velocities greater than 15 feet per second are expected, special provisions such as thrust blocking and piping materials shall be made to protect against displacement by erosion and shock.

7B.100 Drops

Straight grades between inverts are preferred over drops whenever possible when connecting to an existing manhole. Care must be taken when designing steep grades or sweeps so as not to create a situation of excessive velocity or excavation. Grade changes associated with "sweeps" shall not be allowed unless otherwise approved by the Director of Public Works.

An outside drop connection shall be provided for a sewer entering a manhole at an elevation of 24 inches or more above the manhole invert. Where the difference in elevation between the incoming sewer and the manhole invert is less than 24 inches, the invert shall be filleted to prevent solids deposition.

An inside drop connection will not be allowed by the City unless otherwise approved by the Director of Public Works. Outside drop structures shall be constructed per detail.

7B.110 Clean outs

Clean outs are not an acceptable substitute for manholes, however, they may be used in lieu of manholes at the end of 8 inch diameter lines of not more than 150 feet in length.

All clean outs in the City right-of-way or easements shall be extended to grade. A 4 foot square by 8 inch thick concrete pad with #4 rebar shall be installed around all clean outs that are not in a pavement area. See detail.

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CITY OF LACEY

7C LIFT STATIONS

7C.010 General

The need for a sewage lift station, as identified in the Wastewater Comprehensive Plan or necessary for a development as determined by the City, shall be presented by the Developer in a design report. If the City determines the area cannot be served by gravity services and is sized at 50 homes or more or in a gravity basin, the Developer shall provide information and design the lift station to comply with the following minimum standards.

7C.020 Design Report

If a lift station is determined to be necessary, the Developer shall perform a study prepared and stamped by a Professional Engineer licensed in the State of Washington, to determine that the lift station installation is sized to serve the overall sewage flows generated within the potential service area. The service area study shall include the Developer's plat boundary area and may include adjacent and future service areas as determined by the City. The final service area shall be the entire area which could be served by the installation of the lift station(s).

The design of any lift station shall conform to City of Lacey standards, Department of Ecology's "Criteria for Sewage Works Design" and applicable standards as set forth in herein and in sections 3.020 and 3.040.

The station's design flow capacity shall be based on an average daily per capita flow with related peaking factors and inflow/infiltration allowances.

Documentation of present and future service area flow rates for lift station size and capacity determination shall be included in the report.

The effects of the minimum flow conditions shall be estimated to be sure that retention of the sewage in the wet well will not create a nuisance and that pumping equipment operation will be optimized. The wet well shall be sized to provide full submergence on the pumps as recommended by the pump manufacturer and a minimum of four (4) minutes between pump cycles at pump design capacity.

The lift station shall be sized to meet the maximum rate of flow expected. The size of the receiving sewer shall also match the flow expected. At least two (2) pumping units shall be provided at each lift station installation. The pumps shall have sufficient capacity and

capability to efficiently handle the peak design flow with one (1) pump out of service and to ensure a minimum velocity of two-and-one-half (2-1/2) feet per second velocity in the pressure main.

The pressure main shall be sized for a minimum velocity of three-and-one-half (3-1/2) feet per second and a maximum velocity of eight (8) feet per second. The minimum inside diameter of the pressure main shall be four (4) inches.

Four (4) copies of the Design Report shall be submitted to the City for review. As a minimum, the report shall include:

1. Project description
2. Projected flows
3. Connection point with downstream capacity
4. Wet well sizing
5. Run time calculation and cycle time
6. Pump station head calculation and system curve
7. Pump selection and wet well details
8. Pressure main size, length and material (see section 7D Pressure Sewer)
9. Electrical requirements and Generator sizing
10. Odor and corrosion calculations

Information prepared by an engineering firm with experience in hydrogen sulfide formation and remediation shall be provided for the following:

- A. Collection system to the lift station
- B. Lift station wet well
- C. Pressure main
- D. Downstream gravity system
- E. A statement that odors will not be detected at the lift station site or at the point of release, or the Developer will provide odor control and corrosion reduction at the appropriate locations in accordance with current City of Lacey odor and corrosion control method. See also chapter 7D.080 Pressure main Termination.

11. Geotechnical analysis for wet well and lift station site
12. Backfill and compaction specifications
13. Preliminary site plan layout

7C.030 Design Drawings

The drawings shall be prepared by a Professional Engineer licensed in the State of Washington to an appropriate scale to show details of the site. See Chapter 3.040 . AutoCAD electronic files are available of the City Standard Lift Station details. The Developer's Engineer shall revise the drawings and review all dimensions to ensure accuracy for the applicable site and pump selection. AutoCAD electronic files are also available of the approved City of Lacey lift station electrical wiring diagrams.

The detailed engineering drawings shall accurately depict the equipment selected by the Engineer. The drawings shall include an equipment list showing manufacturer, model number, and size or capacity for all structures, mechanical and electrical components.

The Developer shall furnish a site layout for the lift station installation.

The lift station shall be located as far as practicable from present and/or proposed residential areas. Sites shall be of sufficient size for access, maintenance and future expansion or addition, if applicable.

Lift station sites together with access to the site shall be deeded to the City.

As a minimum, the following shall be provided on the plans for construction:

1. Complete lift station
2. Auxiliary power
3. All electrical
4. Telemetry compatible with existing system, including complete start up and revising existing screens at Lacey Operation Center.
5. 2-inch water service with DCVA assembly and wash down hydrant.
6. Odor control, as applicable for location and capacity.
7. Site soil conditions. Excavation, select backfill and compaction requirements.
8. Cuts and fills to provide level site for maintenance.
9. Asphalt, concrete pavement for access.
10. Concrete within the maintenance area.
11. Landscaping per City of Lacey development criteria.
12. Seven-foot (7') high fence enclosing the site and a twelve-foot (12') wide lockable access gate.
13. Address sign
14. Site lighting.

7C.040 Submittals

At the time construction plans are submitted for approval, the following information shall be provided:

1. Pump Data
 - Size and type
 - Pump curves
 - Head capacity
 - Velocity
 - Manufacturer/distributor

2. Motor Data
 - Size and type
 - Horsepower
 - Service factor
 - Motor insulation
 - Cycle length
 - Full load amps
 - Voltage
 - Frame and type of mount
 - Manufacturer/distributor

- 3 Controls
 - Timers and relay mounting
 - Motor starter size
 - Phase monitor
 - NEMA type enclosure
 - Thermal magnetic circuit breaker
 - GFI outlet
 - Indicating lights
 - Level controller
 - Telemetry failure points
 - Elapse time meters
 - Component manufacturer/distributor

4. Telemetry
 - Alarm system (must be compatible with City system)

5. Auxilliary Power
 - Diesel generator
 - Fuel storage tank
 - Automatic Transfer switch

6. Maintenance
 - Warranty
 - Staff training upon completion
 - Tools and equipment required

-
7. Electrical Service
 - Specifications (service size, voltage, motor size, enclosure type, etc.)
 - Source of power
 - Calculations
 - Single line diagram
 - Primary distribution equipment
 - Service entrance
 - Branch circuiting
 - Mechanical equipment power requirements
 - Control diagrams & schematics
 - Schedules of fixtures, panel boards & switch gear
 - Shop drawings
 8. Lighting
 - Exterior lighting
 9. Wet Well
 - Size
 - Storage capacity
 - Access hatch
 - Locking mechanism
 - Penetration seals
 - Safety entry equipment
 - Safety net
 - Manufacturer
 - Corrosion protection, material, application, warranty.
 10. Valve Vault
 - Size
 - Access ladder
 - Access hatch
 - Penetration seals
 - Manufacturer
 11. Piping
 - Size and material
 - Valves
 - Flow meter
 - Bypass pumping fittings
 - Pipe supports
 - Corrosion protection, material, application, warranty
 12. Testing Plan
 - Factory test
 - Operational test & start up.
 - Pressure test
 - Start up & training

The design drawings may be used to provide the information required in Items 1 through 13 above. Design drawings shall be reviewed and verified for completeness and compliance by the Design Engineer prior to submittal to the City.

The City's review does not relieve the Engineer and/or Developer of the responsibility for constructing a lift station that is trouble free and suitable for its purpose.

The general notes for gravity sewer and pressure sewer construction found in section 7B and 7D of this chapter shall accompany the following lift station general notes on the plans.

GENERAL NOTES (LIFT STATION INSTALLATION)

1. All workmanship, materials and testing shall be in accordance with the most current WSDOT/APWA Standard Specifications for Road, Bridge and Municipal Construction, National Electrical Code and City of Lacey Development Guidelines unless otherwise specified below. In cases conflict the most stringent standard shall apply. When the most stringent standard is not clear, the City Engineer will make the determination. The Electrical Contractor shall be familiar with all above stated publications and guidelines as they will be strictly enforced by the City.
2. Any changes to the station design shall first be reviewed and approved by the project engineer and the City of Lacey.
3. Contractors shall be responsible for cleanup of any debris in the wet well, tanks, vaults and site associated with the project prior to start up.
4. Prior to backfill, all mains, tanks, wet well and vaults shall be inspected and approved by the City of Lacey Construction Inspector. Approval shall not relieve the contractor for correction of any deficiencies and/or failures as determined by subsequent testing and inspections. It shall be the contractor's responsibility to notify the City of Lacey for the required inspections.
5. All work shall be done per National Electrical Code (N.E.C.) and The City of Lacey Standards. The City of Lacey Standards may exceed the N.E.C. The Developer shall obtain all permits and arrange inspections.
6. The Developer shall coordinate power service with serving utilities and make arrangements for power service connection. It shall be the Developers responsibility to maintain power service for lift stations serving commercial properties or developments.
7. Prior to testing and start-up of the lift station, five (5) copies of the Operation and Maintenance Manual, together with the number of approved copies required by the Developer, shall be submitted to the City for review and approval.
8. The Developer, at its own expense with the Design Engineer, shall arrange for an authorized factory-trained representative of the company or companies supplying the various items of equipment to check the installation, adjust and test the equipment furnished before the acceptance of the work by the City. The factory representative shall be responsible to check and resolve any unacceptable vibration of the pump assemblies. Furthermore, the Developer shall assist and instruct the City's operating staff in adjusting and operating the equipment during the initial start-up period. Said representative shall be experienced and knowledgeable of the equipment being tested.

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9. The Developer at its own expense shall conduct an instruction program for up to five (5) personnel designated by the City. Developer shall furnish the services of qualified instructors from the various equipment manufacturers. Program shall include instruction covering basic system operation theory, routine maintenance and repair, and "hands on" operation of equipment. Training shall not proceed until all operation maintenance manuals are complete and accepted by the City.
 10. All equipment shall be tested and Developer shall demonstrate to City personnel that proper operation and capacity have been fully obtained. The City will not accept any facility until successful full operation of all components has been demonstrated by the Developer.
 11. It is the Developer's responsibility to construct and start-up a complete and trouble-free system. The Developer shall be responsible for correcting all design errors and/or construction defects that are discovered in the start-up or during the warranty period of the agreement with the City.
 12. Developer shall give initial lubrication to all equipment as required by the part or component manufacturer.
 13. Wet well shall have safety net installed under hatch opening prior to start up and acceptance.
 14. Lift station and generator, site, driveway, access, concrete areas, lighting and water service shall all be completed prior to start up request and inspection.
 15. Generator and fuel storage tank shall be mounted on concrete pad. Generator shall have weather proof sound dampening enclosure, block heater, battery charger, auto exerciser, radiator louvers or protection and shall comply with all requirements in section 7C.070 of the City of Lacey Development Guidelines.
 16. Telemetry shall be set up completely and coordinated with TSI Inc. including revising telemetry computer screens at Lacey Operations center prior to start up request and acceptance.

17. Spare parts shall be provided for the station at time of start up acceptance.

- One set mechanical seals.
- One set of O-rings.
- One set of pump wear rings.

Additionally, any special tools specific to the pump manufacturer shall be provided to the City of Lacey at start up.

Revised: August 6, 2002

ww/dev07

7C.050 LIFT STATION

The Lift Station shall be submersible style non-clog pumps mounted in the wet well, and shall meet all of the conditions outlined in chapter 7C.

Requirements:

Furnish and install submersible non-clog wastewater pumps. Each pump shall be equipped with ____ HP, submersible electric motor, connected for operation on ____ volts, 3-phase, 60 hertz, with 30 feet of submersible cable (SUBCAB) suitable for submersible pump application. The power cable shall be sized according to NEC and ICEA standards and also meet with U.L. and C.S.A. P-MSHA approval. The pump shall be supplied with a mating iron ____ inch discharge connection and be capable of delivering ____ GPM at ____ TDH. Shut off head shall be ____ feet (minimum).

Pump Design:

The pumps shall be automatically and firmly connected to the discharge connection, guided by no less than two guide bars extending from the top of the station to the discharge connection. There shall be no need for personnel to enter the wet well. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal-to-metal watertight contact or interface with a diaphragm, O-ring, or profile gasket.

Pump Construction:

Major pump components shall be of gray cast iron, ASTM A-48, Class 40B, with smooth surfaces devoid of blow holes or other irregularities. All exposed nuts or bolts shall be ANSI Type 316 stainless steel construction. All metal surfaces coming into contact with the sewage, other than stainless steel shall be protected by a factory applied spray coating of high solids poly-amide epoxy free of any chips, cracks, voids or imperfections.

Sealing design shall incorporate metal-to-metal contact between machined surfaces. Critical mating surfaces where watertight sealing is required shall be machined and fitted with nitrite or Viton rubber O-rings. Fittings will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit.

Rectangular cross-sectioned gaskets requiring specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.

Cable Entry Seal:

The cable entry seal designs shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of a single cylindrical elastomer grommet, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the body containing a strain relief function, separate from the function of sealing the cable. The assembly shall provide ease of changing the cable when necessary using the same entry seal. The cable entry junction chamber and motor shall be separated by a terminal board, which shall isolate the interior from foreign material gaining access through the pump top.

Motor:

The pump motor shall be explosion proof, induction type with a squirrel-cage rotor, shell type design, housed in an oil or air-filled, watertight chamber, NEMA B type. The stator windings and stator leads shall be insulated with moisture resistant, Class F, insulation rated for 155°C (311°F). The stator shall be dipped and baked three times in Class F varnish and shall be heat-shrink fitted or mechanically fastened into the stator housing. The motor shall be designed for continuous duty handling pumped media of 40°C (104°F) and capable of ten (10) to fifteen (15) evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of cast aluminum. Thermal switches set to open at 140°C (250°F) shall be embedded in the stator lead coils to monitor the temperature of each phase winding. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the control panel. The junction chamber shall be hermetically sealed from the motor by an elastomer O-ring seal. Connection between the cable conductors and stator leads shall be made with threaded compression type connectors. The motor and pump shall be designed and assembled by the same manufacturer.

The combined service factor (combined effect of voltage, frequency and specific gravity) shall be a minimum of 1.15. The motor shall have a voltage tolerance of plus or minus 10% ($\pm 10\%$). The motor shall be designed for operation up to 40°C (104°F) ambient and with a temperature rise not to exceed 80°C (176°F).

A performance chart shall be provided showing curves for torque, current, power factor, input/output kW and efficiency. This chart shall also include data on starting and no-load characteristics.

The power cable shall be sized according to the NEC and ICEA standards and shall be U.L. and C.S.A. approved and of sufficient length to reach the control panel without the need of any splices. The outer jacket of the cable shall be water and oil resistant chloroprene rubber. The outer jacket shall not be cut, stripped or opened in any way prior to entering the cabinet at the landing point. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of sixty-five (65) feet.

The motor horsepower shall be adequate so that the pump is non-overloading throughout the entire pump performance curve from shut-off through run-out.

Bearings:

The pump shaft shall rotate on two bearings. Motor bearings shall be permanently oil or grease lubricated. The upper bearing shall be a single deep groove ball bearing. The lower bearing shall be a single or two-row angular contact bearing to compensate for axial thrust and radial forces. Single-row lower bearings shall not be acceptable.

Mechanical:

Each pump shall be provided with a tandem mechanical shaft seal system consisting of two totally independent seal assemblies. The seals shall operate in an oil reservoir that hydro-dynamically lubricates the lapped seal faces at a constant rate. The lower, primary seal unit located between the pump and the oil chamber, shall contain one stationary ceramic and one positively driven rotating silicon carbon seal ring. Each seal interface shall be held in contact by its own spring system. The seals shall require neither maintenance nor adjustment nor depend on direction of rotation for sealing. The position of both mechanical seals shall depend on the shaft. Mounting of the lower mechanical seal on the impeller hub shall not be acceptable. For special applications, other seal face materials shall be available.

The following seal types shall not be considered acceptable nor equal to the dual independent seal specified: shaft seals without positively driven rotating members, or conventional double mechanical seals containing either a common single or double spring action between the upper and lower seal faces.

Cartridge type systems shall be acceptable. No system requiring a pressure differential to offset pressure and to effect sealing shall be used. Proprietary seals shall not be allowed.

Each pump shall be provided with an oil chamber for the shaft sealing system. The oil chamber shall be designed to prevent overfilling and to provide oil expansion capacity. The drain and inspection plug, with positive anti-leak seal shall be easily accessible from the outside. The seal system shall not rely upon the pumped media for lubrication. The motor shall be able to operate dry without damage while pumping under load.

Pump Shaft:

Pump and motor shaft shall be the same unit. The pump shaft is an extension of the motor shaft. Couplings shall not be acceptable. The pump shaft shall be AISI type 430F stainless steel.

Impeller:

The impellers shall be of gray cast iron, Class 40B, dynamically balanced, double shrouded non-clogging design having a long throughlet without turns. The impellers shall be capable of handling solids, fibrous materials, heavy sludge and other matter found in wastewater. Whenever possible, a full vaned or vortex impeller shall be used for maximum hydraulic efficiency; thus, reducing operating costs. Mass moment of inertia calculations shall be provided by the pump manufacturer upon request. The impellers shall be keyed to the shaft, retained with an Allen head bolt and shall be capable of passing a minimum 3-inch diameter solid. Impeller wear rings shall be replaceable bronze ASTM B144.

Wear Rings:

A wear ring system shall be used to provide efficient sealing between the volute and suction inlet of the impeller. Each pump shall be equipped with a replaceable bronze ASTM B144 wear ring insert fitted to the volute inlet.

Volute:

Pump volute(s) shall be single-piece gray cast iron, Class 40B, non-concentric design with smooth passages large enough to pass any solids that may enter the impeller.

Protection:

All stators shall incorporate thermal switches in series to monitor the temperature of each phase winding. At 120°C (250°F) the thermal switches shall open, stop the motor and activate the alarm.

A leakage sensor shall be provided to detect water in the stator chamber. Either a Float/Seal Leakage Sensor (FLS) small float switch used to detect the presence of water in the stator chamber, or resistance-type shall be acceptable. When activated, the FLS shall stop the motor and send an alarm, both local and remote. Use of voltage sensitive solid state sensors and trip temperature above 120°C (250°F) shall not be allowed.

The thermal switches and FLS shall be connected to appropriate relays in the control panel.

Miscellaneous:

The pump guide rails shall be M-T-M style with two-inch (2") diameter minimum, 316 stainless steel pipe.

All brackets and mounting hardware shall be 316 stainless steel construction.

Each pump shall be fitted with a 316 stainless lifting bracket large enough to be easily attached to with a crane lifting hook without manned entry into the wet well. Attached lifting chains shall not be allowed.

The following spare parts shall be provided:

1. One set mechanical seals
2. One set O-rings
3. One set wear rings

Wet Well, Valve Vault, Piping, Fittings and Valves:

The wet well shall be a pre-cast manhole meeting the requirements of ASTM C 478 with a flat top cover and aluminum access hatch designed for H-20 loading. Wet well shall be a minimum of six (6) feet diameter. A larger diameter wet well may be required upon review by the City.

The wet well shall be designed for the soil conditions on the site including soil bearing conditions and ground water levels. Ladder rungs shall not extend below the high water level line.

The valve vault shall be a pre-cast utility vault as manufactured by Utility Vault, Inc. Provide solid walls without knockouts, but with pre-cut holes for pipe penetrations. All pipes shall be grouted in place with non-shrink grout. Vault shall have floor with drain sump and drain line back to wet well with a inline check valve and in line trap to prevent odors from entering the vault.

The access hatches shall be hinged, spring-assisted hatches designed for H-20 loading. The hatch for the pump station shall be the size recommended by the pump manufacturer but shall be no less than (2) 36" x 36" minimum clear inside opening. The hatches for both the wet well and valve vault shall be by the same manufacturer and shall be Halliday Products or approved equal. The access hatch shall include a written manufacturer's guarantee to seal out all offensive odors completely.

The inside of the wet well shall be coated completely to prevent corrosion.

Wet Well Coating:

The wet well coating material shall be ISO 9000 certified hi grade calcium aluminate, LaFarge Sewper Coat HS 2000 or approved equal.

The product shall be installed in accordance with the manufacturer's instructions by a factory certified applicator.

The wet well shall be thoroughly pressure washed using a minimum of 3,000 psi in preparation for the application to remove any dirt, debris or loose material.

The sprayed-on material shall be applied to completely and uniformly cover the wet well concrete floor, walls and underside of lid a minimum of one (1) inch in thickness. Finished surface shall be smooth.

All manhole joints and pipe penetrations shall be watertight to prevent infiltration or ex-filtration of the wet well prior to application of the product.

Any drilling, cutting or fabricating done in the wet well that breaks or disturbs the newly applied coating shall be repaired with the same hi grade calcium aluminate coating in accordance with the manufacturer's instructions.

All piping and fittings in the wet well and valve pit and between the two units shall be ductile iron, Class 52 and shall be epoxy or polyethylene lined to a minimum of 10 mils or be constructed of 316 stainless steel.

The isolation valves in the vault shall be epoxy coated Waterous Series 500 plug valves or approved equal meeting the requirements of AWWA C 509. Valves larger than 6" shall have gear reduction operation with hand wheels. 4" and 6" valves shall have standard 10 position operator lever.

The check valves shall be epoxy or P.E. lined and coated Clow F 5381 equipped with outside spring and levers or approved equal.

The by-pass emergency pumping connections shall be equipped with PT Coupling aluminum 6-inch female Cam-Lock fittings or approved equal. A 6" Cam-Lock plug shall be installed in each fitting.

7C.060 ELECTRICAL

General:

Definition of all terms, etc., shall be according to AIA and IEEE standard definitions. Shop drawings shall be submitted during design review on all special equipment, and approval obtained before manufacture. Drawings are diagrammatic; locations of all outlets to be checked and verified on project site.

Where conflict occurs with other equipment, consult City for final decision. The Developer is responsible for obtaining rough-in dimensions from supplier for equipment.

All work shall be done per National Electrical Code as amended by WAC. 296-46, City of Lacey electrical code as adopted by LMC 14.13 and City of Lacey Standards. The most stringent standard shall apply. The Developer shall obtain all permits and arrange inspections.

The Developer shall coordinate power service with serving utilities and make arrangements for power service connection.

The pump control and electrical equipment shall be factory manufactured and field installed. It shall be fabricated and assembled by an approved U.L. 508 listed manufacturer.

Pump Station Telemetry & Controls:

Duplex Pump Control Function: The two submersible pumps shall operate in a duplex mode. Each pump shall be provided with a HAND-OFF-AUTO selector switch which shall control the pump as follows:

1. **Hand Position:** When the HOA switch is placed in the HAND position, the pump shall immediately start and run until HOA switch is placed in the OFF position. Pumps shall not be controlled by level sensors when the HOA switch is in the HAND position.
2. **OFF Position:** When the HOA switch is placed in the OFF position, the pumps shall immediately stop, regardless of the water level.
3. **AUTO Position:** When the HOA switch is placed in the AUTO position, the pumps shall start and stop automatically in response to the water level and in the sequence determined by the controller. One pump shall start as the lead pump when the water level rises above the Lead Pump-On level. The pump shall run continuously until the water level decreases to the Pump-Off level. When both pumps are called to run, the lag pump will be set to shut off at a point 10% before to the lead pump shut off.

Pump Running Indication: Provide indicating lights (green) that shall indicate the pump running condition. The light shall glow steadily when pump is running and shall be turned off whenever the pump is not running. In addition, provide contacts for remote monitoring of pump operation.

Alarms: Alarms shall be reported locally at the control panel and contacts provided for remote alarms. In the event of an alarm, individual indicating alarm lights on the pump control panel shall be lit to pinpoint the specific trouble. The alarm contact wiring shall be complete to the telemetry box as per Technical Systems Incorporated (TSI) instructions for landing.

The schematic and line diagrams shall show the following telemetry points if applicable and a common termination point shall be provided in the lift station to interface between the lift station and the Remote Telemetry Unit (RTU). The telemetry points shall consist of the following:

**Standard
Lift Station**

- High Wet Well
- Phase loss
- 1 Pump Run
- 2 Pump Run
- 1 Pump Fail
- 2 Pump Fail
- Intrusion
- Wet Well Level
- Pump Control Over ride

**Community S.T.E.P.
Lift Station**

- High Primary tank
- High Wet Well
- 1 Pump Run
- 2 Pump Run
- 1 Pump Fail
- 2 Pump Fail
- *Intrusion
- *Wet Well Level
- *Pump Control Over Ride

* Telemetry functions not applicable to Community systems with Orenco duplex controls (float switch controls).

Control Panels: Circuit breakers, motor starters, control power transformers, control relays, interlocks, selector switches, elapsed time meters, contacts for remote mounted equipment and other type devices required to meet the functional equipment specified herein. The control panel, designed by the pump manufacturer, shall be UL listed and shall have the following minimum features:

1. Enclosure (cabinet) shall be Stainless Steel NEMA 4x construction.
2. Intrinsic-safe barrier relays for liquid level sensor circuits.
3. Indicating light units shall be all-tight type. Units shall include a 120-6 Volt transformer and 6-8 Volt lamp and shall be of the illuminated push-button type with the push-button wired for push-to-test function. Lens caps for lights indicating alarms shall be red and for lights indicating motor running status, green. Six spare lamps shall be furnished.
4. Elapsed time meters shall have a 5-digit non-reset register with the last digit indicating tenths of an hour.
5. Control relays shall be hermetically sealed, industrial grade rated for 600 Volts AC. Contacts shall be silver alloy. Parts shall be corrosion-resistant or treated in an approved manner to resist corrosion.

6. Selector switches shall be 3-position maintained type meeting NEMA Type 13 requirements. Legend plate shall be marked HAND-OFF-AUTO. Selector switches shall be provided with a padlock attachment (so that switch can be locked in the OFF position),
7. Provide for each starter a fused control circuit transformer with two fuses in the primary and one fuse in the secondary.
8. Panel wiring shall be Stranded Type XHHW or SIS rated 90°C with a minimum size of No. 14 AWG. Compression or ring tongue type lugs shall be used for transformers. Wires crossing hinges shall be installed in a manner to prevent chaffing. Plastic wire gutters and nylon cable wrap and wires shall be used to guide and train the wire as necessary.
9. Space shall be provided for TSI telemetry. This space shall be a minimum of 16" x 14" x 8". The telemetry unit shall be provided and installed per specification as required by the City and George Nelson, TSI. Telemetry shall be operational prior to station acceptance.
10. Main disconnect and transfer switches shall be mounted in the enclosure.
11. Radio mast and weather head for telemetry shall be 1 ¼" PVC coated rigid conduit with a tee condelet mounted at the point where antenna cable penetrates cabinet with a Myers hub type watertight connection. All connections exposed to weather shall be heat shrunk. A Uni-Strut support bar shall be mounted at a 45 degree angle to the mast and cabinet for extra support. All mounting hardware shall be 316 stainless steel.

High Level Sensors: Level sensors shall be a float switch type utilizing a mercury switch mounted in a chemical resistant casing suspended on its own cable. If the sensor comes in contact with the rising liquid level, the sensor shall tilt and cause the internal mercury switch to close its contact. The sensor shall stay tilted until the liquid level decreases below the sensor. The level sensor shall be designed for intrinsically-safe low power applications. The cable shall be 45 feet long. Sensor shall be provided for high level alarm.

The following list of approved materials shall be shown on the plans and include brand name, model and part numbers.

APPROVED ELECTRICAL MATERIALS LIST:

Wiring / Instrumentation / Controls:

- A. Conduit and fittings -Underground or entering wet well, vaults and cabinets shall be PVC coated rigid steel R.M.C. with polyethylene inner coat.
- B. Supports and Mounting brackets - Shall be PVC coated Uni-strut, brackets and clamps with stainless steel mounting hardware.
- C. Wire - #14 copper THWN minimum.
- D. Enclosure – Hoffman Stainless Steel NEMA 4X. Standard Burgess lock #A136. Double entry doors. Minimum cabinet size 60"x60". Rain gutter and weather proof seal. Hoffman Lighting and D-AH8001b heater. Cabinet shall display a permanent mounted identification tag with model, serial number, make and manufacturer info.
- E. Control panel box – Hoffman Stainless steel enclosure. Orenco duplex community systems shall use standard Orenco fiberglass control panel box.
- F. Intrusion switch – Cuttler Hammer or Square D.
- G. Timers – Crouzet Chronos
- H. Relays – Idec
- I. Phase Monitor – ICM #ICM450
- J. Thermal Magnetic Circuit Breakers – Square D or Cuttler Hammer
- K. Indicator Lights – Cuttler Hammer or Square D
- L. Fuses & Holder– Bussman
- M. Starters – Sprecher Schuh
- N. Overloads - Sprecher Schuh
- O. Selector Switches – Square-D or Cuttler Hammer, Class 9001, Type TL3, or equal.
- P. Float switch – Rotofloat
- Q. Limit switches – GO Switch model #11-11120-00
- R. Control Breakers – Square D class 9080 GCB
- S. Automatic Transfer switch – ASCO

- T. Manual Transfer switch – Cutler Hammer or Square D, knife style
- U. Elapsed Time Meter – Yokogawa 240211AAAB
- V. Amp Meters – Yokogawa
- W. Receptacle – Leviton 20A - 120V GFCI with weatherproof cover.
- X. Level Controller – Miltronics Hydroranger 828711, XPS-10 transducer, Key pad 69900007. (no splice allowed in cable).
- Y. UPS Back Up – Solal Heavy Duty
- Z. Transformers – Solal Heavy Duty
- AA. Power Supply – Power 1 International Power
- BB. Terminal Blocks – Entrelec M 4/6 5116

Radio Telemetry:

- A. Enclosure – Hoffman
- B. Corrosion Inhibitor – Hoffman A-HCI-1DV
- C. R.T.U. Base Card – Autocon 9701
- D. Radio Modem – Autocon 9513
- E. Analog Expansion Card – Autocon 212D 12B2
- F. Expansion Card D.I. – Autocon 9542
- G. Power Converter – Power One or CDF dc to dc.
- H. Battery - Gel Cell Panasonic
- I. UHF Radio – EF Johnson 2 Watt 3472
- J. UHF Antenna – Larson YA-1-450PL

All penetrations made to panels, breaker boxes, soft starts, etc. shall be made with water tight fittings such as a Myers hub.

7C.070 AUXILIARY POWER SYSTEM

General:

Diesel emergency power generation equipment shall be provided at the lift station site which will operate the lift station in the event of a commercial power outage.

It is essential that the emergency system be designed with capacity and rating to carry safely the entire connected lift station load.

The auxiliary power unit shall be complete in every respect and shall include, but not be limited to, the following:

1. Generator, control panel and circuit breaker.
2. Engine, radiator and exhaust system.
3. Fuel tank (capacity for 24 hours full load, plus 25%).
4. Generator set enclosure, lockable to City standards.
5. Automatic transfer switch.
6. Radiator protection or automatic louvers.
7. Block heater.
8. Battery and rack.
9. Battery charger.
10. Conduit, wire and piping.

The generator set and transfer switch shall be Cummins/Onan, Katolite or City approved equal complying with the latest edition of Onan Corporation standard specifications and with the City standards. The generator shall be 60 Hertz, 3-phase, _____ volt standby power.

The generator set shall include the following:

Engine:

- Single phase, 1500 watt coolant heater manufactured by KIM – hot shot 115 volt or 240 volt sized accordingly for the engine and climate conditions.

Generator Set:

- Mainline circuit breaker
- Weather-protective/sound dampening enclosure with mounted silencer (maximum noise level of 68 dBA at 23 feet).
- 5-year basic power warranty.

Accessories:

- Batteries
- Battery Charger, 2 AMP, 12 VDC, 120 VAC Input
- Vibration Isolators, Pad Type

Control Panel:

- Annunciator relays (12)
- Run relay package (3)
- Low coolant level shutdown
- Anti-condensation space heater, 120 VAC
- Oil temperature gauge
- Wattmeter
- Emergency stop switch

Fuel System:

- Diesel

Alternator:

- Anti-condensation heater, 120 VAC

Exhaust System:

- Exhaust silencer (68dBA AT 23 feet)

Control Features:

- Run-stop-remote switch
- Remote starting, 12-volt, 2-wire
- Coolant temperature gauge
- Field circuit breaker
- DC voltmeter
- Running time meter
- Lamp test switch
- Oil pressure gauge
- Fault reset switch
- Cycle cranking
- 12-light engine monitor with individual 1/2 amp relay signals and a common alarm contact for each of the following conditions:
 - Run (Green Light)
 - Pre-Warning for low oil pressure (Yellow Light)
 - Pre-Warning for high coolant temp (Yellow Light)
 - Low oil pressure shutdown (Red Light)
 - High coolant temperature shutdown (Red Light)
 - Over crank shutdown (Red Light)
 - Over speed shutdown (Red Light)
 - Switch off (Flashing Red Light - indicates generator set not in automatic start mode)
 - Low coolant temperature (Yellow Light)
 - Low fuel (Yellow Light)
 - Two customer selected faults (Red Light)

AC Meter Package:

Order with NFPA 110 monitor to meet code requirements.

- AC voltmeter (dual range)
- AC ammeter (dual range)
- Voltmeter/ammeter phase selector switch with an off position
- Dual scale frequency meter/tachometer
- AC rheostat (panel mounted) for +5% voltage adjust

The transfer switch shall include the following:

- Sized for full station and auxiliary equipment load, plus 25%

Pole Configuration:

- Poles - 3 (Solid Neutral)

Frequency:

- 60 Hertz

Application:

- Application - Utility to Genset

System Operation:

- Three-phase, 3-wire or 4-wire

Enclosure:

- B002 Type 3R; Intended for outdoor use (dust proof and rainproof) Shall have radiator grill protection or automatic louver system.

Listing:

- Listing - UL 1008

Programmed Transition:

- Program Transition - 1-60 sec.

Exerciser Clock:

- 7-day solid-state exerciser clock

Application Modules:

- Monitor - Phase Sequence/Balance

Suitable guards shall be provided on all electrical parts to minimize the personal shock hazard.

Generator shall be broken-in sufficiently to permit application of full load immediately upon installation.

Generator supplier shall provide all tools for the generator set as recommended and required by the manufacturer.

Generator installation shall be checked by the supplier after installation to determine that the installation is correct. Written confirmation shall be provided to the City. Generator supplier shall perform a full load test for two (2) hours after installation is complete. Provide resistive load bank for this test.

Generator supplier shall provide a minimum of four (4) hours of training for City personnel at the station site during start-up.

