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## CHAPTER 7

### 7.000 SANITARY SEWER

#### 7A GENERAL CONSIDERATIONS

##### 7A.010 General

Sanitary sewage 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 Lacey, Olympia, Tumwater, Thurston County Cleanwater Alliance (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 Washington State 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 shall connect to public sewer. A new On-site Sewer System (OSS) may be allowed only where all the following conditions are met: The project site was a parcel of record prior to January 1<sup>st</sup> 2016; the proposed use of the site is for one single family dwelling unit; the existing public sewer system is located more than 200 feet from the property line; and the site is suitable for an OSS meeting all Thurston County Environmental Health standards.

All new homes and businesses constructed within the ~~or the~~ City of Lacey's Urban Growth area shall connect to public sewer, regardless of distance, when made a condition of land use approval or where the ~~provided that~~ public sewer is within 200 feet of the property line of the parcel. ~~Also, connection to sewer shall be required regardless of distance to existing sewer when made a condition of approval.~~

Where an existing OSS has failed or is otherwise in need of repair, except for "minor repairs" as defined in the Sanitary Code for Thurston County, the property shall connect all structures to the public sewer system. Where the public sewer is greater than 200 feet from the property line or is inaccessible via right of way or existing easement, the Director may approve OSS repairs in lieu of a connection if the connection is determined to be infeasible at the present time. ~~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).~~ When additional improvements occur to a developed parcel within 200 feet of a public sewer main, or the parcel is otherwise required to connect to public sewer, all

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## SANITARY SEWER

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structures on that parcel shall be connected to sewer [and the OSS shall be abandoned per Thurston County standards](#).

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. Mains and fittings shall be located on the south or west side six feet off of centerline of the roadway, drive aisle, private drive or easement. On boulevards and arterial roadways, the location of the sewer main and fittings shall be located as directed by the City, see Chapter 4 street details.

Prior to the operation of any sewer systems, all Public Works improvements shall be completed and approved and all applicable fees shall 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 and 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 Uniform Plumbing Code (UPC). [Gravity sewer laterals shall have a cleanout installed at the right of way \(see detail\)](#).

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 UPC.

Duplexes on a gravity, grinder or S.T.E.P. 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 ~~IBC~~ [UPC](#). 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.

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Commercial sewer laterals shall be connected at a manhole. If a manhole does not exist, a new manhole shall be installed.

All sewer services for private lots and those not required to connect to a manhole shall be extended from the main to 1 foot behind the right-of-way in the utility easement with a cleanout and then extended to the back of the utility easement.

7A.016 Grease ~~Traps~~ Interceptors

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

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

7A.017 Roof Drains and Stormwater discharges to Sanitary Sewer

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

7A.020 Sanitary Sewer/Water Main Crossings

See Chapter 6.130 for requirements regarding sewer and water separation.

7A.025 Casing

The casing shall be as follows: one quarter inch steel casing pipe or ductile iron class 52. In special cases, C-900 DR 14 PVC pipe may be allowed. Casing spacers are required. A minimum of three sets of spacers are required per 20 feet of pipe. Spacers shall be as manufactured by Uni-Flange®, Calpico Inc. or approved equal. No more than one inch of clearance is allowed per set of spacers or insulators.

The joints of the transmission pipe within the casing pipe shall be restrained. Casing Spacers shall be manufactured by UniFlange®, or if using Calpico Inc. insulators; the pipe joints shall be restrained with a restraint system approved by the City of Lacey. Restrained joints shall be required on the transmission line one pipe length past either end of the casing pipe. Additional restraints may be required by the City.

## SANITARY SEWER

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Directional boring or horizontal directional drilling (HDD) is approved for use with high density polyethylene pipe (HDPE) or CertainTeed Certa-Lok C900/RJ Restrained Joint PVC pipe for the installation of sewer pressure mains. The process, alignment, depth and soil type being drilled shall be called out on the plans and approved by the City during design. Under no circumstances shall gravity sewer mains and or gravity sewer services be installed using the directional boring (HDD) method. The process for HDD shall follow the standard 3 step process of (1) drilling the pilot hole (2) enlarging the hole, back reaming (3) pulling through the transmission pipeline. The use of drill fluid such as bentonite or polymer is required. A proper sized hole and ample amount of drill fluid shall be used to prevent damage to the pipe being installed. During the installation of the transmission pipe a second smaller HDPE CL 200 pipe minimum  $\frac{3}{4}$  inch diameter shall be pulled through alongside the transmission pipe. The smaller pipe shall have a standard 12 gauge direct bury U.S.E. green coated copper tracer wire pulled through and connected to the tracer wire of the main at each end using the low voltage grease-type splice kits. Soils that have too many cobbles may not be approved by the City for HDD.

Concrete, Control Density Fill (CDF) or other methods of encasement not listed above shall not be allowed.

### 7A.030 Staking

All surveying and staking shall be performed by an engineering or surveying firm capable of performing such work. The surveyor directing such work shall be licensed as a 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. All staking shall include a hub and an informational stake with station(s) and offset(s)
- B. Stake location of mainline pipe shall be at a minimum every 50 feet with cut or fill to invert of pipe.
- C. Stake location of all manholes and cleanouts for alignment and grade with cut or fill to rim and invert of pipes.
- D. Stake locations of laterals for alignment and grade with cut or fill to cleanout rim and invert of pipes at the right-of-way line.

### 7A.060 Street Patching and Restoration

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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 provide a minimum of 2 complete sets of test gear to test two (2) sections of pipe manhole to manhole at the same time. The contractor shall perform an air pre-test prior to notifying the City to schedule the actual 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.

2. Testing of the sewer main shall include a television inspection by the contractor. The camera shall 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 inch in diameter and on a flexible shaft. Television inspection shall be done after the WSDOT low pressure air test # 7-17.3(2) F has passed, the pipe line cleaned 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, unless televising is done right after the cleaning has taken place. 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. Televising shall start at the closest manhole to the tap and extend 15 feet beyond the tap.
3. A negative air pressure "vacuum" test of all manholes is also required.

The negative air pressure "vacuum" test shall 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

SANITARY SEWER

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regardless of manhole diameter. The minimum test time shall be 40 seconds for all manholes 8 feet or shallower. 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 (2)G of the WSDOT/APWA Standard Specifications shall be required on all sewers except laterals as defined in Section 3.025 of these standards as directed by the City.

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~~ 175 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~~ 175 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.
2. A water test for all wet wells in accordance with the manhole water test for gravity sewer shall be 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. 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.
3. A mandrel test in accordance with Section 7-17.3 (2) G of the WSDOT/APWA Standard Specifications shall be required as directed by the City.
- ~~3.4.~~ All pressure mains shall be pigged with a soft foam swab a minimum of one size larger than the pipe the entire length of the main.

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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 ~~200~~ 175 pounds for 15 minutes and any leaks or imperfections developing under said pressure shall be remedied by the contractor ~~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.~~ 3. ~~Electrical inspection and testing of all electrical components of the system is required. All tested parts shall pass before the City accepts the system. Additionally all electrical structures shall have a concrete base or floor. The concrete base or floor shall extend 4 feet to the front and 1 foot on all sides. The generator requires the pad be extended 4 feet beyond where the doors are located.~~

- ~~4.~~ 4. ~~All pressure mains shall be pigged with a soft foam swab a minimum of one size larger than the pipe the entire length of the main.~~

#### 7A.080 Effluent Spills

The LOTT Alliance's NPDES permit requires that all sanitary sewer collection system spills, including those occurring from STEP systems, and reclaimed water spills are reported to the Washington State Department of Ecology and, in most cases, the Department of Health. The cities of Lacey, Olympia, and Tumwater are required to report sewage and reclaimed water spills (reclaimed water spills greater than 500 gallons) to LOTT, which in turn notifies the state agencies. The following reporting requirements need to be followed by partner jurisdiction staff to ensure timely reporting:

1. All spills need to be reported to the LOTT Clean Water Alliance at **360-528-5700** as soon as practical by the responding jurisdiction, but never later than **20** hours after the spill is discovered. LOTT must report spills verbally to Ecology within 24 hours.

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Exceptions:

- a. If the spill enters any type of waterway – pond, creek, river, or Puget Sound – it must be reported immediately to LOTT at the number listed above and to Thurston County Environmental Health at 360-867-2626 or after hours and on weekends at 360-867-2661
  - b. If there is a need to directly bypass a pump station or collection line to a waterway this must be reported to LOTT as soon as the decision is made – preferably prior to initiating the bypass as Ecology must be immediately notified.
2. Provide as much information and detail as possible during the report:
    - a. Name of person reporting spill and contact phone number
    - b. Name of person in charge of spill management and cleanup
    - c. Location by address or nearest street and cross-street
    - d. Start & stop times of the spill
    - e. Volume of the spill (estimate is ok)
    - f. Cause of the spill and type of water (raw sewage, step system effluent, reclaimed water in amounts greater than 500 gallons, etc...)
    - g. Clean up actions (diverted, vactored, lime to ground area, etc...)
    - h. Actions taken to prevent reoccurrence of the spill
    - i. If photos were taken of the spill, email a representative sample of the spill photos to [laurieperce@lottcleanwater.org](mailto:laurieperce@lottcleanwater.org) or [kenbutti@lottcleanwater.org](mailto:kenbutti@lottcleanwater.org) .
  3. If the spill does enter a receiving water body it is likely that the jurisdiction will need to make two or more reports – the initial report with information available at the time and follow-up report(s) with all the details listed above.
  4. The point of contact for questions concerning these requirements is the LOTT Operations Supervisor at 360-528-5749 or the Operations and Facilities Director at 360-528-5727 - [laurieperce@lottcleanwater.org](mailto:laurieperce@lottcleanwater.org)

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 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)

#### 7A.100 Easement Access/Entry and Roadway

The structure of the roadway shall be a minimum of 12 inches in depth of which the top 6 inches shall be 1 ¼ inch crushed rock and the bottom 6 inches shall be at a minimum ballast per WSDOT standard Specifications 9-03.9(1). When soil conditions are not ideal, the soils shall be tested by a Geotechnical Laboratory and if necessary additional depth for the roadway structure shall be added.

When the Access Roadway is connected to a Public road through a curb or driveway cut the first fifteen feet of the access shall be paved to eliminate the unwanted rocks on the sidewalks or roadway that is unsafe and unsightly. The access roadway shall be installed over the utility with the minimum width as required by the detail of this chapter. When the easement is required for 2 utilities then the access roadway may be installed in the middle of the utilities keeping in mind that all structures that extend to the finish surface of the roadway shall be in the structured section.

SANITARY SEWER

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All access roadway shall have a turn around with a radius big enough for the trucks using it to negotiate the turn easily. Turning radii shall also be addressed for ease of turns.

**7B GRAVITY SEWER**

## 7B.010 General

All sewers shall be designed as a gravity sewer whenever physically possible 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, 3.040 and 7A.010.

The layout and depth 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 flow of not less than 100 gallons per day per person (250 gal/day/ERU). See table 2, Design Basis For New Sewage Works for other non-residential sewer flow rates. These flow rates are assumed to cover normal infiltration, but an additional allowance shall be made where conditions are unfavorable. For some commercial and industrial applications, the design engineer may propose to use flow rates other than those found in Table 2. Any such proposal shall include water consumption records, sewer discharge records, fixture counts, or other forms of documentation justifying the proposed flow rates, and is subject to the review and approval of the Public Works Department.

All gravity sewer facilities and conveyance piping shall be sized to accommodate the peak hourly flow of the contributing basin. Peak hourly flow is defined as the average flow rate times the peaking factor plus the discharge of any upstream pump stations. The peaking factor shall be calculated from the following equation:

$$P.F. = \frac{18 + \sqrt{\text{population in thousands}}}{4 + \sqrt{\text{population in thousands}}}$$

Conveyance for pressure sewer systems (STEP or Grinder) shall be designed to accommodate the peak flow from all individual systems plus the discharge of any upstream pump stations without adversely affecting the performance of any pump connected to the system. Peak flow for individual STEP or Grinder systems shall be calculated by one of the following equations:

$$Q_p = 15 + [(0.5) \times (\text{number of dwellings})]$$

Or:

$$Q_p = 15 + [(0.15) \times (\text{population})]$$

Where:  $Q_p$  = peak flow in gallons per minute

SANITARY SEWER

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

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**GENERAL NOTES (SANITARY SEWER MAIN INSTALLATION)**

1. Gravity sewer main shall be PVC, ASTM D 3034 SDR 35 or ASTM F 679 with joints and rubber gaskets conforming to ASTM D 3212 and ASTM F 477.
2. Pre-cast manholes shall meet the requirements of ASTM C 478. Manholes shall be Type 1-48 inch manhole unless otherwise specified on the plans. All manhole bases shall be positive seal type as manufactured by Predl Systems North America Inc. or approved equal. 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.) Connection of a pipe line to a system where a manhole is not available shall be accomplished by the use of a saddle type or cast-in-place manhole. This is accomplished by pouring a concrete base and setting manhole sections on it. The existing pipe shall not be cut into until the manhole is vacuum tested and approved by the City. (See detail)
3. Manhole frames and Logo Lids shall be EJ or Olympic Foundry WSDOT style ductile iron casting marked "City of Lacey", "Sewer", "Made in USA", "Confined Space", "Permit Required" and conforming to the requirements of ASTM A-30, Class 25. The frames and lids shall be free of porosity, shrink cavities, cold shunts, cracks, or any surface defects which would impair serviceability. The frames and lids shall be machine finished or ground on seating surfaces so as to assure a non-rocking, self seating 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. The manhole opening shall be centered over the outlet channel regardless of the location of the ladder rungs. All casting shall be coated with a bituminous coating prior to delivery to the job site.
4. Side sewer services shall be PVC, ASTM D 3034 SDR 35 with flexible gasket joints (see detail). 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. When a tap is used to connect a new service lateral to an existing sewer main, televising from the closest manhole to 15 feet past the tap is required. Foreign objects and debris shall be removed by high pressure cleaning and/or vacuum removal.
5. All sewer mains shall be field staked for grades and alignment in accordance with section 7A.030 of the Development Guidelines.
6. All plastic pipe and services shall be installed with continuous green tracer tape 12 inches to 18 inches 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 shall be furnished by the contractor.
7. All side sewer locations shall be marked on the face of the curb with an embossed "S" 3 inch high and 1/4 inch into concrete.

