

Chapter 7

WASTEWATER

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7A GENERAL CONSIDERATIONS

7A.010 General

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

Any extension of Olympia's sanitary sewer system must be approved by the [Community Planning and Development Department](#) and must conform to the current [City of Olympia Wastewater Management Plan](#), [Thurston County Health Department](#), [Department of Ecology \(DOE\)](#), and [Washington State Department of Health \(DOH\)](#) requirements.

See [Chapter 2](#) for definitions of specific sewers. Maintenance of a private sewer, building, or side sewer will be the responsibility of the property owner. Maintenance of the lateral to and including the point of connection to the sewer main will be the responsibility of the property owner.

7A.020 Sanitary Sewer/Water Main Crossings

See [Chapter 6, Section 6.130](#) for requirements regarding sewer and water separation.

7A.030 Staking

All surveying and staking will be performed by an engineering or surveying firm capable of performing such work and possessing the appropriate business licenses. The engineer or surveyor directing such work will be licensed by the State of Washington.

A preconstruction meeting will be held with the City prior to commencing staking. All construction staking will be inspected by the City prior to construction, and staking will be maintained throughout the construction.

The minimum staking of sewer lines will be as follows:

- A. Centerline alignment must be staked with cuts and/or fills to flow line at 25 feet and 50 feet from the manhole or structure and every 50 feet from there on, unless more frequent staking is required for construction at the discretion of the City Inspector.

- B. Manholes must be staked with hubs to include invert elevations of all pipes and top-of-rim elevations to finished grade.
- C. Location of valves, fixtures, and septic tank will be staked for force mains and STEP systems.

7A.040 Trench Excavation

See [Chapter 6, Section 6.160](#) for requirements regarding trench excavation.

7A.050 Backfilling

See [Chapter 6, Section 6.170](#) for requirements regarding backfilling.

7A.060 Street Patching and Restoration

See [Chapter 4, Sections 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 will apply to each type of construction:

A. Gravity Sewer

1. After the pipes have been cleaned, the gravity sewer pipe will be subject to a low-pressure air test pursuant to the current [WSDOT/APWA specifications](#). The contractor will furnish all equipment and personnel for conducting the test under the observation of the City Inspector. The testing equipment will be subject to the approval of the City.

The contractor will make an air test for his own purposes prior to notifying the City to witness the test. The air test for acceptance will be made after the trench is backfilled and compacted and the roadway section is completed to subgrade.

All wyes, tees, and end-of-side sewer stubs will be plugged with flexible joint caps, or acceptable alternates, securely fastened to withstand the internal test pressures. Such plugs or caps will be readily removable and

their removal will provide a socket suitable for making a flexible, jointed lateral connection or extension.

2. Testing of the sewer main will include a television inspection by the City. The television inspection shall be conducted at the applicant's expense. All television inspection shall be performed in accordance with the City's Sewer Television Inspection and Assessment Services Specifications.

Under special conditions, when approved on a case-by-case basis by the City Engineer, contractors may be permitted to perform the television inspection under the direct supervision of City personnel.

Any additional televising that is deemed necessary may be addressed in either of two manners: At the City's discretion, the contractor can have the City perform the work and reimburse the City for all associated labor and materials; or the contractor may perform the inspection under direct supervision of City personnel. Television inspections performed without City personnel present will be deemed invalid and will be repeated at the contractor's expense. Television inspection will be done after the air test has passed, the manhole has been channeled, and before the roadway is paved. Immediately prior to a television inspection, enough water will be run down the line so it comes out the lower manhole and the line is flushed clean.

Acceptance of the line will be made after the television inspection record has been reviewed and approved by the inspector. Any tap to an existing system needs to be televised at the applicant's expense.

The City will televise the new line during periods of high groundwater within the first two years after construction and acceptance of the line. Any conditions resulting in inflow and infiltration (I & I) will be considered a system failure that will be repaired by and at the expense of the contractor.

3. A vacuum test of all manholes is required prior to acceptance. The structure will be tested in accordance with [ASTM-C 1244-93](#). This test method covers procedures for testing cast in place or precast concrete manhole sections using the vacuum test method to demonstrate the integrity of the installed materials and the construction procedures.

Testing will be done in the following manner:

- a. All lift holes and pipes entering into the manhole will be plugged, taking care to securely brace each plug from being drawn into the structure.

- b. The test head will be placed at the top portion of the structure in accordance with the manufacturers' recommendations.
- c. A vacuum of 10 inches of mercury will be drawn on the manhole, the valve on the vacuum line of the test head closed, and the vacuum pump shut off. With the valves closed, the time will be measured for the vacuum to drop by 1 inch to 9 inches. The manhole will pass the vacuum test if the time is greater than the time shown in [Table 1](#).
- d. If the manhole fails the initial test, necessary repairs will be made by an approved method. The structure will then be retested until a satisfactory test is obtained.
- e. If the manhole joint is displaced during the vacuum test, the manhole will be disassembled, the seal replaced, the structure reassembled, and retested until compliance is obtained.
- f. Testing can be done either before or after backfill operations around the structure; however, if during backfill operations it is found that the structure has been disturbed and it is suspected that the integrity of the joint has been compromised, retesting will be required.
- g. All other requirements stipulated in Section 7-05 of the latest edition of the [Washington State Department of Transportation's Standard Specifications for Road, Bridge and Municipal Construction](#) that has been adopted by the City will also be adhered to for final acceptance of the manhole structure.