Generator manufacturer shall provide five (5) copies of the maintenance and operation manual. These manuals shall be complete and shall include all information necessary to all City personnel to maintain the generator.

Generator and fuel tank mounting pad shall be reinforced concrete to carry the weight of the unit and shall extend a minimum of 6 inches beyond generator housing. Chamfer all edges 3/4 inch.

7C.080 ODOR CONTROL

Odor control shall be provided at the lift station and/or at the pressure main discharge manhole as determined and required by the City.

Refer to chapter 7D.080 for pressure main termination and odor control requirements.

7C.090 LIFT STATION INSPECTION CHECKLIST

The checklist on the following pages will be used by the City when doing a final inspection of a lift station. Additional items may be added depending on the type and style of station constructed. This list is provided to help the Developer prepare for the final inspection.

LIFT STATION INSPECTION CHECKLIST

Inspectors: _____ Date: _____

Name of Lift Station: _____

Location: _____

Address: _____

Assigned Lift Station Number: _____

	OPERATION OKAY	
	Yes	No
Control Panel components:		
Ultrasonic level instrument	_____	_____
Pump Run Lights:	_____	_____
Hour Meters:	_____	_____
H.O.A.:	_____	_____
Limit Switches:	_____	_____
Panel wiring	_____	_____
Grounding	_____	_____
UPS	_____	_____
Power supplies	_____	_____
Legend Plates	_____	_____
Markings and Identifications	_____	_____

Comments: _____

Alarm Functions:

Power Fail:	_____	_____
High Wet Well:	_____	_____
Low Wet Well:	_____	_____
High High Wet Well	_____	_____
Control Override	_____	_____
Intrusion	_____	_____

Pump Functions:

Pump #1 Fail	_____	_____
Pump #2 Fail:	_____	_____
Pump #1 Run:	_____	_____
Pump #2 Run:	_____	_____
Pump control override	_____	_____

Comments: _____

Telemetry Function at Maintenance Shop:

High Wet Well:	_____	_____
Pump #1 Fail:	_____	_____
Pump #2 Fail:	_____	_____
Intrusion:	_____	_____
Pump #1 Run:	_____	_____
Pump #2 Run:	_____	_____
Phase loss:	_____	_____
Pump control override:	_____	_____
Wet Well Level:	_____	_____

Comments: _____

Control Panel Enclosures Appropriate UL Labels: _____

Comments: _____

Wiring Schematics for Correlation: _____

Comments: _____

Wire Gauge (usually 18): _____

Comments: _____

Raceways & Electrical Conduit for Defects: _____

Comments: _____

Terminal Block: _____

Comments: _____

Proper Sized Circuit Breakers & Fuses: _____

Comments: _____

Electrical Control Devices Sized for Motors: _____

Comments: _____

Overload Devices, Trip Test & Manual Reset: _____

Comments: _____

All Wires Connected & Grounding: Comments: _____	_____	_____
Transformers: Comments: _____	_____	_____
Load Centers: Comments: _____	_____	_____
Electrical cabinet Heater Operation: Comments: _____	_____	_____
Disconnect Operation: Comments: _____	_____	_____
Auxiliary Generator Operation: Comments: _____	_____	_____
Transfer Switch Operation: Comments: _____	_____	_____
Isolation Valves Operation: Comments: _____	_____	_____
Check Valve Operation: Limit Switches: Comments: _____	_____	_____
Emergency Bypass Operation & Fittings: Comments: _____	_____	_____
All Nuts, Bolts and Anchors to spec., grade and in place: Comments: _____	_____	_____
All Mechanical Components Installed in Wet Well: Comments: _____	_____	_____
Wet Well Piping for Proper Size: Comments: _____	_____	_____
Corrosion Resistant (epoxy coating wet well pipes): Comments: _____	_____	_____
Calcium Aluminate Coating in Wet Well: Comments: _____	_____	_____
Flow Meter: Comments: _____	_____	_____

Note: Check that motors are not exceeding their nameplate amperage multiplied by the motor service factor, (i.e., with FLA = 10 and SF = 1.15, the amperage recorded should not exceed 11.5 amps). The motor will operate satisfactorily under the following conditions of voltage and frequency variation, but not necessarily in accordance with the standards established for operation under rated conditions.

- The voltage variation may not exceed 10% above or below rating specified on the motor nameplate.
- The frequency variation may not exceed 5% above or below motor nameplate.
- The sum of the voltage and frequency variations may not exceed 10% above or below motor nameplate rating, provided the frequency variation does not exceed 5%.

Motor Nameplate Amps: #1 _____ #2 _____ #3 _____

Motor Nameplate SF Amps: #1 _____ #2 _____ #3 _____

Voltage Taken @ Terminal Block: L1 _____ L2 _____ L3 _____

	OPERATION OKAY	
	Yes	No
Unusual Noise #1 Pump or Motor: Comments: _____	_____	_____
Unusual Noise #2 Pump or Motor: Comments: _____	_____	_____
Unusual Noise #3 Pump or Motor: Comments: _____	_____	_____
Proper Pump Rotation: Comments: _____	_____	_____
Sealed Bearings: Comments: _____	_____	_____
Pump Alternator Operation: Comments: _____	_____	_____

AMP reading recorded at startup: #1 _____ #2 _____ #3 _____

Comments: _____

Motor Data: HP _____ RPM _____ Phase _____ Cycle _____
Volt _____

Comments: _____

Pump Design in gallons per minute: #1 _____ #2 _____ #3 _____
#1, #2 and #3 _____ TDH _____

Comments: _____

Pump performance during startup in gallons per minute: #1 _____ #2 _____
#3 _____ #1, #2 and 3 _____ TDH _____

Comments: _____

Hour Meter Readings: #1 _____ #2 _____ #3 _____

Comments: _____

Pump #1 Running Amps: L1 _____ L2 _____ L3 _____
Pump #2 Running Amps: L1 _____ L2 _____ L3 _____
Pump #3 Running Amps: L1 _____ L2 _____ L3 _____

Actual Wet Well Pump down and fill levels:

High Water: _____
Fill Level: _____
Pump Down: _____

	OPERATION OKAY	
	Yes	No
Debris in Wet Well: Comments: _____	_____	_____
Wet Well Ladder: Comments: _____	_____	_____
Infiltration Points: Comments: _____	_____	_____
Operation of Wet Well Hatch & Latch: Comments: _____	_____	_____
Wet Well Safety Net: Comments: _____	_____	_____
Wet Well & Site Cleanliness: Comments: _____	_____	_____
Operation of Valve Vault Hatch & Latch: Comments: _____	_____	_____
Valve Vault Drain Sump / Cleanliness: Comments: _____	_____	_____
2" Wash Down Hydrant and DCVA: Comments: _____	_____	_____
Locks: Comments: _____	_____	_____
Site Lighting: Comments: _____	_____	_____
Fence and Gate Area: Comments: _____	_____	_____
Driveway / Access: Comment: _____	_____	_____
O & M Manuals (5 copies): Comments: _____	_____	_____
Warranty: Comments: _____	_____	_____

Other Comments:

Inspectors Signature of Acceptance :

Project Inspector: _____ Date: _____

Shop Operations: _____ Date: _____

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7D PRESSURE SEWER (PRESSURE MAIN)**7D.010 General**

Low pressure systems, such as S.T.E.P. or grinder may be considered for situations where conditions make gravity sewer impractical. Lift station pressure mains will also fall under this same design criteria.

7D.020 Design Standards

The design of any sewer extension/connection shall conform to City standards, Department of Ecology's "Criteria of Sewage Works Design", and any applicable standards as set forth herein and in sections 3.010 and 3.040.

The layout of extensions shall provide for the future continuation of the existing system as determined by the City. In addition, main extensions shall be extended to and through the site of the affected property fronting the main.

The system shall be designed at full depth of flow on the basis of an average daily per capita flow as shown on the table in Section 7B.020. A friction factor of 0.013 shall be used for Manning's "n" value.

New sewer systems shall be designed by methods in conjunction with the basis of per capita flow rates. Methods shall include the use of peaking factors for the contributing area, allowances for future commercial and industrial areas, and modification of per capita flow rates based on specific data. Documentation of the alternative method used shall be provided along with plans.

Privately owned pressure mains shall have a control valve installed on the main at the right of way.

Grinder system pressure mains shall not be combined with or connected to S.T.E.P. pressure sewer mains. Grinder and/or S.T.E.P. sewers may be allowed to connect to gravity sewer mains. Grinder pressure mains may be allowed to connect to lift station pressure mains. S.T.E.P. sewers shall not be allowed to connect to lift station pressure mains.

Pressure sewer pipe shall be even sizes only (ie. 2", 4", 6", etc.) Minimum pressure sewer pipe size for S.T.E.P. or grinder shall be 2" dia.

Minimum pressure sewer (pressure main) pipe size for lift stations shall be 4" dia.

The applicable General Notes in section 7B.020 shall be included on any plans dealing with pressure sanitary sewer design.

GENERAL NOTES (PRESSURE SEWER MAIN INSTALLATION)

1. All workmanship and materials shall be in accordance with City of Lacey standards and the most current copy of the *State of Washington Standard Specifications for Road, Bridge and Municipal Construction* (WSDOT/APWA). In cases of conflict, the most stringent standard shall apply.
2. All safety standards and requirements shall be complied with as set forth by OSHA, WISHA and Washington State Department of Labor and Industries.
3. All approvals and permits required by the City of Lacey shall be obtained by the contractor prior to the start of construction.
4. If construction is to take place in the County right-of-way, the contractor shall notify the County and obtain all the required approvals and permits.
5. A pre-construction meeting shall be held with the City of Lacey Construction Inspector prior to the start of construction.
6. The City of Lacey Construction Inspector shall be notified a minimum of 48 hours in advance of a tap connection to an existing main. The inspector shall be present at the time of the tap.
7. Any changes to the design shall first be reviewed and approved by the project engineer and the City of Lacey.
8. The contractor shall be responsible for all traffic control in accordance with the *Manual on Uniform Traffic Control Devices* (MUTCD). Prior to disruption of any traffic, traffic control plans shall be prepared and submitted to the City for approval. No work shall commence until all approved traffic control is in place.
9. The contractor shall be fully responsible for the location and protection of all existing utilities. The contractor shall verify all utility locations prior to construction by calling the Underground Locate Line at 1-800-424-5555 a minimum of 48 hours prior to any excavation.
10. All sewer mains shall be field staked for grades and alignment in accordance with section 7A.030 of the Development Guidelines.
11. All side sewer locations shall be marked on the face of the curb with an embossed "S" 3" high and 1/4" into concrete.
12. Bedding of the pressure sewer main and compaction of the backfill material shall be required. Bedding material shall be clean 5/8" minus sand/gravel mixture free from organic matter. The applicable Chapter 4-8 Trench Restoration detail shall be used (See Note #1).

-
13. A 4 foot square x 8 inch thick concrete pad with #4 rebar shall be installed around all valves that are not in a pavement area.
 14. Temporary street patching shall be allowed for as approved by the City Engineer. Temporary street patching shall be provided by placement and compaction of 1 inch maximum asphalt concrete cold mix. Contractor shall be responsible for maintenance as required.
 15. Erosion control measures shall be taken by the contractor during construction to prevent infiltration of existing and proposed storm drainage facilities and roadways.
 16. All buried power for S.T.E.P/Grinder systems shall be installed with continuous tracer tape installed 12" above the buried power. The marker shall be plastic non-biodegradable, metal core backing marked "power". Tape shall be furnished by contractor.
 17. Pressure mains 2" diameter shall be Schedule 80 PVC, ASTM D2241, SDR 21 with rubber gasket joints. Gaskets shall comply with ASTM D 1869 (7E.030). Pressure mains over 2" diameter shall be PVC C-900. Welded Poly (HDPE) pipe shall be Hi density ASTM D 3350, SDR 11 3408 socket welded or butt fusion welded. Fittings and valves shall comply with section 7E.040 of the Development Guidelines.
 18. S.T.E.P/Grinder service line from main connection to service ball valve shall be 1 ¼" or 2" diameter schedule 80 PVC. HDPE pipe shall be hi density ASTM D 3350, SDR 11 3408 socket or butt fusion welded.
 19. All plastic pipe and services shall be installed with continuous tracer tape installed 12" to 18" under the proposed finished sub grade. The marker shall be plastic non-biodegradable, metal core or backing marked sewer which can be detected by a standard metal detector. In addition, S.T.E.P systems and pressure mains shall be installed with 14 gauge direct bury, U.S.E. green coated copper wire wrapped around all plastic pipe, brought up and tied off at valve body. Continuity testing of the wire will be done by the City. Tape shall be Terra Tape "D" or approved equal. The tape and wire shall be furnished by the contractor.
 20. All pressure mains shall be hydrostatic tested in conformance with the above-referenced specification for testing water mains. (See note 1.) In addition, all Pressure mains shall be pigged in the presence of the City Inspector prior to placing main in service.

21. Prior to backfill, all mains and appurtenances shall be inspected and approved by the City of Lacey Construction Inspector. Approval shall not relieve the contractor for correction of any deficiencies and/or failures as determined by subsequent testing and inspections. It shall be the contractor's responsibility to notify the City of Lacey for the required inspections.

Revised: August 6, 2002

ww/dev07

7D.030 S.T.E.P./Grinder/Lift Station Pressure Main

- A. **Material:** 2" diameter pressure mains shall be schedule 80 pipe with gasket couplings. Glued or solvent weld pipe and fittings will not be allowed. Pressure main 4 to 12 inches shall be PVC C900 Class 200 with ductile iron fittings or PVC C-900 fittings and gasket joints. For 14 to 24 inch mains, pipe shall be PVC C905 Class 235 with ductile iron fittings and gasket joints. A more rigid pipe may be required where unlimited trench widths occur. All ductile iron fittings shall be epoxy coated or PE lined both inside and outside. The coating material shall be designed for use with corrosive materials. The use of ductile iron pipe will be limited to the lift station site only. Ductile iron pipe will not be used down stream of the lift station check valve vault. Pipe material & fittings for pressure mains larger than 24" shall be reviewed by the City of Lacey. Sewer rated C-151 class 50 ductile iron pipe may allowed under special circumstances as deemed necessary by the Director of Public Works.
- B. **Depth:** Pressure mains shall have a minimum 68 inches of cover to top of pipe. This minimum assumes 42 inches cover to an 8 inch diameter water pipe and 18 inches separation from the bottom of water pipe to the top of the sewer line. See Chapter 7A.020 for sanitary sewer/water main crossing requirements.
- C. **Lift Station Pressure Main Velocity:** The minimum velocity allowed is 2 feet per second (fps) at average Dry Weather Flow. 2 fps is required to maintain solids in suspension although 3 fps is desired to scour settled solids. Maximum velocity allowed shall be 8 fps.
- D. **Welded Poly Pipe:** Welded poly pipe shall be hi density ASTM D 3350, SDR 11 3408 socket welded or butt fusion welded. Welded poly pipe shall be allowed for pressure sewer sizes 2" through 24".

7D.035 Connections to Pressure mains.

Connection to existing pressure main shall be done with stainless steel tapping saddle and epoxy coated resilient wedge gate valve. When connecting a S.T.E.P. or grinder main or service lateral to a lift station pressure main a check valve shall be installed directly up stream of the tapping valve. The check valve shall be made accessible for maintenance or replacement. Installation of a manhole with bottom shall be required to facilitate access to the check valve.

7D.040 Lift Station Pressure Main Surge Protection

PVC is subject to fatigue failure due to cyclic surge pressures. The pressure main shall be constructed to minimize rapid changes in velocities. A properly sized surge tank may be required on the pressure main.

7D.045 Valves

All valves up to 2" shall be red handle Philmac FIPT x FIPT ball valves with appropriate couplings. All valves four to 24 inch shall be Waterous Series 500 plug valves or approved equal. Plug valves shall be ductile iron and epoxy coated on the inside and outside as specified in 7D.030. All plug valves shall have a 2" operating nut. Plug valves 10" & larger shall have gear reduction operation. Tapping valves shall be resilient wedge gate valves and be epoxy coated on the inside and outside.

A. Pressure Main Valve Spacing:

Valves shall be installed at all locations where the size of the pipe changes. (See also 7D.065 pig port requirements for pipe line size changes and spacing). Three valves shall be installed at each cross and two valves shall be installed at every tee. In no case shall valve spacing exceed 1000' for mains up to 10". Valve spacing shall not exceed 500' for mains over 10". At every lift station, a pressure main isolation valve is required within ten feet of the station.

B. Air Release Valves:

Air release valves shall be Crispin model PVC US10S with ¼" operating orifice and operating range of 10 to 100 psi. Air release valves and air/vacuum valves shall be located at the high points of the line. Air release valves shall be fitted with an activated carbon canister to absorb compounds with disagreeable odors prior to releasing the air to the surrounding area. Grades shall be designed to minimize the need for air/vacuum valves when practical. Vehicular access to valve is required for maintenance. See detail.

C. Pressure Sustaining Valve Assembly:

Pressure sustaining valves are sometimes required in the design of S.T.E.P systems to keep the pipeline full during periods of low or no flow or when siphoning conditions exist. Pressure sustaining valve and assembly shall be reviewed by the City of Lacey prior to approval. See detail.

7D.055 Fittings

- A. All pipe fittings shall have a minimum working pressure rating equal to the pipe with which they are connected. Fittings shall be PVC 1120, rubber joint complying with ASTM D-1784, D-2466, or D-2467.
- B. Fittings for welded poly pipe shall be electro fusion welded. Tee connections shall be electro fusion branch saddles or side wall fusion reducing tees. Connection to existing poly mains shall be by self tapping electro fusion saddles or Romac SST-H.

7D.060 Pressure Main Low Point Drain

Provisions to drain a pressure main to facilitate repairs or to temporarily remove pressure main from service shall be provided. This may be accomplished through the use of a valved tee connected to a drain line at the low point of the line. See detail.

7D.065 S.T.E.P./Grinder Pressure Main Pigging Ports

A pipeline pig is a projectile that is forced through the inside of a pipe to clean pressure pipelines. A pigging port is used as a point to send or retrieve the pig. Pigging ports shall be required:

1. At every change in pipeline size.
2. At the end of every dead end line.
3. At the connection point to the main when the main being constructed will be a secondary main.
4. Location and number of pigging ports required are subject to review and approval by the City of Lacey. See detail.

7D.070 Thrust Blocking

Location of thrust blocking shall be shown on plans. Thrust block concrete shall be Class B poured against undisturbed earth. A barrier shall be placed between all thrust blocks and fittings.

Designed and approved restraining joint systems may be allowed in lieu of thrust blocking. "Megalug" type joint restraints will not be allowed on PVC pipe. Mechanical restraints shall be split grip ring type. Restraining joint brand, type, and size shall be specified on the plans.

7D.080

Pressure Main Termination

Sewer odors and gases, hydrogen sulfide odors (H₂S), and the buildup of sulfuric acid (H₂SO₄) occur in the operation of a pressure main and/or S.T.E.P/Grinder system.

Odor and corrosion control measures shall be addressed on pressure sewer systems connecting to a gravity sewer system.

A determination of need for odor and corrosion prevention shall be prepared and stamped by a Professional Engineer licensed in the State of Washington. The report, along with said engineer's history of odor control experience and references shall be submitted during design phase for review by the City of Lacey. As a minimum, the odor control system shall be designed and installed according to current method of City of Lacey odor control treatment. If required, an odor control facility shall be installed in order to inject a treatment product into the system so that both odor and corrosion issues generated by the system are addressed. The pressure main shall be sized to provide adequate contact time for treatment to be effective. In addition to the injection of a treatment product a soil bed filter shall be installed at the terminus manhole to eliminate offensive sewer odors and corrosive H₂S gas. The soil bed system shall be designed and installed according to current method used by the City of Lacey. All manholes within 400' downstream of the out fall manhole and including the out fall manhole shall be entirely coated from the top grade ring to the channel flow line with ISO 9000 certified hi grade Calcium Aluminate material, LaFarge Sewper Coat HS 2000 or approved equal. The coating shall be applied under direction of the product representative, by a factory trained/certified applicator of the product. If new gravity manholes are to be installed at the terminus, all of the new manholes shall be coated as well. The pressure main discharge shall be made with a smooth transition of flow into the existing flow so as to not cause splashing of the effluent at the discharge.

7E S.T.E.P SYSTEM:**7E.010 General**

A Septic Tank Effluent Pump (S.T.E.P) system may be installed to serve single family residential, multi-family residential (Community System), and commercial applications where approved by the City. A S.T.E.P application with a proposed site plan is required for each individual on-site system. An example of the S.T.E.P application can be found in the appendix.

Any new single family subdivision designed with S.T.E.P sewers shall include an easement on the face of the plat for access to all lots as shown in the appendix. Other S.T.E.P applications shall require easements as outlined in the appendix.

A S.T.E.P system is a facility consisting of a tank or tanks for settling and digesting wastewater solids, and a pressure piping system for conveying the supernatant liquid into the sewer system.

S.T.E.P pump systems may be designed and installed as either single family, duplex or a community system or a combination of these. A chart (City of Lacey S.T.E.P System Requirement Chart) outlining the general S.T.E.P system design requirements can be found in this section.

The single family and duplex S.T.E.P. tanks shall be located in the front yard of the residence. If space is not available in the front yard of the residence, a gravity sewer system with community pump facility may be required. All S.T.E.P. tank riser lids shall be set to grade for maintenance access. No shrubs, bushes, trees or ground cover vegetation other than grass shall be planted within a 3' radius of any tank lid. All of the tank lids shall be visible.

The community S.T.E.P tank pump facility shall be located on an adequately sized lot or open space with an easement granted to the City. An additional 15' easement shall be granted around all sides of the facility for maintenance access. A driveway and/or adequate parking shall be provided at the facility for City of Lacey maintenance vehicular access. Driveway shall be constructed as a permanent all weather surface capable of supporting an 80,000 lb. vehicle.

Commercial S.T.E.P. systems that have kitchen or cooking facilities such as churches, community gathering places, restaurants, schools, etc. shall require installation of a grease trap.

The grease trap shall be designed, installed and constructed according to Thurston County Health Dept. requirements and the Uniform Plumbing Code. The grease trap shall be installed on the gravity building sewer between the building and the tank. Grease traps shall be approved and inspected by the City of Lacey Building Section of Community Development. Grease traps shall be maintained by the customer to the satisfaction of the City of Lacey and DOH requirements. Verification of grease trap maintenance shall be provided to the City of Lacey yearly.

Only sanitary wastewater shall be discharged into the tank. Roof drains and other storm water sources shall be strictly excluded.

Operation and maintenance of the tank, pump, and pump controls shall be the responsibility of the City only after the system has been inspected and approved and an easement is granted to the City and the warranty period of one year has expired. The one year warranty period for the onsite S.T.E.P. tanks and/or pump facilities shall begin when the residence or business discharging effluent into the tanks becomes occupied. The one year warranty period for the pressure main will begin when the S.T.E.P. tank /pump facilities connected to the main become occupied and begin pumping effluent into the conveyance system. It is required by the City that the easements for a new development be granted on the plat, otherwise, an easement for each lot will have to be granted at the time of connection. The City will be responsible for mapping the single family and duplex on-site system for "as built" purposes. Community pump station facilities shall be installed/constructed per the approved plans and as-built by the designing engineer.

Power for the single family, duplex or commercial system shall be provided by the customer. Power for the community type pump station shall be provided by the City of Lacey.

The customer shall be responsible for notifying the City when the control panel alarm buzzer is activated. The customer shall be responsible for curtailing water usage until City forces respond to the customers notification in the event of an alarm or problem. The City will accept no responsibility for damages resulting from a plumbing backup, such as may occur if water usage is not curtailed during an alarm condition or if the customer disables the alarm.

All sewer pipe, drains and plumbing between the tank and the building for single family, duplex or commercial systems shall be the responsibility of the customer.

Community type pump systems shall use the applicable criteria outlined in Chapter 7B for the design and construction of the gravity sewer and 7C for the design and construction of the pump station site and components.

Commercial S.T.E.P systems and tanks installed for the purpose of pumping industrial cleaning effluent, truck wash bays or car washes shall require the installation of an oil water separator prior to the S.T.E.P pump tank. The entire facility shall be owned and maintained by the customer to the location of the service valve/check valve box located down stream of the facility. Verification of maintenance shall be provided to the City of Lacey yearly.

All Grinder systems shall be owned and maintained by the customer. The City of Lacey shall take over ownership and maintenance of the main at the valve connection to the main at the right of way.

7E.020

Design Standards

The design of any S.T.E.P sewer system shall conform to City standards and any applicable standards as set forth herein and in Sections 3.010 and 3.040.

The layout of extensions shall provide for the future continuation of the existing system as determined by the City. In addition, main extension shall be extended to and through the side of the affected property fronting the main. Individual S.T.E.P service boxes shall be located at the corner of the lot opposite the water meter. S.T.E.P service boxes shall not be installed in driveways. The location of these boxes should be coordinated with Puget Sound Energy so the S.T.E.P services can be located on the same corner of the lot as the power drops.

Pump station design standards for any proposed community or commercial pump system that serves more than 50 homes or equivalent dwelling units shall fall under the Lift Station design criteria as outlined in section 7C.020 of this manual. Primary tank shall be sized according to City of Lacey S.T.E.P. system requirement chart.

Odor control measures shall be addressed on S.T.E.P/Grinder sewer systems connecting to a gravity sewer. An odor control facility shall be installed in order to inject a treatment product into the system so that both odor and corrosion issues generated by the system are addressed. Odor control system shall be designed according to current method of City of Lacey odor control treatment. The S.T.E.P/Grinder system main shall be sized to provide adequate contact time for treatment to be effective. In addition a soil bed filter shall be installed at the out fall manhole to eliminate offensive sewer odors and corrosive H₂S gas. An adequately sized space shall be provided and an easement granted to the City of Lacey for the installation of the odor control facility.

The standards outlined in section 7D "Pressure Sewer" of this manual shall be used for the design and construction of S.T.E.P/Grinder pressure mains.

Pump, pipeline, and appurtenant component sizing shall conform to the criteria as set forth in the Lacey "Comprehensive Sanitary Sewer Plan".

The applicable General Notes in section 7B.020 shall be included on any plans dealing with pressure sanitary sewer design.

The standards outlined in Section 7D.080, "Pressure Main Termination" shall be used for S.T.E.P main termination.

7E.030

Service Lateral Pipe and Building Sewer

- A. Service line: See City of Lacey S.T.E.P. System Requirement Chart for pipe size. Pipe shall be schedule 80 PVC water pipe, solvent weld joint located at 90 degrees to the mainline when possible. Solvent cements and primer for joining PVC pipe and fittings shall comply with ASTM D 2564 and shall be used as recommended by the pipe and fitting manufacturers. Poly pipe shall be hi density ASTM D 3350, SDR 11 3408 socket or butt fusion welded. Services shall have a minimum 24 inches cover to top of pipe. Pressure services must cross under any water line. See chapter 6.130 for water & sewer separation requirements.
- B. Building Sewer: The gravity building sewer pipe between the building and the tank for single family, duplex and commercial systems shall be designed and installed in accordance with the Uniform Plumbing Code as adopted in LMC 14.06. A clean out shall be installed on the gravity building sewer, located between the structure and the tank, raised to grade and installed per plumbing code.

- C. All pipe shall be installed with continuous tracer tape installed 12 to 18 inches under the proposed finished grade. The marker tape shall be plastic; non-biodegradable, metal core or backing which can be detected by a standard metal detector. Tape shall be Terra Tape "D" or approved equal. In addition to tracer tape, install 14 gauge green coated copper wire, wrapped around the pipe, brought up and tied off at the valve boxes.

7E.035 Fittings

Solvent weld fittings for one inch through two inch pipe shall be socket type Schedule 80 and shall comply with ASTM D 1784 and ASTM D 2466. Poly fittings shall be electro fusion welded high density ASTM D 3350 socket or butt fusion welded and of the same pressure rating and classification as the pipe.

7E.040 Service Lateral Valves

- A. All service valves shall be 1 ¼ or 2 inch Philmac FIPT x FIPT ball valves. Valves shall be left "off" and have a threaded plug installed in the end until the lot is connected.
- B. Check Valves: Check valves used on service lines shall be a tee or wye pattern swing check PVC. Valves shall have a working pressure of 150 psi. Valves shall be designed for use with corrosive fluids. A check valve shall be installed at the end of the service stub out at the property line to be installed in a valve box. Check valves shall be King Brothers, KSC or approved equal. The check valve shall be mounted horizontally and be visible in the valve box along with the ball valve. Check valve shall not be buried.
- C. Service Valve Box Lids. Valve box lids shall be specified to be marked "SEWER" so they can quickly be distinguished from valves in the water system.

D. Service Valve Boxes:

Earth Bury:

- Carson 1419E. For single service.
- Carson 1324E. For large or community type service.

Traffic Areas:

- Midstates Plastics BCF 1419SL. For single family service.
- Midstates Plastics BCF 1324SL for large or community type service.

7E.060

Concrete S.T.E.P. / Septic Tanks

Approved S.T.E.P tanks and sizes are listed in the City of Lacey S.T.E.P. System Requirement Chart.

Tanks shall be rectangular, pre-cast concrete, dual chamber, and shall have been designed by a registered structural engineer. The chambers shall be divided in such a way that 1/3 of the tank capacity is designed as the pumping chamber and 2/3 of the tank capacity is designed as the settling chamber. All tanks shall be manufactured for acceptance of pump assemblies or effluent filters and have a pre-cast groove 1 inch wide by 1/2 inch deep, 30 inches in diameter to allow positive attachment of the riser. The manufacturer shall provide the structural design and certification to the City for review. The design or analysis shall be in accordance with accepted engineering practice. Tanks 1.5 to 4 feet in depth shall be designed for the following loading conditions:

- A. Top of tank 400 pounds per square foot.
- B. Lateral load of 62.4 pounds per square foot (62.4 pcf equivalent fluid).
- C. The tank shall be designed to support a 2,500 pound wheel load with minimum allowable earth cover.
- D. The tank shall be designed to withstand hydrostatic loading equal to the maximum depth of bury, in addition to the soil loading. Maximum depth of bury shall be measured from the ground elevation to the invert of the sewer line entering the tank.

Deeper installations, if required by local conditions, will require special consideration, as will tanks located where a vehicle might be driven over them. Tanks approved as traffic bearing tanks shall be designed to withstand an H-20 live load with a minimum soil cover of 18 inches. Load rating of tank shall be clearly stamped in lid and side of tank. A specific design done by a Structural Engineer needs to be submitted to verify that the tank specified is designed for the depth and loading to be incurred.

All tanks shall be guaranteed in writing by the tank manufacturer for a period of two years from the date of delivery to the project. Manufacturer's signed guarantee shall accompany delivery.

Systems installed on a site where an existing septic tank exists may not use the existing tank. The existing tank must be removed or abandoned per DOH and/or county requirements. Concrete material and construction shall meet the requirements of section 6-02 of the WSDOT/APWA Standard Specifications for Road, Bridge, and Municipal Construction most current edition.

The concrete mix shall not be modified unless the mix design is reviewed and approved by the City.

Walls, bottom and top of reinforced-concrete tanks shall be designed across the shortest dimension using one-way slab analysis. Stresses in each face of monolithically-constructed tanks may be determined by analyzing the tank cross-section as a continuous fixed frame. The walls and bottom slab shall be poured monolithically. Concrete shall achieve a minimum compressive strength of 4000 psi in 28 days. Date of manufacture shall be clearly stamped in lid and side of tank.

Reinforcing steel shall be ASTM A-615, Grade 60, $f_y = 60,000$ psi. Details and placement shall be in accordance with ACI 315 and ACI 318.

Modification of completed or existing tanks will not be permitted for structural, warranty, and liability reasons. In order to demonstrate water tightness, tanks shall be tested prior to acceptance. Each tank shall be tested at the factory, by filling with water to the base of the riser and letting stand. After 24 hours, the tank shall be refilled to the soffit and the ex-filtration rate shall be determined by measuring the water loss during the next two hours. The two hour water loss shall not exceed one gallon.

Tanks shall not be moved from the manufacturer's site to the job site until the tank has cured for at least 7 days and has reached two thirds of the design strength.

Tanks shall be bedded on 6 inches 5/8 inch crushed rock or pea gravel. Backfill material shall be sand to within 12" of the finished grade Sides shall be compacted in 2 foot lifts to the same or greater density than the surrounding area.

After the tanks have been set in place and the riser installed, but prior to back filling, each tank shall be tested by filling the tank riser with water to the top or to a level that equals 3 PSI against the tank to riser seal for a 2 hour period. Water loss during the test shall not exceed 1 gallon. Electrical "J" box shall not be submerged during the test.

Tanks installed where groundwater levels are above tank bottom require precautions to prevent flotation. In general, tanks shall immediately be filled with water and shall not be pumped down more than 3 feet below top of tank.

Finish grading, cleanup, and restoration shall be completed prior to final acceptance by the City.

7E.065 Fiberglass Septic Tanks

Fiberglass tanks approved for use in the City of Lacey will be of the sizes called out in the City of Lacey S.T.E.P. System Requirement Chart found in this chapter only. Fiberglass tanks will not be approved for use for single family or duplex applications.

Fiberglass septic tanks approved for use in the City of Lacey must be double wall air testable Xerxes fiberglass tanks or approved equal.

All tanks shall be guaranteed in writing by the tank manufacturer for a period of two years from the date of delivery to the project. Manufacturer's signed guarantee shall accompany delivery.

Systems installed on a site where a septic tank exists may not use the existing tank. The existing tank must be removed or abandoned per DOH and/or county requirements.

The tank gallon size used shall be determined by the City of Lacey S.T.E.P. System Requirement Chart found in this chapter. Actual diameter and length of the tank shall be determined by site conditions such as gravity system depth requirements feeding the primary tank, space available, or groundwater and soil conditions.

Fiberglass tanks shall only be installed by persons who have attended an installation class sponsored by the manufacturer of the tank being installed.

All factory requirements shall be strictly adhered to during the delivery, storage and installation process of the fiberglass tank(s).

In areas of high groundwater concrete dead man anchoring of the fiberglass tank(s) may be required. All factory anchoring installation requirements of the tank(s) shall be met.

All backfill requirements recommended by the manufacturer of the fiberglass tank being installed shall be met.

All fiberglass tanks must be air tested for leakage at the factory prior to shipment. A second air test shall be done at the job site and witnessed by the City of Lacey Inspector prior to back filling to verify no damage or leakage has occurred during shipment or during storage at the job site. All air tests shall be done according to factory specifications.

A standard hydrostatic test for the riser connection shall be required and witnessed by the City of Lacey inspector immediately after installing and back filling the tank(s) by filling the tank riser with water to the top or to a level that equals 3 PSI against the tank to riser seal (aprox. 7 feet) for a 2 hour period. Water loss during the test shall not exceed 1 gallon.

7E.070 Tank Risers and Lids

Tank chamber risers shall be 8, 24, 30 or 48" inch diameter, fiberglass ribbed or PVC as manufactured by ORENCO SYSTEMS, INC., 2826 Colonial Road, Roseburg, Oregon 97470 or approved equal. Solids compartment risers shall be 24" diameter. Clean out risers between compartments on 1,500 and 3,000 tanks shall be 8" diameter. Pump chamber risers shall be 30" diameter. 3,000 and 1,500 gallon tank riser height shall not exceed 48" from top of tank to finished grade. All tank riser lids shall be set to grade for maintenance access.