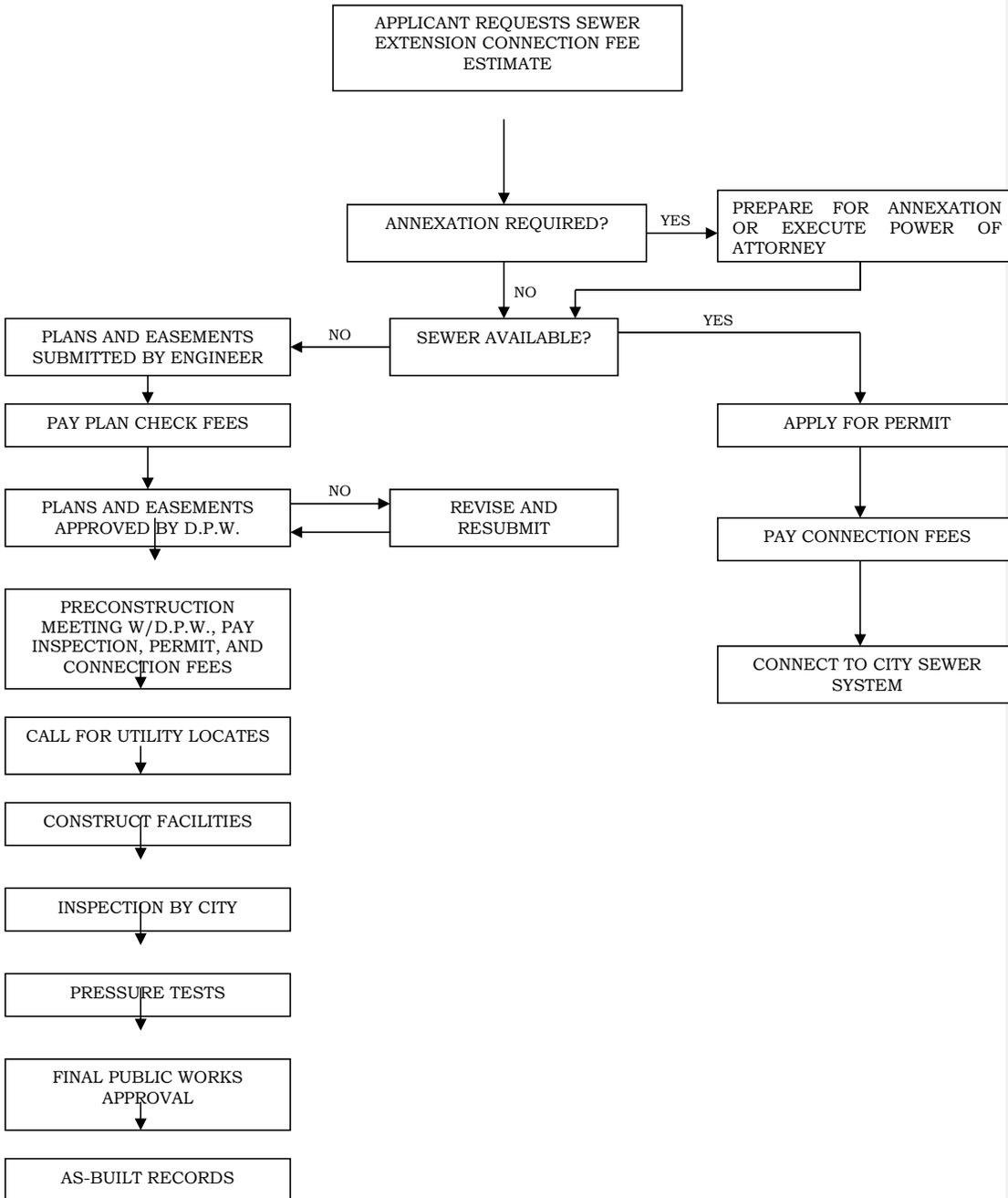
## SANITARY SEWER

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8. Bedding of the sewer main shall be a minimum 6 inches of 3/8 inch minus pea gravel under the pipe and a minimum of 12 inches of 3/8 inch 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. All pea gravel shall be washed. 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 details and detail 7-20 shall be used.
9. Install a 4' x 4' square x 8 inch thick concrete pad with #4 rebar around all manhole frames and cleanouts that are not in a pavement area.
10. 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 inspector. Acceptance of the line will be made after the tape has been reviewed and approved by the inspector. A 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 and videotape 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 disposed at the Developer's expense.
11. 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. The sewer system shall be televised to assure the system is clean.
12. Encasement material shall include ¼ inch steel, ductile iron and in special or unusual cases C-900 DR 14 PVC pipe may be allowed if approved by the Director of Public Works in advance. Concrete, CDF and other methods of encasement shall not be allowed.

Revised: 03/2014

**PROCESS TO OBTAIN SEWER SERVICE**



SANITARY SEWER

**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 6 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. Greater depths may be required to serve adjacent properties and to facilitate future line extensions.

~~E. D. Service Connections. If not made at an existing manhole, all residential service sewer connections to a new the main shall be made with a wye-connection; connections to an existing main shall be made with a tap. Commercial connections shall be made at a manhole.~~

- F. All new mains connecting to existing mains require the installation of a cast-in-place saddle manhole.

~~E.G.~~ Flow. 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.

~~F.H.~~ Termination of Mains. All sewer mains shall end with a manhole.

7B.050 Connection to Existing System

When connecting to an 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.

- A. Connection of new pipe lines to existing manholes shall be accomplished by using provided knock-outs with sand collars. Where knock-outs are not available, the manhole shall be core drilled for a core and seal boot connection. The transition of connecting channels shall be constructed so as not to interrupt existing flow patterns.
- B. Connection of a pipe line to a system where a manhole is not available shall be accomplished by the use of a saddle type or cast-in-place manhole. This is accomplished by pouring a concrete base and setting

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manhole sections on it. The existing pipe shall not be cut into until the manhole is vacuum tested and approved by the City. (See detail)

- C. Connections to manholes requiring a drop shall follow the criteria as outlined in Section 7B.100
- D. 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.
- E. 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 main. 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 15 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 beginning two feet outside the outer foundation wall at the structure to a cleanout at the right-of-way line (LMC 13.04.160 and 14.06.015). Side sewer laterals from the main to the right-of-way line shall be minimum 6 inch diameter ending at a clean out. Maintenance of the building or side sewer is the responsibility of the property owner. Prior to connection of a building or side sewer to the public sewer a connection permit shall be obtained. Materials and design criteria for a building sewer are covered by the IBC as adopted by LMC 14.06. Inspection of the building or side sewer is the responsibility of the Community Development Department.
- B. Each separate commercial/industrial building shall have its own separate side sewer connection to a manhole. The side sewer from the City's manhole to the building connection manhole shall be the responsibility of the owner of the building. When multiple side sewers are connected to one manhole the private side sewer shall start from that manhole. Each building owner shall be responsible for its own side sewer. If a manhole does not exist, one shall be installed, 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.

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- C. Location of clean out for building sewer is governed by the IBC as adopted by LMC 14.06.010.

7B.060 Manholes and Logo Lids

Precast manholes shall meet the requirements of ASTM C 478. All manhole bases shall be positive seal type as manufactured by Predl Systems North America Inc. or approved equal. Cast-in-place bases shall be 3000 psi commercial concrete installed per detail. 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.

The manhole opening shall be centered over the outlet channel regardless of ladder rung locations.

Manhole frames and Logo Lids shall be EJ or Olympic foundry WSDOT style ductile iron casting marked "City of Lacey", "Sewer", "Confined Space", "Permit Required" and conforming to the requirements of ASTM A-30. Class 25 and made in the United States of America.

The frames and lids shall be free of porosity, shrink cavities, cold shuts, cracks, or any surface defects which would impair serviceability. The frames and lids shall be machine-finished or ground-on seating surfaces so as to assure a non-rocking, self seating fit in any position and be interchangeable in other standard manhole frames. All manhole frames and lids with defects shall be replaced with new. All castings shall be coated with a bituminous coating prior to delivery to the job site.

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.

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.

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 wrapped around the manhole to the shelf. The top two safety steps (hand holds) shall not be installed in the manhole.

## SANITARY SEWER

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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, pipe size or as directed by the City. (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.

The manhole opening shall be centered over the outlet channel regardless of the location of the ladder rungs.

Manhole Sizing shall be determined by the following criteria:

- A. 48 inch 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 inch 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 inch 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 provide peak design flow velocities of not less than 2.0 feet per second based on Manning's formula using an "n" value of 0.013. Peak design flow shall not exceed 80% depth of flow in the pipe. Average design flow should be greater than 20% depth of flow in the pipe, or 2.0 fps. Surcharging of manholes will not be allowed. 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)

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 lower. 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~~ shall be used whenever possible when connecting to an existing manhole. Care shall 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.

Drop connections will only be allowed for sewer lines/laterals 8 inches in diameter or smaller, or where the line velocity would otherwise exceed 8 feet per second. An outside or inside drop (inside drops on existing manholes

## SANITARY SEWER

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only, with City approval) 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.~~ All drop structures shall be constructed per details and shall enter the manhole in a channel.

### 7B.110 Clean outs

Clean outs are not an acceptable substitute for manholes on City sewer mains, Cleanouts may be installed at future main extensions and shall be installed for side sewer laterals at the right-of-way line.

All clean outs in the City right-of-way or easements shall be extended to grade. A 3 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 clean out detail.

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**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. The Developer shall provide information and design the lift station to comply with the following minimum standards.

Lift station sites together with access to the site shall be deeded to the City. Sites for lift stations shall not count toward open space requirements. The minimum site area shall be 5000 square feet. When selecting the site, special care shall be taken to ensure minimum setbacks, truck turning radius, vehicle length and access requirements can be met.

The lift station shall be located as far as feasible from present and/or proposed residential areas. Sites shall be of sufficient size (based on a 1:1 ratio from the depth of the wet well to the property line on all sides and include all vaults, cabinets, structures, and appurtenances) for vehicle access, maintenance and future expansion or addition, if applicable. The entire site shall be at a maximum slope of 2%.

The lot frontage shall be a minimum of 50 feet wide and provide a minimum paved driveway approach of 20 feet wide and 40 feet deep.

The site design shall include the distance required for the approach manhole and piping. The approach pipe length shall be a minimum of 100 feet (200 feet is preferred) from the last manhole to the wet well. It shall also have a minimum slope of 2 percent and a maximum of 6 percent.

Prior to Site Plan Review or plat submittal, a pre-design meeting with the City shall occur to define the lift station location and lay out in accordance with Lacey lift station details. After guidance from the City is provided, a layout shall be provided to the City and approved prior to Site Plan Review or plat submittal.

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**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 any future service areas that will discharge to the lift station 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, 3.040 and 7A.010. The

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station's design flow capacity shall be based on the sizing criteria in Section 7B.020. Documentation of present and future service area flow rates for lift station size and capacity determination shall be included in the report.

If the force/pressure main ties into an existing force main, an engineer's report shall be provided showing the new lift stations effect on existing pumps within the system.

The average and low inflow conditions shall be analyzed to determine the effects of retention of sewage in the wet well. The retention of sewage shall not create odor problems at the wet well or outfall manhole. The design report shall indicate what mitigation measures will be implemented if odor problems are anticipated, or realized after lift station start up and operation.

The wet well shall be sized to provide full submergence of the pumps as recommended by the pump manufacturer. The design shall provide for adequate distance between the approach pipe inlet and outlet elevations to provide for proper programming of pump intervals (lead pump call, lag pump call and high level float override). Cycle times shall be calculated from pump off to pump on for each duty pump (excludes standby pump). The wet well shall have adequate capacity to provide a maximum of six (6) starts per hour under inflow conditions equal to one-half (1/2) of the pumps' capacity.

The lift station shall be sized to meet the maximum calculated flow rate. The size of the receiving sewer shall have adequate capacity for the pump station discharge. At least two (2) pumping units shall be provided at each lift station installation. Where flows into the new station are anticipated to have large portions of fibrous debris, special consideration shall be given to the pump type/design. The pumps shall have sufficient flow and pressure capacity to efficiently handle the peak design flow with 1 pump out of service, and be selected by the stamping licensed professional engineer.

Three hard copies along with an electronic copy of the final Design Report shall be submitted to the City and approved by the City prior to submitting the civil drawings for approval. As a minimum, the report shall include:

1. Project description
2. Projected flows and map of contributing basin
3. Connection point with downstream capacity
4. Wet well sizing and buoyancy calculations
5. Run time calculation and cycle time
6. Pump station head calculation and system curve
7. Pump selection and wet well details
8. Site layout with plan and profile views including the wet well, approach pipe, electrical cabinet and generator
9. Pressure main size, length and material (see section 7D, Pressure Sewer)
10. For pressure mains greater than 1,100 feet in length, a transient analysis shall be completed and identified water hammer conditions mitigated.
11. Electrical requirements and Generator sizing

12. Lift station voltage (confirmed by Puget Sound Energy)
13. Odor and corrosion calculations:

A detailed analysis and report 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. Verification 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.
14. Geotechnical analysis for wet well and lift station site
15. Backfill and compaction specifications

#### 7C.030 Design Drawings

The drawings shall be prepared by a Professional Engineer licensed in the State of Washington at a minimum 1:30 scale to show details of the site. See Chapter 3.040. Electronic files are available of the City Standard Lift Station details and electrical wiring diagrams. The Developer's Engineer shall scale and customize the drawings and review all dimensions to ensure the City's lift station layout can be accommodated per the details.