Riser on inlet of community tanks shall be 24" diameter. Bio-tube compartment risers on community system tanks shall be 30" or 48" diameter as required. Primary tanks shall have 24" risers evenly spaced along tank length to facilitate pumping. Spacing of risers shall not exceed 10' to center of risers. No shrubs, bushes, ground cover or trees shall be planted within a 3' radius of the tank lids. Community system tank riser height shall not exceed

96" from top of tank to finished grade. All tank riser lids shall be set to grade for maintenance access.

Pump chamber risers shall be factory equipped with the following:

- A. Appropriately sized (IPS) neoprene grommets shall be installed no less than eight inches from the top of the riser and no more than twelve inches from the top of the riser around the pump discharge pipe(s) and electrical splice box conduits where they exit the riser and create a seal to prevent the infiltration of ground water into the tank.
- B. Single family tank splice box shall be Orenco model SB4.
- C. Duplex systems shall be Orenco model SB4 for the floats and SB2 for the motors.
- D. Splice box in the Thurston County, commercial & community systems shall be SB5 for the floats. Motor leads shall exit riser and be housed in a standard concrete electrical junction box. There shall be a slack loop in the junction box along with Erickson union and seal off. Motor leads shall be continuous from motors to electrical cabinet without splices.

A lid shall be furnished with each riser. It shall be latching and constructed of fiberglass with an aggregate finish. Riser and lid combination shall be able to support a 2500 pound wheel load. This does not imply that PVC risers are intended for traffic areas.

Each riser shall be bonded to the top of the concrete tank with a two-part epoxy that shall be supplied with the riser by the manufacturer. The epoxy shall be applied in accordance with the manufacturer's recommendations. A generous bead of epoxy shall be laid completely around the bottom of the riser prior to mounting the riser on the top of the tank. After the riser is in place, a generous fillet shall be run completely around the inside base. The epoxy shall be allowed four hours curing time at 64 degrees Fahrenheit; otherwise a greater time shall be allowed based on the manufacturer's recommendations before backfill is placed over tank. Care shall be exercised during the curing period to avoid dislodging the riser or disrupting the water-tight seal between the riser and tank. Fiberglass tanks shall have a portion of the risers manufactured as part of the tank and sized to fit the standard Orenco risers and lids. The two part epoxy mentioned above shall be used to attach the Orenco riser to the fiberglass riser along with the adapter ring.

7E.080 Pumping Tank Equipment

Pumps shall be UL listed for use in effluent. All pumping systems shall be Orenco Systems Model OSI S 4000 Series High Head Pumping Assemblies or approved equal. See City of Lacey S.T.E.P System Requirement Chart and details.

All pumping systems shall be installed in accordance with the manufacturer's recommendations.

7E.090 Control Panel Power

See detail for single family control panel and section 7E.095. Control panel for duplex or commercial systems shall be mounted within three feet of the meter base on the building and be wired to a properly sized dedicated breaker. This is required to avoid damage or overload to system and appliances. Power to the S.T.E.P control box shall be provided to and maintained by the owner of the building that the system serves.

The control cabinet for community systems shall be a free standing stainless steel enclosure mounted on a concrete pad at the pump tank site. See section 7C Lift Station for all applicable requirements.

If S.T.E.P systems are to be installed for commercial buildings, a copy of the proposed manufacturer's specifications and load calculations shall be submitted to the City for review and approval prior to installation. The property owner per Thurston County Assessor's records shall be responsible to supply and maintain the dedicated power circuit to the S.T.E.P system control panel.

All buried power shall be installed with continuous tracer tape installed 6 inches above the buried power. The marker tape(s) shall be plastic non-biodegradable and be labeled with the appropriate marking.

Wiring from the pump control panel to the splice box in the wet well riser shall be a minimum #14 stranded wire and colored insulation matching the manufacturer's diagram. Connections in the riser junction box shall be installed as per the manufacturer's specification. A good quality heat shrink shall be used on all leads. Splices shall be capable of lifting out of the junction box a minimum of six inches. The motor and control circuits will be meggered as part of the inspection procedure and shall be no less than 50 megohms before acceptance by the City.

7E.095 Control Panels

1. Control panels for single family dwellings shall be Orenco Systems Model# ORS1DS City of Lacey Control Panel .or City approved equal. Control panel boxes shall not be painted. The control panel and riser junction box shall be dry and clean before acceptance. The control panel shall be furnished with the following features:
 - A. Rating: 1 HP/115 VAC, 2 HP/230 VAC, single phase, 60 Hz. Motor start contact shall be rated for 25 FLA (full load amps), single phase, 60 Hz.
 - B. Audible alarm, panel mount with a minimum of 80 dB sound pressure at 24 inches continuous sound.
 - C. Oil-tight visual alarm, red lens, with push-to-silence feature.
 - D. Automatic audio-alarm reset.
 - E. 15 amp motor rated toggle switch, single-pole, double-throw with three positions: manual (MAN), automatic (AUTO) and center (OFF).
 - F. NEMA 4X-rated fiberglass enclosure with gasketed, hinged cover, and locking latch. Padlock will be installed by City at time of City's acceptance of the completed installation and shall signify final acceptance.
 - G. Alarm circuit shall be wired separately from the pump, so that if the internal pump overload switch is tripped, the alarm will still function.
 - H. 20-amp power disconnect assembly toggle switch to de-energize entire control panel, to permit servicing panel without access to the customer's breaker switches.
 - I. All wiring systems shall be installed in accordance with the National Electrical Code (NEC) and City of Lacey specifications, and the manufacture's specifications. In cases of conflict the most stringent standard shall apply.
 - J. When required, the Thurston County disconnect switch shall be mounted directly below the control panel and shall be a "Square D" 30A 240 VAC 3R safety switch, non fused.

2. Control panels for duplex, commercial or community systems shall be designed, assembled and ordered as a packaged unit from Orenco Systems Inc. or approved equal for the size and type of system mentioned in the City of Lacey S.T.E.P. System Requirement Chart.

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7F INTERIM SEWERAGE FACILITIES**7F.010 General**

In those areas, located within the City of Lacey's Urban Growth Management Area boundary, where connection to a permanent public sewerage system is not feasible, a community on-site septic system may be constructed to serve residential and non-residential locations when approved by the City. Approval for construction of a community on-site, interim sewerage facility shall be secured from the City prior to engineering and design. Approval by Thurston County Environmental Health shall not constitute City of Lacey approval. In cases of conflict between the County and City, the more stringent criteria shall apply. In certain cases, a value engineering study may be required by the City prior to granting approval for an interim sewerage facility. A separate application is still required for each individual lot's connection to the community system.

Community on-site systems shall be dedicated, maintained and operated by the City. A monthly sewer service charge shall be applicable as provided for in LMC 13.16. (13.30.010) A ULID Waiver of Protest shall be required of the Developer to facilitate the extension of a public sewer trunk line to the site. (LMC 13.30.030)

Five sets of manuals complete with maintenance and operating instructions for the drain fields, filters, pumps and all plumbing associated with the system shall be supplied to the City of Lacey at time of start up. Operating instructions shall define and address dosing and pumping requirements for initial flows as well as build out flows for the system designed.

Any new single family and/or commercial subdivision designed with a community on-site sewer system shall include an easement on the face of the plat for access to all lots. A Septic System Maintenance Agreement, submitted at the time of plan review, shall also be required. The maintenance agreement shall be signed and reviewed prior to plan approval. See Appendix J for easement and maintenance agreement forms. For any existing platted subdivision requiring a community on-site sewer system, an easement for each lot shall be granted prior to the connection to the community system.

Maintenance and pumping of the community on-site system shall be the responsibility of the City only after the system has been inspected and approved by Thurston County Environmental Health and City of Lacey. The one year warranty period shall begin when the residences or businesses discharging effluent into the system become occupied. The sewer lateral between the building and the main shall be the responsibility of the owner.

7F.020 Design Standards

The design of any community on-site system shall conform to City standards and any applicable standards as set forth herein and in Sections 3.010, 3.040, 3.065 and 7A.010. As built drawings shall also comply with Thurston County Environmental Health requirements.

All collection lines, dry lines, pumping stations and other sewer appurtenances and sizing shall conform to the criteria as set forth in the "Comprehensive Sanitary Sewer Plan", most current copy.

The layout of the dry line extension shall provide for the future continuation of the existing system as determined by the City. In addition, the dry line main extension shall be installed within a plat prior to new roadway construction and extended to and through the side of the affected property fronting the main to the existing roadway.

The community system shall be designed so that each residential or non-residential unit will discharge into the gravity sewer collection system. The gravity system will then convey sewer to a community pumping facility. The community pump facility will discharge the effluent into a City designed pre treatment system depending on site conditions prior to discharge of the effluent to a pressurized community drain field. See detail.

Tank design standards shall meet the applicable standards as set forth in section 7E.060 "Septic Tank / S.T.E.P."

The applicable General Notes in section 7B.020 shall be included on any plans dealing with gravity sanitary sewer design.

7F.050 Pumping Chamber

The pumping chamber leading to the pressurized drain field shall be designed and constructed as set forth in Chapter 7E S.T.E.P. System.

7F.060 Septic Tank

The tanks shall be designed and constructed as designated in 7E.060. Only sanitary wastewater shall be discharged into the tank. Roof drains and other storm water sources shall be strictly excluded. The effluent shall be discharged by gravity to the community pumping station.

7F.070 Pipe**A. Pressurized Drain field:**

All pipe used in construction of the pressurized drain field shall be as specified in Section 7E 030 "Service Lateral Pipe and Building Sewer" or Thurston County Environmental Health requirements. In cases of conflict the more stringent criteria shall apply and shall be specified on the approved plans.

B. Gravity Lines:

All gravity sewer lines and dry lines installed for future extension shall meet the standards as set forth in section 7B.040, "Main Line - Gravity" and 7F .130 "Dry Line System".

C. Lateral:

The lateral between the building and the gravity sewer main shall be designed and installed in accordance with the Uniform Plumbing Code as adopted by LMC 14.06. Maintenance of this line is the building owner's responsibility.

7F.080 Fittings

A combination of solvent weld and threaded fittings shall be required and called out on the approved plans.

7F.090 Valves

All ball valves shall be Philmac or approved equal. Other special valves shall be reviewed and approved by the City of Lacey during design.

7F.100 Testing

All testing of the gravity sewer, pump facility & tanks and the pressurized drain field shall be witnessed by the City of Lacey Inspector. Testing of the pressurized drain field shall be per Thurston County standards. Testing of the pumping facility, the septic tank, and the sewer lines shall be per the appropriate section of this book for that appurtenance.

7F.130 Dry Line System

A future dry line sewer shall be installed. The last gravity manhole installed before the community pump facility shall be channeled for a gravity dry line sewer main extension to the property line to allow for future connection to the public sewer system. See detail. The gravity dry line shall have a plug installed in the line at the last manhole. The manhole channel shall be sloped to flow towards the community pump facility to prevent the accumulation of sewer in the channel. The lines shall meet all extension requirements and standards for that type line as outlined elsewhere in this chapter.

7F.140 Connection to a Permanent Public Sewer Line

The ultimate connection of the community interim sewerage facility and incorporation of interim sewerage facilities with a permanent public sewerage system will be the responsibility of the City. (LMC 13.30.040)

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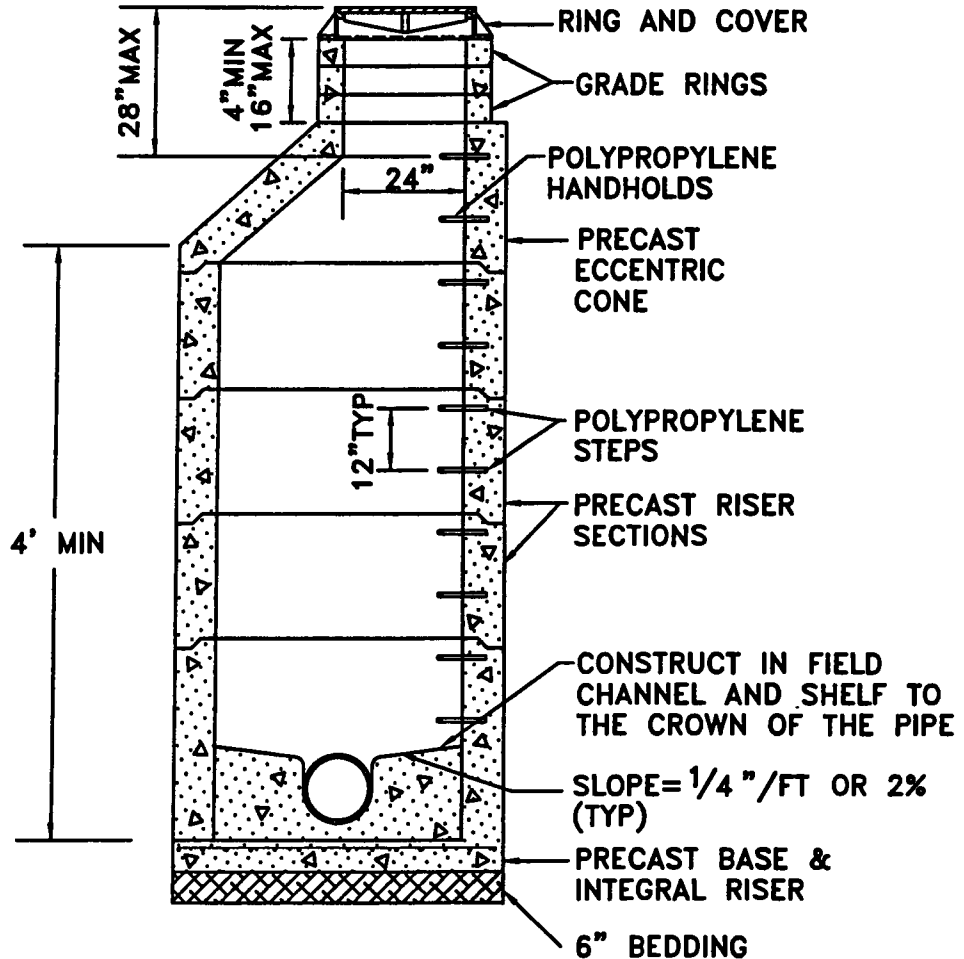
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City of Lacey S.T.E.P. System Requirement Chart

EDUs	Primary / Solids Tank	Pump Tank	Pumps	Service Lateral pipe	Electrical & Cabinet Requirements	Generator Requirements	Telemetry Requirements
Single Family	1,500 gallon capacity concrete tank baffled at 2/3 for pump compartment Maximum depth of bury from top of concrete tank to grade is 4' See detail		One Orenco High-Head, 120V, single phase Model 10 OSI 05 HHF, with 8 foot cord and 1/8 inch bypass orifice Bio Tube Vault # PVU57-1819	1 1/4" Schedule 80 PVC or welded poly See section 7E.030	Orenco simplex ORS1DS Lacey panel mounted on garage near power service. Dedicated 20 amp service.	None	None
Duplex	3,000 gallon capacity concrete tank baffled at 2/3 for pump compartment Maximum depth of bury from top of concrete tank to grade is 4' See detail		Two Orenco High-Head, 120V, single phase Model 10 OSI 05 HHF, with 8 foot cords and 1/8 inch bypass orifice PVU Bio Tube Vault sized accordingly	1 1/4" Schedule 80 PVC or welded poly. See section 7E 030	Orenco duplex Lacey panel mounted on garage near power service with dedicated meter service for S T E P tank operation only.	None	None
Community Systems							
3 - 9 home community system	6,000 gallon single compartment tank 24" Orenco riser/lid over inlet. Minimum inlet and outlet pipe size shall be 6" Outlet fitted with hard plumbed Orenco Bio-Tube filter and 30" riser/lid See section 7E 065 and 7E 070	60" diameter manhole. Bottom of manhole set to match primary tank base elevation. 30" diameter Orenco riser/lid over pumps 24" riser/lid over inlet tee 24" maximum riser height from top of concrete manhole lid to grade	Two Orenco 20 gpm pumps with PVU Bio-Tube vault. Motor and pump selected to fit system head requirements. Vault free standing on bottom of pump chamber	2" Schedule 80 PVC or welded poly See section 7E 030	Freestanding stainless enclosure NEMA 4X, with standard Orenco duplex controls Audio and visual alarm shall be mounted on the face of the cabinet See section 7C for other applicable site information Minimum cabinet size 40" x 48"	Onsite generator not required 100 amp generator plug receptacle and manual transfer switch shall be installed Part # ADR1044RS, 250VDC 600VAC.	None
10 - 16 home community system	10,000 gallon single compartment tank. 24" Orenco riser/lid over inlet. Minimum inlet and outlet pipe size shall be 8" Outlet fitted with two hard plumbed Orenco Bio-Tube filters and 30" riser/lid. See section 7E.065 and 7E 070	60" diameter manhole. Bottom of manhole set to match primary tank base elevation. 30" diameter Orenco riser/lid over pumps. 24" riser/lid over inlet tee 24" maximum riser height from top of concrete manhole lid to grade	Two Orenco 30 gpm pumps with PVU Bio-Tube vault. Motor and pump selected to fit system head requirements. Vault free standing on bottom of pump chamber	2" Schedule 80 PVC or welded poly . See section 7E 030	Freestanding stainless enclosure NEMA 4X, with standard Orenco duplex controls See section 7C for other applicable site information Minimum cabinet size 60" x 60".	Onsite diesel generator with auto transfer switch required See section 7C 070	Radio Telemetry required. See section 7C Lift Stations
17 - 33 home community system	20,000 gallon single compartment tank 24" Orenco riser/lid over inlet. Minimum inlet and outlet pipe size shall be 8" Outlet fitted with three hard plumbed Orenco Bio-Tube filters and 48" riser/lid See section 7E 065 and 7E 070	72" diameter manhole Bottom of manhole set to match primary tank base elevation 30" diameter Orenco riser/lid over pumps 24" riser/lid over inlet tee 24" maximum riser height from top of concrete manhole lid to grade	Two Orenco 30 gpm pumps with PVU Bio-Tube vault effluent filter basket. Greater than 26 homes use 50 gpm pumps Motor and pump selected to fit system head requirements Vault free standing on bottom of pump chamber	2" Schedule 80 PVC or welded poly See section 7E 030	Freestanding stainless enclosure NEMA 4X, with standard Orenco duplex controls See section 7C for other applicable site information Minimum cabinet size 60" x 60".	Onsite diesel generator with auto transfer switch required. See section 7C 070	Radio Telemetry required. See section 7C Lift Stations
34 - 50 home community system	30,000 gallon single compartment tank 24" Orenco riser/lid over inlet Minimum inlet and outlet pipe size shall be 8" Outlet fitted with three hard plumbed Orenco Bio-Tube filters and 48" riser/lid	72" diameter manhole Bottom of manhole set to match primary tank base elevation 30" diameter Orenco riser/lid over pumps 24" riser/lid over inlet tee. 24" maximum riser height from top of concrete manhole lid to grade	Two Orenco 50 gpm pumps with PVU Bio-Tube vault effluent filter basket. Motor and pump selected to fit system head requirements. Vault free standing on bottom of pump chamber.	2" Schedule 80 PVC or welded poly . See section 7E 030	Freestanding stainless enclosure NEMA 4X, with standard Orenco duplex controls See section 7C for other applicable site information Minimum cabinet size 60" x 60"	Onsite diesel generator with auto transfer switch required See section 7C 070	Radio Telemetry required See section 7C Lift Stations
51 - 83 home community system	50,000 gallon single compartment tank 24" Orenco riser/lid over inlet. Minimum inlet and outlet pipe size shall be 8" Outlet fitted with three hard plumbed Orenco Bio-Tube filters and 48" riser/lid	See City of Lacey submersible lift station design criteria chapter 7C of this manual.		See section 7D Pressure Sewer and 7C Lift Station	See section 7C 060 Minimum cabinet size 60" x 60".	Onsite diesel generator with auto transfer switch required See section 7C 070	Radio Telemetry required See section 7C Lift Stations

- 1) Access shall be provided at Community station sites for City of Lacey maintenance vehicles. See section 7C.030
- 2) All applicable requirements for section 7C Lift Stations shall apply for Community Systems and site as deemed necessary by the City of Lacey.
- 3) Maximum riser height for 1,500 and 3,000 gallon tanks is 48". Maximum riser height for community (fiberglass tanks) is 96".
- 4) Concrete tanks over 3,000 gallons and poured in place concrete tanks will not be allowed.
- 5) 51 to 83 home, 50,000 gallon system is the largest approved Community System accepted by City of Lacey Multiple primary holding tanks served by a single pump station shall not be allowed.

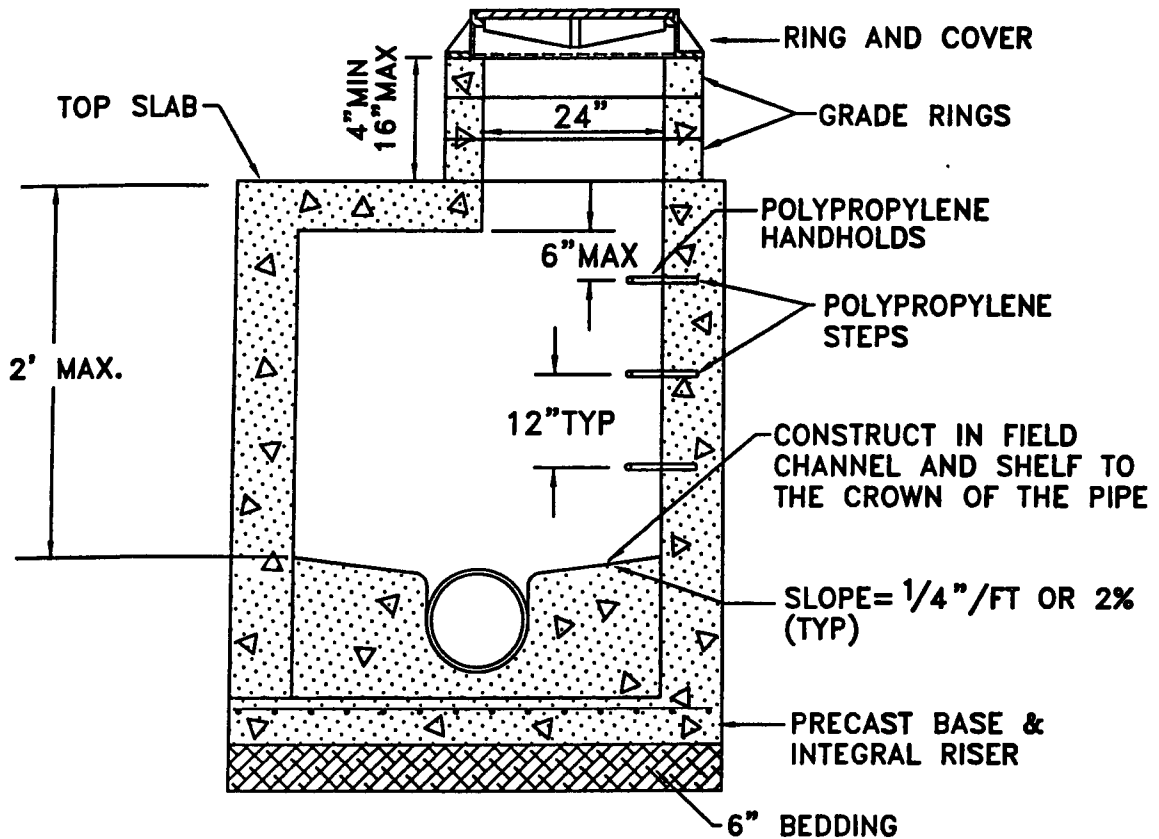


NOTES:

1. PRECAST MANHOLES SHALL MEET THE REQUIREMENTS OF ASTM C478. JOINTS SHALL BE RUBBER GASKETED CONFORMING TO ASTM C443 AND SHALL BE GROUTED FROM THE INSIDE. LIFT HOLES SHALL BE GROUTED FROM THE OUTSIDE AND INSIDE OF THE MANHOLE.
2. STEPS IN MANHOLE SHALL HAVE 6" MINIMUM CLEARANCE.
3. PRECAST BASES SHALL BE FURNISHED WITH CUTOUTS OR KNOCKOUTS. KNOCKOUTS SHALL HAVE A WALL THICKNESS OF 2" MINIMUM.
4. CONNECTION TO MANHOLE SHALL BE MADE BY KOR-N-SEAL BOOT, SAND COLLAR OR A-LOCK.
5. SEE DETAIL 7-3 FOR MANHOLE COLLAR INSTALLATION.
6. A SEWER GUARD SHALL BE INSTALLED IN ANY MANHOLE SUBJECT TO FLOODING.

DG71.DWG

CITY OF LACEY, WASHINGTON DEPT. OF PUBLIC WORKS			
TYPE 1 MANHOLE			
APPROVED			DWG. NO.
CITY ENGINEER		DATE	7-1
DES. HEK	DWN. WHO	CKD	DATE 1/2/02



NOTES:

1. PRECAST MANHOLES SHALL MEET THE REQUIREMENTS OF ASTM C478. JOINTS SHALL BE RUBBER GASKETED CONFORMING TO ASTM C443 AND SHALL BE GROUTED FROM THE INSIDE. LIFT HOLES SHALL BE GROUTED FROM THE OUTSIDE AND INSIDE OF THE MANHOLE.
2. STEPS IN MANHOLE SHALL HAVE 6" MINIMUM CLEARANCE.
3. PRECAST BASES SHALL BE FURNISHED WITH CUTOUTS OR KNOCKOUTS. KNOCKOUTS SHALL HAVE A WALL THICKNESS OF 2" MINIMUM.
4. CONNECTION TO MANHOLE SHALL BE MADE BY KOR-N-SEAL BOOT, SAND COLLAR OR A-LOCK.
5. SEE DETAIL 7-3 FOR MANHOLE COLLAR INSTALLATION.
6. A SEWER GUARD SHALL BE INSTALLED IN ANY MANHOLE SUBJECT TO FLOODING.

DG72.DWG

CITY OF LACEY, WASHINGTON
DEPT. OF PUBLIC WORKS

SHALLOW MANHOLE

APPROVED

DWG. NO.

CITY ENGINEER

DATE

7-2

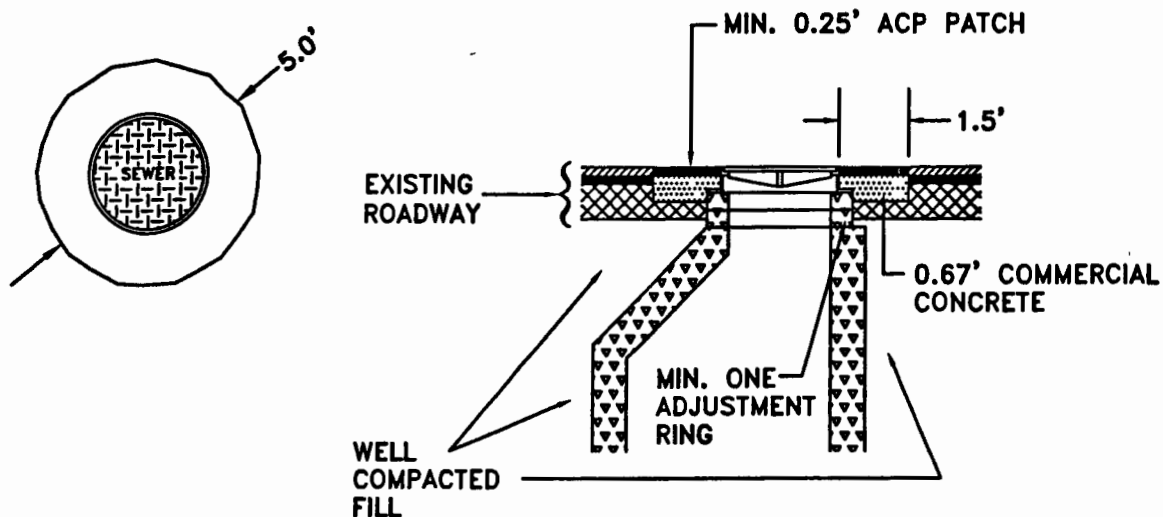
DES.
HEK

DWN.
WHO

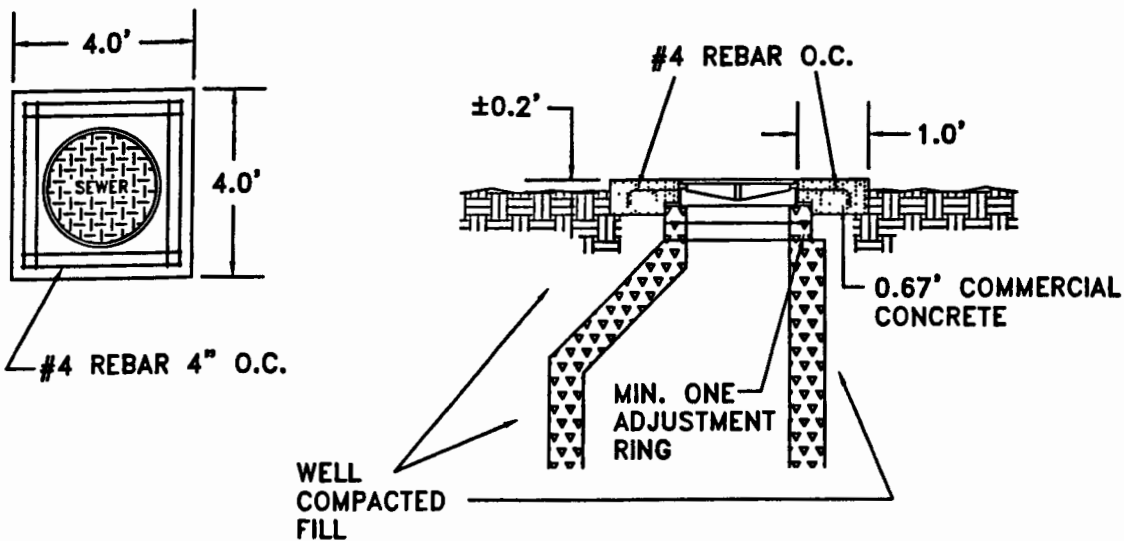
CKD

DATE
1/2/02

MANHOLE IN ASPHALT



MANHOLE OUTSIDE ASPHALT



NOTE:

1. ON MANHOLE OUTSIDE ASPHALT ADD REINFORCING STEEL AS SHOWN ABOVE. DEFORMED BAR TO MEET ASTM A615 GRADE 60 FY=60,000 P.S.I.

CITY OF LACEY, WASHINGTON
DEPT. OF PUBLIC WORKS

MANHOLE COLLAR

APPROVED

DWG. NO.