The detailed engineered 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 per details. Minimum set backs shall be included as depicted on the site layout details.

~~The lift station shall be located as far as feasible from present and/or proposed residential areas. Sites shall be of sufficient size (based on a 1:1 ratio from the depth of the wet well to the property line on all sides and include all vaults, cabinets, structures, and appurtenances) for vehicle access, maintenance and future expansion or addition, if applicable. The entire site shall be at a maximum slope of 2%.~~

~~The lot frontage shall be a minimum of 50 feet wide and provide a minimum paved driveway approach of 20 feet wide.~~

~~The site design shall include the distance required for the approach manhole and piping. The approach pipe length shall be a minimum of 100 feet (200 feet is preferred) from the last manhole to the wet well. It shall also have a minimum slope of 2 percent and a maximum of 6 percent.~~

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

1. Complete lift station
2. Standby power generation system
3. Electrical wiring diagrams
4. Telemetry compatible with existing system, including complete start up and revising existing screens at Lacey Operation Center.
5. 2 inch water service with heated Reduced Pressure Backflow Assembly (RPBA) and wash down hydrant.
6. Odor control, as applicable for location and capacity.
7. Site soil conditions. Excavation, select backfill and compaction requirements as determined by a geotechnical engineer.
8. Cuts and fills to provide level site for maintenance.
9. Asphalt or concrete pavement for access as directed by the City.
10. Concrete within the maintenance area shall encompass all components of the site, per detail.
11. Landscaping per City of Lacey development criteria.
12. Six foot high (minimum) black chain link fence with top and bottom rails enclosing the site and a minimum fifteen foot wide lockable access gate.
13. Sign with lift station identification number and street address (to be paid for by the developer and manufactured by the City).
14. Site lighting.
15. All site enclosures such as the control cabinet, generator, etc., shall be keyed the same.
16. The plans shall include an adequate distance between the last manhole and the wet well to accommodate the approach pipe design per the detail.

#### 7C.040 Submittals

After the lift station plans have been approved and prior to the pre-construction conference, the Developer or the Developer's Contractor shall provide submittal data as one single submittal for all proposed equipment. The data shall be provided in printed format bound into a single three-ring binder. The data shall be divided into sections as indicated below, separated by tabbed sheets. Three (3) copies shall be provided in printed format and all data in the submittal shall be included on one electronic medium (CD or DVD) for City use. The electronic media shall be submitted with the printed media. Additional printed copies may be submitted for return to the Developer or Contractor with markup notes. Re-submittals (if required) shall only include the corrected items.

The following minimum information shall be provided:

1. Pump Data
  - Size and type
  - Pump design performance curves
  - Pump factory test performance curves
  - Head and flow capacity
  - Solids handling capacity
  - Manufacturer/distributor
  - Pump volute and impeller Coating submittal
  
2. Motor Data
  - Size and type
  - Horsepower
  - Service factor
  - Motor insulation
  - Full load current draw
  - Voltage requirements
  - Frame and type of mount
  - Manufacturer/distributor
  
- 3 Controls
  - Timers and relay mounting
  - Motor starter size
  - Phase monitor
  - NEMA type 3R enclosure
  - Thermal magnetic circuit breaker
  - GFI outlet
  - Indicating lights, switches, resets
  - Level controller
  - Terminal and fuse blocks
  - Elapsed time meters and event counters
  - Component manufacturer/distributor
  - Current transformers
  - Ammeters
  - Programmable Logic Controller
  - Human Machine Interface Module
  
4. Telemetry
  - Telemetry and SCADA system (shall be compatible with City system)
  - Lift station radio communication path terrain analysis certified by Accu-Com Inc.

SANITARY SEWER

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| 5. Standby Power Generation System | <ul style="list-style-type: none"><li>• <a href="#">Diesel generator</a></li><li>• <a href="#">Generator system ratings</a></li><li>• Fuel storage tank</li><li>• Automatic Transfer switch</li><li>• Battery charger and engine heater</li><li>• <a href="#">Sound attenuating enclosure</a></li><li>• <a href="#">Exhaust silencer</a></li><li>• <a href="#">Rain Shroud</a></li><li>• <a href="#">5-year extended warranty required</a></li></ul>  |
| 6. Maintenance                     | <ul style="list-style-type: none"><li>• Warranty (See Ch 3 bond requirements)</li><li>• Staff training upon completion</li><li>• Tools and equipment required</li></ul>   |
| 7. Electrical Service              | <ul style="list-style-type: none"><li>• Specifications (service size, voltage, motor size, enclosure type, etc.)</li><li>• Source of power <a href="#">and service provided by Puget Sound Energy</a></li><li>• Power and Load Calculations</li><li>• One line diagram</li><li>• Primary distribution equipment</li><li>• Service entrance</li><li>• Branch circuit protection</li><li>• Mechanical equipment power requirements</li><li>• Control diagrams &amp; schematics</li><li>• Schedules of fixtures, panel boards &amp; switch gear</li><li>• Shop drawings</li><li>• <a href="#">Arc flash calculations</a></li><li>•</li></ul> |
| <del>8. Lighting</del>             | <ul style="list-style-type: none"><li>• Exterior lighting</li></ul>   |
| 9. Wet Well                        | <ul style="list-style-type: none"><li>• Size</li><li>• Storage capacity</li><li>• Access hatch <a href="#">and operating handle</a></li><li>• Locking mechanism</li><li>• Penetration seals</li><li>• Safety entry equipment</li><li>• <del>Safety grate</del></li><li>• Safety rail system</li><li>• Manufacturer Specifications</li><li>• <a href="#">Corrosion protection, material, application, warranty.</a></li><li>• <a href="#">Access hatch seal</a></li></ul>  |

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10. Valve Vault

- Size
- Access ladder
- Access hatch (3 door hatch LW Model HTD)
- Penetration seals
- [Manufacturer](#)
- [Maximum 48-inches from finish grade to floor](#)

11. Piping

- Size and material
- Valves
- Flow meter
- Pressure transmitter
- Pressure gauges
- 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 the items 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. [Additional General Construction notes found in section 3.045 apply.](#)

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**GENERAL NOTES (LIFT STATION INSTALLATION)**

1. Any construction changes to the lift station design shall first be reviewed and approved by the project engineer and the City of Lacey.
2. 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.
3. Prior to backfill, all mains, tanks, wet well, [electrical conduits \(electrical conduit inspection shall be coordinated through the City inspector with the City Maintenance Department\)](#) 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 contact City of Lacey to request the required inspections.
4. The Developer shall coordinate power service with serving utilities and make arrangements for power service connection. It shall be the Developer's responsibility to maintain power service for private lift stations serving commercial properties or developments.
5. All pipe and fittings in the wet well shall be, DR11 ~~34084710~~ HDPE or ductile iron thickness class 52. Ductile iron pipe and fittings shall be epoxy lined and polyethylene coated to a minimum of 10 mils thick on the inside and outside with coatings approved for constant contact with H<sub>2</sub>S (hydrogen sulfide) [such as ENDURON Protecto 401 or 3M Scotchkote 134 fusion bonded epoxy.](#) Coatings shall be applied according to the manufacturers' requirements by a certified applicator of the product. Coatings shall not be applied to pipe, fittings or valves in the field. All bolts, fasteners, brackets and hardware in the wet well shall be 316 stainless steel.
6. **Prior** to testing and start-up of the lift station, ~~three~~two hard copies along with an electronic copy 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. The lift station information checklist found in Section 7C. 085 shall be filled out by the developer and included on the face of the engineered as-built drawings and in the Operation and Maintenance manual.
7. The Developer, at its own expense, 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's representative(s) shall assist and instruct the City's operating staff in adjusting and operating the equipment during the initial start-up

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period. Said representative shall be experienced and knowledgeable of the equipment being tested. Prior to the start up being requested, the Developer shall conduct a successful pre-start up. The pre-start up shall include calibration and testing of all equipment on the pre-start up checklist.

8. An instruction program shall be held for City personnel at the Developer's expense. Developer shall furnish the services of qualified instructors from the various equipment manufacturers. Program shall cover basic system operation theory, routine maintenance and repair, and "hands on" operation of equipment. Training shall not proceed until all operation and maintenance manuals are complete and accepted by the City.
9. Developer is responsible to construct and start up a complete and trouble-free system. All design errors and/or construction defects discovered during start up or the warranty period stated in the agreement with the City shall be corrected at the Developer's expense. The City will not accept any facility until successful full operation of all components has been demonstrated. The Developer shall conduct a pre-start up without City staff to verify proper operation of all lift station components prior to scheduling a start up with City of Lacey staff.
10. Developer shall lubricate all equipment as required by the part or component manufacturer.
11. Wet well shall have a rail system installed per Lacey Standard 7C.050 ~~under hatch opening~~ prior to start up and acceptance.
12. Lift station and generator, site, driveway, access, concrete areas, lighting and water service shall all be completed prior to start up and inspection request.
13. Generator and fuel storage tank shall be mounted on concrete pad. The fuel tank shall be full of fuel at the time of start up. 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 chapter 7C.070.
14. Telemetry set up, including revision of telemetry computer monitors at the Maintenance Service Center, shall be coordinated with TSI Inc. Set up shall be completed prior to start up request and acceptance.
15. The following items ~~Spare parts~~ shall be provided for the station at time of start up acceptance.
  - ~~• One set of mechanical seals.~~
  - One spare pump and motor assembly.
  - ~~• with impeller coated with Metalclad Ceramally CP+AC as manufactured by ENEON Corporation~~
  - ~~• One set of O-rings.~~
  - One set of pump wear rings.
  - One complete re-build kit for each pump and motor.

- [One spare soft start assembly](#)
- [Certified pump performance testing](#)
- [Arc flash and short circuit Calculations](#)

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

16. Duplicate pump and motor data plates shall be provided to the City of Lacey at the time of start up. Acceptance of the pumps will be contingent upon factory test data conformance with design performance data. Contractor shall be required to remove pumps from wet well for inspection at time of start up .
17. The developer shall provide test data from a state Department of Health certified Backflow Assembly Tester for all backflow devices on site prior to the start up.
18. A geotechnical analysis shall be performed for the wet well and lift station site by a licensed geotechnical engineer. The analysis shall include: soil compaction, testing methodology, recommended suitable backfill material and compaction techniques. A compaction report shall be provided to the City inspector following wet well and valve vault backfill.
19. Check valves shall be [Crispin RF Series with rubber flapper valves](#)~~sewer rated bronze on bronze style seat~~ with an outside lever, ~~and~~ spring [and limit switch hardware](#). Valves shall be epoxy coated on both the inside and outside a minimum of 10 mils thick with a coating approved for ~~sewer constant contact with H2S (hydrogen sulfide)~~. Check valves shall be ordered and installed in the vault as one right hand and one left hand model with the outside levers furthest away from each other (outside of piping configuration). The valve vault emergency by-pass pumping connections shall be 6 inch 316 stainless steel male cam lock style fittings. Fittings shall have a stainless female cap installed. Cam lock fittings shall face "UP" as shown on the detail and clearly visible and accessible for connection with 6 inch by-pass hose from above.
- ~~19.~~20. [Isolation valves in the valve vault shall be full port round 100 percent opening plug valves: Crispin, Pratt or Milliken. Valves shall be epoxy coated on both the inside and outside a minimum of 10 mils thick with a coating approved for sewer. 4 inch valves shall have a hand lever supplied for each valve. 6 inch and larger valves shall have gear reduction operation with hand wheels.](#)
- ~~20.~~21. The pump volute and impellers shall be coated with Metalclad Ceramalloy CP+AC manufactured by ENECON Corporation [\(where required by the City\)](#).
- ~~21.~~22. The control panel shall be manufactured and tested at the control panel manufacturer's facility. After manufacturer has verified the control panel is fully functional, the inspector shall be notified and a City witnessed control panel factory test shall be scheduled and completed before shipment of the control panel. The control panel shall not be shipped from the control panel manufacturer's facility prior to written verification of testing from the City.

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### 7C.050 Lift Station Design Criteria

The Lift Station shall be submersible style with non-clog pumps mounted in the wet well, and shall meet all of the criteria 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 wet well to the discharge connection. There shall be no need for personnel to enter the wet well.

#### Pump Construction:

Major pump components shall be of gray cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blow holes or other irregularities. All nuts, washers, bolts and studs shall be AISI Type 316 stainless steel construction with passivation, conforming to ASTM F593H. 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. Any coating imperfection caused by handling or installation shall be field repaired using the same coating material.

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 nitrile or Viton rubber O-rings. Connections or seals 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

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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. Hydromatic epoxy barrier style seals may also be acceptable.

**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 rated for 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).

Factory test pump performance curves shall be provided showing data for torque, current, power factor, input/output kW and efficiency. The information shall be gathered from factory testing of the actual pumps to be installed. This information shall also include data on starting and no-load characteristics. [This report shall be sent to the City inspector for review.](#)

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 wet well junction box without the need of any splices. The cable shall be water and oil resistant chloroprene rubber and shall not be cut, stripped or opened in any way prior to entering the decontactor plug assembly. 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 operates non-overloading throughout the entire pump performance curve from shut-off

through run-out. The most efficient pump curve for the design criteria shall be utilized as approved by the City.

The power requirements for pumps one horsepower or less shall be 120/240 VAC single phase 60 Hz. Pumps above one horsepower shall operate on no less than 120/208 VAC three phase power. Pumps five horsepower and greater shall be 277/480 VAC three phase.

**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 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 carbide 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 may be available.

The following seal types shall not be considered acceptable or 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 affect sealing shall be used. Pumps requiring use of 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 pump shall be able to operate dry without seal or bearing damage.