CITY ENGINEER

DATE

7-3

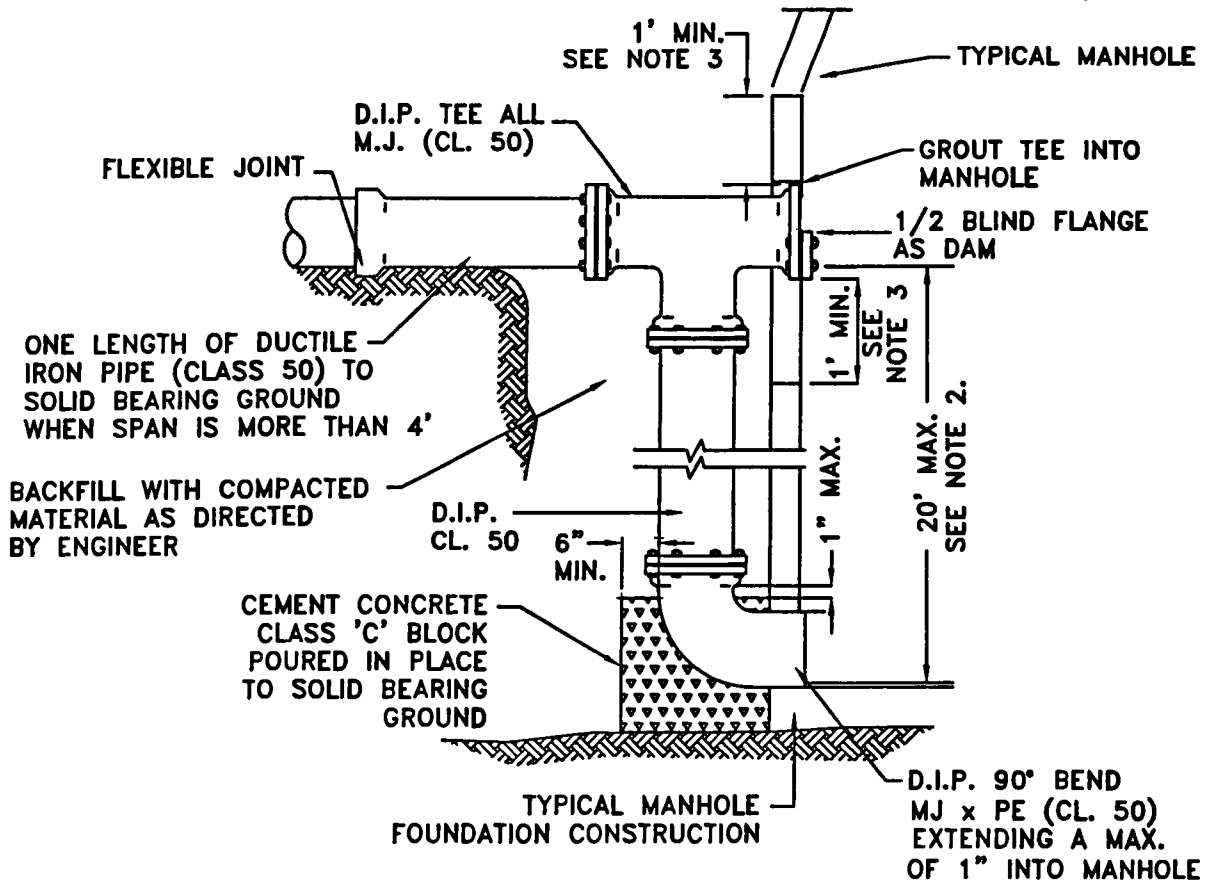
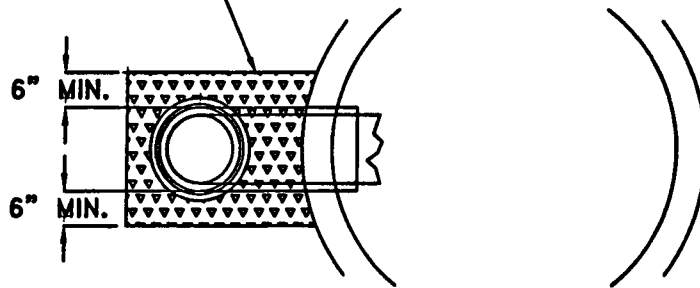
DES.
LRW

DWN.
GGW

CKD

DATE
1/2/02

CONCRETE BLOCK
UNDER 90° BEND



NOTE:

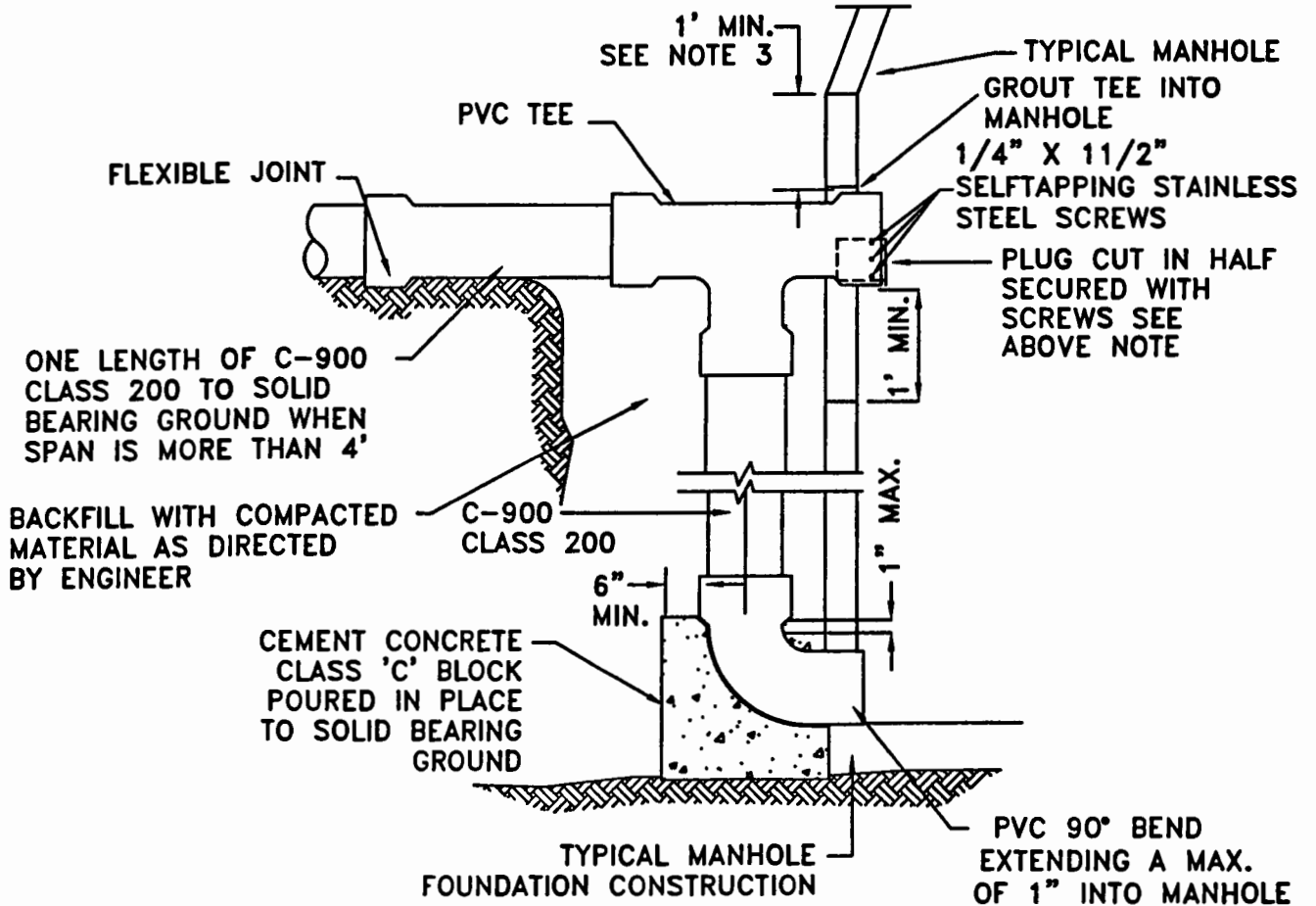
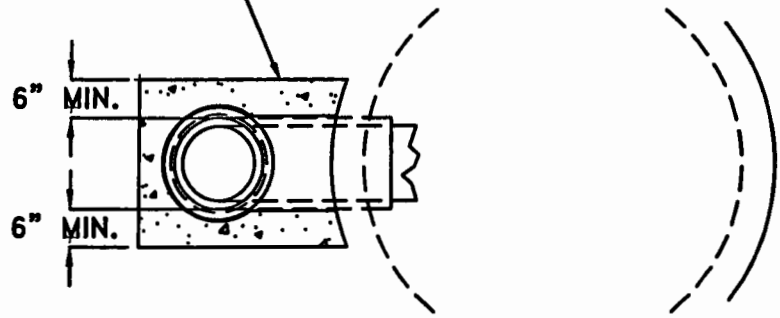
1. THE INTERIOR OF ALL DUCTILE IRON SHALL BE COATED WITH EPOXY OR TNE MEC 66.
2. DEPTHS OVER 20' MAY BE ALLOWED IF MEGA-LUG JOINTS ARE USED.
3. MAINTAIN A MINIMUM OF 1' BETWEEN MANHOLE JOINTS AND TEE.

CITY OF LACEY, WASHINGTON
DEPT. OF PUBLIC WORKS

DROP CONNECTION

APPROVED			DWG. NO.
CITY ENGINEER		DATE	7-4
DES. LRW	DWN. WHO	CKD HEK	DATE 1/2/02

CONCRETE BLOCK
UNDER 90° BEND



ONE LENGTH OF C-900
CLASS 200 TO SOLID
BEARING GROUND WHEN
SPAN IS MORE THAN 4'

BACKFILL WITH COMPACTED
MATERIAL AS DIRECTED
BY ENGINEER

CEMENT CONCRETE
CLASS 'C' BLOCK
POURED IN PLACE
TO SOLID BEARING
GROUND

TYPICAL MANHOLE
FOUNDATION CONSTRUCTION

PVC 90° BEND
EXTENDING A MAX.
OF 1" INTO MANHOLE

NOTE:

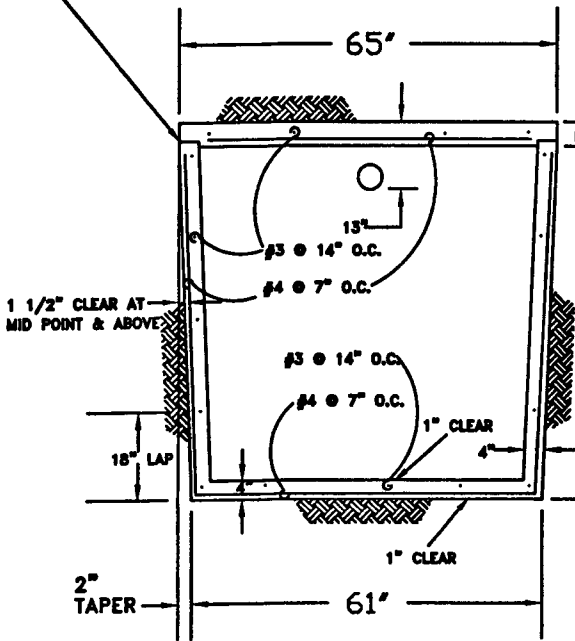
1. ALL JOINTS SHALL BE RESTRAINED
2. MAINTAIN A MINIMUM OF 1' BETWEEN MANHOLE JOINTS AND TEE.

CITY OF LACEY, WASHINGTON
DEPT. OF PUBLIC WORKS

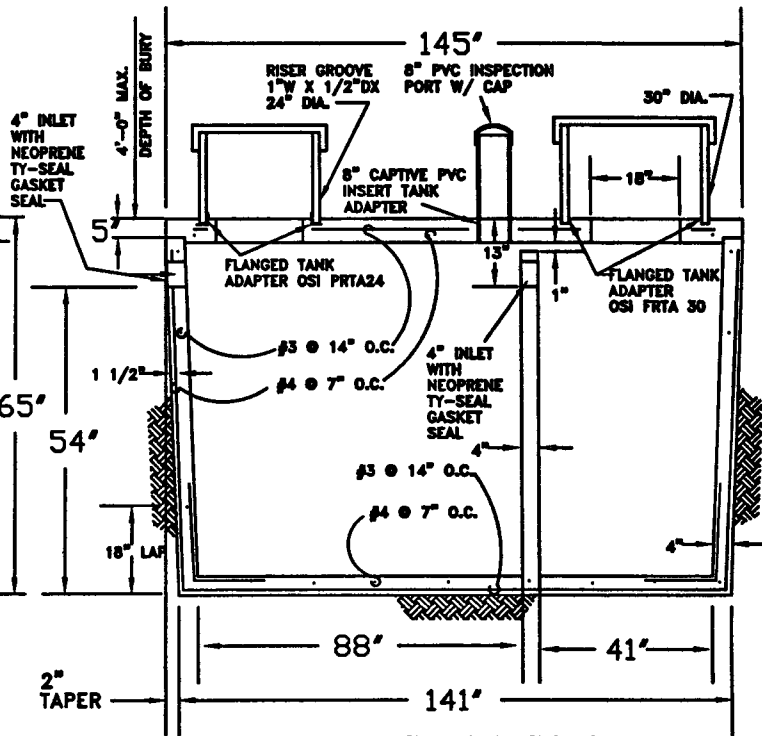
DROP CONNECTION

APPROVED			DWG. NO.
CITY ENGINEER		DATE	7-4.1
DES WHO	MODIFIED WHO	CKD RAS	DATE 3/5/2001

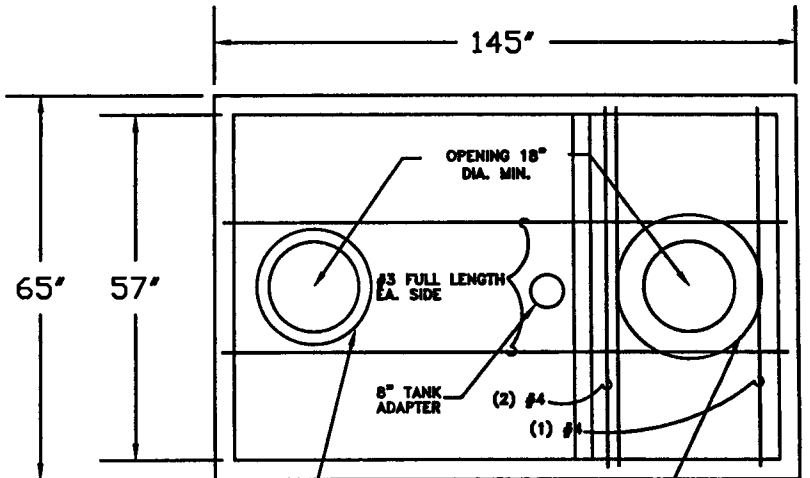
CONSEAL CS102
CONCRETE SEALANT



END VIEW



SIDE VIEW



PLAN

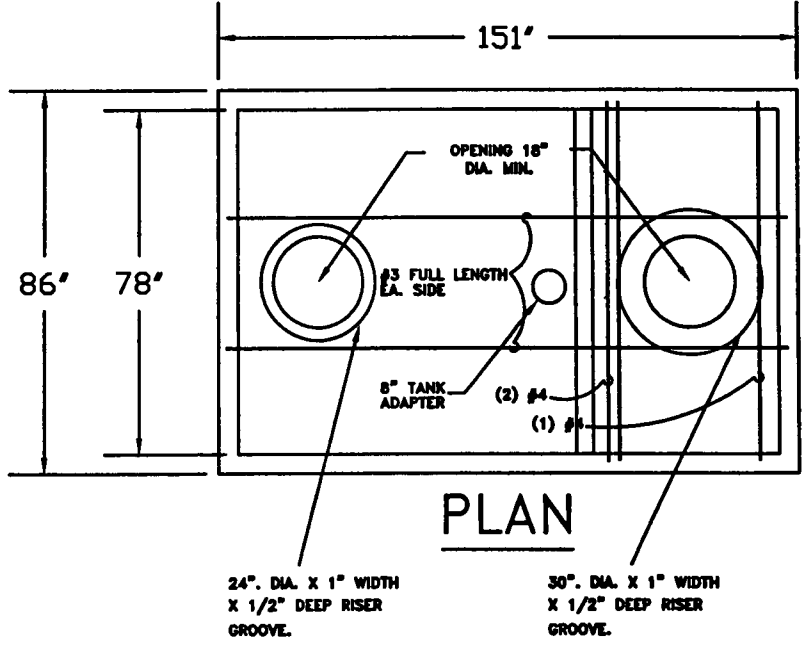
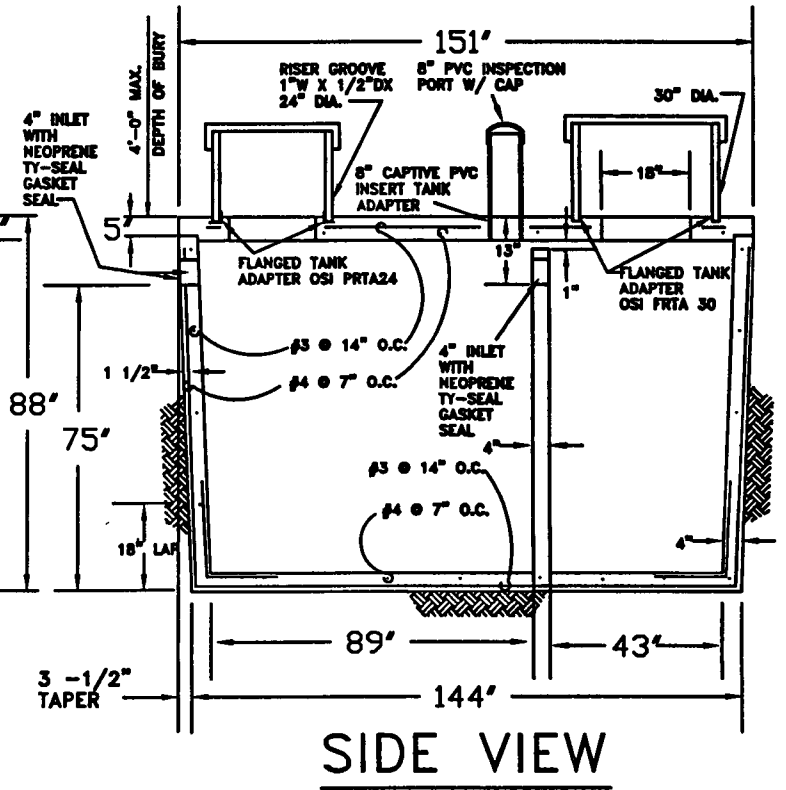
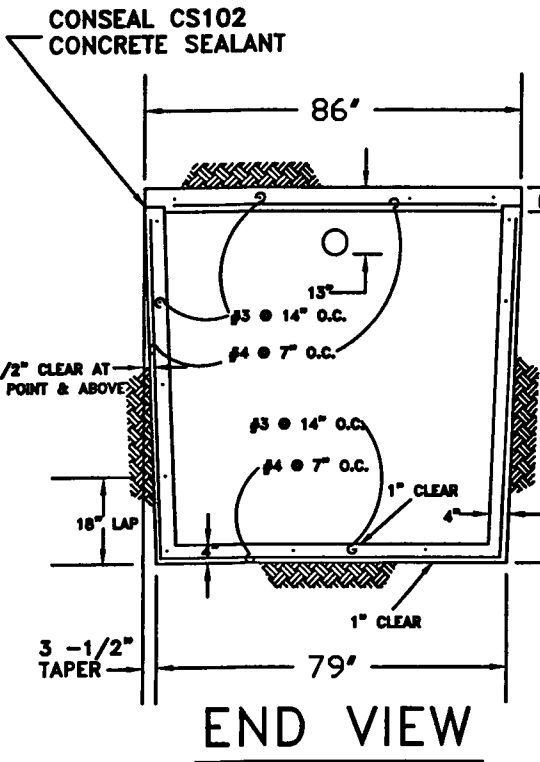
GENERAL NOTES:

1. SEE SECTION 7E.060 FOR APPROVED TANKS.
2. REINFORCING STEEL:
DEFORMED BAR ASTM A615
GRADE 60 FY=60,000 P.S.I.
3. CONCRETE: F'C=4000 P.S.I.
COMPRESSIVE STRENGTH @ 28
DAY TEST. MAX. AGGREGATE
SIZE 3/4"
4. LOADING:
TOP SLAB:
2500 LB. WHEEL LOAD
OVER 2 1/2 SQ. FT.
400 P.S.F. SOIL LOAD

LATERAL LOAD:
62.4 P.C.F. HYDROSTATIC

SOIL BEARING:
1000 P.S.F. ASSUMED
5. THIS TANK IS NOT DESIGNED
TO WITHSTAND AN H-20
LIVE LOAD.

CITY OF LACEY, WASHINGTON DEPT. OF PUBLIC WORKS			
1,500 GALLON S.T.E.P. SEPTIC TANK			
APPROVED		DWG. NO.	
CITY ENGINEER		DATE	
DES. LRW	DWN. GGW	CKD. DER	DATE 10/22/96



GENERAL NOTES:

1. SEE SECTION 7E.060 FOR APPROVED TANKS.
2. REINFORCING STEEL:
DEFORMED BAR ASTM A615
GRADE 60 FY=60,000 P.S.I.
3. CONCRETE: F'C=4000 P.S.I.
COMPRESSIVE STRENGTH @ 28
DAY TEST. MAX. AGGREGATE
SIZE 3/4"
4. LOADING:
TOP SLAB:
2500 LB. WHEEL LOAD
OVER 2 1/2 SQ. FT.
400 P.S.F. SOIL LOAD

LATERAL LOAD:
62.4 P.C.F. HYDROSTATIC

SOIL BEARING:
1000 P.S.F. ASSUMED
5. THIS TANK IS NOT DESIGNED
TO WITHSTAND AN H-20
LIVE LOAD.

CITY OF LACEY, WASHINGTON DEPT. OF PUBLIC WORKS			
3,000 GALLON S.T.E.P. SEPTIC TANK			
APPROVED		DWG. NO.	
CITY ENGINEER		DATE	
		7-6A	
DES. LRW	DWN. GGW	CKD. DER	DATE 10/22/96

067-7A.DWG

ALL RISER LIDS SHALL BE RAISED TO FINISH GRADE. THE BACKFILL MATERIAL SHALL BE PLACED UP THE SIDES OF THE TANK TO WITHIN 10" OF FINISH GRADE COVERING THE TOP OF THE TANK. INSTALLED AT FINISH GRADE

FIBERGLASS LID WITH STAINLESS STEEL BOLTS, NEOPRENE GASKET AND OPTIONAL STYROFOAM INSULATION
24" DIA. RIBBED PVC RISER
INSTALLED AT FINISH GRADE

INSTALL 1 EA. STAINLESS STEEL EYE HOOK A MAXIMUM OF 10 INCHES FROM TOP OF RISER AND A MAXIMUM 6 INCHES AWAY FROM SPLICE BOX.

FIBERGLASS LID WITH STAINLESS STEEL BOLTS, NEOPRENE GASKET AND OPTIONAL STYROFOAM INSULATION
MAXIMUM HEIGHT = 48 INCHES.
30" DIA. X MIN. 18" HIGH RIBBED PVC RISER WITH 1 NEOPRENE GROMMET.

1" DIA. HIGH PRESSURE PVC HOSE AND BALL VALVE ASSEMBLY WITH FLO-CONTROL AT (A)

FLANGED TANK ADAPTER

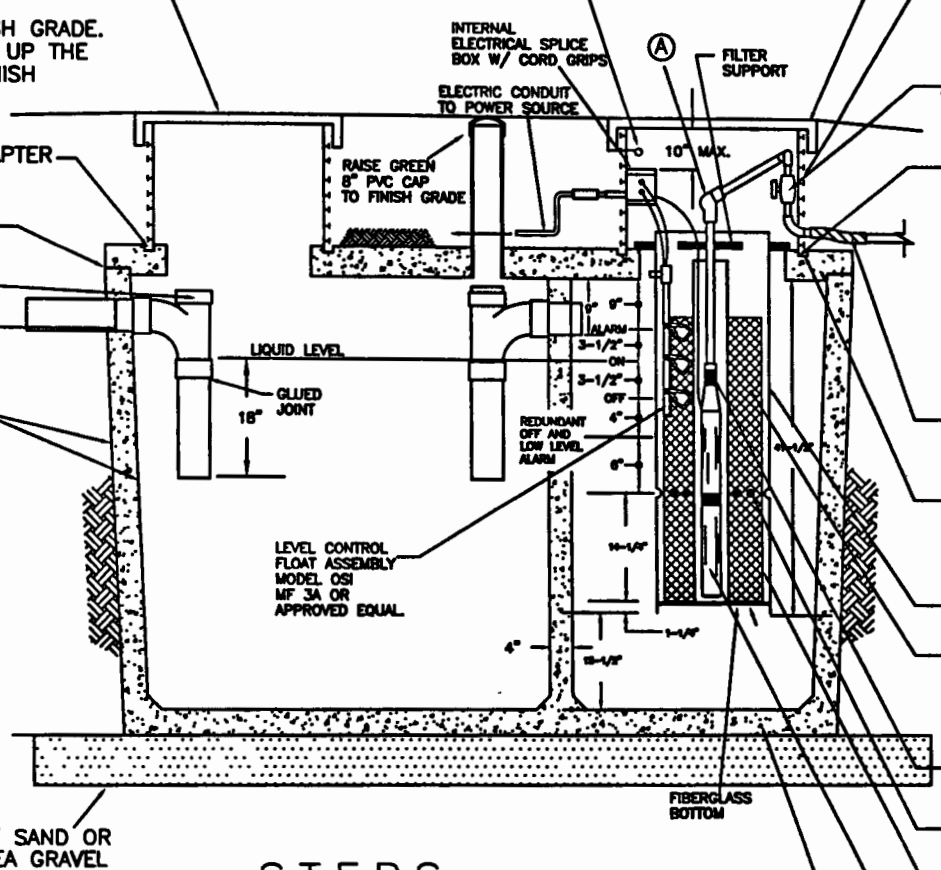
FOR SERVICE BOX CONNECTION SEE DETAIL 7-12.

FLANGED TANK ADAPTER

CONSEAL CS102 CONCRETE SEALANT

STANDARD PVC INLET TEE
4" NEOPRENE TY-SEAL GASKET SEAL (ASTMC564)

THE INSIDE AND OUTSIDE SURFACES SHALL BE PROTECTED BY APPLYING A HEAVY CEMENT-BASE WATERPROOF COATING OF THOROSEAL OR AN APPROVED EQUAL.



1" DIA. HIGH PRESSURE HOSE (12" LONG WITH FITTINGS).

2-PART EPOXY IN 1" WIDE BY 1/2" DEEP GROVE FORMED IN TOP OF TANK. (TYP)

PVU 57-1820 VAULT

BIO-TUBE (1/8" MESH).

1-1/4" BRONZE CHECK VALVE.

1-3/8" DIA. INLET HOLES AROUND PERIMETER OF VAULT (8 EACH).

DRAIN PORT WITH NEOPRENE FLAP CHECK.

MODEL P10 OSI 05 HHF HIGH HEAD SUBMERSIBLE EFFLUENT PUMP OR APPROVED EQUAL WITH S.O. POWER CABLE AND 1/8" BY-PASS ORIFICE IN THE DISCHARGE HEAD.

SEE SECTION 7E FOR APPROVED TANKS.

S.T.E.P.S.

(STEP TANK EFFLUENT PUMP SYSTEM)
SIDE VIEW TYPICAL 1,500 GALLON TANK

NOTE:

1. TANKS SHALL BE BEDDED ON 6 INCHES OF 5/8" CRUSHED ROCK OR PEA GRAVEL. SIDES SHALL BE COMPACTED IN 2 FOOT LIFTS TO THE SAME OR GREATER DENSITY THAN THE SURROUNDING AREA.
2. PIPING FROM PUMP TO THE MAINLINE CONNECTION SHALL BE 1 1/4" SCHEDULE 80 PVC.
3. ALL BACKFILL MATERIAL FOR THE TANK SHALL BE SAND OR GRAVEL BACKFILL FOR PIPE ZONE BEDDING PER WSDOT 9-03.12(3) PAGE 9-27.

CITY OF LACEY, WASHINGTON DEPT. OF PUBLIC WORKS		1500 GALLON S.T.E.P. TANK	
APPROVED	CITY ENGINEER	DWG. NO.	7-7
DES. LRW	DWN. GGW	OKD. RAS	DATE 1/5/2001

DGT-7A.DWG

ALL RISER LIDS SHALL BE RAISED TO FINISH GRADE. THE BACKFILL MATERIAL SHALL BE PLACED UP THE SIDES OF THE TANK TO WITHIN 10" OF FINISH GRADE COVERING THE TOP OF THE TANK. INSTALLED AT FINISH GRADE

FIBERGLASS LID WITH STAINLESS STEEL BOLTS, NEOPRENE GASKET AND OPTIONAL STYROFOAM INSULATION 24" DIA. RIBBED PVC RISER INSTALLED AT FINISH GRADE

INSTALL 1 EA. STAINLESS STEEL EYE HOOK A MAXIMUM OF 10 INCHES FROM TOP OF RISER AND A MAXIMUM 6 INCHES AWAY FROM SPLICE BOX.

FIBERGLASS LID WITH STAINLESS STEEL BOLTS, NEOPRENE GASKET AND OPTIONAL STYROFOAM INSULATION MAXIMUM HEIGHT = 48 INCHES.

30" DIA. X MIN. 18" HIGH RIBBED PVC RISER WITH 1 NEOPRENE GROMMET.

1" DIA. HIGH PRESSURE PVC HOSE AND BALL VALVE ASSEMBLY WITH FLO-CONTROL AT (A)

FLANGED TANK ADAPTER

FOR SERVICE BOX CONNECTION SEE DETAIL 7-12.

1" DIA. HIGH PRESSURE HOSE (12" LONG WITH FITTINGS).

2-PART EPOXY IN 1" WIDE BY 1/2" DEEP GROVE FORMED IN TOP OF TANK. (TYP)

PVU BIO TUBE VAULT

BIO-TUBE (1/8" MESH).

1-1/4" BRONZE CHECK VALVE.

1-3/8" DIA. INLET HOLES AROUND PERIMETER OF VAULT (8 EACH).

DRAIN PORT WITH NEOPRENE FLAP CHECK.

MODEL P20 OSI 05 HHF HIGH HEAD SUBMERSIBLE EFFLUENT PUMP OR APPROVED EQUAL WITH S.O. POWER CABLE AND 1/8" BY-PASS ORIFICE IN THE DISCHARGE HEAD.

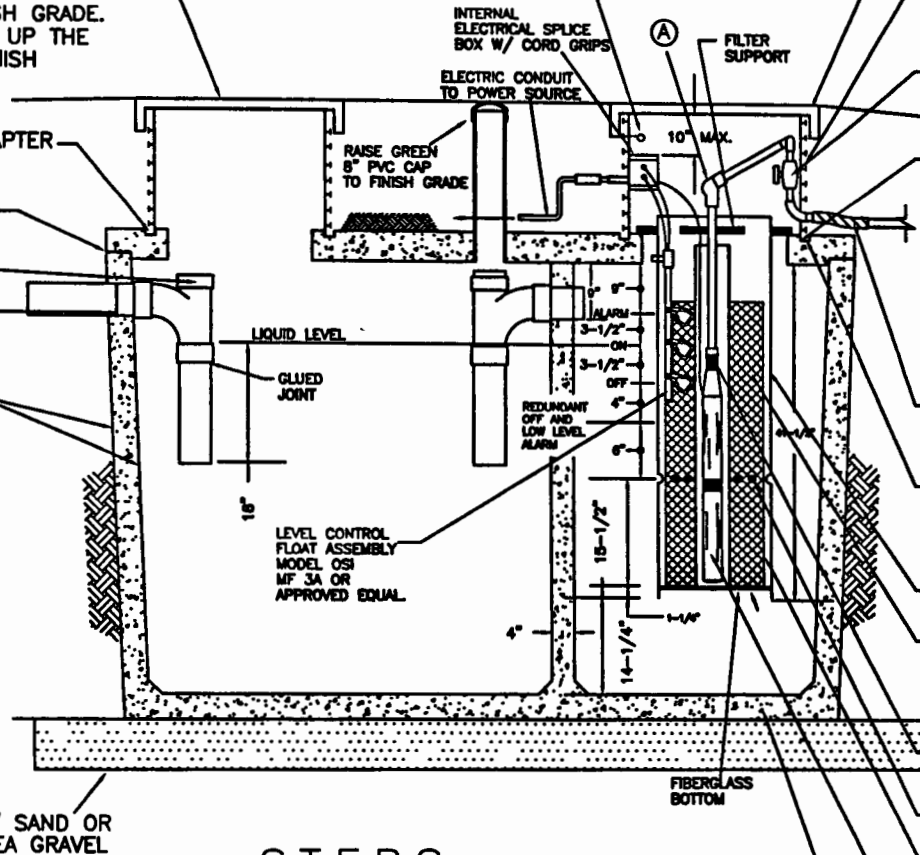
SEE SECTION 7E FOR APPROVED TANKS.

FLANGED TANK ADAPTER

CONSEAL CS102 CONCRETE SEALANT

STANDARD PVC INLET TEE
4" NEOPRENE TY-SEAL GASKET SEAL (ASTMC564)

THE INSIDE AND OUTSIDE SURFACES SHALL BE PROTECTED BY APPLYING A HEAVY CEMENT-BASE WATERPROOF COATING OF THOROSEAL OR AN APPROVED EQUAL.



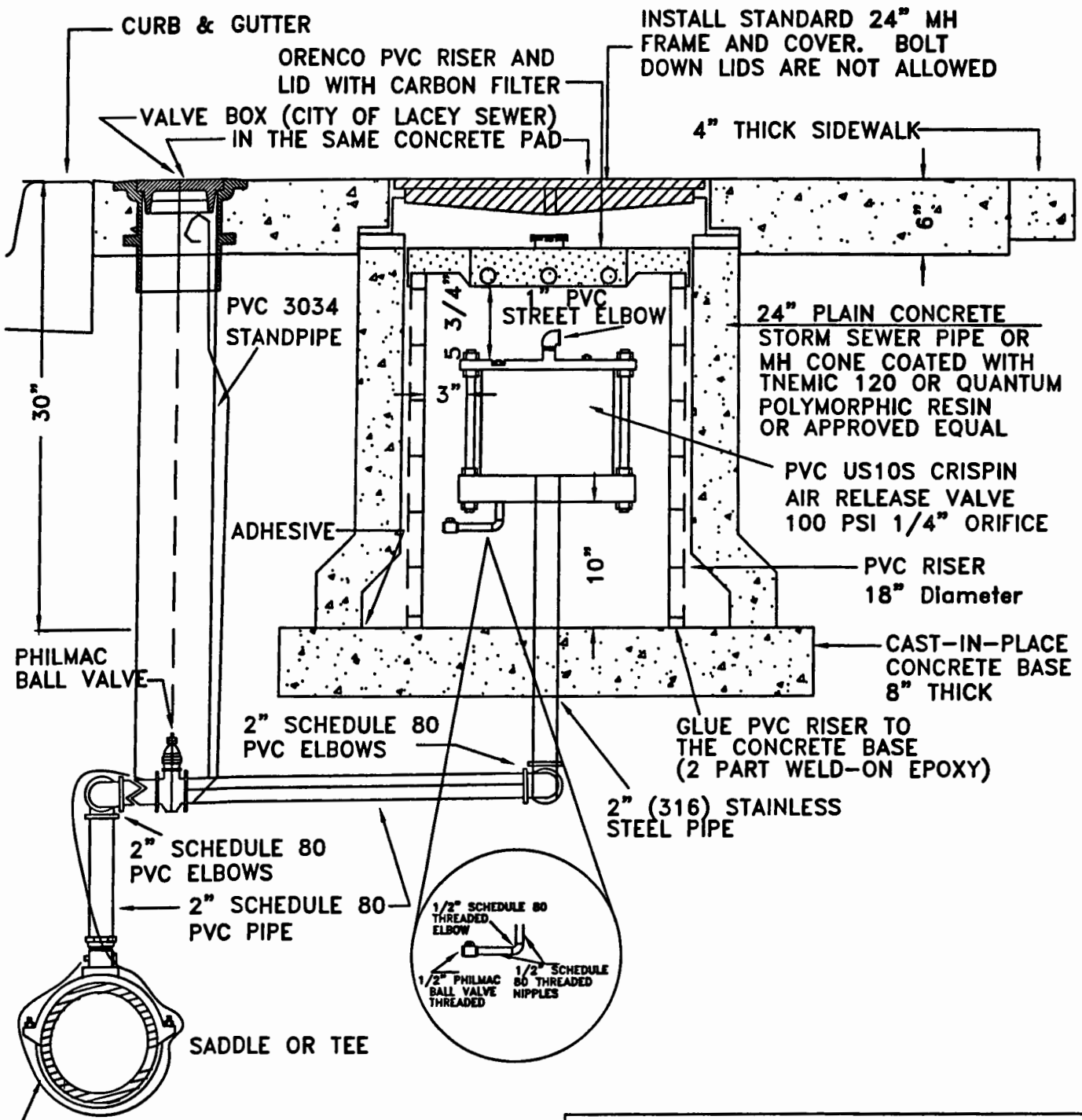
S.T.E.P.S.

(STEP TANK EFFLUENT PUMP SYSTEM)
SIDE VIEW TYPICAL 3,000 GALLON TANK

NOTE:

1. TANKS SHALL BE BEDDED ON 6 INCHES OF 5/8" CRUSHED ROCK OR PEA GRAVEL. SIDES SHALL BE COMPACTED IN 2 FOOT LIFTS TO THE SAME OR GREATER DENSITY THAN THE SURROUNDING AREA.
2. PIPING FROM PUMP TO THE MAINLINE CONNECTION SHALL BE 1 1/4" SCHEDULE 80 PVC.
3. ALL BACKFILL MATERIAL FOR THE TANK SHALL BE SAND OR GRAVEL BACKFILL FOR PIPE ZONE BEDDING PER WSDOT 9-03.12(3) PAGE 9-27.

<p>CITY OF LACEY, WASHINGTON DEPT. OF PUBLIC WORKS</p>		<p>3,000 GALLON S.T.E.P. TANK</p>
APPROVED		
CITY ENGINEER	DATE	DWG. NO.
LRW	DWN. GGW	7-7A
DES.	CKD. RAS	DATE
LRW	RAS	1/5/2001



CURB & GUTTER

ORENCO PVC RISER AND LID WITH CARBON FILTER

INSTALL STANDARD 24" MH FRAME AND COVER. BOLT DOWN LIDS ARE NOT ALLOWED

VALVE BOX (CITY OF LACEY SEWER) IN THE SAME CONCRETE PAD

4" THICK SIDEWALK

PVC 3034 STANDPIPE

1" PVC STREET ELBOW

24" PLAIN CONCRETE STORM SEWER PIPE OR MH CONE COATED WITH TNEMIC 120 OR QUANTUM POLYMORPHIC RESIN OR APPROVED EQUAL

PVC US10S CRISPIN AIR RELEASE VALVE 100 PSI 1/4" ORIFICE

PVC RISER 18" Diameter

CAST-IN-PLACE CONCRETE BASE 8" THICK

ADHESIVE

10"

GLUE PVC RISER TO THE CONCRETE BASE (2 PART WELD-ON EPOXY)

2" (316) STAINLESS STEEL PIPE

2" SCHEDULE 80 PVC ELBOWS

2" SCHEDULE 80 PVC ELBOWS

2" SCHEDULE 80 PVC PIPE

1/2" SCHEDULE 80 THREADED ELBOW

1/2" PHILMAC BALL VALVE THREADED

1/2" SCHEDULE 80 THREADED NIPPLES

SADDLE OR TEE

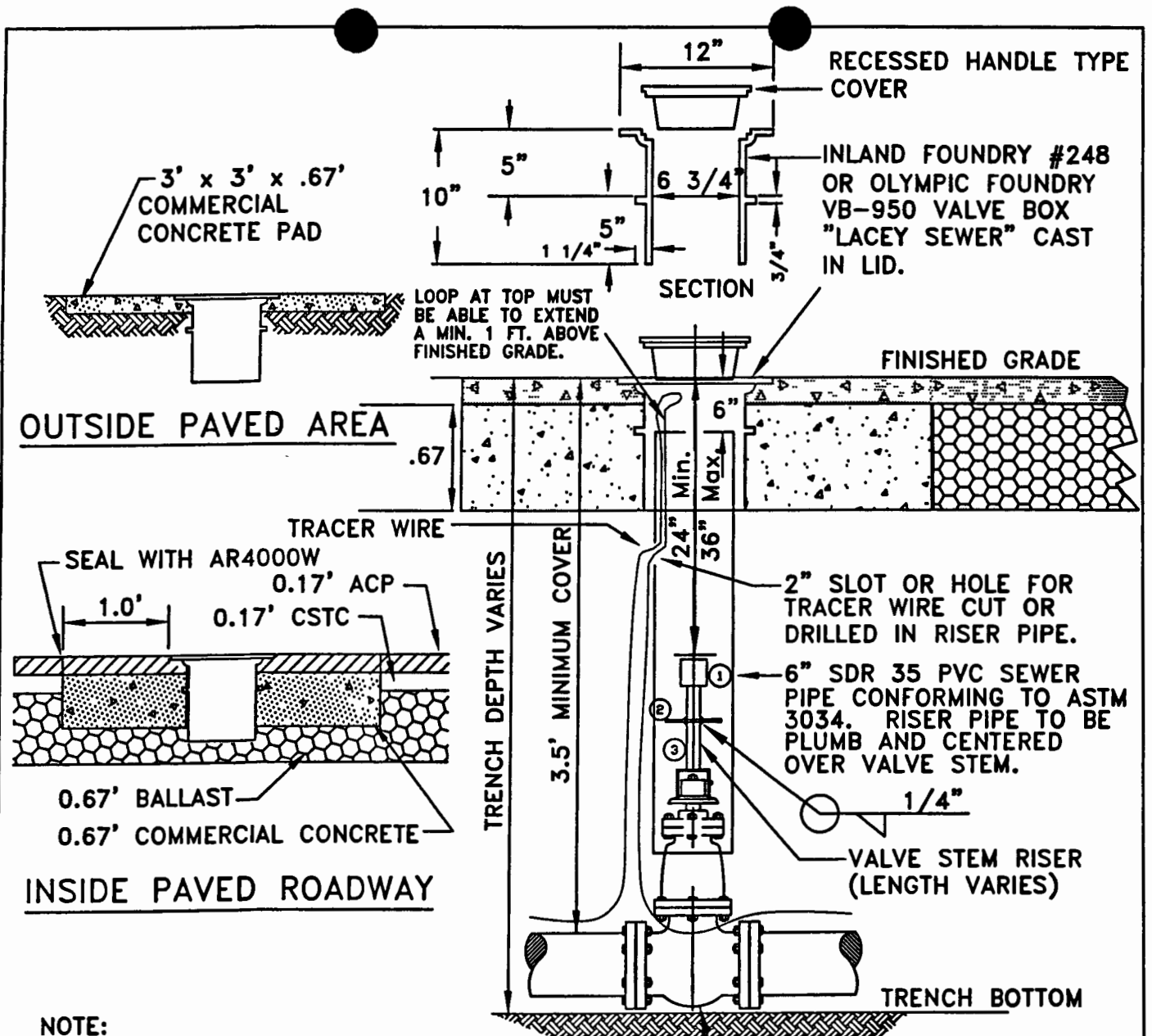
PRESSURE STEP MAIN LOCATED IN THE ROAD 6' OFF OF THE CENTER LINE

1. THE CONCRETE CYLINDER SHALL BE BONDED TO THE BASE TO PREVENT THE EFFLUENT FROM SEEPING INTO THE GROUND.
2. A RAIN GUARD SHALL BE REQUIRED.

CITY OF LACEY, WASHINGTON
DEPT. OF PUBLIC WORKS

AIR RELEASE ASSEMBLY

APPROVED			DWG. NO.
CITY ENGINEER		DATE	7-8
DES. WHO	DWN. WHO	CKD. RAS	DATE 3/5/2001



LOOP AT TOP MUST BE ABLE TO EXTEND A MIN. 1 FT. ABOVE FINISHED GRADE.

RECESSED HANDLE TYPE COVER

INLAND FOUNDRY #248 OR OLYMPIC FOUNDRY VB-950 VALVE BOX "LACEY SEWER" CAST IN LID.

SECTION

FINISHED GRADE

OUTSIDE PAVED AREA

TRACER WIRE

SEAL WITH AR4000W

0.17' ACP

0.17' CSTC

0.67' BALLAST

0.67' COMMERCIAL CONCRETE

INSIDE PAVED ROADWAY

TRENCH DEPTH VARIES

3.5' MINIMUM COVER

2" SLOT OR HOLE FOR TRACER WIRE CUT OR DRILLED IN RISER PIPE.

6" SDR 35 PVC SEWER PIPE CONFORMING TO ASTM 3034. RISER PIPE TO BE PLUMB AND CENTERED OVER VALVE STEM.

VALVE STEM RISER (LENGTH VARIES)

TRENCH BOTTOM

GATE VALVE SHOWN—SIMILAR INSTALLATION REQUIRED FOR BUTTERFLY VALVES.

NOTE:

ALL VALVES MUST HAVE 14 GAUGE COATED COPPER TRACER WIRE TIED OFF AT VALVE BODY, EXTENDED OUTSIDE PVC RISER PIPE THEN EXTENDED ONE FOOT TOP OF VALVE BOX.

VALVE STEM EXTENSION LEGEND

- ① VALVE OPERATING NUT OR 1 7/8" X 1 7/8" X 2" HIGH GRADE STEEL WELDED TO GUIDE PLATE.
- ⓔ 3/16" THICK X 5 1/5" DIA STEEL GUIDE PLATE WELDED TO RISER SHAFT.
- ⓐ 2"X2"X 3/16" SQUARE STRUCTURAL STEEL TUBING TO FIT OPERATING NUT. LENGTH AS REQUIRED.

NOTE:

ALL WELDS TO SHAFT SHALL BE FILLET WELD ALL AROUND, AS SPECIFIED ABOVE

CITY OF LACEY, WASHINGTON
DEPT. OF PUBLIC WORKS

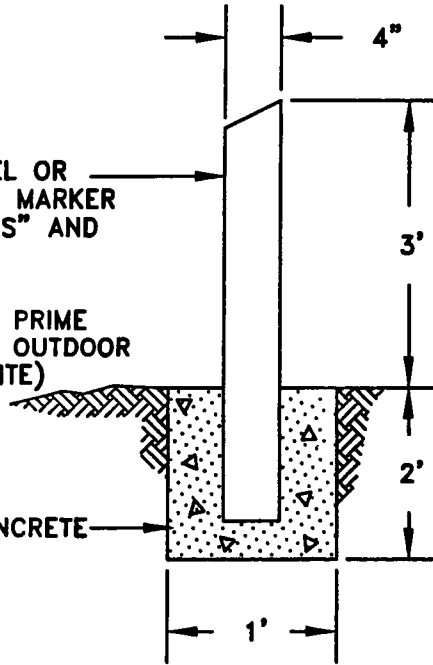
STANDARD VALVE BOX

APPROVED		DWG. NO.	
CITY ENGINEER		DATE	
DES. WHO	MODIFIED WHO	CKD. RAS	DATE 3/5/2001

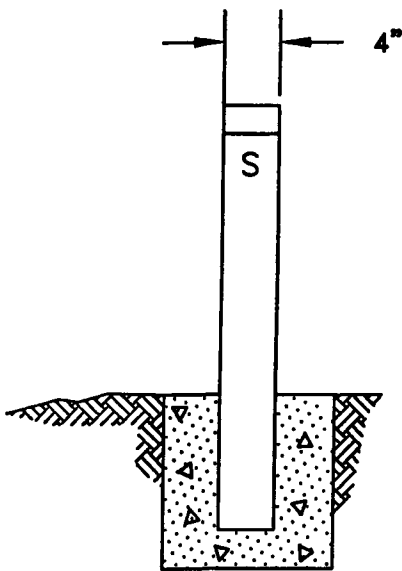
4" SCHEDULE 40 STEEL OR
REINFORCED CONCRETE MARKER
POST STAMPED WITH "S" AND
DISTANCE TO VALVE

POST TO RECEIVE ONE PRIME
COAT AND TWO COATS OUTDOOR
OIL BASE ENAMEL (WHITE)

COMMERCIAL CONCRETE



SIDE



FRONT

CITY OF LACEY, WASHINGTON
DEPT. OF PUBLIC WORKS

VALVE MARKER POST

APPROVED

DWG. NO.

CITY ENGINEER

DATE

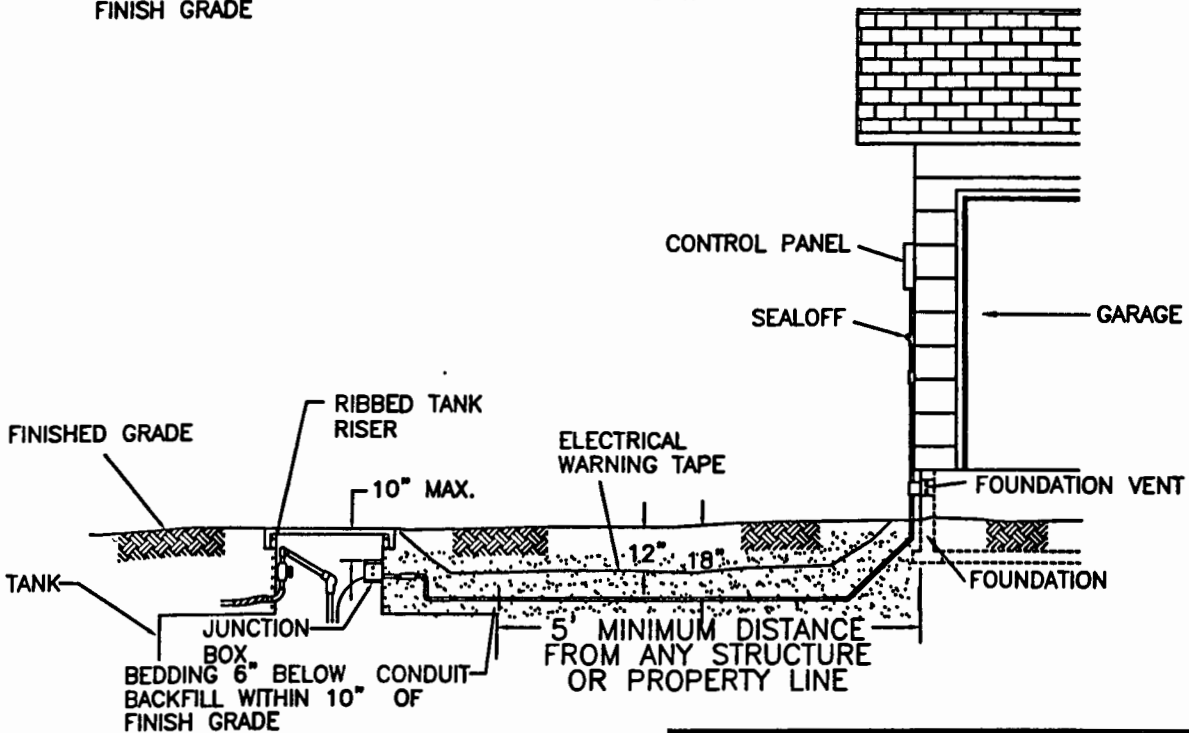
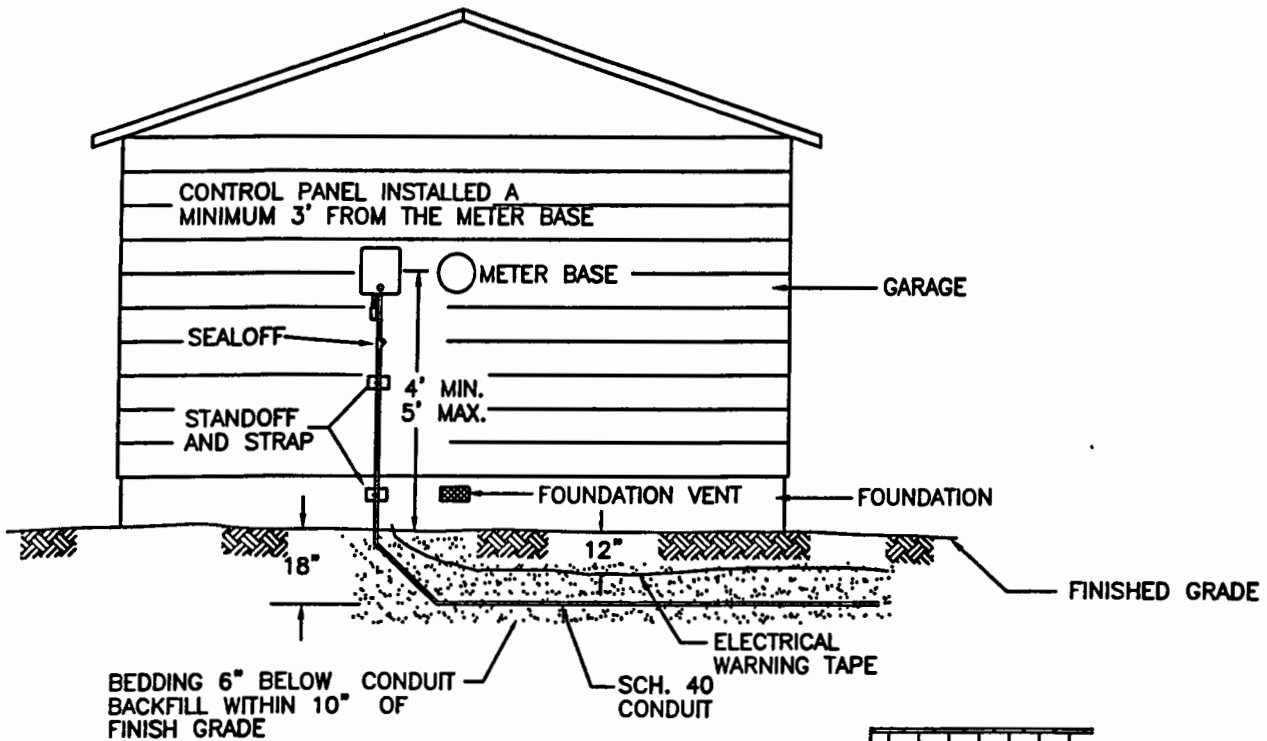
7-10

DES.
LRW

DWN.
GGW

CKD
DER

DATE
1/2/02



NOTE:

1. CONTROL PANEL REQUIREMENT ARE IN 7E.095 PAGE 7-62.
2. ELECTRICAL CONDUIT MUST BE BEDDED IN SAND OR PEA GRAVEL.
3. STEP LINES UNDER DRIVEWAYS SHALL BE CASED IN 2" CLASS 200 PVC EXTENDED 2 FEET BEYOND THE DRIVEWAY EDGES.
4. IN THE COUNTY A SQUARE D 30A 240 VAC 3R SAFETY SWITCH NON-FUSED IS REQUIRED.

CITY OF LACEY, WASHINGTON
DEPT. OF PUBLIC WORKS

**S.T.E.P. CONTROL
PANEL DETAIL**

APPROVED

DWG. NO.

CITY ENGINEER

DATE

7-11

DES.

DWN.

CKD.

DATE

LRW

GGW

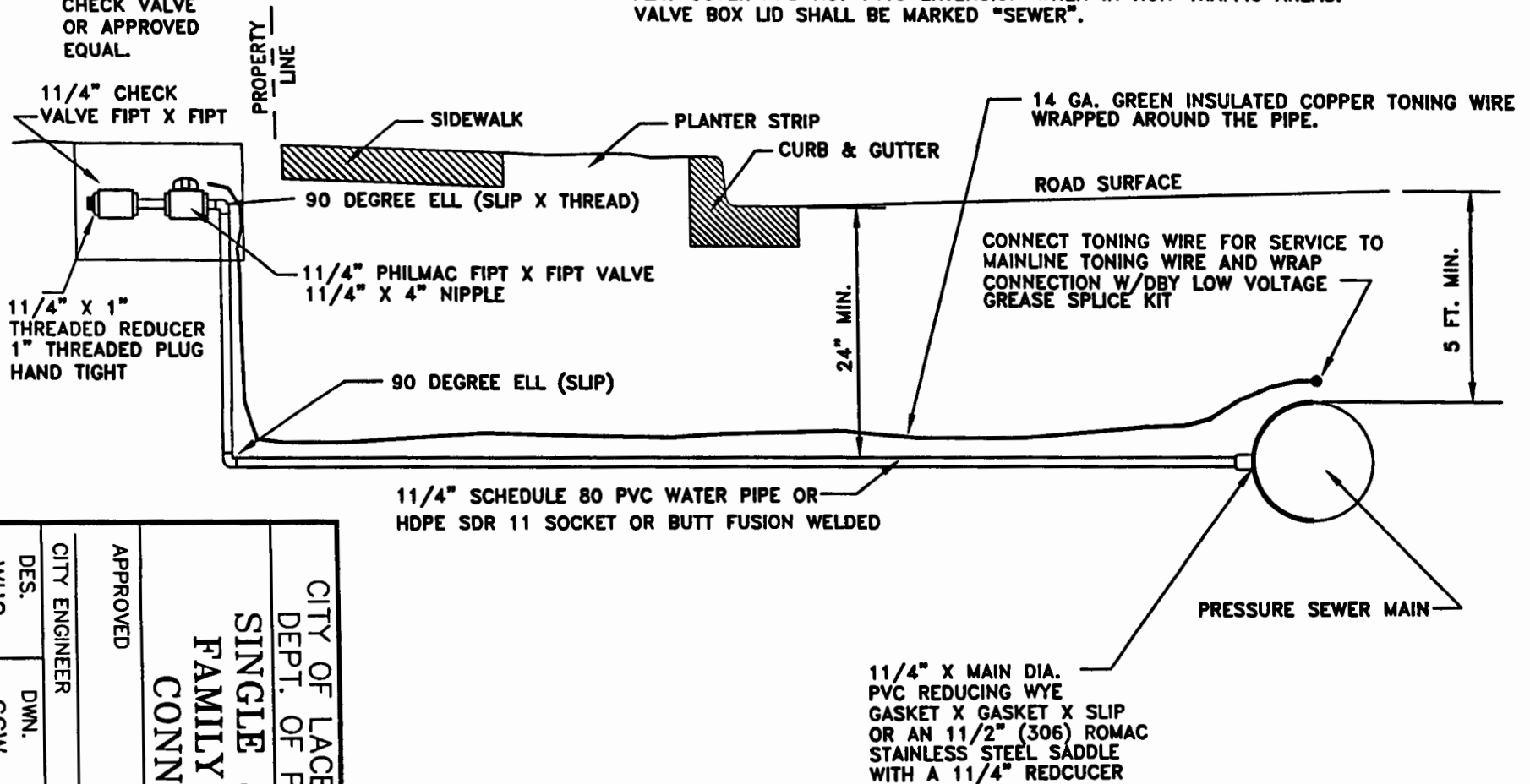
DER

10/24/96

DG712.DWG

REMOVE PLUG AND INSTALL KING BROS. MODEL KSC 1000-S PVC SWING CHECK VALVE OR APPROVED EQUAL.

SERVICE BOX-CARSON INDUSTRIES MODEL NO. 1419 WITH BOLTED, FLAT COVER AND NO. 1419 EXTENSION WHEN IN NON-TRAFFIC AREAS. VALVE BOX LID SHALL BE MARKED "SEWER".



11/4" SCHEDULE 80 PVC WATER PIPE OR HDPE SDR 11 SOCKET OR BUTT FUSION WELDED

11/4" X MAIN DIA. PVC REDUCING WYE GASKET X GASKET X SLIP OR AN 1 1/2" (306) ROMAC STAINLESS STEEL SADDLE WITH A 1 1/4" REDUCER

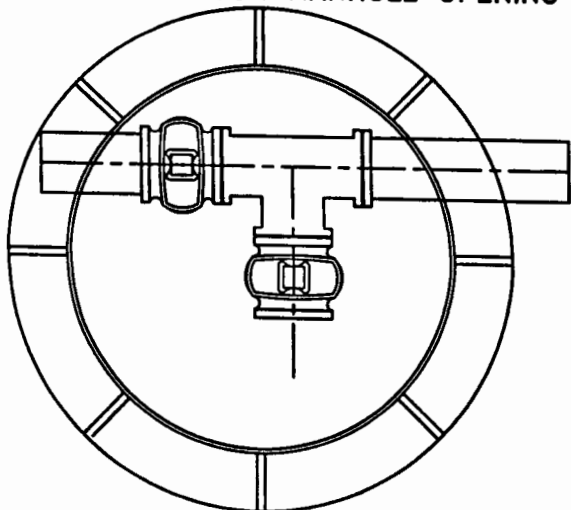
NOTES:

1. FILL SERVICE BOX WITH FIBERGLASS INSULATION AT TIME OF ON-SITE CONNECTION TO THE STUB.
2. AFTER THE HYDRO-STATIC TEST HAVE BEEN APPROVED BY THE CITY INSPECTOR THE CHECK VALVE SHALL BE INSTALLED.
3. FOR HDPE REQUIREMENTS SEE CHAPTER 7D.

CITY OF LACEY, WASHINGTON DEPT. OF PUBLIC WORKS SINGLE & DUPLEX FAMILY SERVICE CONNECTION			
APPROVED		DWG. NO.	
CITY ENGINEER	DATE	7-12	
DES. WHO	DWN. GGW	CKD. DER	DATE 10/21/96

D6713.DWG

TOP VIEW THROUGH MANHOLE OPENING



1. ALL APPURTENANCES INSTALLED SHALL BE THE SAME SIZE AS THE PIPE.
2. THE SIZE OF THE MANHOLE SHALL BE DETERMINED BY THE SIZE OF THE PIPE.

30" OPENING W/30" CAST IRON
MANHOLE FRAME AND COVER
NO BOLT DOWN LIDS ALLOWED
RAIN GUARD REQUIRED

72" DIA. MANHOLE

GRADE RING

POLYPROPYLENE
STEPS

TOP SLAB

" FLAT TOP
MANHOLE W/BASE
AS REQUIRED
BY THE CITY OF LACEY

EPOXY COATED
FLANGED RESILIENT
PLUG VALVES

UNIFLANGE

FLANGE TEE

UNIFLANGE

GROUT GAPS WITH
SHRINKLESS GROUT
AROUND ALL PIPES

FLOW

" PIPE

" PIPE

2" MIN.
CLEARANCE

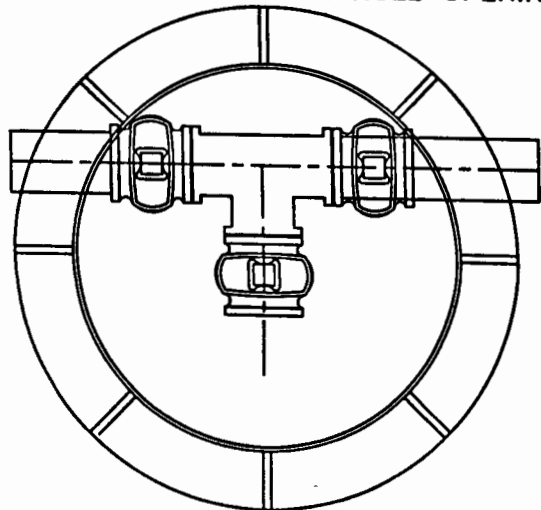
2" MIN. CLEARANCE

ADJUSTABLE PIPE
SADDLE SUPPORTS

CITY OF LACEY, WASHINGTON DEPT. OF PUBLIC WORKS		APPROVED	
PIG CATCHER PORT 4" AND LARGER		DWC. NO.	
CITY ENGINEER	DATE	7-13	
DES. EA & RD	DWN. WHO	CKD. RAS	DATE
			3/5/2001

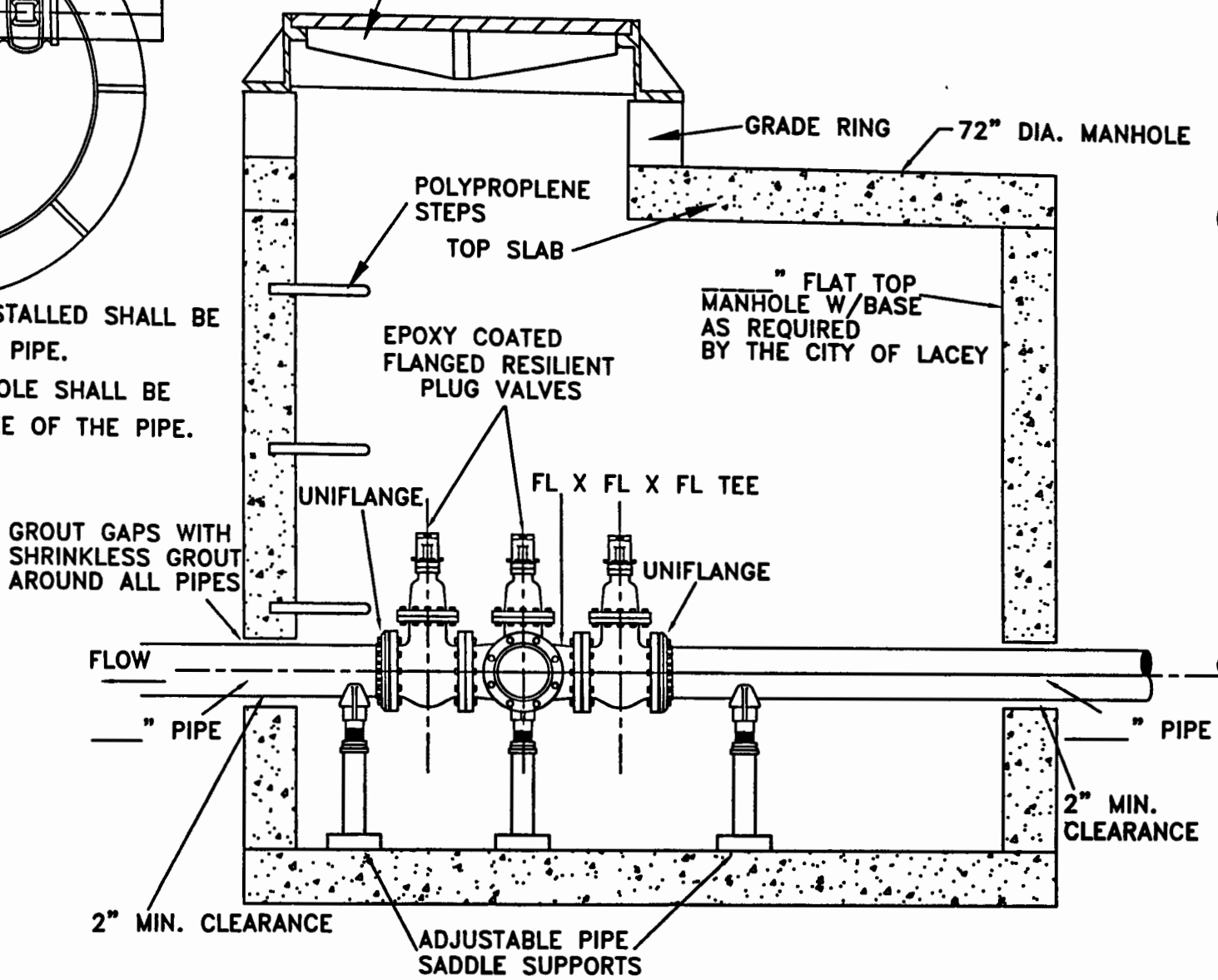
D0713A.DWG

TOP VIEW THROUGH MANHOLE OPENING



1. ALL APPURTENANCES INSTALLED SHALL BE THE SAME SIZE AS THE PIPE.
2. THE SIZE OF THE MANHOLE SHALL BE DETERMINED BY THE SIZE OF THE PIPE.

30" OPENING W/30" CAST IRON
MANHOLE FRAME AND COVER
NO BOLT DOWN LIDS ALLOWED
RAIN GUARD REQUIRED



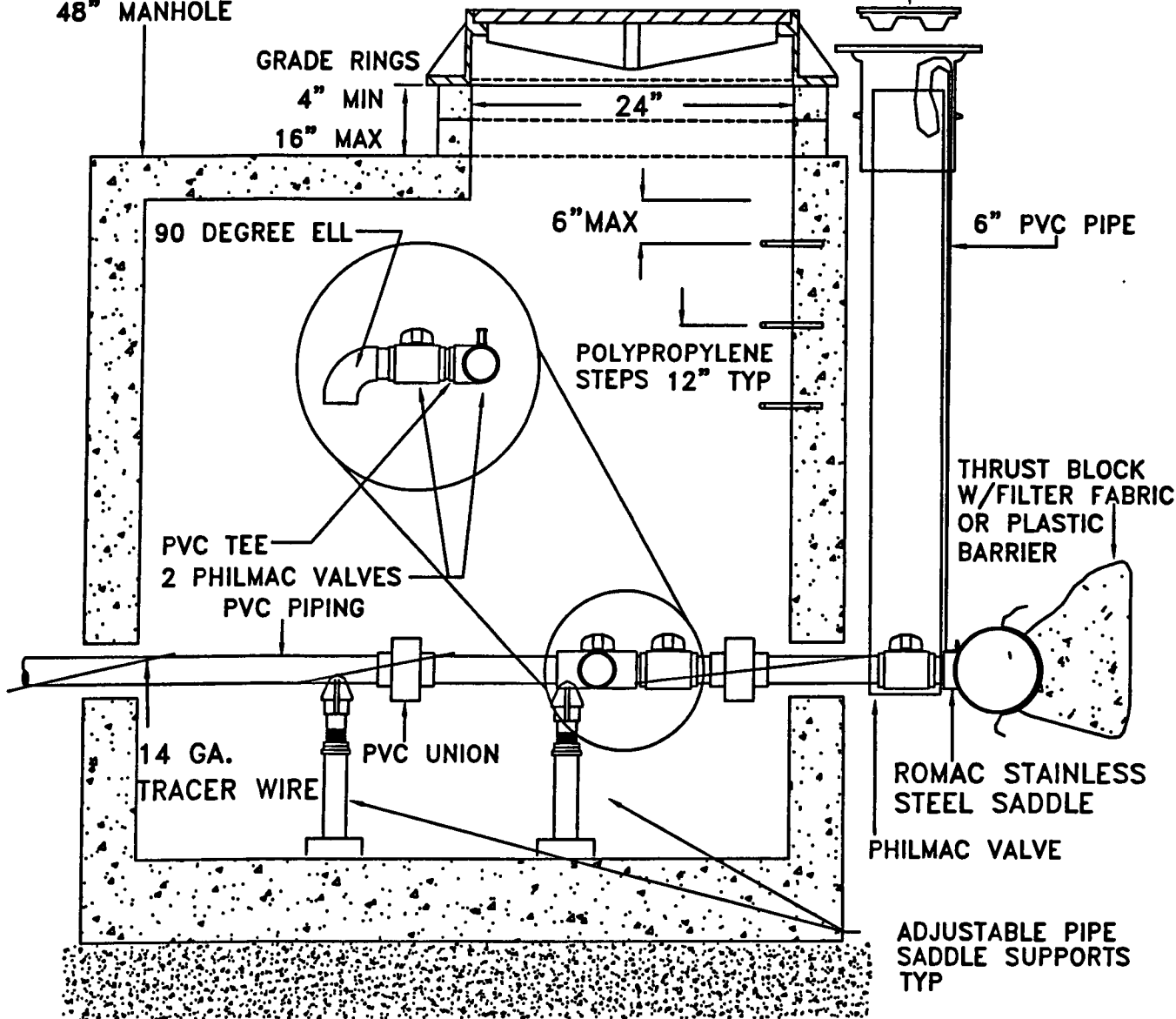
CITY OF LACEY, WASHINGTON DEPT. OF PUBLIC WORKS	
INLINE PIG CATCHER PORT 4" AND LARGER	
APPROVED	DWG. NO. 7-13A
CITY ENGINEER	DATE
DES. EA & RD	DWN. WHO
CKD. RAS	DATE 3/5/2001

NOTE:
FOR LIVE TAP,
ROADWAY INSTALLATION

TOP SLAB OF THE
48" MANHOLE

FRAME AND LID

APPROVED VALVE BOX
W/"LACEY SEWER"



GRADE RINGS
4" MIN
16" MAX

24"

90 DEGREE ELL

6" MAX

6" PVC PIPE

POLYPROPYLENE
STEPS 12" TYP

PVC TEE
2 PHILMAC VALVES
PVC PIPING

THRUST BLOCK
W/FILTER FABRIC
OR PLASTIC
BARRIER

14 GA.
TRACER WIRE

PVC UNION

ROMAC STAINLESS
STEEL SADDLE
PHILMAC VALVE

ADJUSTABLE PIPE
SADDLE SUPPORTS
TYP

6" OF 5/8" CRUSHED ROCK BEDDING

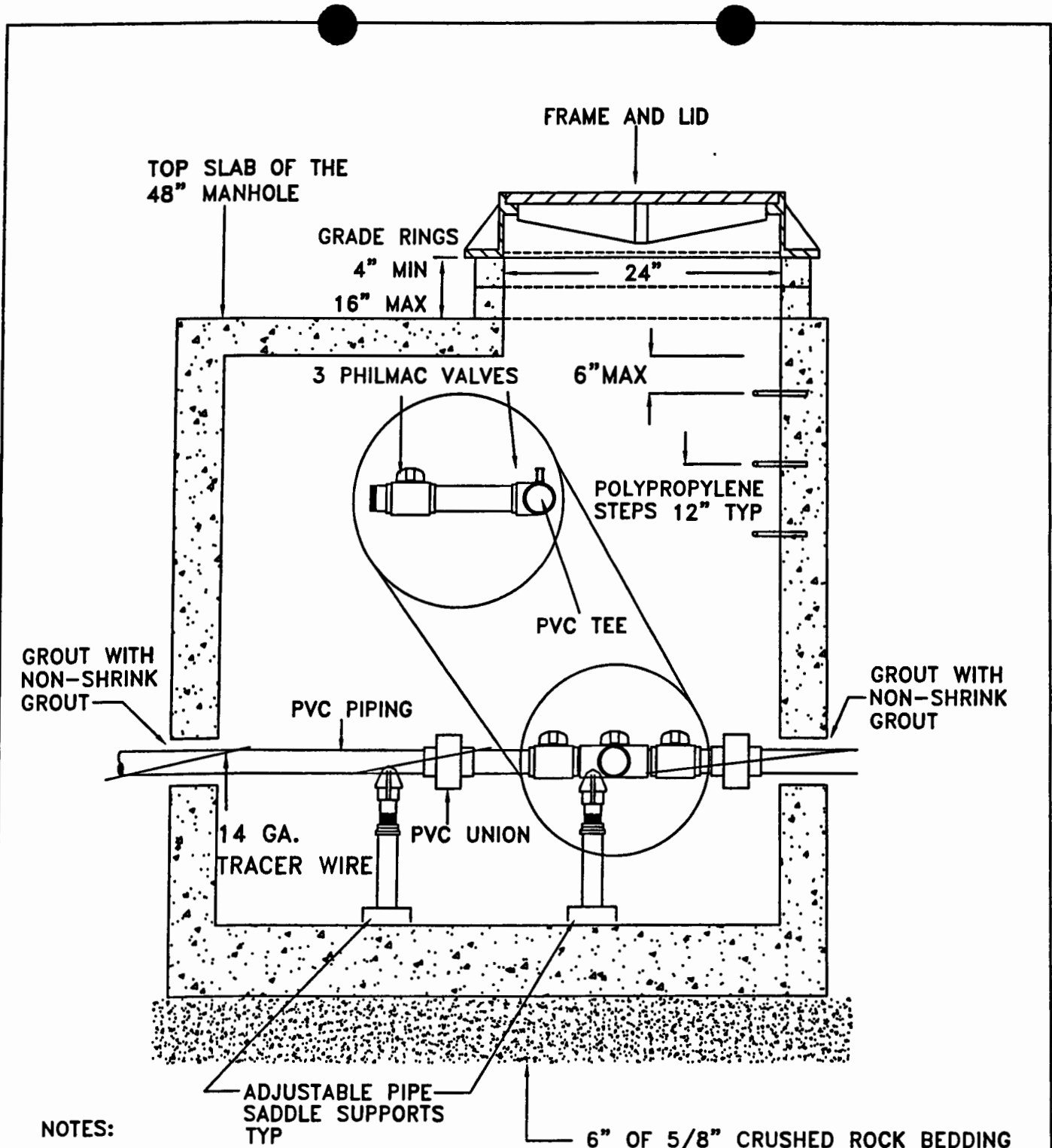
NOTES:

1. CONNECTION TO MANHOLE SHALL BE MADE BY KOR-N-SEAL BOOT.
2. SEE DETAIL 7-3 FOR MANHOLE COLLAR INSTALLATION.
3. A SEWER GUARD SHALL BE INSTALLED IN ANY MANHOLE SUBJECT TO FLOODING.
4. GROUT ALL JOINTS AND CONNECTION POINTS WITH NON-SHRINK GROUT.
5. THE PLACEMENT OF THE VALVE ASSEMBLY SHALL BE DIRECTLY BELOW THE MANHOLE FRAME AND LID.