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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 material shall be AISI type 416F stainless steel in accordance with ASTM A276.

Impeller:

At the minimum impellers shall be of ductile iron ASTM A-536, dynamically balanced, coated with Metalclad Ceramally CP+AC manufactured by ENECON Corporation, 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. 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 ~~304~~410 stainless steel. [Pumps with optional cutter or chopper impellers may be required by the City.](#)

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 410 stainless steel wear ring insert fitted to the volute inlet.

Volute:

The minimum pump volute material shall be single-piece gray cast iron, ASTM A-48 Class 30, coated with Metalclad Ceramally CP+AC manufactured by ENECON Corporation, 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 as per the Approved Electrical Materials List. 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 send an alarm, to the PLC which will be indicated on the HMI and the SCADA. Use of a trip temperature above 120°C (250°F) shall not be allowed.

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

Miscellaneous:

The pump guide rails shall be metal to metal 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 with passivation.

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 or guide cables shall not be allowed.

The following ~~spare parts~~ additional items shall be provided:

- ~~1. One set of mechanical seals~~
- ~~2. One set of O rings~~
- ~~3. One set of wear rings~~
- ~~4. One spare impeller coated with Metaclad Ceramally CP+AC manufactured by ENECON Corporation~~
- 1. One spare pump and motor assembly.
- 2. One set of pump wear rings.
- 3. One complete re-build kit for each pump and motor.
- 4. One spare soft start assembly.

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, Flygt FLED-13 HD heavy duty aluminum hatch, 36" x 60" unobstructed clear opening, or sized as required by the pump manufacturer. or City of Lacey approved equal. The wet well opening shall be fitted with a City approved ~~Ultra-GuardRail~~ safety rail system, see detail. The wet well shall be a minimum of six feet diameter. A larger diameter wet well may be required upon review by the City. The wet well bottom shall have a manufactured hopper bottom that directs solids toward the pumps, see detail.

The wet well shall be core drilled for all conduit and pipe penetrations. 316 Link-seal shall be used around all pipe and conduit penetrations to the wet well and the valve vault. After Link-seal has been installed the openings shall be sealed on both the inside and outside with non-shrink grout. Inside the wet well the non-shrink grout material shall be covered with an approved the ~~hi-grade calcium aluminate (Sewper coat)~~ wet well coating material.

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 be installed in the wet well ~~extend below the high water level line.~~

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## SANITARY SEWER

The valve vault shall be a pre-cast utility vault as manufactured by Utility Vault, Inc. (Old Castle) or equal. The depth of the vault shall not exceed 48-inches from the top of the lid to the inside floor as delivered from the manufacturer. Modifications to over depth vaults to achieve the 48" requirement will not be accepted. Vault shall have solid walls without knockouts. Pipe penetrations shall be cast or core drilled through walls and floor. All pipes shall be link sealed and grouted in place with non-shrink grout. Vault shall have floor with drain sump and drain line back to wet well with an inline check valve and an in line P trap to prevent odors from entering the vault.

The valve vault hatches shall be aluminum as manufactured by LW Products Company or Halliday products or City of Lacey approved equal. The aluminum access hatches shall be hinged, spring-assisted hatches designed for H-20 loading.

The inside of the wet well shall be coated as outlined below to prevent corrosion.

As determined by the City during the civil plan review, the outlet of the last manhole prior to the wet well shall be equipped with a plug valve. . See detail.

### Wet Well Coating:

The wet well coating material shall be 100% VOC-free self-priming structural polyurethane, SprayWall manufactured by SprayRoq, Inc., Birmingham, AL. In lieu of coating, a Predl lined manhole may be used. The product shall be installed in accordance with the manufacturer's instructions by a factory certified applicator.

The wet well shall be prepared in accordance with the manufacturer's recommendation 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, walls and underside of lid a minimum of 250 mils (0.250 inch) in thickness. The sprayed on material shall form a seamless bond between the wet well wall and fiberglass hopper bottom. Some applications may require a greater surface coating; the manufacturer shall determine the proper application thickness. The finished surface shall be smooth and free from defects.

All manhole joints and pipe penetrations shall be watertight to prevent infiltration or ex-filtration prior to application of the product. Any drilling, cutting or fabricating done in the wet well that breaks or disturbs the coating shall be repaired with the same ~~hi-grade calcium aluminat~~ coating in accordance with the manufacturer's instructions.

All pipe and fittings in the wet well and valve vault shall be minimum ductile iron class 52 and shall be epoxy coated or polyethylene lined to a minimum of 10 mils thick on the inside and outside with Induron Protecto 401 or 3M

~~Scotchkote 134 fusion bonded epoxy, a coating approved for constant contact with H<sub>2</sub>S (hydrogen sulfide).~~ Coatings shall be applied according to the manufacturers' requirements by a certified applicator of the product. Coatings shall not be applied to pipe, fittings or valves in the field. All bolts, fasteners, brackets and hardware in the wet well shall be 316 stainless steel.

~~All pipe, fittings and valves in the valve vault shall be ductile iron class 52 and shall be epoxy or polyethylene lined to a minimum of 10 mils thick on the inside only with a coating approved for constant contact with H<sub>2</sub>S (hydrogen sulfide). Coatings shall be applied according to the manufacturers' requirements by a certified applicator of the product. Coatings shall not be applied to pipe, fittings or valves in the field.~~ The outside of the pipe, fittings and valves in the vault shall be prepped, primed and painted with a minimum of 2 coats green hi-grade enamel after all components in the vault have been assembled.

An additional option for piping in the wet well and valve vault shall be welded HDPE meeting ASTM standard D 3350, SDR 11 ~~3408~~4710.

Isolation valves in the valve vault shall be Pratt, Milliken or Crispin round full port, 100% opening sewer rated plug valves. Valves shall be epoxy coated on both the inside and outside a minimum of 10 mils thick with a coating approved for sewer~~constant contact with H<sub>2</sub>S (hydrogen sulfide)~~. 4 inch ~~and 6 inch~~ valves shall have standard 2 inch hub with 10 position operating lever. Valves sized ~~8-6~~ inch and larger shall have gear reduction operation and hand wheels.

Check valves shall be Crispin RF Series ~~sewer rated, bronze on bronze style seat~~ with outside lever and spring. Valves shall be epoxy coated on both the inside and outside a minimum of 10 mils thick with a coating approved for sewer~~constant contact with H<sub>2</sub>S (hydrogen sulfide)~~. Check valves shall be ordered and installed in the vault as one right hand and one left hand model with the outside levers furthest away from each other (outside of piping configuration).

The valve vault emergency by-pass pumping connections shall be 6 inch 316 stainless steel~~aluminum~~ male cam lock style fittings. Fittings shall have a female cap installed. Cam lock fittings shall face "UP" as shown on detail and clearly visible and accessible for connection with 6 inch by-pass hose from above.

#### 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 shall be diagrammatic; locations of all outlets will be checked and verified on project site.

The main control~~Electrical~~ cabinets shall be equipped with a metal cabinet roof (see detail). The minimum overhang shall be a minimum of 4 feet on the front face with one foot on all other sides. The design shall be approved by the City.

Where conflict occurs with other equipment, consult City for final decision. The engineer 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 witness tested by the City prior to being field installed. It shall be fabricated and assembled by an approved U.L. or ETL listed manufacturer, and constructed in conformance with U.L. 508A standards.

Pump Station Telemetry & Controls:

The station electrical shall be constructed in accordance with the City of Lacey standard lift station package and shall use Lacey standard control program. Please contact City of Lacey Maintenance department for the lift station electrical package.

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~~Multiple pump control function: Each pump shall operate in an alternating configuration providing rest for the last lead pump. Each pump shall be provided with a HAND OFF AUTO (HOA) 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, except when the high water alarm has been tripped.~~
- ~~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.~~

~~Alarms: Alarms shall be reported locally at the control panel Human Machine Interface (HMI). In the event of an alarm, the corresponding indicator shall light showing the alarm condition/fault. All alarms shall be relayed by the Programmable Logic Controller (PLC) to the Master Telemetry Unit (MTU) for logging and display in the SCADA system.~~

~~The schematic and line diagrams shall show the following input/output addresses.~~

SANITARY SEWER

The controller shall be wired using the following addresses:

<b>Standard Lift Station</b>	<b>PLC Input Address</b>
High Water Level	I: 0/0
	I: 0/1
Intrusion	I: 0/2
Control Volt Fail	I: 0/4
High Water Reset	I: 0/5
	I: 0/6
Generator Run	I: 0/7
Generator Fail	I: 0/8
Water Level	I: 1/0
Force Main Pressure	I: 1/1
Force Main Flow	I: 1/2
Pump 1 Auto	I: 2/0
Pump 1 Hand	I: 2/1
Pump 1 Overload	I: 2/2
Pump 1 Seal Fail	I: 2/3
Pump 1 Overtemp	I: 2/4
Pump 1 Run CV SW	I: 2/5
Pump 1 Fail Reset	I: 2/6
Pump 1 Jog	I: 2/7
Pump 2 Auto	I: 2/8
Pump 2 Hand	I: 2/9
Pump 2 Overload	I: 2/10
Pump 2 Seal Fail	I: 2/11
Pump 2 Overtemp	I: 2/12
Pump 2 Run CV SW	I: 2/13
Pump 2 Fail Reset	I: 2/14
Pump 2 Jog	I: 2/15
Pump 3 Auto	I: 3/0
Pump 3 Hand	I: 3/1
Pump 3 Overload	I: 3/2
Pump 3 Seal Fail	I: 3/3
Pump 3 Overtemp	I: 3/4
Pump 3 Run CV SW	I: 3/5
Pump 3 Fail Reset	I: 3/6
Pump 3 Jog	I: 3/7
Pump 4 Auto	I: 3/8
Pump 4 Hand	I: 3/9
Pump 4 Overload	I: 3/10
Pump 4 Seal Fail	I: 3/11
Pump 4 Overtemp	I: 3/12
Pump 4 Run CV SW	I: 3/13

~~Pump 4 Fail Reset I: 3/14~~

~~Pump 4 Jog I: 3/15~~

Control cabinets shall have the following minimum features:

- ~~1. Enclosure (cabinet) shall be stainless steel NEMA 3R construction, with drip shield installed by the manufacturer. The cabinet shall be custom manufactured at the cabinet manufactured facilities to receive the 3R rating and labeled before leaving the manufactured factory. A NEMA 12 cabinet that has a field installed 3R drip shield will not be accepted. Cabinet shall be UL listed and labeled accordingly.~~
- ~~2. Intrinsically safe barriers for liquid level sensor circuits within hazardous areas.~~
- ~~3. A short circuit study and Arc Flash calculations shall be completed. Pertinent Arc Flash labels shall be applied within the cabinet per OSHA WISHA standards.~~
- ~~4. Indicating light units shall be oil tight sealed type. Units shall use a full voltage LED lamp and shall be of the illuminated push button type with the push button wired for both the push to test function and reset function as indicated. Lens caps for lights shall be colored as specified in the applicable wiring diagram.~~
- ~~5. Elapsed time meters shall have a 5 digit non reset register with the last digit indicating tenths of an hour. Lag pump counter shall be a 5 digit re-settable meter.~~
- ~~6. 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. Selector switches shall be 3 position maintained type meeting NEMA Type 4X requirements. Legend plate shall be marked HAND OFF AUTO. Each pump power supply wiring shall be equipped with a thermal magnetic circuit breaker within the pump control panel equipped with a lockable actuator accessible from the outside of the control panel.~~
- ~~7. A control power transformer is required for all 277/480 systems. The primary of the transformer shall be protected with the appropriate size circuit breaker and the secondary shall be connected to the load center main breaker only. The transformer shall have 7.5 KVA minimum capacity sized to supply 125% of the total control, heating, lighting, and other miscellaneous 120 VAC loads.~~
- ~~8. Panel wiring shall be Stranded Type MTW 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. Radio communication and data transfer between lift station and the operations center Supervisory Control And Data Acquisition (SCADA) system shall be fully operational prior to station acceptance. The contractor or developer shall provide services by Technical Services Inc. (TSI) to have the SCADA screens programmed to the City's specifications to accommodate the new lift station.~~

~~10. Main power service disconnect shall be mounted on the outside of the controls cabinet. The service disconnect shall be lockable in both the on and off positions. The main circuit breaker and transfer switch shall be mounted inside the enclosure.~~

~~11. Radio antenna, mast and weather head for telemetry shall be mounted per detail. All mounting hardware shall be 316 stainless steel.~~

~~12. Electrical control cabinet shall be wired and supplied with a "Pendant Station" for remote operation of the pumps. Pendant shall be Woodhead model 4052 for two pump systems, Woodhead model 4023 for three pump systems and Woodhead model 4024 for four pump systems.~~

~~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 wet well level alarm and pump down override.~~

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

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**CITY OF LACEY LIFT STATION  
APPROVED ELECTRICAL MATERIALS LIST:**