CITY OF LACEY, WASHINGTON
DEPT. OF PUBLIC WORKS

2" PIG CATCHER PORT

APPROVED		DWG. NO.	
CITY ENGINEER		DATE	
DES. W.H.O.		DATE 10/21/96	
DWN. W.H.O.		DATE 10/21/96	
CKD. L.R.W.		DATE 10/21/96	

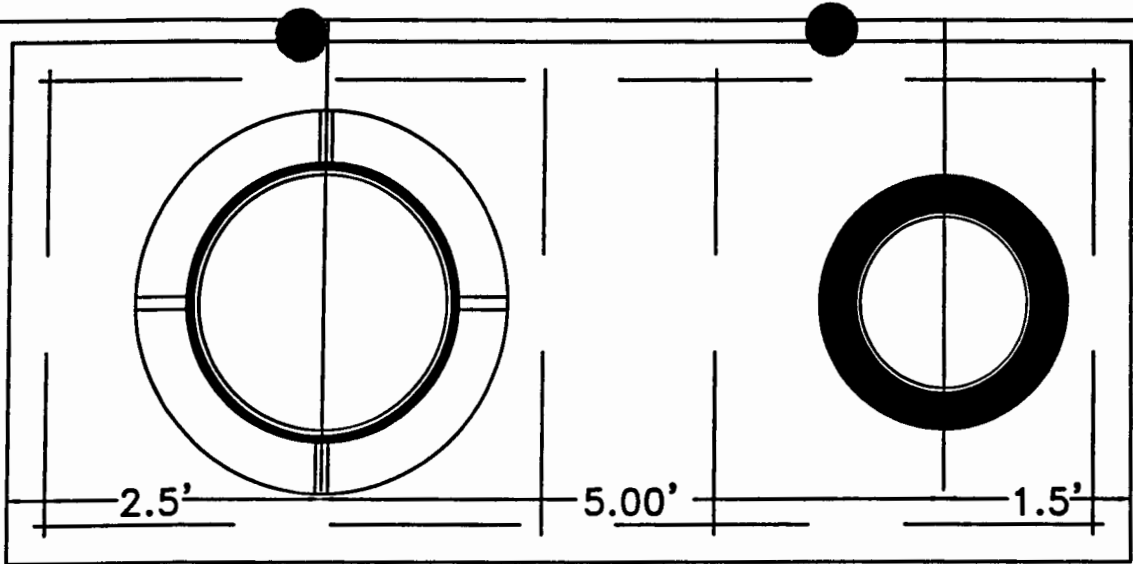


NOTES:

1. CONNECTION TO MANHOLE SHALL BE MADE BY KOR-N-SEAL BOOT.
2. SEE DETAIL 7-3 FOR MANHOLE COLLAR INSTALLATION.
3. A SEWER GUARD SHALL BE INSTALLED IN ANY MANHOLE SUBJECT TO FLOODING.
4. GROUT ALL JOINTS AND CONNECTION POINTS WITH NON-SHRINK GROUT.
5. THE PLACEMENT OF THE VALVE ASSEMBLY SHALL BE DIRECTLY BELOW THE MANHOLE FRAME AND LID.

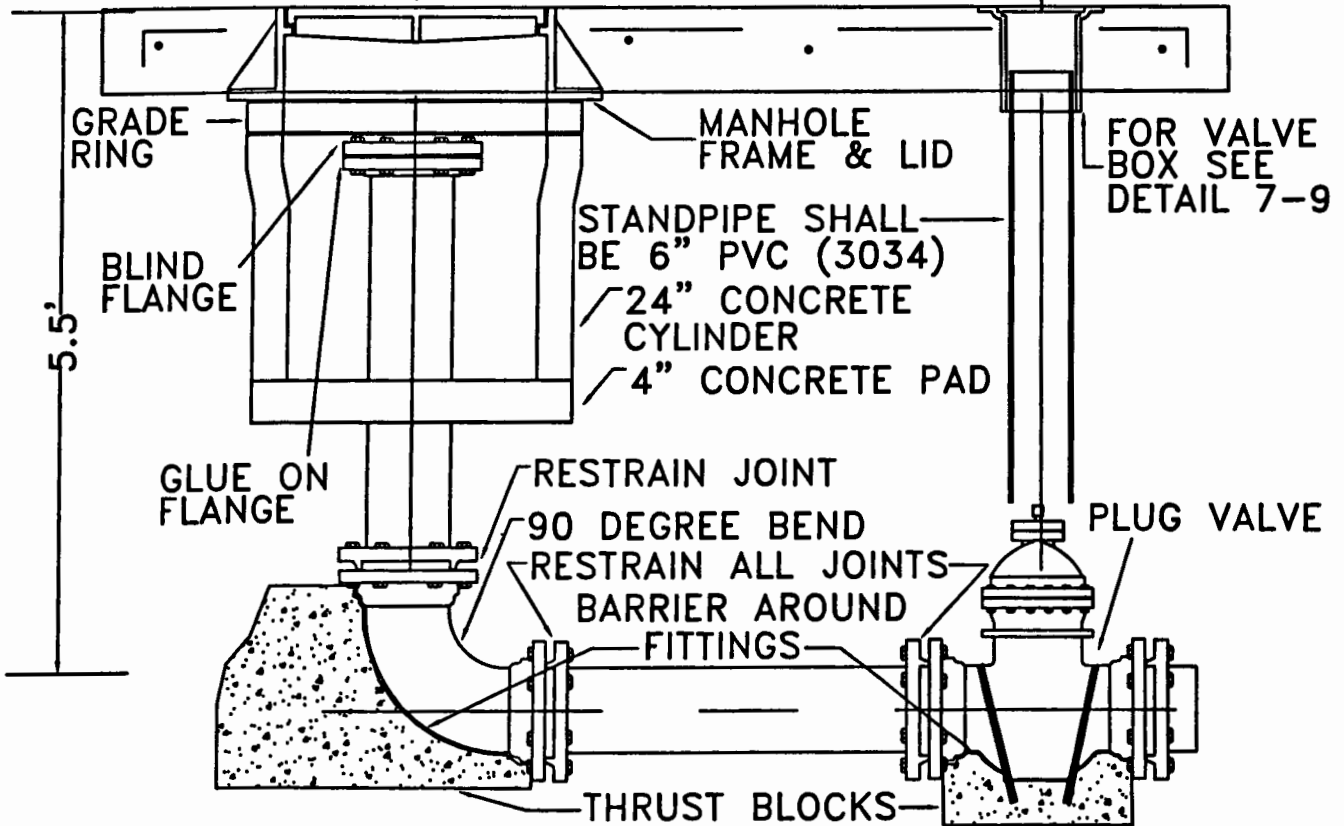
6" OF 5/8" CRUSHED ROCK BEDDING

CITY OF LACEY, WASHINGTON DEPT. OF PUBLIC WORKS			
2" INLINE PIG CATCHER PORT			
APPROVED		DWG. NO.	
CITY ENGINEER		DATE	
7-13C			
DES.	DWN.	CKD.	DATE
W.H.O.	W.H.O.	L.R.W.	10/21/96



9' X 4' X .67'
CONCRETE PAD

#4 REBAR TO MEET
ASTM A615 GRADE
60 FY=60,000 PSI



NOTE:

1. FOR VALVE STEM RISER REQUIREMENTS SEE DETAIL 7-9.
2. THE PIG LAUNCH SIZES SHALL BE THE SAME SIZE AS THE MAIN.

DG714.DWG

CITY OF LACEY, WASHINGTON DEPT. OF PUBLIC WORKS			
LAUNCH PORT 4" AND LARGER			
APPROVED		DWG. NO.	
CITY ENGINEER		DATE	7-14
DES. WHO	DWN. WHO	CKD	DATE 3/7/00

#4 REBAR TO MEET
ASTM A615 GRADE
60 FY=60,000 PSI

COMMERCIAL CONCRETE
PAD - 9' x 4' x .67'
(IF OUTSIDE PAVED
ROADWAY)

PAVEMENT

THREADED CAP
HAND TIGHT

MALE ADAPTOR

24" CONCRETE CULVERT
PIPE, 2' DEEP, WITH
STANDARD SEWER FRAME
AND COVER.

4" COMMERCIAL
CONCRETE

2-45° ELBOWS
TRUST BLOCK
W/ BARRIER NEXT
TO PIPE

UNDISTURBED
EARTH

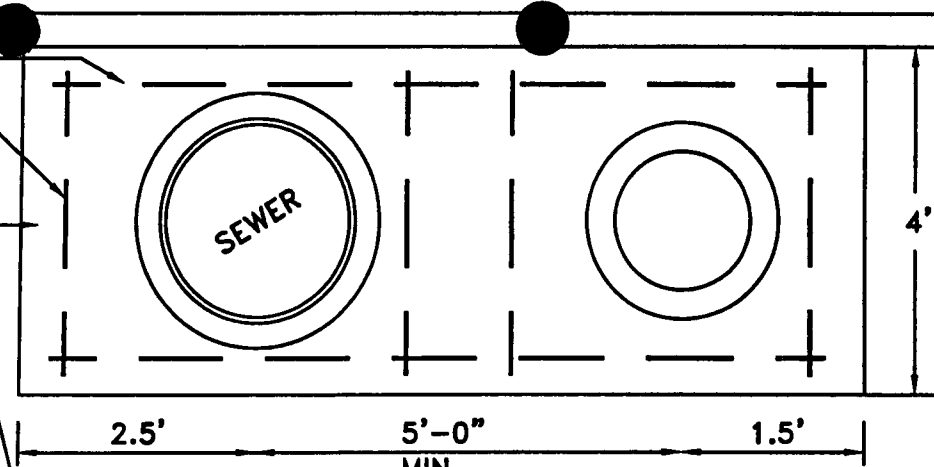
IFCO 248
OR OLYMPIC
VB-950 VALVE
BOX WITH COVER
MARKED
"LACEY SEWER"

5'-0"
PRESSURE MAIN

6" PVC 3034
SEWER PIPE

2" PHILMAC VALVE

THRUST
BLOCK

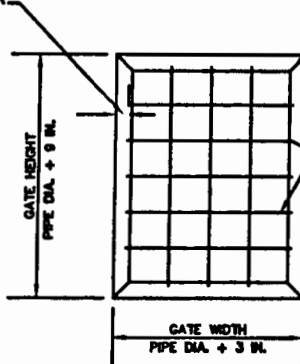


NOTE:

- FOR VALVE STEM RISER REQUIREMENTS
SEE DETAIL 7-9.
PHILMAC VALVES DO NOT REQUIRE
EXTENSIONS.

CITY OF LACEY, WASHINGTON DEPT. OF PUBLIC WORKS			
2" LAUNCH PORT			
APPROVED		DWG. NO.	
CITY ENGINEER		DATE	7-14B
DES. WHO	DWN. GGW	CKD. DER	DATE 10/21/96

2-1/2 IN. CLEAR FOR FRAME

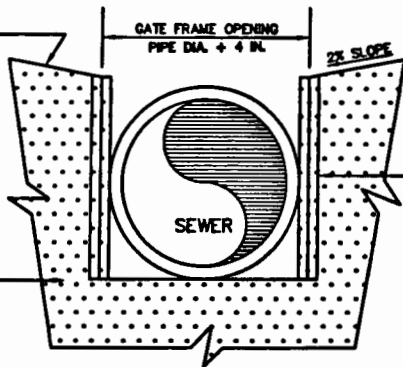


WELD (TYP.)

3" X 1/4" TYPE 316 SS FLAT BAR

1/2" TYPE 316 SS BARS (TYP.) WELD ALL BARS TO FRAME & EACH OTHER. OPENING SIZE = 1-1/2 IN.

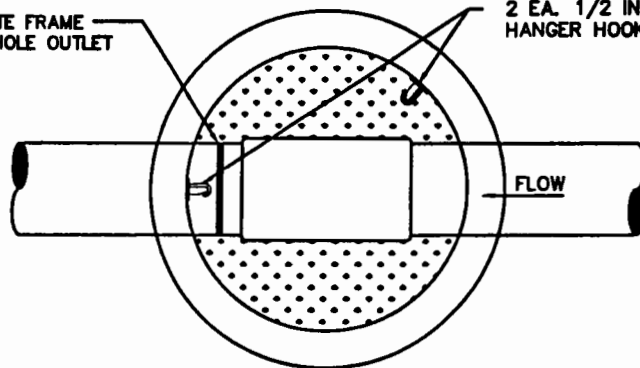
NONSKID SHELF



TYPE 316 SS LAYERED FLAT BAR GATE FRAME W/2" DEEP 3/8" WIDE OPENING ON SIDES ONLY.

TYPE 316 SS GATE FRAME LOCATED @ MANHOLE OUTLET

2 EA. 1/2 IN. TYPE 316 SS GATE HANGER HOOK



GENERAL NOTES:

1. THE DOWNSTREAM AREA BEHIND GATE MUST NOT ALLOW PIG TO CONTINUE TRAVEL DOWN PIPE.

CITY OF LACEY, WASHINGTON
DEPT. OF PUBLIC WORKS

**OUTFALL MANHOLE
PIG CATCHER**

APPROVED

DWG. NO.

CITY ENGINEER

DATE

7-15

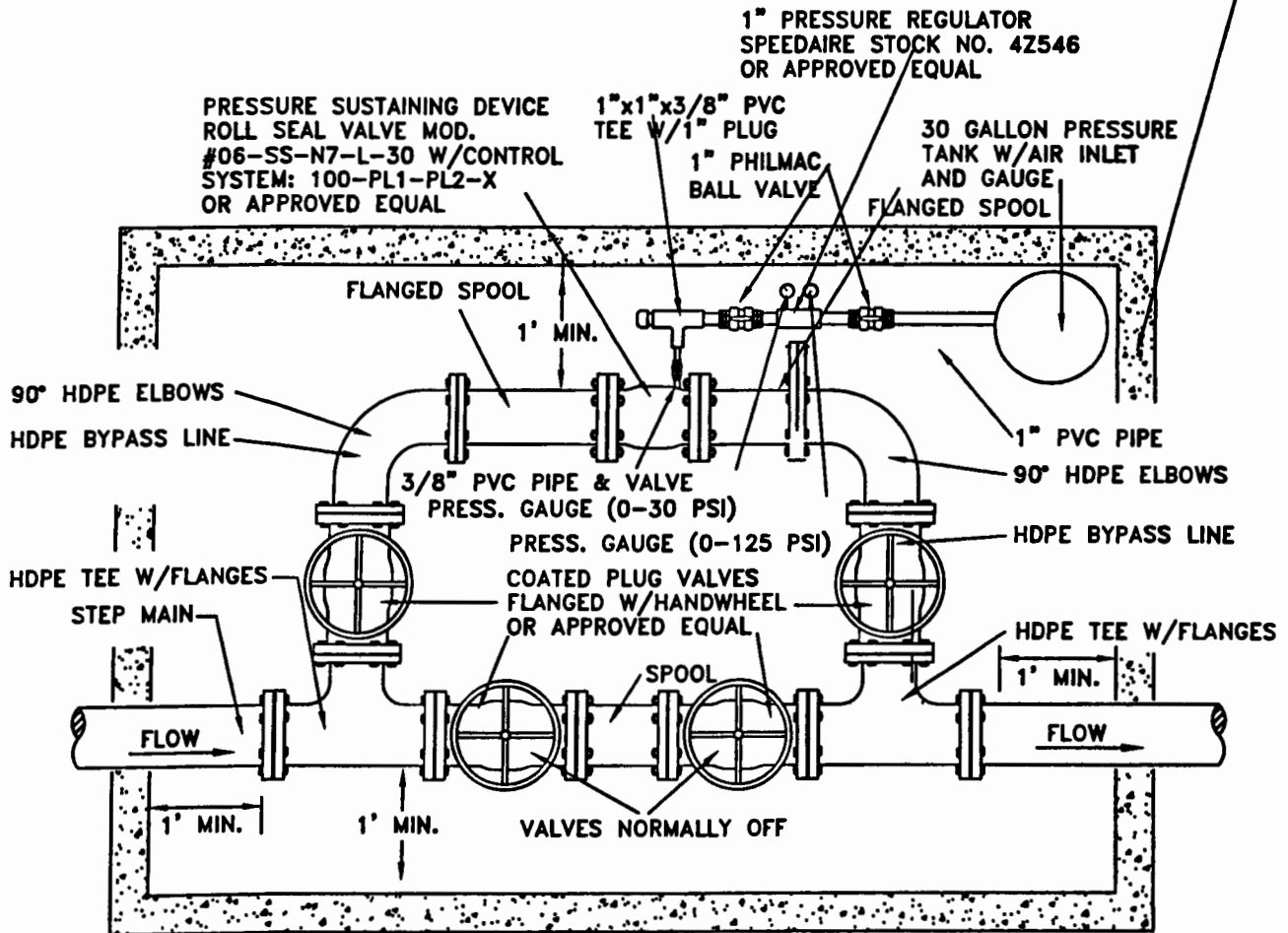
DES.
HEK

DWN.
GGW

CKD.
BFB

DATE
11/26/91

UTILITY VAULT WITH BOTTOM AND SUMP. THE LID SHALL BE WATER PROOF SPRING LOADED TYPE.



NOTE:

1. THE PIPING AND FITTINGS FOR THE PRESSURE SUSTAINING DEVICE SHALL BE MADE OF HDPE FUSED PIPING.
2. PIPE STANDS ARE REQUIRED UNDER PIPING. ON THIS APPLICATION 4 STANDS ARE REQUIRED.
3. THE VAULT SHALL BE EQUIPPED WITH A SUMP TO CONTAIN EFFLUENT LIQUIDS.
4. ADD SPOOL PIECES OF PIPING WHEN NEEDED BUT THE 1' MIN. DISTANCE FROM THE WALLS SHALL BE MAINTAINED.
5. PRESSURE GAUGES SHALL HAVE A VALVE PLACED IN LINE BEFORE THE IT.

DG716.DWG

CITY OF LACEY, WASHINGTON
DEPT. OF PUBLIC WORKS

**PRESSURE
SUSTAINING DEVICE**

APPROVED

DWG. NO.

CITY ENGINEER

DATE

7-16

DES.
WHO

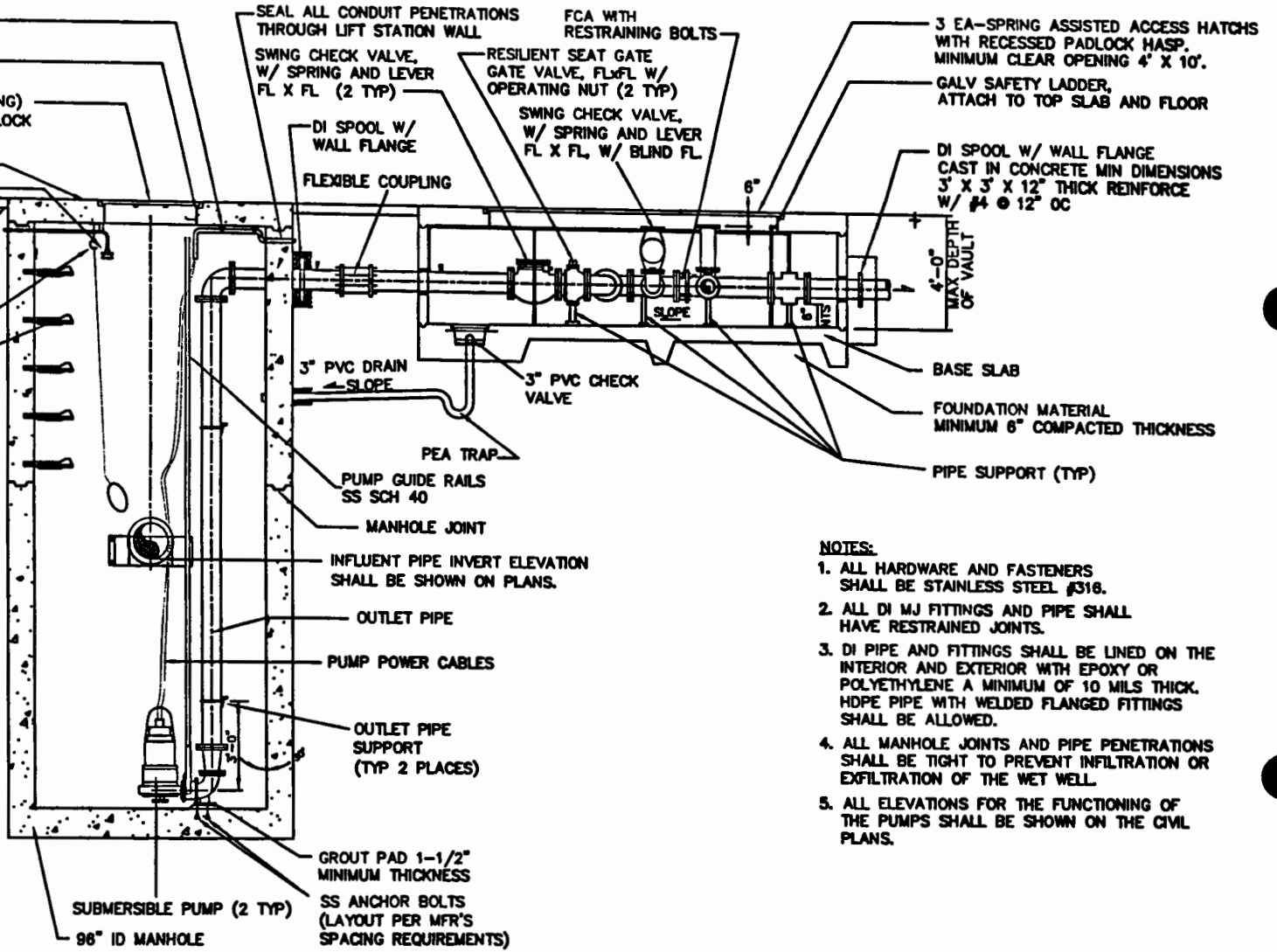
DWN.
WHO

CKD

DATE
1/2/02

DG717.DWG

CORD GRIPS TOGETHER WITH SS STRAIN RELIEFS ON ALL CORDS
 TOP GUIDE BRACKET INSTALL PER PUMP MANUFACTURER'S RECOMMENDATIONS
 SPRING ASSISTED ACCESS HATCH (H-20 LOADING) CENTERED ABOVE PUMPS, WITH RECESSED PADLOCK HASP (MINIMUM SIZE (2 EA) 36" X 36")
 TOP SLAB, FINISHED GRADE ELEVATION
 ULTRASONIC LEVEL TRANSDUCER (POSITION AS SHOWN IN PLAN VIEW)
 8" THICK CONCRETE SLAB W/#4 @16" OC, EA. WAY OVER 4" CRUSHED SURFACING
 EXPANSION MATERIAL (TYP)
 PROVIDE STAINLESS STEEL HOOK TO HANG HIGH LEVEL FLOAT
 POLYPROPYLENE SAFETY STEPS (POSITION AS SHOWN IN PLAN VIEW)



NOTES:

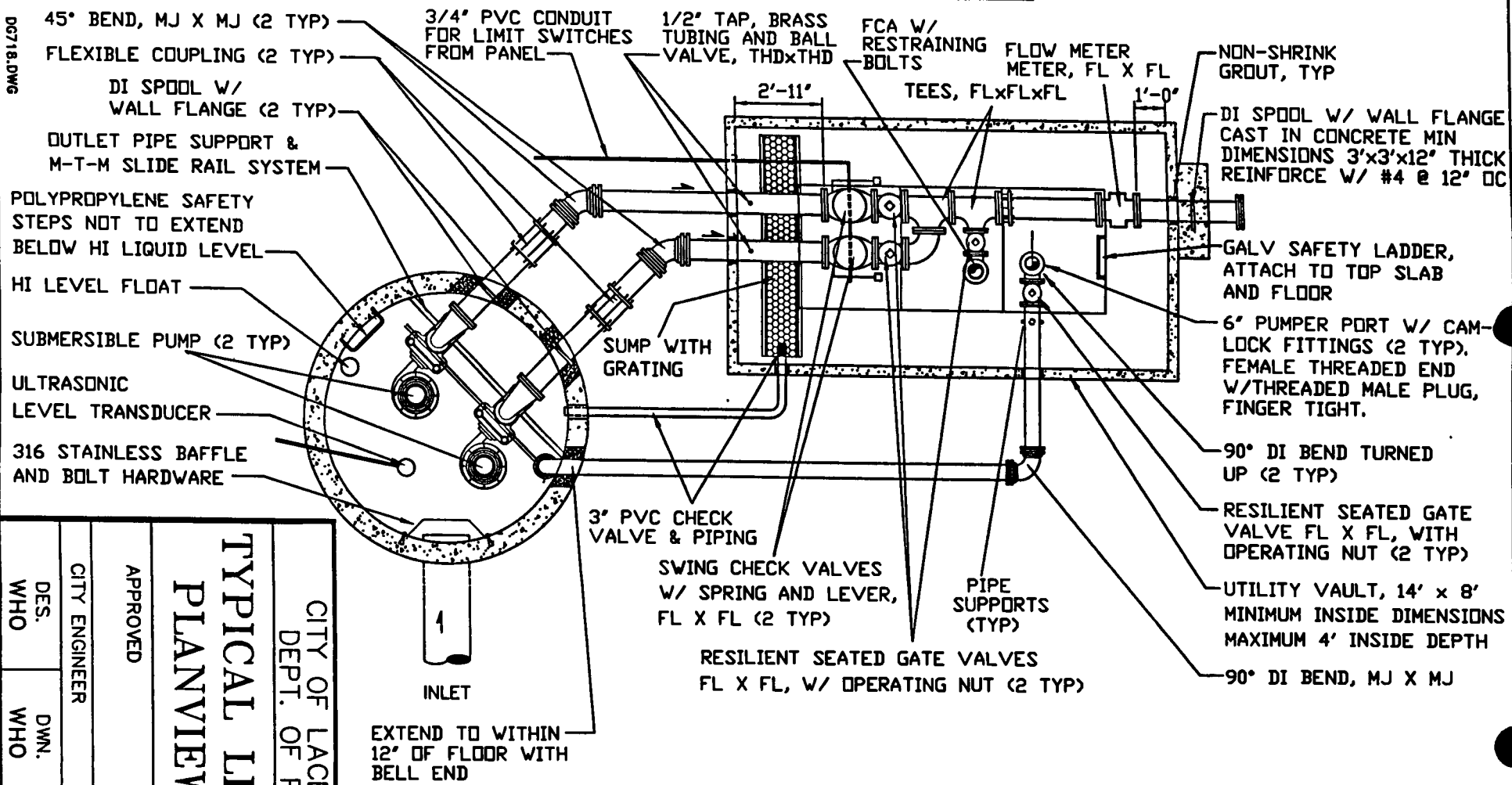
1. ALL HARDWARE AND FASTENERS SHALL BE STAINLESS STEEL #316.
2. ALL DI MJ FITTINGS AND PIPE SHALL HAVE RESTRAINED JOINTS.
3. DI PIPE AND FITTINGS SHALL BE LINED ON THE INTERIOR AND EXTERIOR WITH EPOXY OR POLYETHYLENE A MINIMUM OF 10 MILS THICK. HDPE PIPE WITH WELDED FLANGED FITTINGS SHALL BE ALLOWED.
4. ALL MANHOLE JOINTS AND PIPE PENETRATIONS SHALL BE TIGHT TO PREVENT INFILTRATION OR EXFILTRATION OF THE WET WELL.
5. ALL ELEVATIONS FOR THE FUNCTIONING OF THE PUMPS SHALL BE SHOWN ON THE CIVIL PLANS.

LIFT STATION SECTION LAYOUT

CITY OF LACEY, WASHINGTON DEPT. OF PUBLIC WORKS			
TYPICAL LIFT STATION SECTION LAYOUT			
APPROVED		DWG. NO.	
CITY ENGINEER		DATE	
DES. WHO	DWN. WHO	CKD	DATE
			7-17 3/7/00

DCG718.DWG

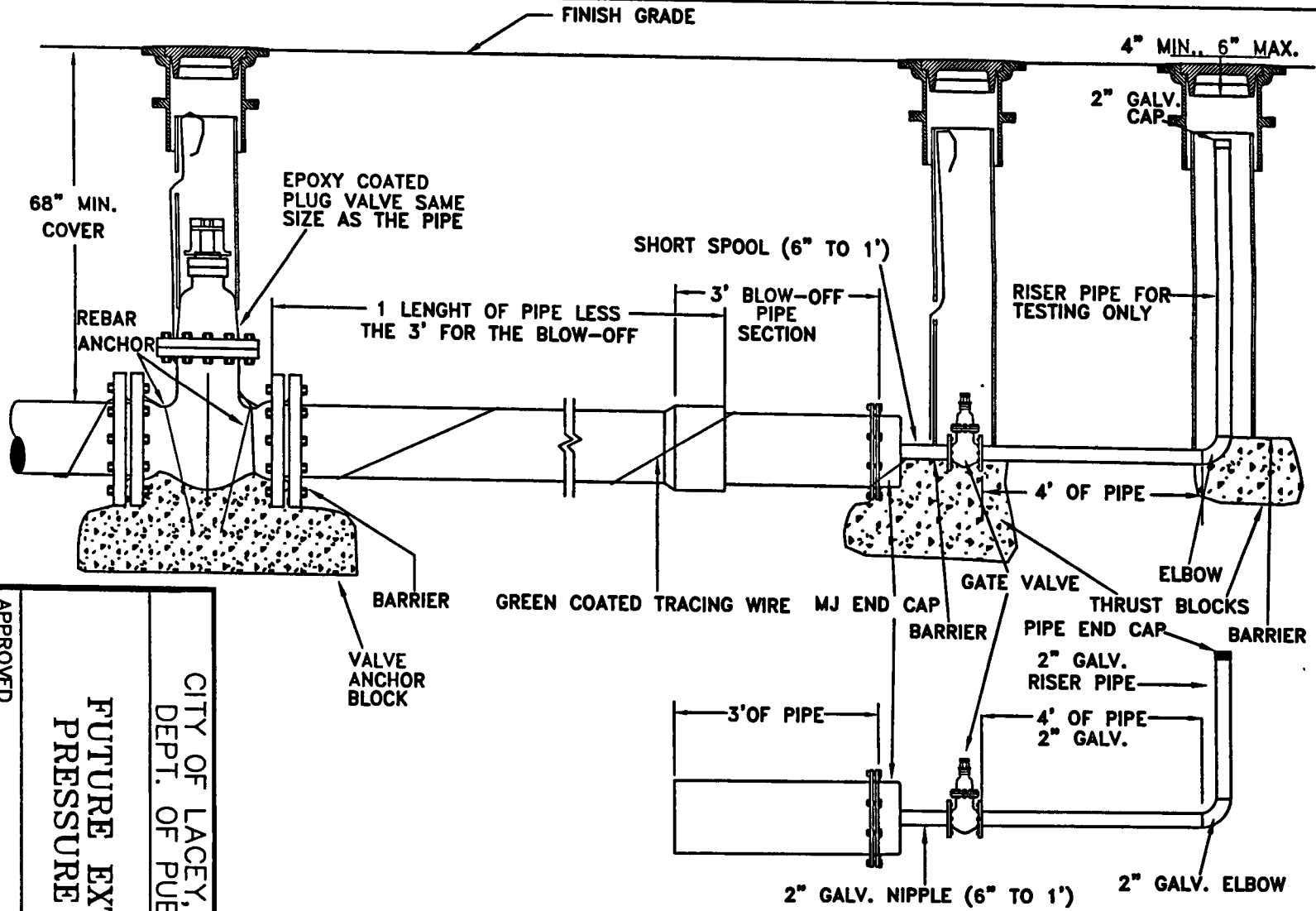
VALVE VAULT



CITY OF LACEY, WASHINGTON DEPT. OF PUBLIC WORKS			
TYPICAL LIFT STATION PLANVIEW LAYOUT			
APPROVED		DWG. NO.	
CITY ENGINEER		DATE	
DES. WHO	DWN. WHO	CKD	DATE
			7-18 3/7/00

TYPICAL LIFT STATION PLANVIEW LAYOUT

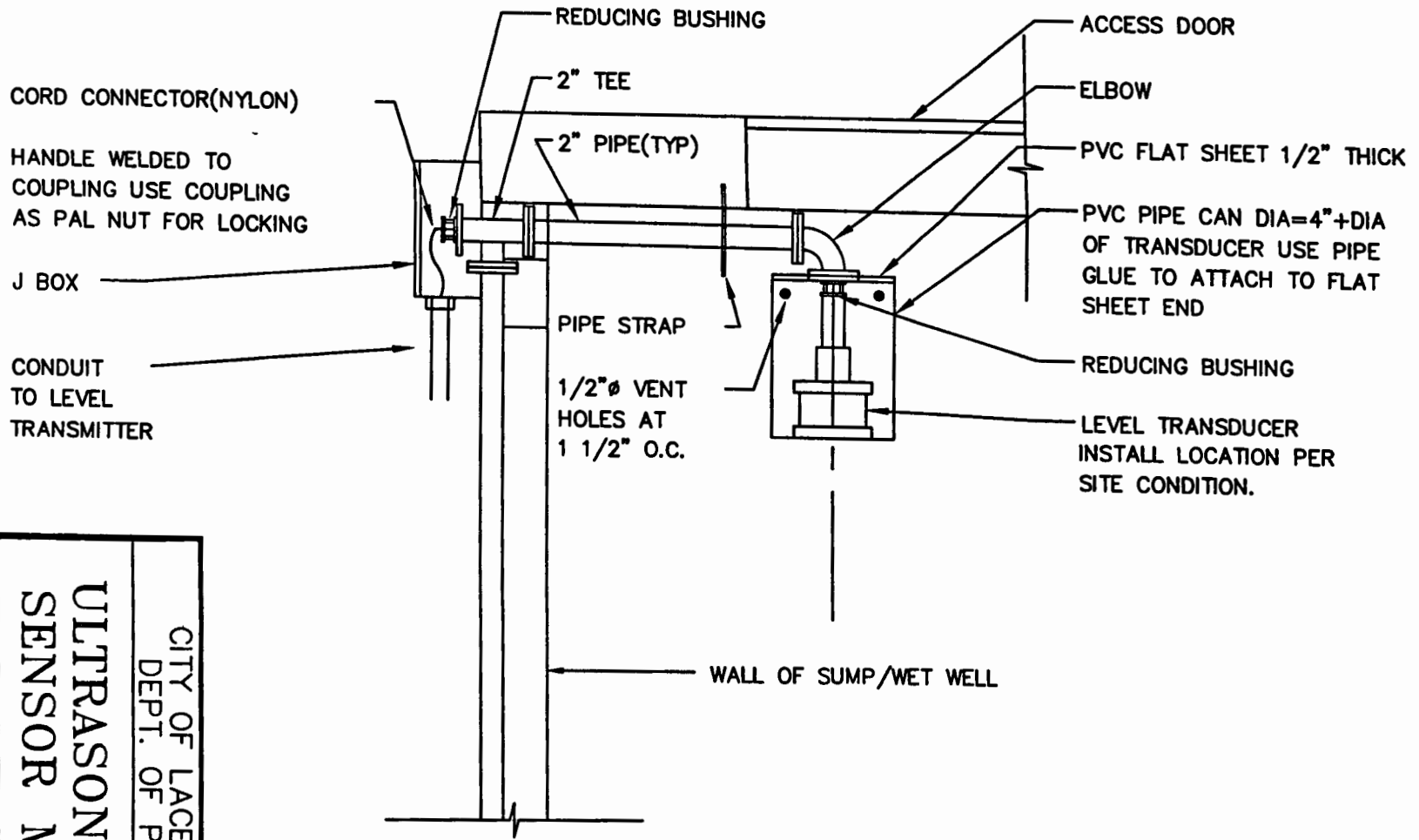
- NOTE:
1. WET WELL SHALL BE COATED WITH A MINIMUM 1" THICK HI-GRADE CALCIUM ALUMINATE.
 2. ALL DUCTILE PIPES SHALL BE EPOXY COATED OR PE LINED BOTH SIDES. ALL BOLTS AND HARDWARE IN WET WELL SHALL BE 316 STAINLESS STEEL.



NOTES:

1. FOR VALVE BOX REQUIREMENTS SEE DETAIL 7-9.
2. THIS IS A FUTURE EXTENSION DETAIL. THE TEST REQUIREMENTS SHALL BE PER SECTION 7A.070 TESTING UNDER FORCE MAINS.
3. FOR PIPING REQUIREMENTS SEE SECTION 7D.030 FORCE MAIN.

CITY OF LACEY, WASHINGTON DEPT. OF PUBLIC WORKS	
FUTURE EXTENSION PRESSURE MAINS	
DES. WHO CITY ENGINEER	APPROVED DWG. NO. 7-19
DWN. WHO DATE	CHK. RAS DATE 4/25/02



TYPICAL ULTRASONIC LEVEL SENSOR MOUNTING DETAIL

NOT TO SCALE

CITY OF LACEY, WASHINGTON DEPT. OF PUBLIC WORKS			
ULTRASONIC LEVEL SENSOR MOUNTING			
APPROVED		DWG. NO.	
CITY ENGINEER		DATE	
DES. WHO	DWN. WHO	CKD	DATE
WHO	WHO		3/7/00
			7-23

SERVICE WYE
GASKET X GASKET X GASKET

SEWER MAIN
SIZE VARIES

45° ELL
SPIGOT X GASKET

SIDE SEWER

GREEN TRACER WIRE

"S" STAMPED 1/4" DEEP
INTO FACE OF CURB

RIGHT OF WAY
2" X 4" X 8'-0"
LOCATION POST
PAINTED GREEN
WITH THE "S"
PAINTED WHITE
FOR SEWER

ROADWAY

WATER MAIN

OTHER UTILITIES

SIDEWALK

22.5° EL
SPIGOT X
GASKET

45° CONNECTION

18" MIN.

6" MIN.

I.E. AS PER PLANS

SIDE SEWER LAID ON UNIFORM
SLOPE, MIN. SLOPE OF 1%.

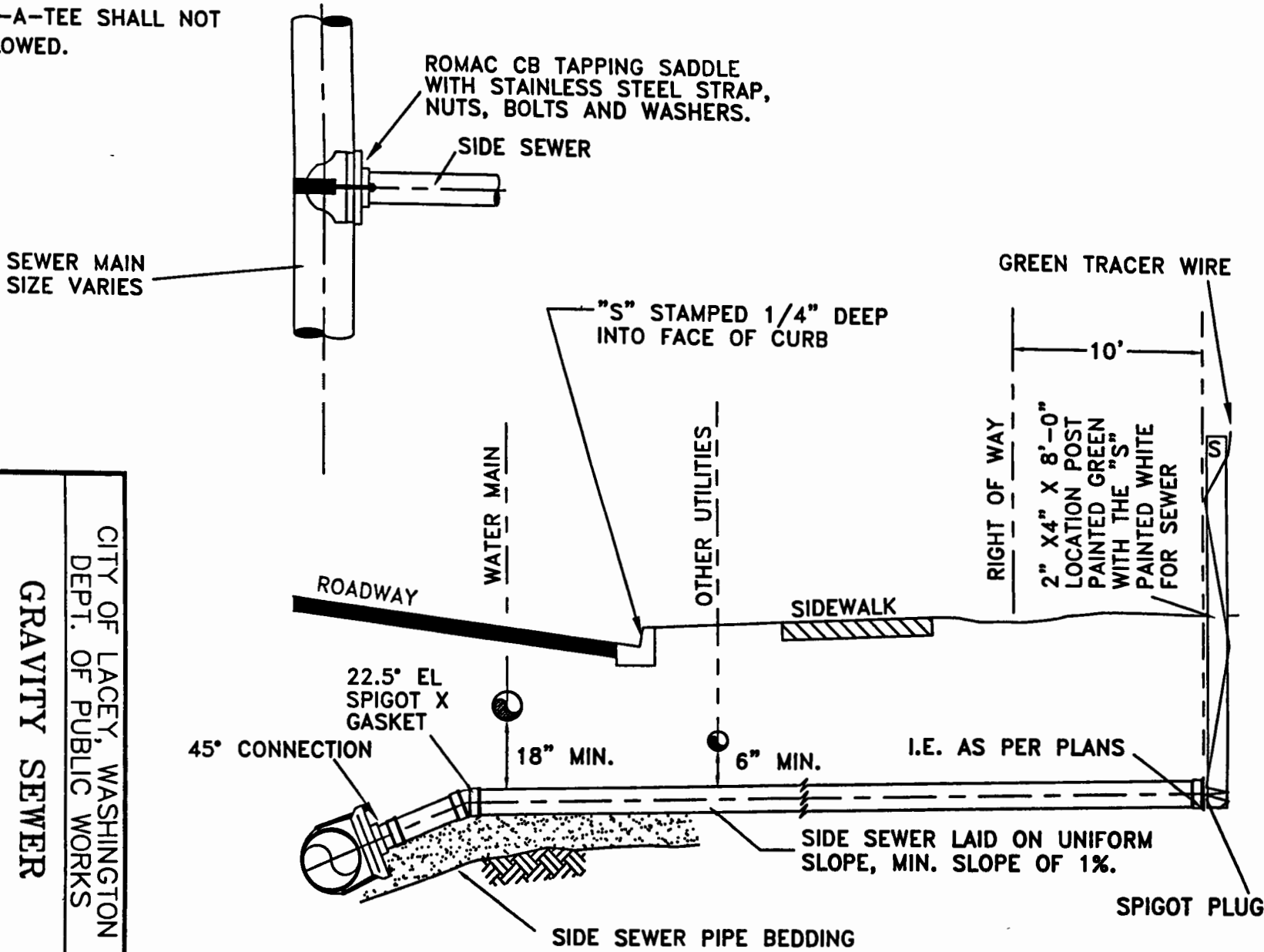
SPIGOT PLUG

SIDE SEWER PIPE BEDDING

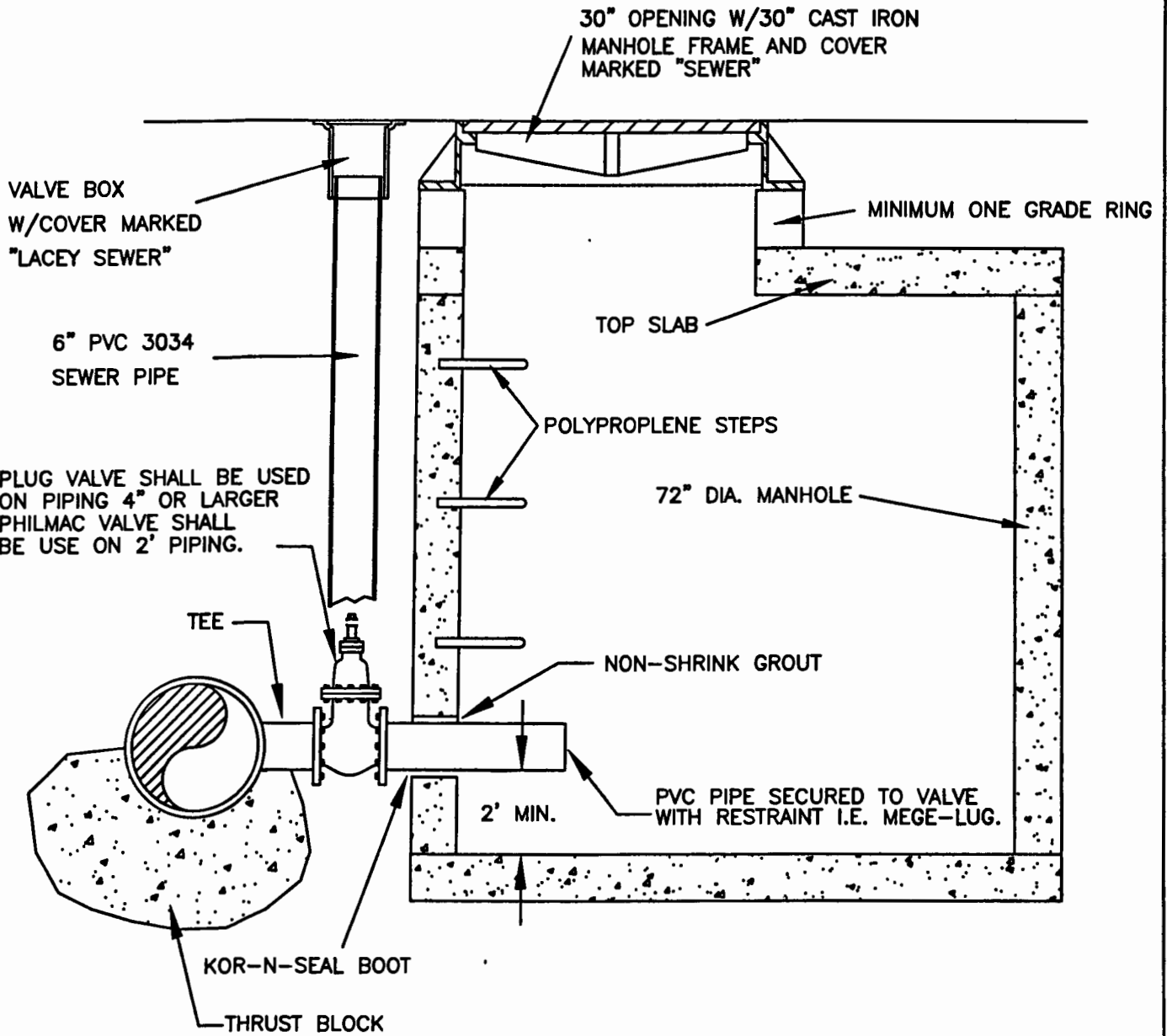
CITY OF LACEY, WASHINGTON DEPT. OF PUBLIC WORKS		GRAVITY SANITARY SEWER SERVICE	
APPROVED	DWG. NO.	7-31	
CITY ENGINEER	DATE	7-31	
DES. WHO	DWN. GGW	OKD. DER	DATE 7/31/96

NOTE:

1. INSERT-A-TEE SHALL NOT BE ALLOWED.



CITY OF LACEY, WASHINGTON DEPT. OF PUBLIC WORKS			
GRAVITY SEWER TAP CONNECTION			
APPROVED	DATE		DWG. NO.
CITY ENGINEER	DATE		7-31.B
DES. WHO	DWN. GGW	CKD. DER	DATE 7/31/96



NOTE:

1. MANHOLE SHALL BE COATED ON THE INSIDE WITH TNEMIC 120 VINYL ESTER OR QUANTUM POLYMORPHIC RESIN.
2. INSTALL A CONCRETE PAD WHEN LOW POINT DRAIN MANHOLE IS INSTALLED OUTSIDE OF PAVED AREA. SEE DETAIL 7-3.

CITY OF LACEY, WASHINGTON
DEPT. OF PUBLIC WORKS

**LOW POINT
DRAIN**

APPROVED

DWG. NO.

CITY ENGINEER

DATE

7-32

DES.

DWN.

CKD.

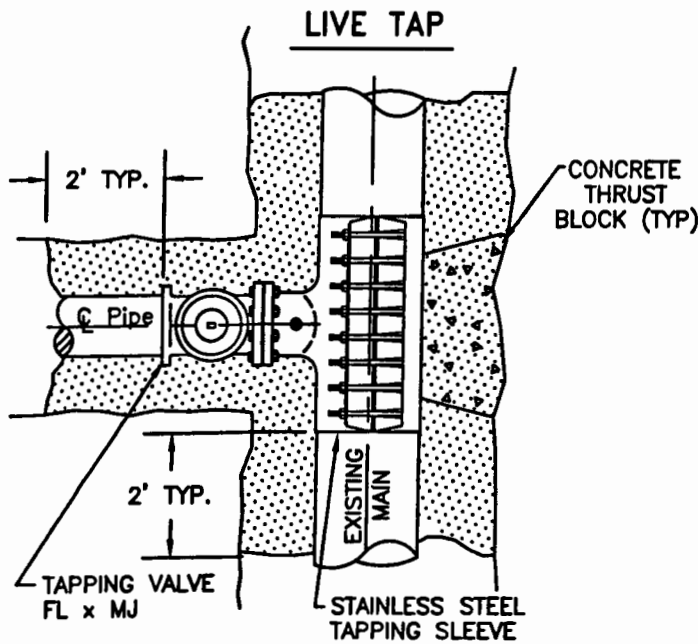
DATE

WHO

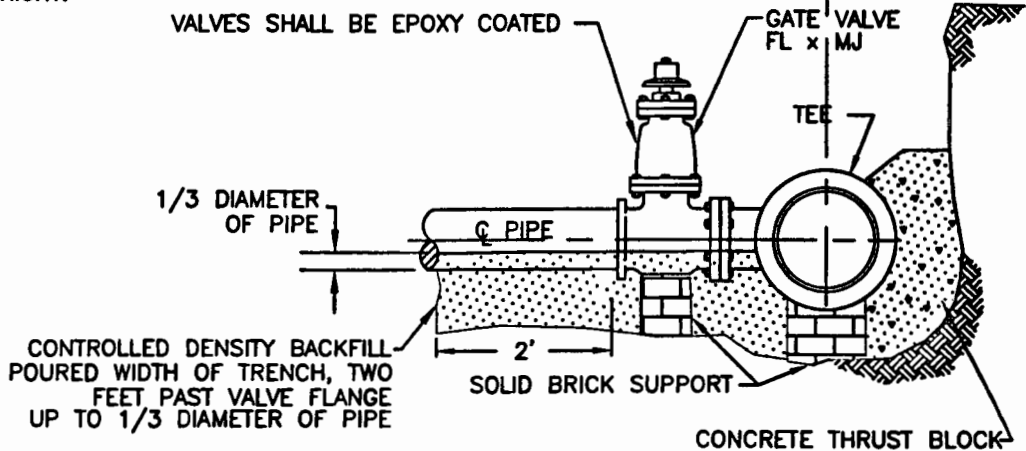
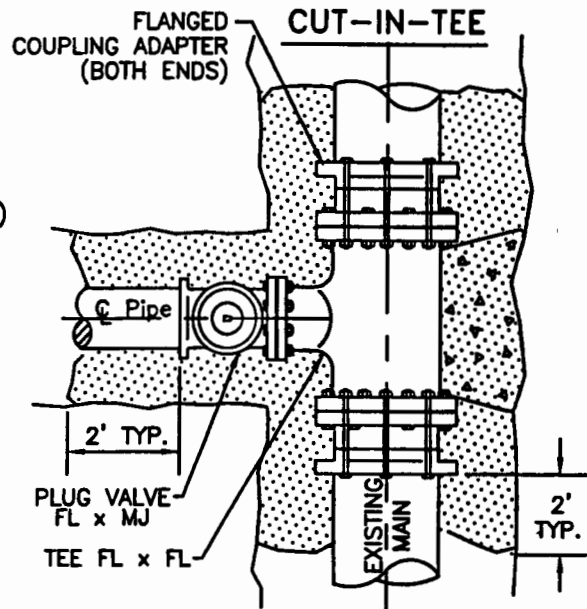
GGW

DER

6/19/95



VALVE AND SLEEVE SHALL BE SUPPORTED AND BACKFILLED AS SHOWN BELOW-RIGHT.



NOTES:

1. 11 MIL PLASTIC OR CONSTRUCTION FABRIC SHALL BE WRAPPED AROUND PIPE AND FITTINGS BEFORE THRUST BLOCK AND BACKFILL ARE POURED.
2. CONTROLLED DENSITY BACKFILL IS A PLANT MIX CONSISTING OF : 3100# SAND, 450# WATER, AND ONE SACK (94#) OF CEMENT.
3. MJ CUT IN TEES SHALL NOT BE PERMITTED.
4. SUPPORT VALVE AND SLEEVE CONTINUOUSLY THROUGH INSTALLATION.

CITY OF LACEY, WASHINGTON DEPT. OF PUBLIC WORKS			
CONNECTION TO EXISTING PRESSURE MAIN			
APPROVED		DWG. NO.	
CITY ENGINEER		DATE	
		7-33	
DES. WHO	DWN. GGW	CKD. DER	DATE 6/19/95

THRUST LOADS

THRUST AT FITTINGS IN POUNDS AT 200 POUNDS PER SQUARE INCH OF PRESSURE

PIPE DIAMETER	90° BEND	45° BEND	22-1/2° BEND	11-1/4° BEND	DEAD END OR TEE
4"	3,600	2,000	1,000	500	2,600
6"	8,000	4,400	2,300	1,200	5,700
8"	14,300	7,700	4,000	2,000	10,100
10"	22,300	12,100	6,200	3,100	15,800
12"	32,000	17,400	8,900	4,500	22,700
14"	43,600	23,600	12,100	6,100	30,800
16"	57,000	30,800	15,700	7,900	40,300

NOTES:

1. BLOCKING SHALL BE COMMERCIAL CONCRETE POURED IN PLACE AGAINST UNDISTURBED EARTH. FITTING SHALL BE ISOLATED FROM CONCRETE THRUST BLOCK WITH PLASTIC OR SIMILAR MATERIAL.
2. TO DETERMINE THE BEARING AREA OF THE THRUST BLOCK IN SQUARE FEET (S.F.):
 EXAMPLE : 12" - 90° BEND IN SAND AND GRAVEL
 $32,000 \text{ LBS} \div 3000 \text{ LB/S.F.} = 10.7 \text{ S.F. OF AREA}$
3. AREAS MUST BE ADJUSTED FOR OTHER PIPE SIZE, PRESSURES AND SOIL CONDITIONS.
4. BLOCKING SHALL BE ADEQUATE TO WITHSTAND FULL TEST PRESSURE AS WELL AS TO CONTINUOUSLY WITHSTAND OPERATING PRESSURE UNDER ALL CONDITIONS OF SERVICE.

SAFE SOIL BEARING LOADS

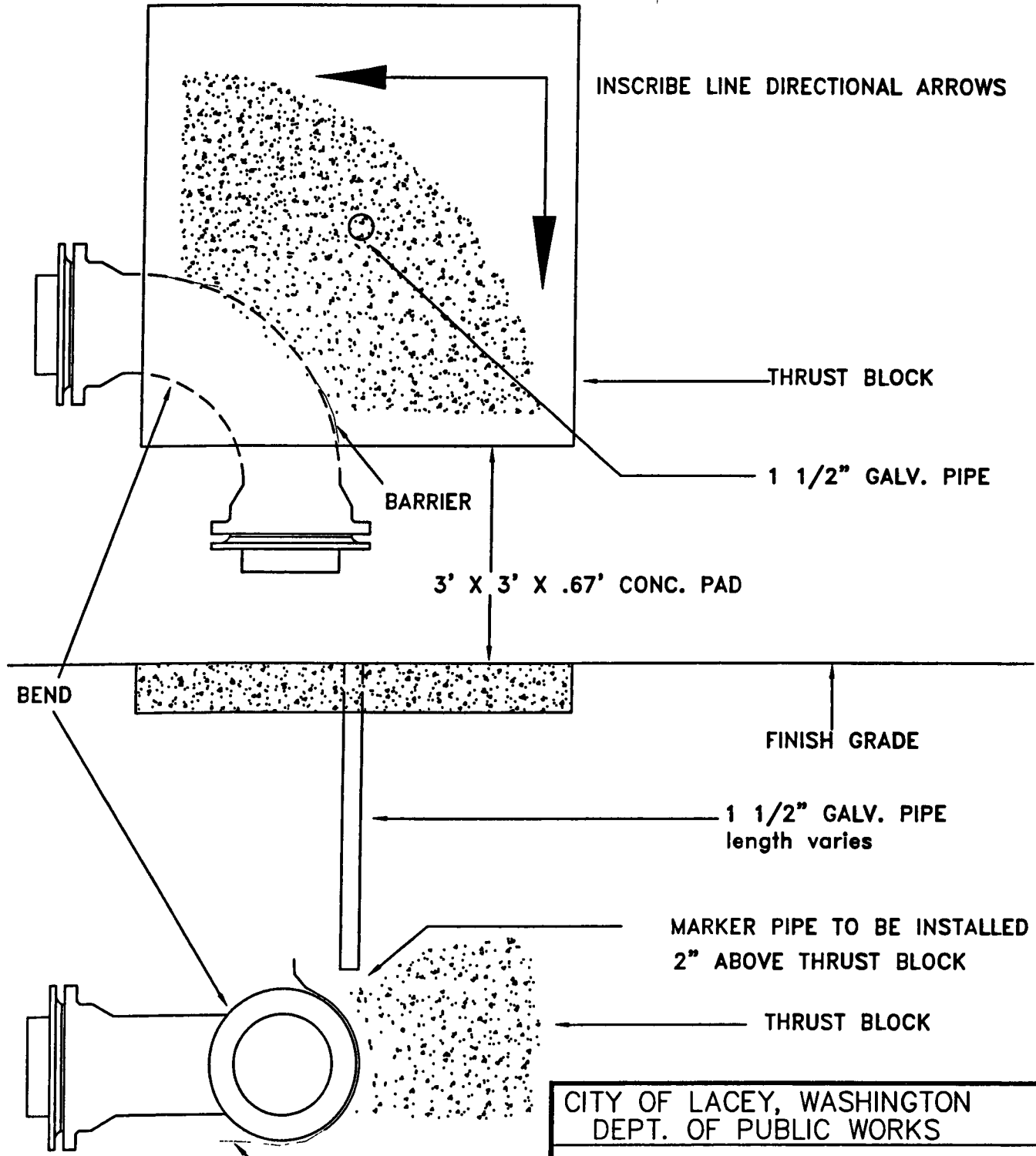
FOR HORIZONTAL THRUSTS WHEN THE DEPTH OF COVER OVER THE PIPE EXCEEDS 2 FEET

SOIL	POUNDS PER SQUARE FOOT
MUCK, PEAT	0
SOFT CLAY	1,000
SAND	2,000
SAND & GRAVEL	3,000
SAND & GRAVEL CEMENTED WITH CLAY	4,000
HARD SHALE	10,000

CITY OF LACEY, WASHINGTON
DEPT. OF PUBLIC WORKS

THRUST LOADS

APPROVED <i>A. Cell</i> 29 Oct 96 CITY ENGINEER			DATE 29 Oct 96	DWG. NO. 7-35
DES. LRW	DWN. GGW	CKD. DER	DATE 6/19/95	



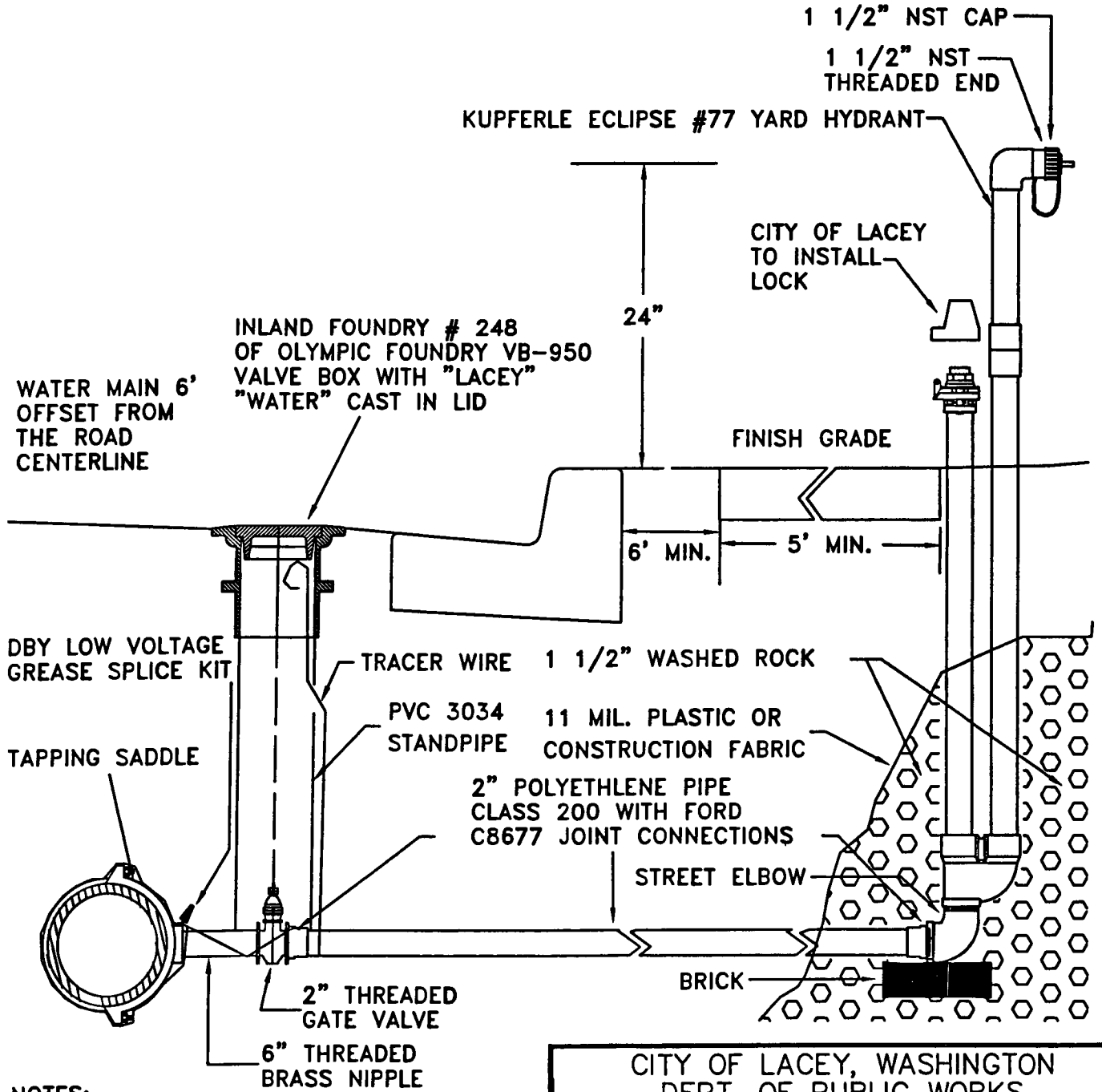
NOTES:
 1. TO BE INSTALLED IN EASEMENTS.

CITY OF LACEY, WASHINGTON
 DEPT. OF PUBLIC WORKS

BEND MARKER

APPROVED			DWG. NO.
CITY ENGINEER			7-40
DES.	DWN.	CKD.	DATE
W.H.O.	W.H.O.	L.R.W.	7/31/96

THIS YARD HYDRANT SHALL
BE LOCATED BEHIND THE
SIDEWALK OR IN THE FENCED
AREA OF THE LIFT STATION



NOTES:

1. THE WATER MAIN IS LOCATED 6' NORTH OR EAST OF THE CENTERLINE.
2. THE BROKEN LINES INDICATE A MISSING DISTANCES. ALL DISTANCES SHALL BE SHOWN ON THE PLANS.
3. 2 COATS OF RED EPOXY PAINT IS REQUIRED AFTER INSTALLATION.
4. WHEN REQUIRED A DCVA SHALL BE INSTALLED.

DG741.DWG

CITY OF LACEY, WASHINGTON
DEPT. OF PUBLIC WORKS

**LIFT STATION
WASH HYDRANT**

APPROVED

DWG. NO.

CITY ENGINEER

DATE

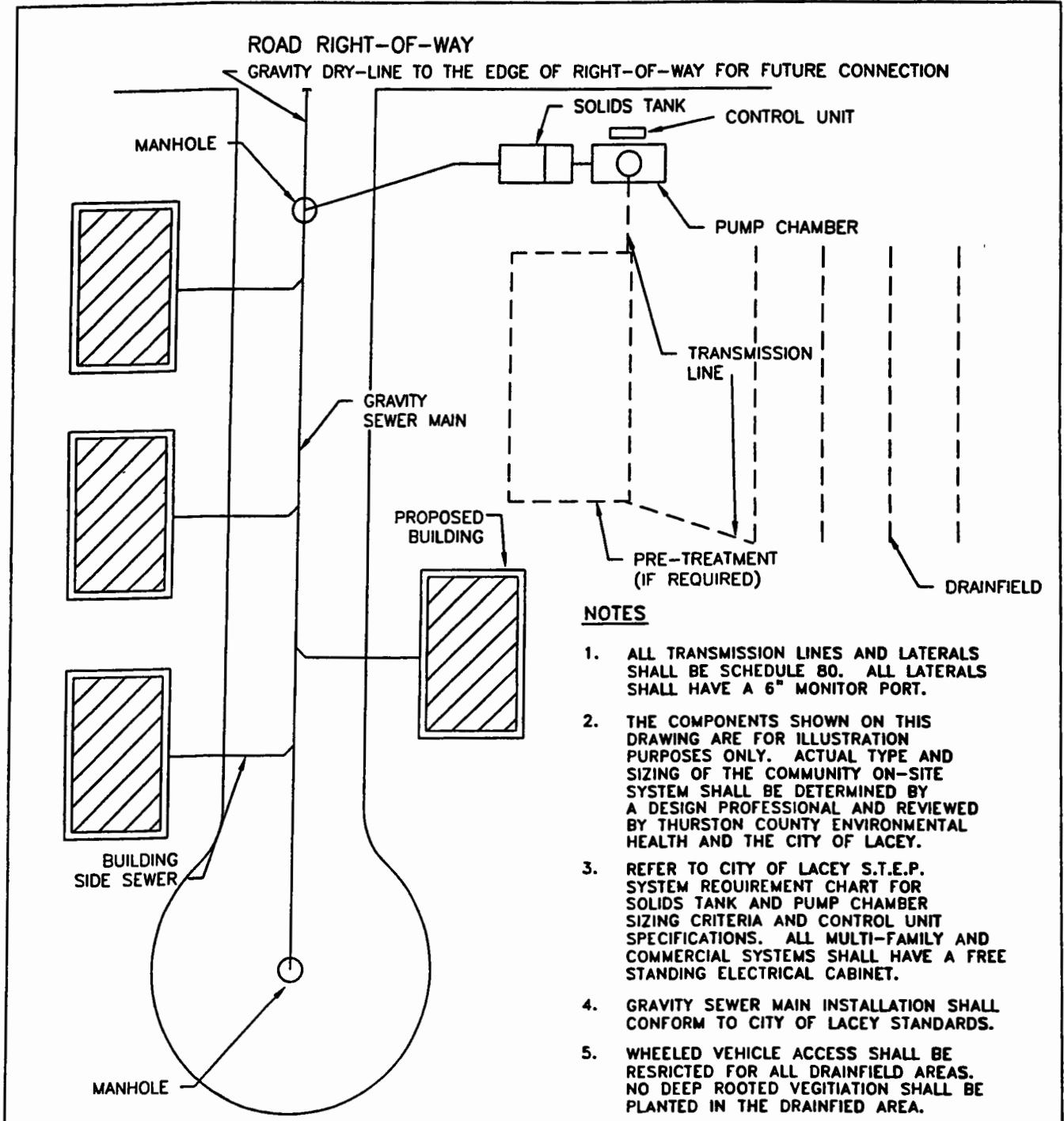
7-41

DES.
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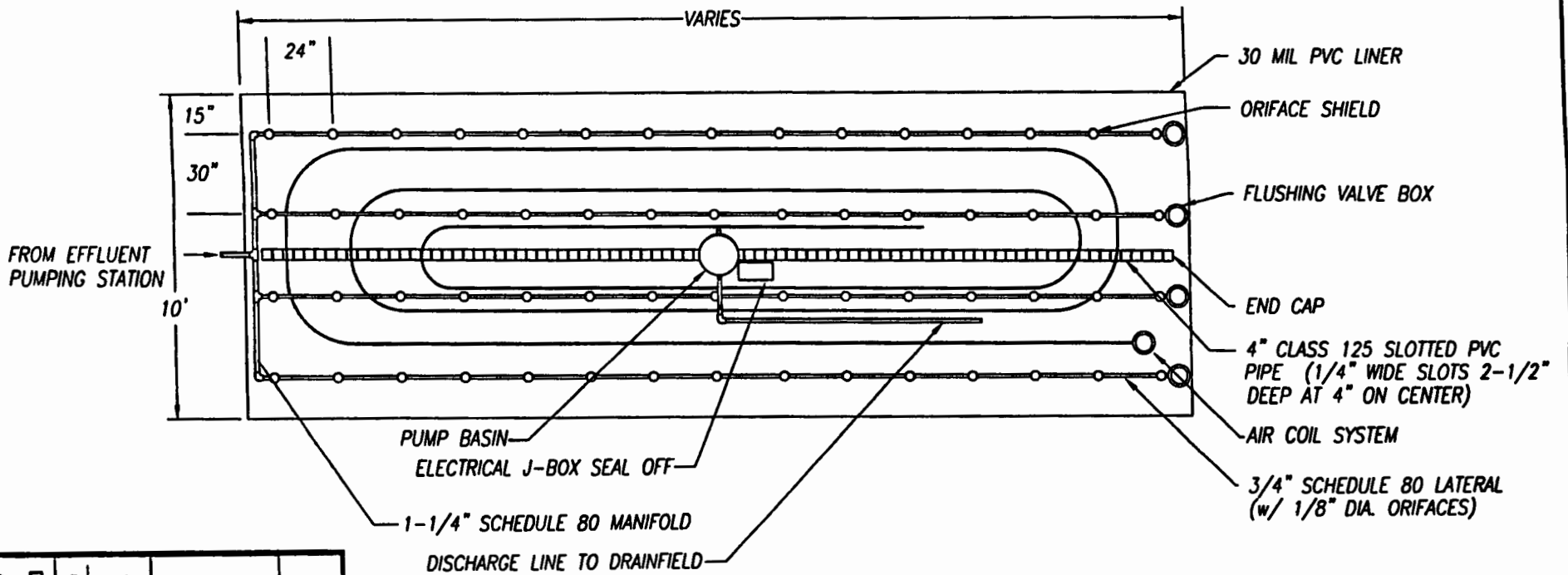
DATE
3/7/00



NOTES

1. ALL TRANSMISSION LINES AND LATERALS SHALL BE SCHEDULE 80. ALL LATERALS SHALL HAVE A 6" MONITOR PORT.
2. THE COMPONENTS SHOWN ON THIS DRAWING ARE FOR ILLUSTRATION PURPOSES ONLY. ACTUAL TYPE AND SIZING OF THE COMMUNITY ON-SITE SYSTEM SHALL BE DETERMINED BY A DESIGN PROFESSIONAL AND REVIEWED BY THURSTON COUNTY ENVIRONMENTAL HEALTH AND THE CITY OF LACEY.
3. REFER TO CITY OF LACEY S.T.E.P. SYSTEM REQUIREMENT CHART FOR SOLIDS TANK AND PUMP CHAMBER SIZING CRITERIA AND CONTROL UNIT SPECIFICATIONS. ALL MULTI-FAMILY AND COMMERCIAL SYSTEMS SHALL HAVE A FREE STANDING ELECTRICAL CABINET.
4. GRAVITY SEWER MAIN INSTALLATION SHALL CONFORM TO CITY OF LACEY STANDARDS.
5. WHEELED VEHICLE ACCESS SHALL BE RESTRICTED FOR ALL DRAINFIELD AREAS. NO DEEP ROOTED VEGETATION SHALL BE PLANTED IN THE DRAINFIELD AREA.