**Wiring / Instrumentation / Controls:**

- A. ~~Conduit and fittings— Shall be PVC coated rigid steel R.M.C. with polyethylene inner coat, RobRoy Plasti Bond, T&B Ocal Blue or approved equal. All bends 11.5° or greater shall be factory formed elbows. All enclosure penetrations shall be sealed with a PVC coated Myers type hub and sealing locknut.~~
- B. ~~Supports and mounting brackets— Shall be 12 gauge, 7/8 and or 1-5/8 inch, stainless steel Unistrut channels with stainless steel clamps, nuts, bolts and mounting hardware.~~
- C. ~~Control Panel Wire— #14 AWG minimum, stranded copper MTW only. No vinyl covered wire.~~
- D. ~~Main Cabinet Enclosure— Stainless Steel NEMA 3R with rain gutter (pre-installed by the manufacturer) and weather tight seal, standard Burgess Lock #A136 and double entry doors. Minimum cabinet size 72x72x24 inches with 12 inch high stainless steel floor stands. Cabinet shall display a permanent mounted identification tag with model, serial number; make manufacturer information and UL or ETL electrical fabrication shop information.~~
- E. ~~Enclosure heater— Hoffman # DAH2002A or properly sized for cabinet, 120 208/240 VAC.~~
- F. ~~Enclosure fan and inlet air filter— ICEcube inc. IQ 150FPWSS 126 Enclosure Thermostat— Stego ZR 01175.0 01~~
- G. ~~Enclosure light— Hoffman ALF16M24R or GE 16547~~
- H. ~~Area Light— Lithonia Lighting Model # KAD 100S R4 120SP D04 on 12' pole~~
- I. ~~Pump control panel— or Hoffman CSD Series enclosure min size 36"H x 30"W x 12"D, or Oreneo duplex community systems shall use standard Oreneo large fiberglass control panel box. The door openings shall be coordinated between the separate internal enclosures to avoid interfering door openings.~~
- J. ~~Load center and housing— Cutler Hammer 12 circuit~~
- K. ~~Intrusion switch— Cutler Hammer E49M11MP1 or E49M11UP1.~~
- L. ~~Timers— Crouzet Chronos OUR1 120VAC~~
- M. ~~Control relays— IDEC RH\_B UL, contact sets and coil voltage as required.~~
- N. ~~Intrinsic safe barriers— Turek IM1 22Ex R DIN rail style mounted intrinsically safe relay barrier. Turek IM31 22Ex I DIN rail style mounted intrinsically safe analog barrier. 2 inch minimum separation between intrinsically safe wiring and other wiring. All analog wiring shall be shielded twisted pair.~~
- O. ~~Phase Fail Relay— Crouzet #84873220~~
- P. ~~Transient voltage surge suppressor— GE 9L15ECC001 for 3 phase applications, GE 9L15FCB001 for 120/240 applications.~~
- Q. ~~Indicator lights— Cutler Hammer or Idec HW Series, 22 mm, 120 VAC LED or incandescent. push to test. Color as indicated on wiring diagram.~~

- ~~R. Fuses and fuse holders — Bussmann fuses. Fuse holders with blown fuse indicator light, Bussmann, Allen Bradley, Idco or Sprecher Schuh.~~
- ~~S. Motor Starters — Cutler Hammer XTOB series with reset modules or Sprecher Schuh CA7 series across the line starters, Cutler Hammer or Sprecher Schuh soft starters required for applications using pump motors greater than 20 HP.~~
- ~~T. Motor Overload Relays — Cutler Hammer XTOB series with reset modules or Sprecher Schuh CEP7 series equipped with CEP7 EMDR reset modules. Soft starters shall be equipped with electronic overload protection that can be reset remotely through the designated 120 VAC PLC output addresses. Automatic reset overload protection is not acceptable.~~
- ~~U. Motor Circuit Breaker — Cutler Hammer HMCPE0xxHIC (Size) R3C with Cutler Hammer EHMVD (length) R lockable operator. Size breaker for motor service factor current draw. Operator shall be on outside of Motor Control Panel door, length is enclosure dependent. Note: xx = current size.~~
- ~~V. Selector Switches — Sprecher Schuh, Idco HW series, or Cutler Hammer, Class 9001, Type TL3, 22 mm~~
- ~~W. Float Switch — Opti Float~~
- ~~X. Limit Switches — Cutler Hammer part # E50BLL16P; stainless steel adjustable arm part # E50KL538 Thermal Magnetic Circuit Breakers — Cutler Hammer~~
- ~~Y. Control Circuit Breakers — Cutler Hammer WMT Series Allen Bradley 1489-A1Cxx0 or Sprecher Schuh~~
- ~~Z. Automatic Transfer Switch — Eaton service entrance rated ATC 300+ rated at 125% full load minimum. Transfer switch must have an auto exerciser for the generator that can be set to operate 24/7, 365 days.~~
- ~~AA. Manual transfer switch — Cutler Hammer, knife style with center off position~~
- ~~BB. Generator Plug — Appleton ADJA1044 150 RS 250VDC 600VAC~~
- ~~CC. Ammeters — Yokogawa, transformer type. Size to read not more than 50% of full scale at full load amp draw.~~
- ~~DD. GFCI Receptacle — Leviton 20A 120V with LED indicator and weatherproof cover.~~
- ~~EE. Level Controller — Siemens LUT. #7ML5050-OAA11 and Siemens Echomax XPS-15 level transducer (no splice allowed in cable). The alarm relay sequence is: relay 1 high wet well, relay 2 low level. Provide analog signal to PLC through shielded twisted pair cable. The location of the transducer head shall not be in conflict with pump removal, piping, or components inside the wet well.~~
- ~~FF. Strain Relief Cord Grips — Max Loc Cord Grip with Plastic Mesh, Type 3R. Manufacturer: Woodhead L.P. Part # 55xxNM (xx = cable size range). Hubbel Single Mesh 024010xx. xx being cable diameter.~~
- ~~GG. Uninterruptable power supply — Cutler Hammer, APC or Sola, 650 VA minimum, heavy duty type. UPS mounts on a shelf in the controls enclosure backplane.~~
- ~~HH. Control Power Transformers — Cutler Hammer or Sola, minimum 7.5 KVA or larger sized accordingly, heavy duty.~~

- ~~II. Power supply—SOLA SDN9-12-100P. Mount inside pump control panel.~~
- ~~JJ. Terminal blocks—Sprecher Schuh V7-W4 Series or Allen Bradley 1492-W4~~
- ~~KK. Pendant station—Woodhead 4052 for 2 pump systems, Woodhead 4023 for 3 pump systems, or Woodhead 4024 for 4 pump systems.~~
- ~~LL. Plastic wiring duct—Panduit or IBOCO~~
- ~~MM. Programmable logic controller—Allen Bradley MicroLogix 1100 P/N 1763-L16DWD base unit.~~
- ~~NN. PLC input/output expansion cards—Allen Bradley 1762-IF4 analog input, 1762-IQ16 digital input (12 VDC), and 1762-OW16 discrete output.~~
- ~~OO. HMI Screen—Allen Bradley 2711P-B6C1A PanelView Plus 700. Allen Bradley H.M.I. panel view plus 700 color touch screen, 120 VAC, Ether Net/IP communication and RS-232 Printer port.~~
- ~~PP. Force Main Pressure Transmitter—Foxboro IGP10-AD1D3F-Z1 with PSTAD-25USSS2SBS1 NPT seal and flush port, Sea-Port Technical Controls SQ 1471880. Pressure transmitter and mechanical gauges shall be mounted with an annular seal manufactured by Onyx valve.~~
- ~~QQ. Flow transmitter—Element: Foxboro series 9100A or Siemens Sitrans FM Mag 5100W. Shall be designed for wastewater, be elastomer lined, and have SS sensors. Transmitter: Foxboro IMT 25 or Siemens Mag 6000I.~~
- ~~RR. Padlocks—BestLock 11-B772 with MA cores. Minimum 5 required, additional locks may be required depending on site layout and security requirements.~~

**~~Radio Telemetry:~~**

- ~~A. UHF radio—DataRadio Integra—TR wireless modem Part No. 242-4048-510, 9600 KBPS, 2W, 450-470 MHz 12.5 KHZ Bandwidth, 12 VDC Powered.~~
- ~~B. UHF antenna—Antenex Y4506, Yagi; 10.2 dB gain 450-470 MHz~~
- ~~C. Lighting Arrestor—Poly Phaser IS-B50LN-C2, N-Type Fittings 125-1000 MHz, 125 W. Connect directly to earth ground rod system with #8 AWG or larger Cu wire.~~
- ~~D. Special Note:~~

All penetrations made to enclosures, panels, breaker boxes, cabinets, etc. shall be made with PVC coated water tight fittings such as Myers Hub type. All penetrations shall be in bottom of the enclosures.

7C.070 Standby Power Generator System

General:

Diesel standby power generation equipment designed with capacity and rating to safely carry the entire connected lift station load shall be provided at the lift station site to operate the lift station in the event of a power outage. The Developer shall provide the City of Lacey the design load calculations during the submittal process. All generators equal to or greater than ~~500~~250 kW shall be equipped with a permanent load bank sized for 80 percent of the engine generators rated capacity. This shall be installed within the discharge air duct

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SANITARY SEWER

work for the generator. [Please contact the City of Lacey Maintenance department for the current generator package.](#)

The auxiliary power unit 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. Locking generator enclosure, keyed with standard City of Lacey cabinet key for all cabinets.~~
- ~~5. Automatic transfer switch.~~
- ~~6. Radiator protection (as approved by the City) or automatic louvers.~~
- ~~7. Block heater connected to L.S. power supply and not generator.~~
- ~~8. Battery and rack.~~
- ~~9. Battery charger connected to L.S. power supply and not generator.~~
- ~~10. Conduit, wire and piping.~~
- ~~11. Coolant recovery system~~

The generator set shall be Cummins/Onan, Katolite, Kohler or City approved equal complying with the latest edition of Onan Corporation standard specifications and with the City standards.

The generator set shall include the following:

Engine:

- ~~• Single phase, 750, 1000, 1500, 2250 or 3000 watt coolant heater manufactured by Universal Engine Heater Co., INC (509 276 5923) 115 volt or 230 volt sized accordingly for the engine displacement. All heaters 1500 watt or larger shall be 230 volt. All engine heaters shall also have the Universal 59 T adjustable thermostat installed.~~
- ~~• A replacement parts kit shall also be supplied for the heater. The kit shall include a replacement water element, thermostat and all gaskets and seals needed to rebuild the heater. Engine heater shall have a proper sized cord connector and receptacle.~~

Generator Set:

- ~~• Mainline circuit breaker~~
- ~~• Weather protective/sound dampening enclosure with mounted silencer (maximum noise level of 64 dBA at 23 feet).~~

- ~~5 year basic power warranty.~~

~~Accessories:~~

- ~~Batteries~~
- ~~Battery Charger, 2 AMP, 12 VDC, 120 VAC Input. Shall maintain a float charge. The battery charger shall be manufactured by the generator manufacture or by Deltran Battery Tender Plus battery charging system, [www.batterytender.com](http://www.batterytender.com) Battery charger shall have a proper sized cord connector and receptacle.~~
- ~~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~~
- ~~Emergency stop switch~~

~~Fuel System:~~

- ~~Diesel~~

~~Alternator:~~

- ~~Anti condensation heater, 120 VAC~~

~~Exhaust System:~~

- ~~Exhaust silencer (64dBA 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)~~
- ~~All lights shall be L.E.D.~~

~~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:~~

- ~~Utility to generator set with programmable automatic transition~~
- ~~Service entrance rated with circuit breakers and neutral bonding provision~~
- ~~Programmable exercise clock for 365 days~~

~~System Operation:~~

- ~~Single phase 3 wire or three phase, 4 wire wye, voltage to match utility power supply.~~

~~Enclosure:~~

- ~~B002 Type 3R; Intended for outdoor use (dust proof and rainproof) shall have radiator grill protection or automatic louver system (as approved by the City).~~

~~Listing:~~

- ~~Listing UL 1008~~

~~Programmed Transition:~~

- ~~Program Transition 1-60 sec.~~

~~Exerciser Clock:~~

- ~~365 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. Results from the start up load tests and generator checklists shall be provided to the City.~~

~~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 three (3) copies along with an electronic copy 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.~~

~~The Developer shall provide the following spare parts for the generator: one complete replacement set, combustion air filters, two complete replacement sets, lube oil filters, two complete replacement sets, fuel filter (if required), two complete replacement sets, coolant filters (if required), one complete replacement set, all V belts, one complete replacement set, special tools for engine or generator.~~

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~~Generator and fuel tank mounting pad shall be per the manufacturer's requirements.~~

7C.080 Odor/Corrosion Control

Odor/corrosion control shall be provided at the lift station and/or at the pressure main discharge manhole as determined and required by the City. Items such as a Little John digester, future conduits or piping may be required.

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

7C.081 Lift Station Safety/Security

Prior to acceptance of the lift station along with the lift station signage, the developer shall be invoiced for five (5-8) Best Lock 11-B772 with cores. Additional locks may be required depending on site layout and security requirements.

7C.085 Lift Station ~~Information~~ Checklist Information

The lift station ~~information~~ construction checklists can be found in Appendix Q shall be filled out by the developer and included on the face of the engineering drawings and in the Operation and Maintenance manual.