CITY OF LACEY, WASHINGTON DEPT. OF PUBLIC WORKS			
TYPICAL INTERIM SEWAGE FACILITIES LAYOUT			
APPROVED			DWG. NO.
CITY ENGINEER		DATE	7-42
DES. ANM	DWN. ANM	CKD. RAS	DATE 12/20/01



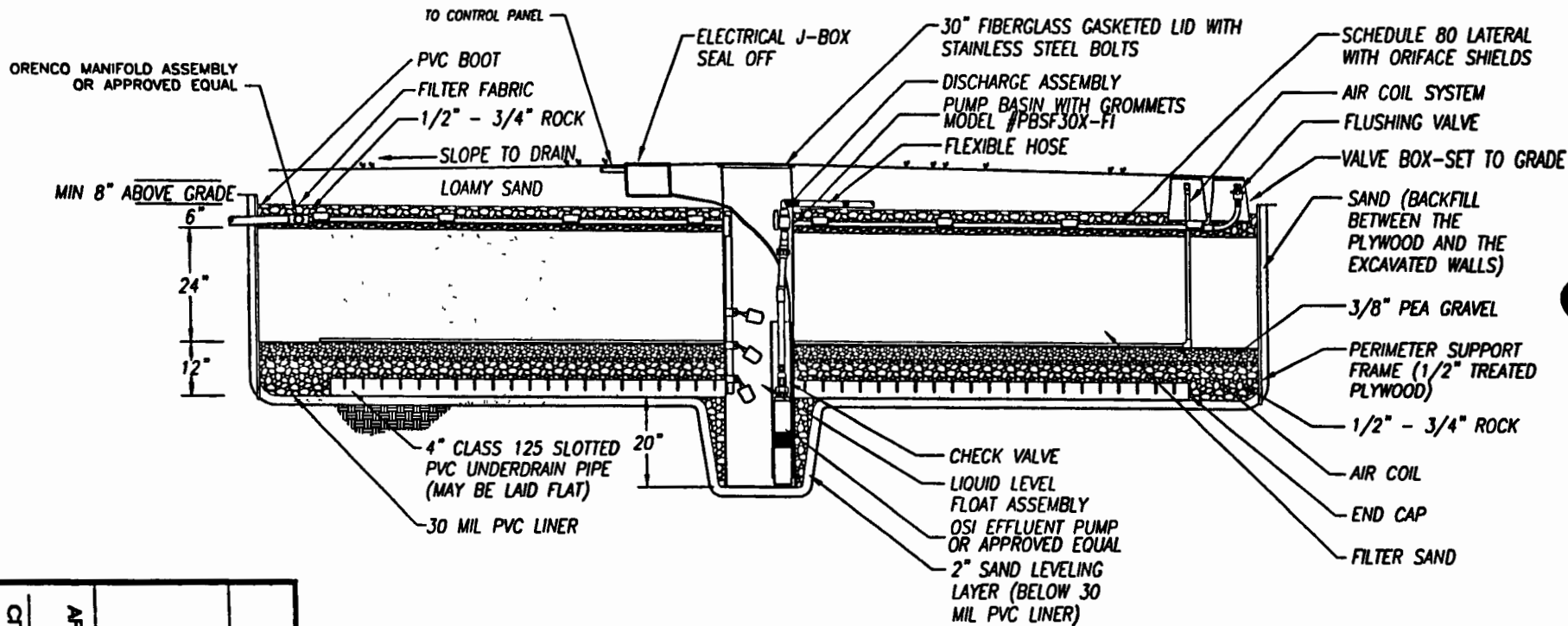
TOP VIEW - INTERMITTENT SAND FILTER

NOT TO SCALE

NOTES

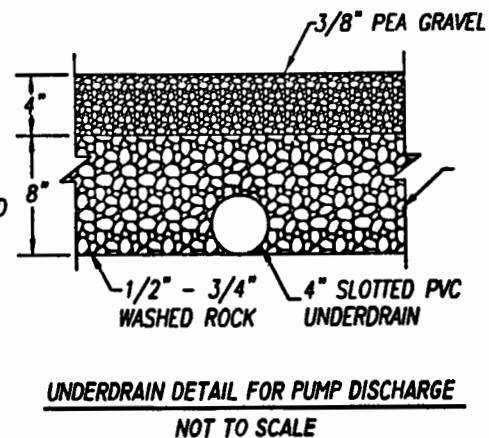
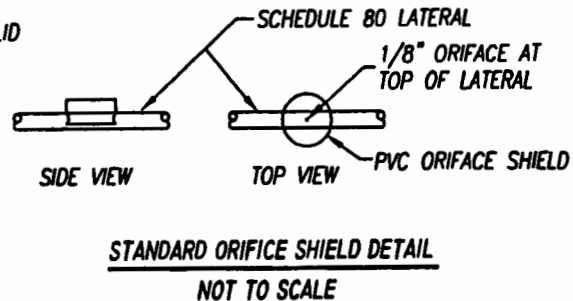
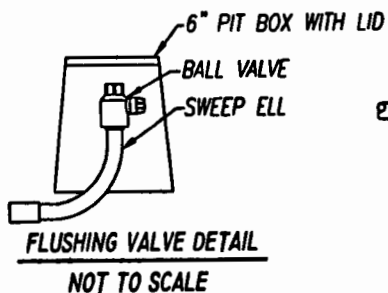
1. ALL STORMWATER AND ROOF DRAINS SHALL BE DIRECTED AWAY FROM ALL ON-SITE SEWAGE DISPOSAL COMPONENTS.
2. ALL COMPONENTS OF THE ON-SITE SEWAGE DISPOSAL SYSTEM SHALL BE INSPECTED AND APPROVED BY THURSTON COUNTY ENVIRONMENTAL HEALTH, THE CITY OF LACEY, AND THE SYSTEM DESIGNER PRIOR TO BACKFILL. THE SYSTEM DESIGNER SHALL SUBMIT AN AS-BUILT DRAWING TO THURSTON COUNTY ENVIRONMENTAL HEALTH AND THE CITY OF LACEY FOR REVIEW AND APPROVAL. APPROVAL OF THE AS-BUILT DRAWING BY THURSTON COUNTY ENVIRONMENTAL HEALTH SHALL BE REQUIRED PRIOR TO CITY OF LACEY FINAL PUBLIC WORKS APPROVAL.

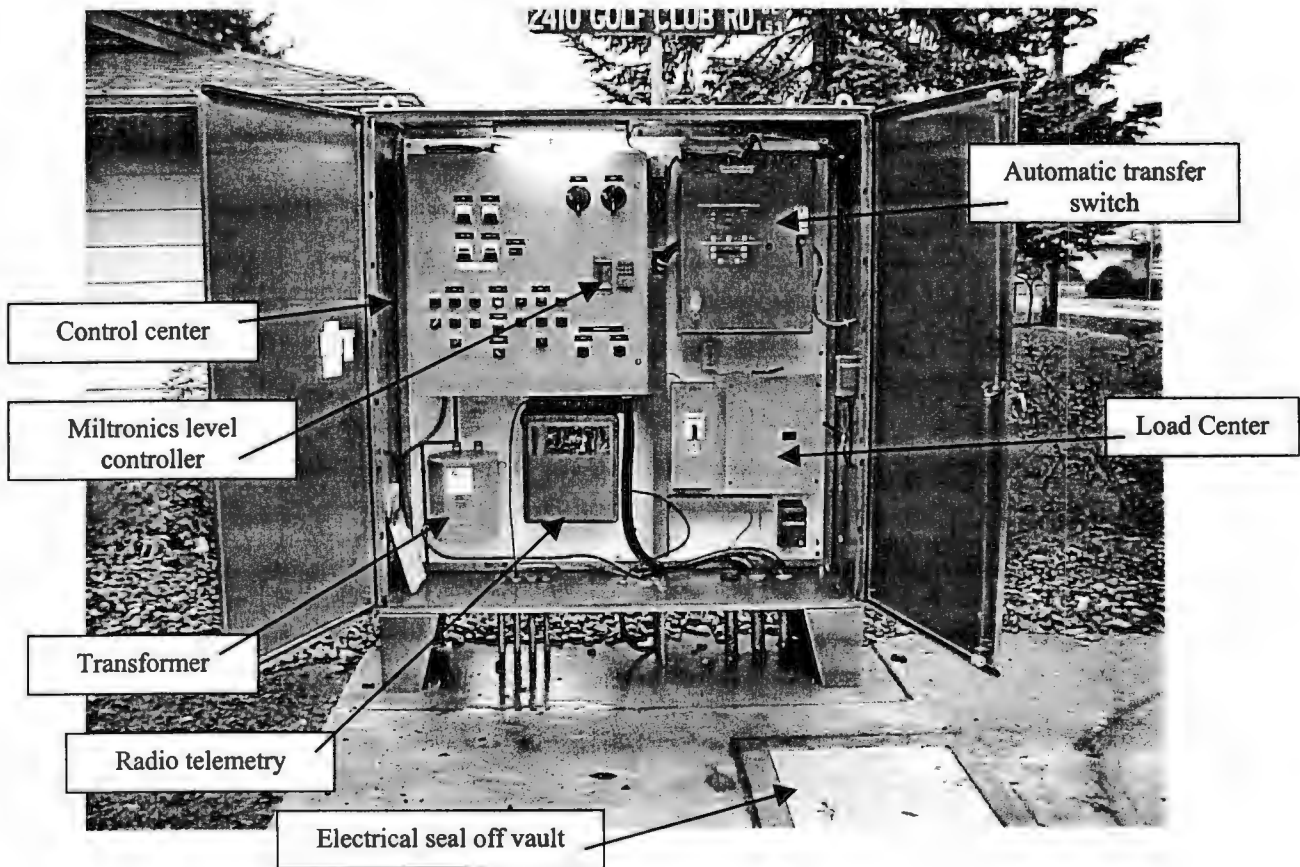
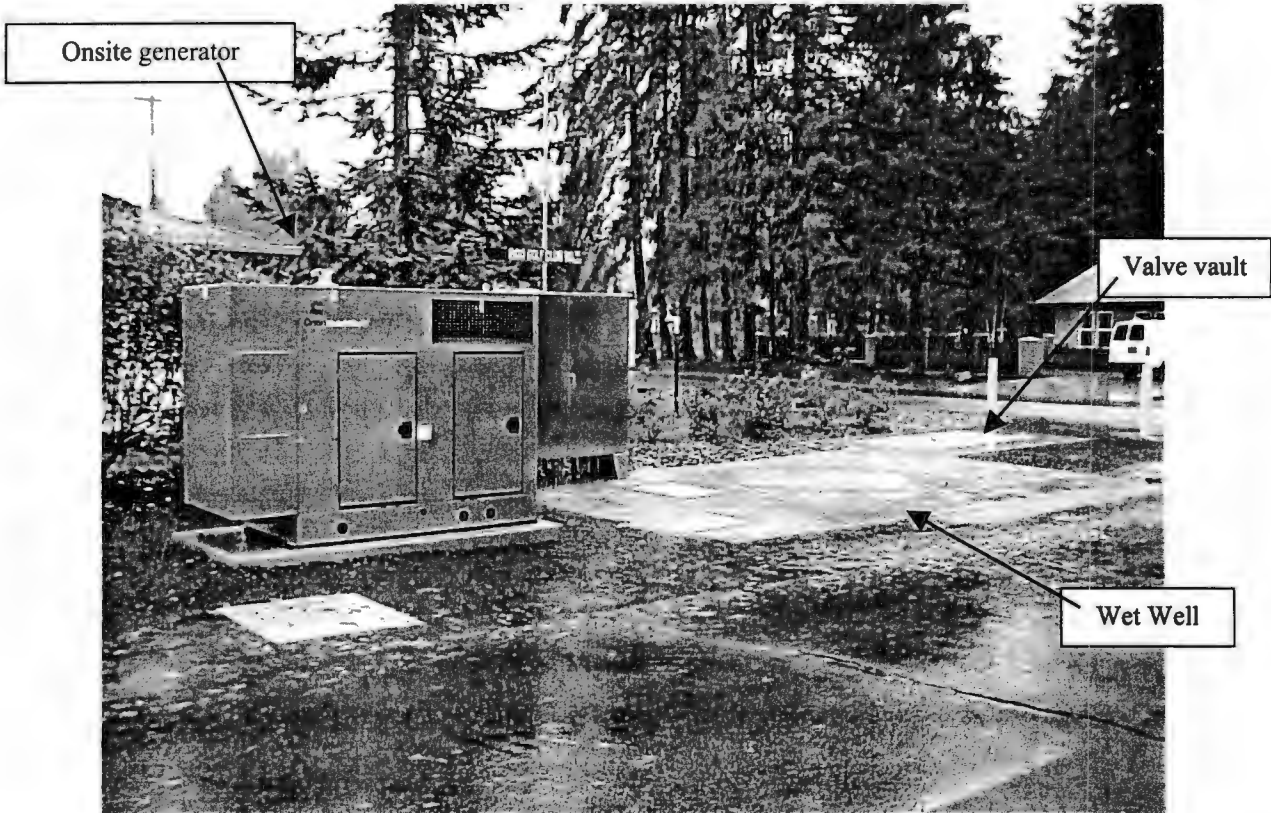
CITY OF LACEY, WASHINGTON DEPT. OF PUBLIC WORKS		INTERMITTENT SAND FILTER PLAN VIEW	
APPROVED		DWG. NO.	7-43
CITY ENGINEER	DATE	DATE	12/20/01
DES. ANM	DWN. ANM	OKD. RAS	



SIDE VIEW - TYPICAL SAND FILTER WITH PUMP DISCHARGE
NOT TO SCALE

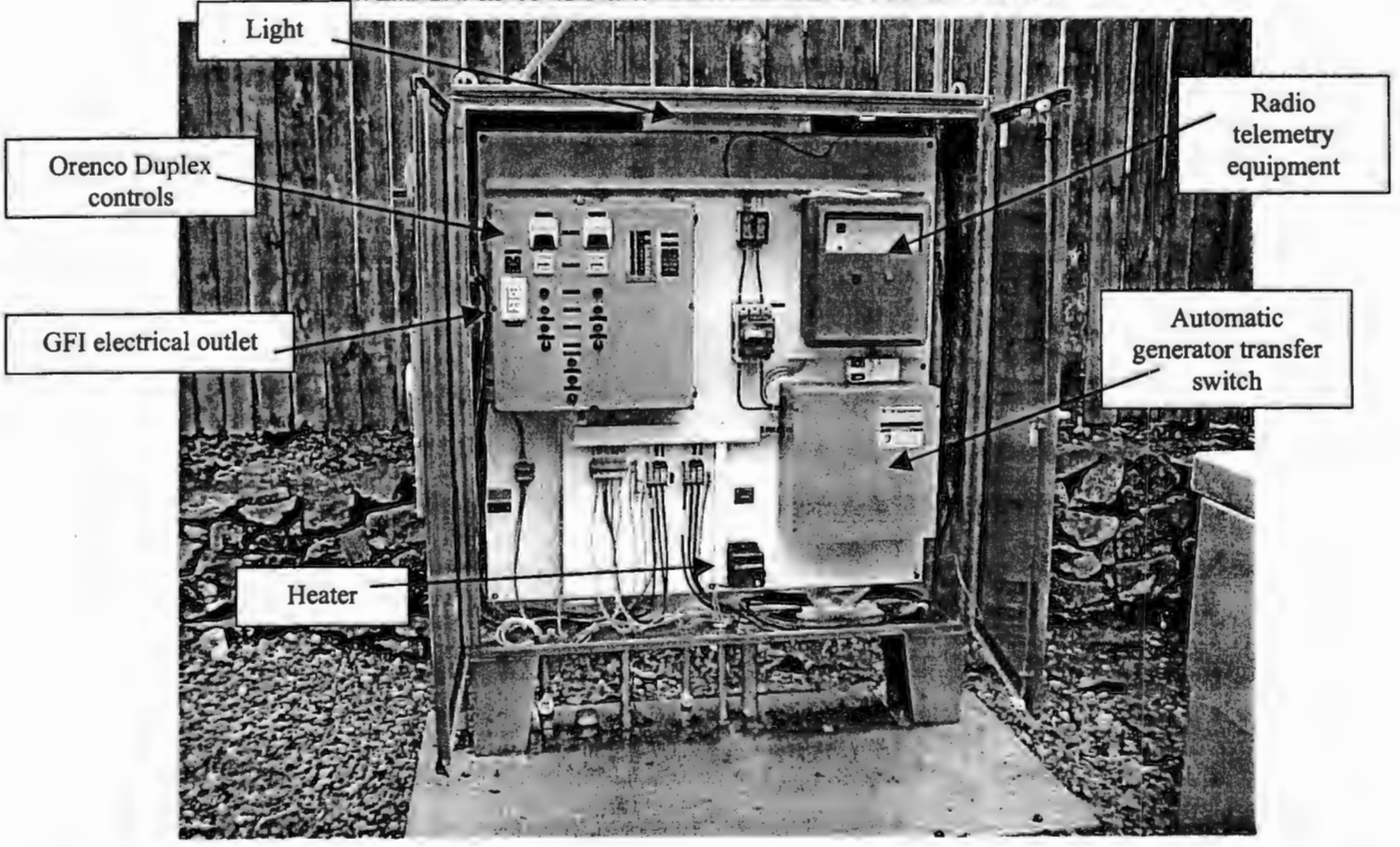
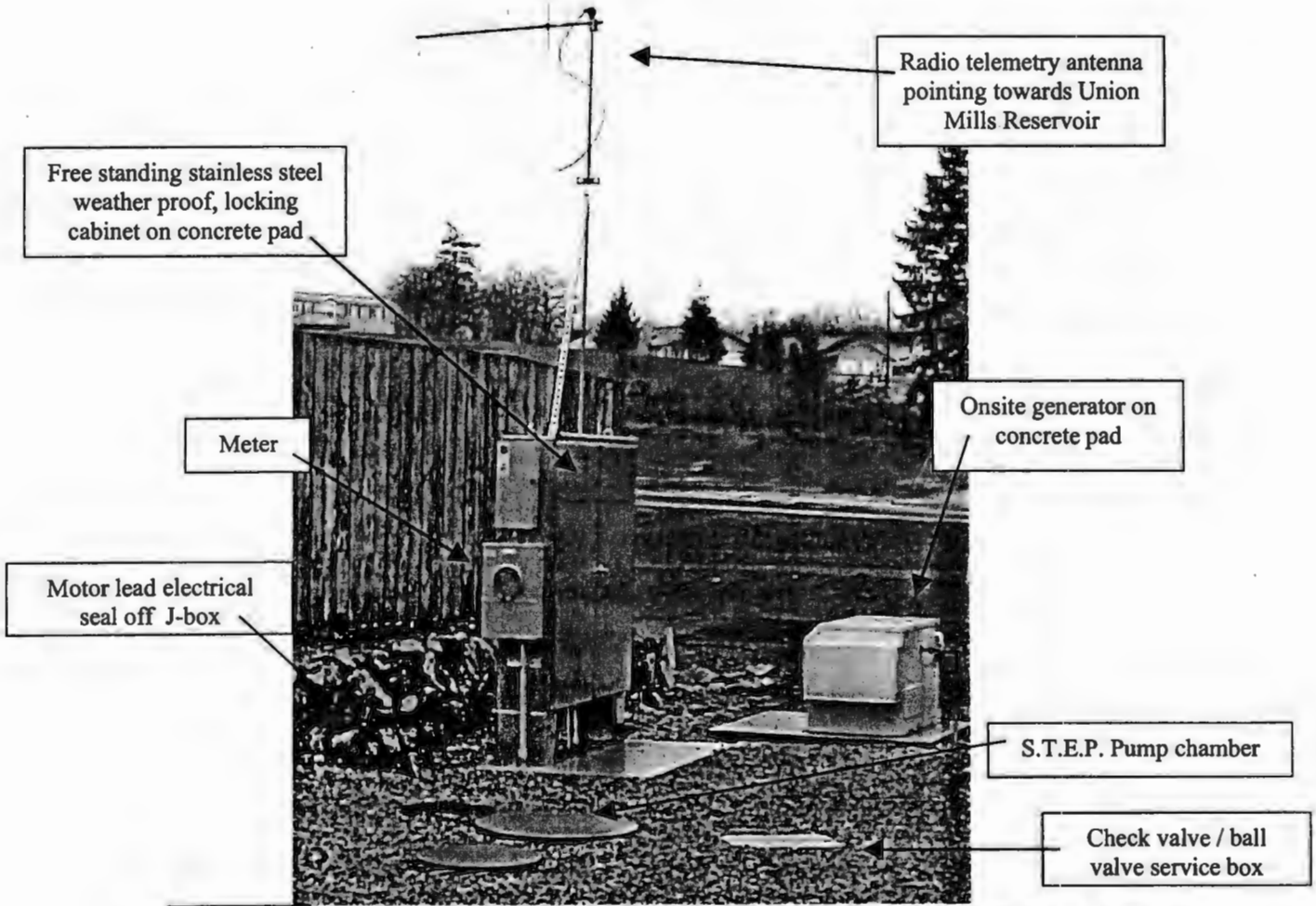
APPROVED		CITY ENGINEER		DATE		DMG NO.	
DES. ANM		DWN. ANM		RAS		DATE 12/20/01	
INTERMITTENT SAND FILTER				CITY OF LACEY, WASHINGTON			
PROFILE VIEW				DEPT. OF PUBLIC WORKS			
						7-44	





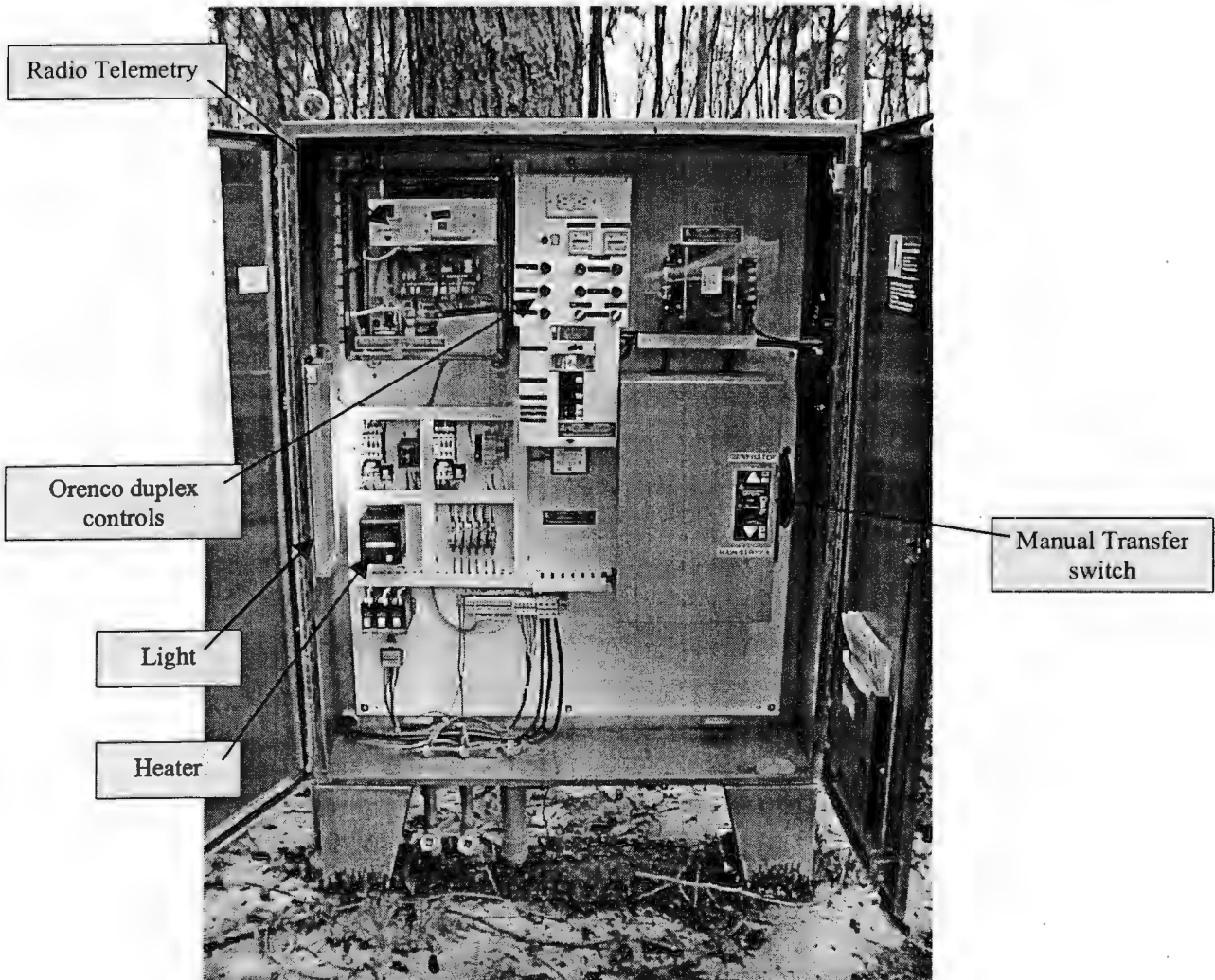
Control Cabinet Enclosure for Community S.T.E.P. System
with Onsite Generator and Telemetry

Photograph #2



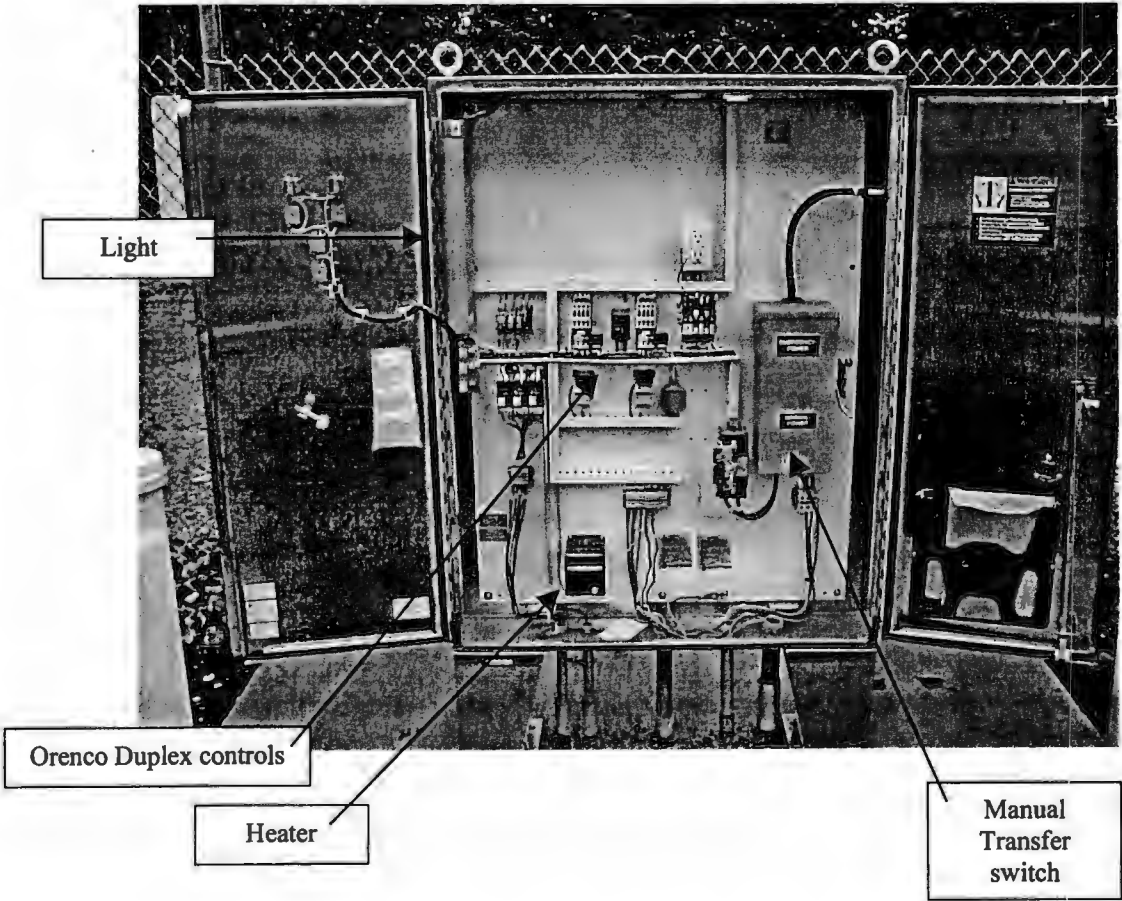
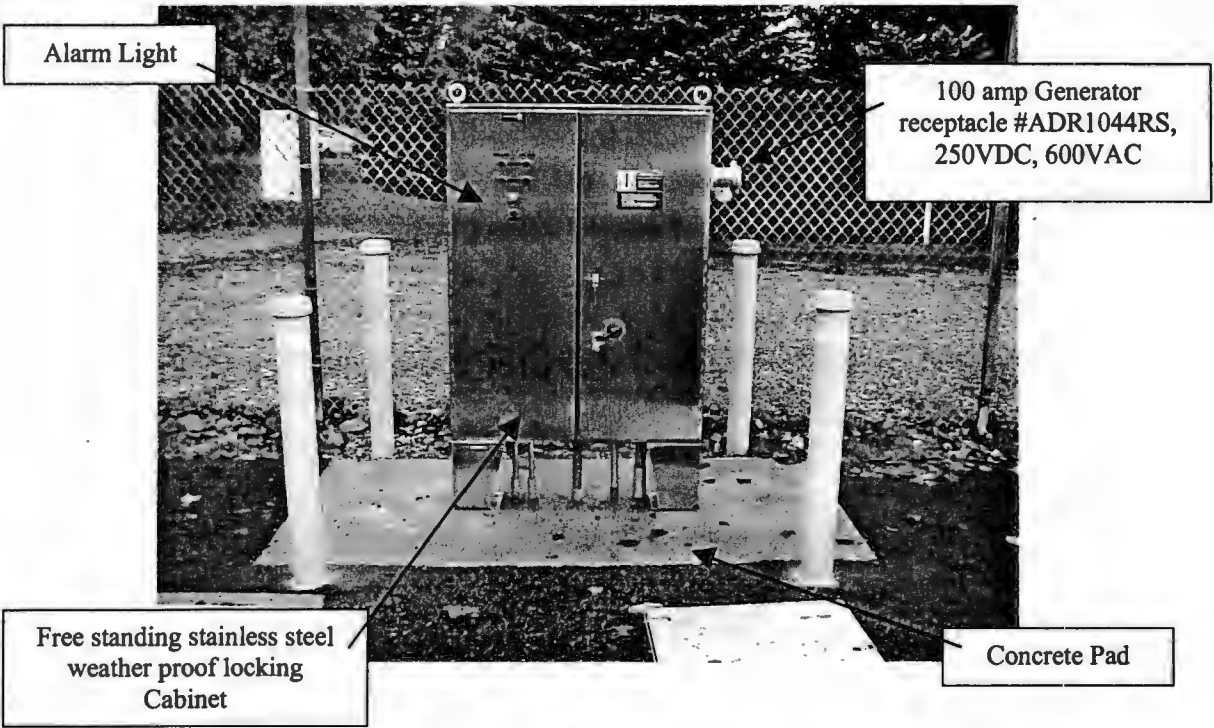
Control Cabinet Enclosure for 10 to 16 home Community S.T.E.P. System
(With Radio Telemetry, No Onsite Generator)

Photograph #3



Control Cabinet Enclosure for 3 to 9 home Community S.T.E.P. System
(No Radio Telemetry, No Onsite Generator)

Photograph #4



Typical Lift Station Electrical Seal-Off Vault