~~7C.090 Lift Station Inspection Checklist~~

~~The lift station inspection 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 contractor prepare for the final inspection.~~

**LIFT STATION INSPECTION CHECKLIST**

Inspectors: \_\_\_\_\_ Date: \_\_\_\_\_

Name of Lift Station: \_\_\_\_\_

Location: \_\_\_\_\_

Address: \_\_\_\_\_

Assigned Lift Station Number: \_\_\_\_\_ Residential / Commercial / Combo

Type of Pump(s) and Quantity (Submersible), (Dry Well/Wet Well), (Step Submersible)  
Type: \_\_\_\_\_ Quantity: \_\_\_\_\_

**Nameplate Data:**

<b>Motor(s)</b>	<b>Pump(s)</b>			
Manufacturer: _____	Manufacturer: _____			
Model #: _____	Model #: _____			
Serial #: _____	Serial #: _____			
Voltage/Phase: _____	Capacity (GPM): _____			
Horsepower : _____	TDH (ft) : _____			
RPM : _____	RPM : _____			
	Impeller Size/Type: _____			
Motor Nameplate Amps: #1 _____ #2 _____ #3 _____ #4 _____				

Motor Nameplate SF Amps: #1 \_\_\_\_\_ #2 \_\_\_\_\_ #3 \_\_\_\_\_ #4 \_\_\_\_\_

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Auxiliary Generator Nameplate Info:**

<b>Generator</b>	<b>Engine</b>	<b>Transfer Switch</b>
Manufacturer: _____	_____	_____
Model: _____	_____	_____
Serial: _____	_____	_____
Voltage/Phase: _____	Spec/CPL#: _____	Voltage/Phase: _____
Size (KW): _____	Fuel Type: _____	Auto: _____ Manual: _____
Phase: _____	Water Cooled: _____	APU Plug: _____
Main Breaker Size: _____	Block Heater: _____	Battery Charger: _____
Auxiliary Generator Operation OK _____	Yes / No	
Transfer Switch Operation OK _____	Yes / No	
Generator Condition OK _____	Yes / No	
Generator Voltage Taken at Terminal Block: _____	L1 _____ L2 _____ L3 _____	

SANITARY SEWER

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**RP Backflow Device Information:** \_\_\_\_\_ **Pressure Transducer Info:** \_\_\_\_\_

Manufacturer: \_\_\_\_\_ Manufacturer: \_\_\_\_\_  
Model #: \_\_\_\_\_ Model #: \_\_\_\_\_  
Serial #: \_\_\_\_\_ Serial #: \_\_\_\_\_  
Size: \_\_\_\_\_ Size: \_\_\_\_\_  
Date Inspected: \_\_\_\_\_ Type: \_\_\_\_\_  
Pass/Fail: \_\_\_\_\_ Pressure Gages: Yes / No  
Inspected By: \_\_\_\_\_ # of Pressure Gages: \_\_\_\_\_

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Wet Well Information:** \_\_\_\_\_ **Force main Piping:** \_\_\_\_\_

Diameter: \_\_\_\_\_ Gallons Per Inch: \_\_\_\_\_ Diameter: \_\_\_\_\_  
Rim Elevation: \_\_\_\_\_ Discharge Elevation: \_\_\_\_\_  
Influent I.E.: \_\_\_\_\_ Pipe Length: \_\_\_\_\_  
Bottom I.E.: \_\_\_\_\_ Type: \_\_\_\_\_  
Influent Pipe Size: \_\_\_\_\_

**Wet Well:** \_\_\_\_\_ **Flow Meter:** Yes / No \_\_\_\_\_

Corrosive Resistant Coating Yes / No Manufacturer: \_\_\_\_\_  
Wet Well Hatch & Latch Yes / No Model #: \_\_\_\_\_  
Wet Well Safety Grate Yes / No Serial #: \_\_\_\_\_  
Wet Well Safety Railings Yes / No Size: \_\_\_\_\_  
Debris in Wet Well Yes / No Type: \_\_\_\_\_  
Infiltration Points Yes / No  
Wet Well Ladder Yes / No (Ladder Not To Extend Below High Water Level)  
Wet Well Piping Proper Size Yes / No  
Piping Epoxy Coated Yes / No  
Wet Well Mechanical Components Installed: \_\_\_\_\_ Yes / No  
Wet Well (Nuts, Bolts, & Anchors to Spec, Grade (316S.S) and in place) \_\_\_\_\_ Yes / No  
Wet Well Surcharging Upstream \_\_\_\_\_ Yes / No  
Fall Protection Railings: (Installed around Hatch) \_\_\_\_\_ Yes / No  
Motor Leads / Float cord Grips: (Installed & Meet spec.) \_\_\_\_\_ Yes / No  
(Woodhead Max Log Cord Grip with Plastic Mesh)

SANITARY SEWER

**Debris Tank:**

Debris Tank Size: \_\_\_\_\_ Gallons.  
Risers installed and sealed: \_\_\_\_\_ Yes / No \_\_\_\_\_  
Lids Install and Screwed in Place No Cracks: \_\_\_\_\_ Yes / No \_\_\_\_\_  
Bio Tubes: (Installed and Removable) \_\_\_\_\_ Yes / No \_\_\_\_\_  
Sanitary Tees Installed and Functional: \_\_\_\_\_ Yes / No \_\_\_\_\_  
External J Box: (Operation Ok) \_\_\_\_\_ Yes / No \_\_\_\_\_  
Septic Float: (Installed & Set, Splice Ok) \_\_\_\_\_ Yes / No \_\_\_\_\_  
Fall Protection Railings or Grates in Place: \_\_\_\_\_ Yes / No \_\_\_\_\_

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Odor Control:**

Product Tank: (Installed & sized correctly) \_\_\_\_\_ Yes / No \_\_\_\_\_ Tank Size: \_\_\_\_\_  
Control Cabinet: (Installed & Wired Correctly) \_\_\_\_\_ Yes / No \_\_\_\_\_  
Pumps & Bellows: (Installed & Sized Correctly) \_\_\_\_\_ Yes / No \_\_\_\_\_  
Calibration Cylinder and Valves: (Installed) \_\_\_\_\_ Yes / No \_\_\_\_\_  
Y Strainer: (Installed and Sized Correctly) \_\_\_\_\_ Yes / No \_\_\_\_\_  
(Injection in Force main not Wet Well:) \_\_\_\_\_ Yes / No \_\_\_\_\_

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Check Valve Vault:**

Operation of Vault Hatch & Latch \_\_\_\_\_ Yes / No \_\_\_\_\_  
Isolation Valves Operation Ok \_\_\_\_\_ Yes / No \_\_\_\_\_  
Vault Drain/Sump/Clean/ \_\_\_\_\_ Yes / No \_\_\_\_\_  
Isolation Valves Handles Ok \_\_\_\_\_ Yes / No \_\_\_\_\_  
Isolation Valves Operation Ok \_\_\_\_\_ Yes / No \_\_\_\_\_  
Check Valve Operation \_\_\_\_\_ Yes / No \_\_\_\_\_  
Emergency Bypass Operation \_\_\_\_\_ Yes / No \_\_\_\_\_  
Check Valve Limit Switches \_\_\_\_\_ Yes / No \_\_\_\_\_  
Limit Switches: (Operational Ok) \_\_\_\_\_ Yes / No \_\_\_\_\_

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Station Control:**

Type: Floats: Yes / No \_\_\_\_\_ Number of Floats: \_\_\_\_\_  
 Milltronics: Yes / No \_\_\_\_\_ XPS 15 Ultrasonic Transducer Yes / No \_\_\_\_\_  
 Pulsar: Yes / No \_\_\_\_\_ Black Box Ultrasonic 130D Yes / No \_\_\_\_\_  
 Red Lion PM Yes / No \_\_\_\_\_ Submersible Transducer: Yes / No \_\_\_\_\_

**Level Settings:**

Set to Engineers Spec.: Yes / No \_\_\_\_\_  
 Relay # 1 High Water Alarm: \_\_\_\_\_: ft/in. / High Water Off: \_\_\_\_\_ ft/in  
 Relay # 2 Lag Counter: \_\_\_\_\_: ft/in. / Lag Counter Off: \_\_\_\_\_ ft/in  
 Relay # 3 Lag Pump On \_\_\_\_\_: ft/in. / Lag Pump Off: \_\_\_\_\_ ft/in  
 Relay # 4 Lead Pump On \_\_\_\_\_: ft/in. / Lead Pump Off: \_\_\_\_\_ ft/in  
 Relay # 5 Low Level On \_\_\_\_\_: ft/in. / Low Level Off: \_\_\_\_\_ ft/in  
 Empty Distance to Transducer: \_\_\_\_\_: ft/in. / Wet Well Depth: \_\_\_\_\_ ft/in

Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**Electrical / Controls:**

Electrical Service Size: \_\_\_\_\_  
 Main Breaker Size: \_\_\_\_\_  
 Panel Size: \_\_\_\_\_  
 Voltage: \_\_\_\_\_  
 Phase: \_\_\_\_\_

Voltage Taken @ Terminal Blocks: L1 \_\_\_\_\_ L2 \_\_\_\_\_ L3 \_\_\_\_\_  
 Control Panel Appropriate UL Labels: Yes / No \_\_\_\_\_  
 Control Panel Lighting: Yes / No \_\_\_\_\_  
 Wiring Schematics for Correlation: Yes / No \_\_\_\_\_  
 Legend Plates / Labels: Yes / No \_\_\_\_\_  
 Wire Gauge Correct/ Color: Yes / No \_\_\_\_\_  
 Raceways & Electrical Conduits for Defects (OK): Yes / No \_\_\_\_\_  
 Terminal Blocks: (Ok for Size and Type) Yes / No \_\_\_\_\_  
 All Wires: (Connected & Grounding Ok): Yes / No \_\_\_\_\_  
 Panel Wiring: (Labeled and Identified) Yes / No \_\_\_\_\_  
 Panel Lights: (Operation Ok / Push to Test) Yes / No \_\_\_\_\_  
 HOA (Operation Ok) Yes / No \_\_\_\_\_  
 Ammeters: (Installed & Sized Correctly) Yes / No \_\_\_\_\_  
 Phase Monitor: (Operation & Set Correctly) Yes / No \_\_\_\_\_  
 UPS: (Connected and Operational) Yes / No \_\_\_\_\_  
 Power Supplies: (Connected and Operational) Yes / No \_\_\_\_\_  
 Transformers: (Sized and Fused Correctly) Yes / No \_\_\_\_\_  
 Load Center: (Sized and Labeled Correctly) Yes / No \_\_\_\_\_  
 Electrical Cabinet Heater: (Operation Ok) Yes / No \_\_\_\_\_  
 Electrical Cabinet Fan & T Stat: (Operation Ok) Yes / No \_\_\_\_\_

SANITARY SEWER

Disconnect: (Operation Ok) \_\_\_\_\_ Yes / No \_\_\_\_\_  
Proper Sized Circuit Breakers & Fuses: \_\_\_\_\_ Yes / No \_\_\_\_\_  
Electrical Control Devices Sized for Motors: \_\_\_\_\_ Yes / No \_\_\_\_\_  
Overload Devices, Trip Test & Manual Reset: \_\_\_\_\_ Yes / No \_\_\_\_\_  
Hour Meter Readings: (Operation Ok) \_\_\_\_\_ Yes / No \_\_\_\_\_  
Pump#1 \_\_\_\_\_ Pump#2 \_\_\_\_\_ Pump#3 \_\_\_\_\_ Pump#4 \_\_\_\_\_  
Event Counter Readings: (Operation Ok) \_\_\_\_\_ Yes / No \_\_\_\_\_  
Pump#1 \_\_\_\_\_ Pump#2 \_\_\_\_\_ Pump#3 \_\_\_\_\_ Pump#4 \_\_\_\_\_  
Lag Counter: (Operation Ok & Resettable) \_\_\_\_\_ Yes / No \_\_\_\_\_  
Pendant Station: (Installed & Operation Ok) \_\_\_\_\_ Yes / No \_\_\_\_\_  
All Equipment UL Listed & to City of Lacey spec. Yes / No \_\_\_\_\_

Comments:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Telemetry / SCADA / Alarm Functions:**

Antenna: (Installed & Sealed / Aimed at Repeater) Yes/No: \_\_\_\_\_

(Operation Ok) At Site: \_\_\_\_\_ (Operation Ok) At Shop: \_\_\_\_\_

Communications: (OK) \_\_\_\_\_ Yes / No: \_\_\_\_\_ Yes / No: \_\_\_\_\_  
RTU Power Fail: \_\_\_\_\_ Yes / No: \_\_\_\_\_ Yes / No: \_\_\_\_\_  
High Wet Well: \_\_\_\_\_ Yes / No: \_\_\_\_\_ Yes / No: \_\_\_\_\_  
Low Wet Well: \_\_\_\_\_ Yes / No: \_\_\_\_\_ Yes / No: \_\_\_\_\_  
Intrusion: \_\_\_\_\_ Yes / No: \_\_\_\_\_ Yes / No: \_\_\_\_\_  
Phase Lose/C volt Fail: \_\_\_\_\_ Yes / No: \_\_\_\_\_ Yes / No: \_\_\_\_\_  
Pump#1 Run: \_\_\_\_\_ Yes / No: \_\_\_\_\_ Yes / No: \_\_\_\_\_  
Pump#1 Fail: \_\_\_\_\_ Yes / No: \_\_\_\_\_ Yes / No: \_\_\_\_\_  
Pump#1 Motor Over/Temp: \_\_\_\_\_ Yes / No: \_\_\_\_\_ Yes / No: \_\_\_\_\_  
Pump#1 Soft Starter Fail: \_\_\_\_\_ Yes / No: \_\_\_\_\_ Yes / No: \_\_\_\_\_  
Pump#1 Seal Fail Alarm: \_\_\_\_\_ Yes / No: \_\_\_\_\_ Yes / No: \_\_\_\_\_  
Pump#2 Run: \_\_\_\_\_ Yes / No: \_\_\_\_\_ Yes / No: \_\_\_\_\_  
Pump#2 Fail: \_\_\_\_\_ Yes / No: \_\_\_\_\_ Yes / No: \_\_\_\_\_  
Pump#2 Motor Over/Temp: \_\_\_\_\_ Yes / No: \_\_\_\_\_ Yes / No: \_\_\_\_\_  
Pump#2 Soft Starter Fail: \_\_\_\_\_ Yes / No: \_\_\_\_\_ Yes / No: \_\_\_\_\_  
Pump#2 Seal Fail Alarm: \_\_\_\_\_ Yes / No: \_\_\_\_\_ Yes / No: \_\_\_\_\_  
Pump#3 Run: \_\_\_\_\_ Yes / No: \_\_\_\_\_ Yes / No: \_\_\_\_\_  
Pump#3 Fail: \_\_\_\_\_ Yes / No: \_\_\_\_\_ Yes / No: \_\_\_\_\_  
Pump#3 Motor Over/Temp: \_\_\_\_\_ Yes / No: \_\_\_\_\_ Yes / No: \_\_\_\_\_  
Pump#3 Soft Starter Fail: \_\_\_\_\_ Yes / No: \_\_\_\_\_ Yes / No: \_\_\_\_\_  
Pump#3 Seal Fail Alarm: \_\_\_\_\_ Yes / No: \_\_\_\_\_ Yes / No: \_\_\_\_\_  
Pump#4 Run: \_\_\_\_\_ Yes / No: \_\_\_\_\_ Yes / No: \_\_\_\_\_  
Pump#4 Fail: \_\_\_\_\_ Yes / No: \_\_\_\_\_ Yes / No: \_\_\_\_\_  
Pump#4 Motor Over/Temp: \_\_\_\_\_ Yes / No: \_\_\_\_\_ Yes / No: \_\_\_\_\_  
Pump#4 Soft Starter Fail: \_\_\_\_\_ Yes / No: \_\_\_\_\_ Yes / No: \_\_\_\_\_  
Pump#4 Seal Fail Alarm: \_\_\_\_\_ Yes / No: \_\_\_\_\_ Yes / No: \_\_\_\_\_  
Generator Run: \_\_\_\_\_ Yes / No: \_\_\_\_\_ Yes / No: \_\_\_\_\_

SANITARY SEWER

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Generator Fail: Yes / No: \_\_\_\_\_ Yes / No: \_\_\_\_\_  
Septic High Level: Yes / No: \_\_\_\_\_ Yes / No: \_\_\_\_\_  
Control Override: Yes / No: \_\_\_\_\_ Yes / No: \_\_\_\_\_  
Flood Alarm: Yes / No: \_\_\_\_\_ Yes / No: \_\_\_\_\_  
Smoke Alarm: Yes / No: \_\_\_\_\_ Yes / No: \_\_\_\_\_

**Analog Signals:**

Wet Well Level: Yes / No: \_\_\_\_\_ Yes / No: \_\_\_\_\_  
L.S Station Flow: Yes / No: \_\_\_\_\_ Yes / No: \_\_\_\_\_  
L.S Station PSI: Yes / No: \_\_\_\_\_ Yes / No: \_\_\_\_\_  
Water System PSI: Yes / No: \_\_\_\_\_ Yes / No: \_\_\_\_\_

**Comments:**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

---

**Pump/Motor/Operation & Performance Test:**

Note: ~~Check that motors are not exceeding their nameplate amperage multiplied by the motor service factor, (i.e., with Full Load Amps (FLA) FLA = 10 and Service Factor (SF) 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%.~~

Pump #1 Running Amps: L1 \_\_\_\_\_ L2 \_\_\_\_\_ L3 \_\_\_\_\_  
 Pump #2 Running Amps: L1 \_\_\_\_\_ L2 \_\_\_\_\_ L3 \_\_\_\_\_  
 Pump #3 Running Amps: L1 \_\_\_\_\_ L2 \_\_\_\_\_ L3 \_\_\_\_\_  
 Pump #4 Running Amps: L1 \_\_\_\_\_ L2 \_\_\_\_\_ L3 \_\_\_\_\_

Pump Performance during Startup: (In Gallons per Minute) TDH: \_\_\_\_\_  
 Pump#1 \_\_\_\_\_ Pump#2 \_\_\_\_\_ Pump#3 \_\_\_\_\_ Pump#4 \_\_\_\_\_  
 Pumps# 1&2&3&4: (Running Together) \_\_\_\_\_ GPM

**OPERATION OKAY**

	<b>Yes</b>	<b>No</b>
Unusual Noise or Vibration #1 Pump or Motor: _____	_____	_____
Comments: _____		
Unusual Noise or Vibration #2 Pump or Motor: _____	_____	_____
Comments: _____		
Unusual Noise or Vibration #3 Pump or Motor: _____	_____	_____
Comments: _____		
Unusual Noise or Vibration #4 Pump or Motor: _____	_____	_____
Comments: _____		
Proper Pump Rotation: _____	_____	_____
Comments: _____		
Scaled Bearings: _____	_____	_____
Comments: _____		
Pump Alternator Operation: _____	_____	_____
Comments: _____		

Comments:

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**Site Layout & O/M Manuals / Spare Parts:**

	<b>Operation Okay</b>
	<b>Yes          No</b>

2 inch Wash down hydrant and RPBA: \_\_\_\_\_  
 Comments: \_\_\_\_\_

Locks: (Developer Invoiced - Six Locks) \_\_\_\_\_  
 Comments: \_\_\_\_\_

Site lighting: \_\_\_\_\_  
 Comments: \_\_\_\_\_

Fence (7' high) and gate Area: (Min: 15 foot Gate) \_\_\_\_\_  
 Comments: \_\_\_\_\_

Driveway / Access: \_\_\_\_\_  
 Comment: \_\_\_\_\_

Site Paving & Site Rock (Done to Spec) \_\_\_\_\_  
 Comments: \_\_\_\_\_

O & M Manuals (3 copies each): \_\_\_\_\_  
 Lift Station: \_\_\_\_\_  
 Comments: \_\_\_\_\_  
 Generator: \_\_\_\_\_  
 Comments: \_\_\_\_\_

Spare Parts Received:

Generator:	Yes	No	Pump:	Yes	No
Filters:	_____	_____	Mechanical seals	_____	_____
Belts:	_____	_____	O Rings:	_____	_____
Hoses:	_____	_____	Wear Rings:	_____	_____

Spare Pump and Motor: \_\_\_\_\_  
 Keys Received: \_\_\_\_\_  
 Warranty: \_\_\_\_\_  
 Comments: \_\_\_\_\_

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**Other Comments:**

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**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 these 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, 3.040, and 7A.010.

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 as per Section 7B.020.

Privately owned pressure mains shall have a isolation 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 mains shall be sized as per Section 7B.020 and reviewed by Environment One. Environment One comments shall be forwarded to the City for approval. If permitted by the Director of Public Works 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.

S.T.E.P. and lift station pressure sewer pipe shall be even sizes only (i.e. 2 inch, 4 inch, 6 inch, etc.) Minimum pressure sewer pipe size for S.T.E.P. shall be 2 inch diameter. Grinder mains of odd sizes shall require the use of HDPE. Minimum pressure sewer (pressure main) pipe size for lift stations shall be 4 inch diameter. HDPE pipe shall be sized by inside pipe diameter (see table). Typically, IPS HDPE pipe is used in Lacey; however, in case where the required inside diameter of the pipe cannot be obtained using IPS HDPE, ductile iron pipe size (DIPS HDPE) pipe may be required.

SANITARY SEWER

TYPICAL SIZES AND DIMENSIONS FOR IRON PIPE SIZE (IPS) PE~~3408~~4710  
HIGH DENSITY POLYETHYLENE (HDPE) PIPE

PRESSURE RATING		DR 11 (160 PSI)		
NOMINAL SIZE	ACTUAL O.D.	MINIMUM WALL THICKNESS	AVERAGE I.D.	WEIGHT LB/LF
2"	2.375"	0.216"	1.917"	0.639
3"	3.500"	0.318"	2.825"	1.387
4"	4.500"	0.409"	3.633"	2.294
5"	5.375"	0.489"	4.339"	3.272
5"	5.563"	0.506"	4.491"	3.505
6"	6.625"	0.602"	5.348"	4.971
7"	7.125"	0.648"	5.752"	5.750
8"	8.625"	0.784"	6.963"	8.425
10"	10.750"	0.977"	8.678"	13.089
12"	12.750"	1.159"	10.239"	18.412
14"	14.000"	1.273"	11.302"	22.199
16"	16.00"	1.455"	12.916"	28.994
18"	18.00"	1.636"	14.531"	36.696
20"	20.00"	1.818"	16.145"	45.304
22"	22.00"	2.000"	17.760"	54.818
24"	24.00"	2.182"	19.375"	65.237
26"	26.00"	2.364"	20.989"	76.563
28"	28.00"	2.545"	22.604"	88.795
30"	30.00"	2.727"	24.218"	101.934

NOTE:

Average inside diameter calculated using nominal OD and minimum wall plus 4% for use in estimating fluid flows. Actual ID will vary.  
The applicable General Notes in section 7B.020 shall be included on any plans dealing with pressure sanitary sewer design.

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**GENERAL NOTES (PRESSURE SEWER MAIN INSTALLATION)**

1. All sewer mains shall be field staked for grades and alignment in accordance with section 7A.030 of the Development Guidelines.
2. All side sewer locations shall be marked on the face of the curb with an embossed "S" 3" high and 1/4 inch into concrete.
3. Bedding of the pressure sewer main and compaction of the backfill material shall be required. (See detail).
4. A 3 foot square x 8 inch thick concrete pad with #4 rebar shall be installed around all valves that are not in a pavement area.
5. 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.
6. Erosion control measures shall be taken by the contractor during construction to prevent infiltration of existing and proposed storm drainage facilities and roadways.
7. All buried power for S.T.E.P/Grinder systems shall be installed with continuous tracer tape installed 12 inches above the buried power. The marker shall be plastic non-biodegradable, metal core backing marked "power". Tape shall be furnished by contractor.
8. Pressure mains less than 4 inches in diameter shall be HDPE SDR 11 or Schedule 80 PVC ASTM D1784 with rubber gasket joints. Pressure mains 4 inches in diameter or greater shall be HDPE SDR 11 or PVC C-900DR 14. Certain-Teed Certa-Lok C-900 R/J pipe is approved for use where restrained joints are required. Welded Poly (HDPE) pipe shall be Hi density ASTM D 3350, SDR 11 [34084710](#) socket welded or butt fusion welded. HDPE pipe shall be sized by inside pipe diameter. Fittings and valves shall comply with section 7E.040 of the Development Guidelines. Piping for sewer lines shall be green, white or black. HDPE sewer pipe shall be green or black with a green stripe manufactured on the pipe.
9. S.T.E.P/Grinder service line from main connection to service ball valve shall be 1 ¼ inch or 2 inch diameter schedule 80 PVC. HDPE pipe shall be hi density ASTM D 3350, SDR 11 [34084710](#) socket or butt fusion welded.
10. All plastic pipe and services shall be installed with continuous tracer tape installed 12 inches to 18 inches 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 12 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.

11. Prior to acceptance of the project the pressure mainline and service lines shall be subject to a hydrostatic pressure test of ~~200-175~~ pounds for 15 minutes and any leaks or imperfections developing under said pressure shall be remedied by the contractor. Pressure testing shall not exceed the pressure rating of valves or other components within the system. 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. In addition, all Pressure mains shall be pigged in the presence of the City Inspector prior to placing main in service.
12. 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.
13. Single and duplex family S.T.E.P. pumping systems installed in Lacey shall be an Orenco certified package and be accompanied by a certificate of origin letter from Orenco. The certificate of origin letter shall be presented to the City of Lacey inspector at time of installation and inspection of the pumping system. Package components and installation requirements shall also comply with Lacey details. A PDF version of the certificate of origin letter and the manufacturer's submittal data of the required components can be found online at the City of Lacey website under the Public Works heading then under Development Guidelines and Public Works Standards.
14. Single and duplex family grinder system shall be manufactured by E-One (Environment One Corporation) only and shall be purchased and installed as a packaged system from E-One. This includes the electrical control panel, wiring from panel to pump chamber, the pump and pumping components and pump chamber. No substitution of parts shall be allowed.
15. All STEP and Grinder systems installed in commercial applications shall meet the applicative electrical requirements for commercial systems.
16. All valves up to 2 inch shall be red handle Cepex Poly True Union FIPT x FIPT ball valves with appropriate couplings. All valves three to 24 inch shall be Pratt, Milliken, or Crispin plug valves or approved equal. Plug valves shall be of a full round port design (100% opening) and epoxy coated on the inside and outside as specified in 7D.030. All plug valves shall have a 2 inch operating nut, gear reduction operation, and be rated for burial. Tapping valves shall be resilient wedge gate valves and be epoxy coated on the inside and outside.

~~13.~~

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

- A. Material: Pressure mains less than 4 inches in diameter shall be HDPE SDR 11 or Schedule 80 PVC, ASTM D1784, with rubber gasket joints. Pressure mains 4 inches in diameter or greater shall be HDPE SDR 11 or PVC C-900DR 14. Certain-Teed Certa-Lok C-900 R/J pipe is approved for use where restrained joints are required. Welded Poly (HDPE) pipe shall be Hi density ASTM D 3350, SDR 11 ~~3408~~4710 socket welded or butt fusion welded. HDPE pipe shall be sized by inside pipe diameter. Fittings and valves shall comply with section 7E.040 of the Development Guidelines. Piping for sewer lines shall be green, ~~white or black~~ or white. HDPE sewer pipe shall be green, ~~black~~ or black with a green stripe manufactured on the pipe. For 14 to 24 inch mains, pipe shall be PVC C905 Class 235 or HDPE SDR 11 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 either 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 downstream of the lift station check valve vault. Pipe material & fittings for pressure mains larger than 24 inches 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. Welded poly pipe shall be hi density ASTM D 3350, SDR 11 ~~3408~~4710 socket welded or butt fusion welded. HDPE sewer pipe shall be green, black with a green stripe manufactured on the pipe. Butt fuse welded pipe shall be de-beaded on the inside of each weld. HDPE pipe that is directionally bored underground or under the road shall have a locating wire installed with the pipe.
- B. Installation. The process for HDD shall follow the standard three step process of (1) drilling the pilot hole (2) enlarging the hole/back reaming (3) pulling through the transmission pipeline. The use of drill fluid such as bentonite or polymer is required. A properly sized hole and ample amount of drill fluid shall be used to prevent damage to the pipe being installed. During the installation of the transmission pipe, a second smaller HDPE DR 14 pipe a minimum of 3/4 inch diameter shall be pulled through alongside the transmission pipe the smaller pipe shall have a standard 12 gauge direct bury U.S.E. green coated copper tracer wire pulled through and connected to the tracer wire of the main at each end using the low voltage grease-type splice kits. Soils that have too many cobbles may not be approved by the City for HDD.
- C. 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 6.130 for sanitary sewer/water main crossing requirements.

- D. 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.

#### 7D.035 Connections to Pressure mains.

Connection to an existing PVC or AC pressure main shall be done with an all stainless steel tapping saddle such as Romac SST with a stainless steel flange. Connection to an existing ductile iron pressure main shall be done with a fabricated steel tapping saddle such as Romac FTS style. Fabricated steel saddles shall have optional fusion epoxy coating 8 to 12 mils lined and coated. Tapping saddle gaskets shall be rated for sewer. The tapping valve shall be an epoxy coated resilient wedge gate valve conforming to AWWA C-515 latest revision requirements. Refer to detail 7-12.2 for specific requirements when connecting a new S.T.E.P. or grinder service to an existing pressure main. S.T.E.P. sewers shall not be allowed to connect to lift station pressure mains.

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 inch shall be red handle Cepex Poly True Union FIPT x FIPT ball valves with appropriate couplings. All valves ~~four~~ three to 24 inch shall be ~~M&H, Clow, Pratt, DeZurik or Milliken, or Crispin~~ plug valves or approved equal. Plug valves shall be of a full round port design (100% opening) and epoxy coated on the inside and outside as specified in 7D.030. All plug valves shall have a 2 inch operating nut. ~~Plug valves 6 inches & larger shall have a gear reduction operation, and be rated for burial.~~ 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 inch. Valve spacing shall not exceed 500' for mains over 10 inches. At every lift station, a pressure main isolation valve is required within ten feet of the station.

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- B. Air Release Valves: Air release valves shall be ARI model D-021 for S.T.E.P ~~and grinder~~ mains and ARI D-025 for Lift station and grinder mains. 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.

#### 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 (or as determined during the plan review).
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.

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#### 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 only by special approval (engineer must submit calculations when requesting approval). Mechanical joints shall utilize a pipe restraint style gland. ~~“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 (H<sub>2</sub>S), and the buildup of sulfuric acid (H<sub>2</sub>SO<sub>4</sub>) 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. All manholes with 400 feet downstream of the out fall manhole and including the out fall manhole shall be entirely coated to the top grade ring with ISO 9000 certified hi grade calcium aluminate material, ~~Kerneous~~ Kerneos Sewper Coat PG a minimum of one inch thickness or 100 % VOC-free self-priming structural polyurethane SprayRoq – SprayWall product. 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 PRESSURE SEWER SYSTEMS:**

7E.010 General

A Septic Tank Effluent Pump (S.T.E.P) system or grinder pump system may be installed to serve single family residential ~~(1 EDU)~~, multi-family residential ~~(duplex, 2 EDU's)~~, ~~(Small Community Systems (3 to 6 EDU's))~~, and commercial applications where approved by the City. 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. A S.T.E.P/Grinder application with a proposed site plan is required for each individual on-site system. An example of the S.T.E.P/Grinder application can be found in Appendix D.

Any new single family subdivision designed with S.T.E.P or grinder 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 or grinder applications shall require easements as outlined in the appendix.

Single family subdivisions designed with individual ~~S.T.E.P. sewers~~pressure sewer systems shall provide civil drawings including the building envelopes, 10 foot private utility trench, driveway, water meter, service box and the ~~S.T.E.P.~~ tank locations in the front of the lot drawn to scale to assure all improvements can be accommodated on site.

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. Grinder pump systems consist of a single pump basin. The pump(s) grind the waste stream into a slurry and pump it to the City sewer system.

The single family and duplex S.T.E.P. tanks or grinder pump basins shall be located in the front yard of the residence. If the lot size is too small for the S.T.E.P. tanks, a community S.T.E.P. system (3 to 6 EDU's) may be required and sized according to the City of Lacey S.T.E.P. system sizing chart.

The Small 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 as determined by the City. Driveway shall be constructed as a permanent all weather surface capable of supporting an 80,000 lb. vehicle.

Multifamily Equivalent Dwelling Unit Sizing Chart

Equivalent Dwelling Units (EDU's)	Number of Bedrooms
1.0	3
0.75	2
0.5	1

The above chart is for design purposes only and cannot be utilized for connection fee calculations.

~~The Small 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 as determined by the City. Driveway shall be constructed as a permanent all weather surface capable of supporting an 80,000 lb. vehicle.~~

Operation and maintenance of the tank, pump, and pump controls for the small community systems 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 grinder~~ 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~~ onsite systems 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. The small community pump station facilities shall be installed/constructed per the approved plans and as-built by the designing engineer.

Power (electricity) for the single family, duplex or commercial system shall be provided by the customer. Power for the small community type pump stations shall be provided by the homeowner's association or property owner.

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.

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. or grinder pump tank. The entire facility shall be owned and maintained by the customer to the location of the service valve/check valve box located downstream of the facility. Verification of maintenance shall be provided to the City of Lacey yearly.

#### 7E.015 ~~S.T.E.P.~~ Customer Responsibilities

All S.T.E.P. and grinder 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'-5'~~ radius of any tank lid. No trees shall be planted within 10' of any tank lid or valve box. All of the tank lids shall be visible.

The property owner must maintain access to the ~~septic~~-tank and controls at all times for City maintenance purposes. The tank riser lid may not be covered or buried. For S.T.E.P. applications only, ~~although~~ the owner may place a bird bath, potted plant or other yard decoration on the riser lid, as long as it can be readily removed for repair or maintenance. ~~Grinder tank lids are vented and require that all dirt, beauty bark, rock, grass, debris, etc. be kept away from the lid to ensure proper venting of the pump chamber (tank).~~

The plumbing from the home to the interceptor tank is the responsibility of the property owner. The City will service and maintain all equipment excepting that which is mentioned above after the warranty period of one year has expired.

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 customer's notification in the event of an alarm, power outage, or other abnormal condition~~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, power outage, or if the customer ~~has disables~~-disabled the alarm.

#### 7E.020 Design Standards

The design of any S.T.E.P or grinder sewer system shall conform to City standards and any applicable standards as set forth herein and in Sections 3.010, 3.040 and 7A.010.

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 or grinder service boxes shall be located at the corner of the lot opposite the water meter. ~~S.T.E.P-service~~-Service boxes shall not be installed in driveways.

The largest S.T.E.P. tank accepted by City of Lacey shall be 8,000 gallon fiberglass as shown in the City of Lacey S.T.E.P. system requirement chart and the details at the end of this chapter.

Odor control measures shall be addressed on S.T.E.P/Grinder sewer systems as per 7D.080.

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" and this chapter of the Development Guidelines and Public Works Standards.

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 [and grinder](#) main terminations.

7E.025 ~~S.T.E.P.~~ Components and Testing

All S.T.E.P. pumping equipment shall comply with the City of Lacey/Oreco Certificate of Origin package. [No substitutions.](#)

[All grinder pump system equipment shall be provided as a packaged system manufactured by Environment One \(E-one\). No substitutions.](#)

Hydrostatic Leakage test shall begin when the tank is filled with water to two inches above base of tank riser. The test duration shall be two hours ~~(maximum allowable loss is one gallon. One gallon is 232.6 cubic inches or about 0.5 inches of depth in a 24 inch riser.)~~

Pressure tests between the pump chamber and the service box shall be 150 pounds per square inch for fifteen minutes. No leakage is allowed.

All electrical work shall be to National Electric Code (NEC) standards. The control box shall be located within three feet of the meter base or City approved location.

All underground wiring shall be a minimum #14 stranded wire for the float switches and a minimum #12 wire for the motor, color coded, in schedule 40 conduit, a minimum 18 inches deep, with warning tape in trench above conduit.

7E.030 Service Lateral Pipe and Building Sewer

- A. Service line: See City of Lacey S.T.E.P./[Grinder](#) 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 green or black with a green stripe, hi density ASTM D 3350, SDR 11 ~~3408~~[4710](#) socket or butt fusion welded. Services shall have a minimum 24 inches cover to top of pipe. Pressure services shall 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 (UPC) 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 UPC.
- 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

## SANITARY SEWER

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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 12 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 hi 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 Cepex Poly or KBI True Union 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 Spears True Union ball check Schedule 80 PVC. Valves shall have a working pressure of 200 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. 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. A Cepex GR 1100-SB, Cepex GR 1000-SB or Schedule 80 PVC assembly as shown in the details may be utilized.
- 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 [Green HDPE 1730 with solid flush cover](#). ~~E. For large or community type service.~~

Traffic Areas:

- ~~Midstates Plastics BCF 1419SL. For single family service.~~
- ~~Midstates Plastics~~ [Carson BCF Heavy wall 1730 with ductile iron lid](#). ~~SL 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 and effluent filters. Tanks shall use Orenco flanged tank adapters cast into the concrete for the 8 inch, 24 inch and 30 inch openings to allow positive attachment of the risers. 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~~3 feet in depth shall be designed for the following loading conditions:

- A. Top of tank 400 pounds per square foot.

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- 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~~ Tanks located where a vehicle might be driven over them will require special consideration and must be traffic rated. 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 shall 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. Fibrous re-bar substitutions such as Novomesh will not be allowed or approved.

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 inches 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 prior to the sewer details in this section. 1500 gallon fiberglass tanks shall be Orenco Model #T1500-23-19/19-11 only. 8000 gallon fiberglass tanks for small community systems shall be Xerxes Inc. or Containment Solutions Inc. or approved equal and shall meet the following specification:

Single-wall fiberglass septic tanks approved for use in the City of Lacey shall meet UL 1316 and ASTM D4021 specification.

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 shall be removed or abandoned per DOH and/or county requirements.

Connection of the PVC inlet and the outlet pipe shall be made with Epoxy coated Romac 501 flexible coupler or Ford Ultraflex. Fernco type coupler with hose clamp connections shall not be installed.

## SANITARY SEWER

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The tank gallon size used shall be determined by the City of Lacey S.T.E.P. System Requirement Chart and details 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 shall 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 (approx. 7 feet ) for a 2 hour period. Water loss during the test shall not exceed 1 gallon.

### 7E.070 Tank Risers and Lids

Pump chamber risers shall be 8, 24 or 30 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 inch diameter. Clean outs or inspection ports between compartments on 1,500 and 3,000 tanks shall be 8 inch diameter. Pump chamber risers shall be 30 inch diameter. 3,000 and 1,500 gallon tank riser height shall not exceed 48 inch from top of tank to finished grade. All tank riser lids shall be set to grade for maintenance access.

No shrubs, bushes, ground cover or trees shall be planted within a 3' radius of the tank lids. Small community system tank riser height shall not exceed 96 inches 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. S.T.E.P. tank splice boxes shall be Orenco model SBEX 1-4.
- C. 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 flanged tank adapter 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. 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. 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. Attachment of Orenco riser to PRTA tank adapters, FRTA tank adapters and fiberglass tank adapters shall be done using OSI ADH100 adhesive or adhesive required by the tank manufacturer.

7E.080 Pumping Tank Equipment

S.T.E.P.- Pumps shall be UL listed for use in effluent. All pumping systems shall be Orenco Systems ~~Model OSI S-4000 Series~~ PF Series 4 High Head Pumping Assemblies ~~or approved equal~~. See City of Lacey S.T.E.P System Requirement Chart and City of Lacey/Orenco certified S.T.E.P. package requirements found in Appendix.

Grinder- Grinder pumps serving 2 or less EDU's shall be E-one model WH231. Systems serving 3-4 EDU's shall be E-one model WH472. Systems serving commercial sites will be sized on a case-by-case basis and may require explosion proof rated pumps.

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

7E.090 Control Panel Power

See details at the end of this chapter for control panel location requirements. ~~Single family and duplex family S.T.E.P. control~~ Control panels for single family and duplex applications 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 the small community systems shall be a free standing stainless steel enclosure mounted on a concrete pad at the pump tank site. See detail at the end of this chapter for all applicable requirements.

~~If S.T.E.P.~~Where 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.~~pump 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.

~~S.T.E.P. system Wiring~~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 Orenco/City of Lacey Certificate of Origin package requirements. Connections in the riser junction box shall be installed as per the City of Lacey 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. Grinder pump wiring from the control panel to the grinder tank shall be as provided with the E-one package. All field wiring shall be installed in an electrical conduit, no splices allowed. The motor and control circuits will be merged as part of the inspection procedure and shall be no less than 50 mega-ohms before acceptance by the City.

#### 7E.095 Control Panels

- A. S.T.E.P. Control panels shall be Orenco Systems models as called out in the Orenco/City of Lacey Certificate of Origin Package for the size system being installed. Grinder pump control panels shall be E-one Sentry Protect Plus with GFCI receptacle and generator receptacle as noted in the details at the end of this chapter. Control panel boxes shall not be painted. The control panel and riser junction box shall be dry and clean before acceptance.
1. 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.
  2. ~~When required, the Thurston County A~~ disconnect switch shall be mounted directly below the control panel of the single family and duplex family systems and shall be constructed as follows: ~~Hubbell Pro, Heavy duty 20A, 120-277 VAC Single Pole switch #4902-1 or approved equal. Thomas & Betts red dot Dry Tite device box #IH3-1-LM with Bell weather proof cover, Rayntite #5031-0, Single Gang aluminum pad lockable cover.~~

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SANITARY SEWER

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S.T.E.P.- Disconnect box shall be Bryant 30100 N-1 enclosure with Bryant 20A 600V 2-pole switch #30002-D.

Grinder- Disconnect box shall be Bryant 30100 N-1 enclosure with Bryant 30A 600V 3-pole switch #30003-D.

~~2. S.T.E.P. panel Disconnect box shall be Bryant 30100 N-1 enclosure with Bryant 30 amp 600V 3 pole switch #3003-D.~~

**Comment [b1]:** Ed, check this, I've got more than one version in my notes.

SANITARY SEWER

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