Table 1 below gives allowable time loss in seconds; i.e., test section is acceptable if vacuum does not drop below 9 inches until after the times shown below have expired.

Table 1: Minimum Test Times for Various Manhole Diameters

Depth (ft)	Diameter in Inches								
	30	33	38	42	48	54	60	66	72
	Time in Seconds								
8	11	12	14	17	20	23	26	29	33
10	14	15	18	21	25	29	33	36	41
12	17	18	21	25	30	35	39	43	49
14	20	21	25	30	35	41	48	51	57
16	22	24	29	34	40	46	52	58	67
18	25	27	32	38	45	52	59	65	73
20	28	30	35	42	50	53	65	72	81
22	31	33	39	46	55	64	72	79	89
24	33	36	42	51	59	64	78	87	97
26	36	39	46	55	64	75	85	94	105
28	39	42	49	59	89	81	91	101	113
30	42	45	53	63	74	87	98	108	

4. A mandrel test in accordance with Section 7-17.3(2)(G) of the [WSDOT/APWA Standard Specifications](#) will be performed by and at the expense of the contractor on all sewers except laterals as defined in [Chapter 2](#) of these standards when televising reveals a possible defect or belly in the pipe.
5. Any time that testing reveals problems that lead to repairs by the contractor, the City may require complete retesting of the entire system that was repaired. This work will be required to ensure that the integrity of the system was not compromised during the repair work.

B. Force Main

1. Prior to road construction, the backfilled pressure line will be subjected to a hydrostatic pressure test. The pressure test shall be pursuant to Section 7-09.3(23), Hydrostatic Pressure Test, in the [WSDOT Standard Specifications for Road, Bridge and Municipal Construction](#). Any leaks or imperfections developing under said pressure will be remedied by the contractor. The pressure test will be maintained while the entire installation is inspected.

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

2. A water test for all wet wells in accordance with the manhole water test for gravity sewer will be required.
3. Verification of operating parameters such as pump operation, alarms, and an electrical inspection is required prior to acceptance of all lift stations. Upon request, the City will provide a final inspection checklist for all pump station components. All testing shall be performed in the presence of a City Inspector and a representative from the Public Works Department.

C. STEP/Grinder Pressure Main System

1. The pressure mainline and service lines will be subject to a hydrostatic pressure test. The pressure test shall be pursuant Section 7-09.3(23), Hydrostatic Pressure Test, in the [WSDOT Standard Specifications for Road, Bridge and Municipal Construction](#). The test shall be modified as follows: The hydrostatic pressure shall equal 100 psi in excess of operating pressure or in no case shall the test pressure be less than 200 psi. Any leaks or imperfections developing under said pressure will be remedied by the contractor. The pressure test will be maintained while the entire installation is inspected.

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

2. A water test of the septic, STEP, or grinder tank at the factory and on-site after installation is required in accordance with the criteria outlined in [Section 7E.060](#). The contractor will perform the test and supply all necessary equipment and materials. The testing will be conducted in the presence of a City Inspector.
3. Verification by City Inspector of all operating parameters, such as pump operation and alarms, and an electrical inspection is required prior to acceptance of any STEP system installation. Upon request, the City will provide a final inspection checklist for all STEP and grinder system components. All testing shall be performed in the presence of a City Inspector and a representative from the Public Works Department.

7A.080 General Notes

The General Notes on the following pages will be included on any plans dealing with sewage system design. In addition, the specific notes pertaining to gravity sewers, STEP systems and lift stations and force mains will be included when these utilities are part of the project.

GENERAL NOTES (SANITARY SEWER MAIN INSTALLATION) (TO BE PRESENT ON ALL SUBMITTALS)

1. All workmanship and materials will be in accordance with City of Olympia standards and the most current copy of the [State of Washington Standard Specifications for Road, Bridge and Municipal Construction](#) (WSDOT/APWA).
2. City of Olympia datum shall be used for all vertical control. A list of benchmarks is available from the [Public Works Department](#).
3. All approvals and permits required by the City of Olympia shall be obtained by the contractor prior to the start of construction.
4. If construction is to take place in the county right-of-way, the contractor shall notify the county and obtain all the required approvals and permits.
5. A preconstruction meeting shall be held with the City of Olympia Construction Inspector prior to the start of construction.
6. The City of Olympia Construction Inspector shall be notified a minimum of 48 hours (two working days) in advance of a tap connection to an existing main. The Inspector shall be present at the time of the tap.
7. The contractor shall be fully responsible for the location and protection of all existing utilities. The contractor shall verify all utility locations prior to construction by calling the [Underground Locate Line](#) at 1-800-424-5555 a minimum of 48 hours (two working days) prior to any excavation.
8. All sewer mains shall be field staked for grades and alignment by a licensed engineering or surveying firm qualified to perform such work. Staking shall be maintained throughout construction.
9. All pipe and services shall be installed with continuous tracer tape installed 12 inches to 18 inches under the proposed finished subgrade. The marker shall be plastic non-biodegradable metal core or backing, marked "sewer" that can be detected by a standard metal detector. If visibility cannot be maintained between structures along the straight alignment of a sewer,

toning wire shall be installed above the sewer line at a depth no greater than 48 inches.

If toning wire is required, it shall be green, UL listed, Type UF, 14-gauge copper taped to the top of the pipe to prevent movement during backfilling. The wire shall be laid loosely enough to prevent stretching and damage. The wire shall be wrapped to manhole or cleanout rings on gravity sewers or valve body on STEP mains and force mains.

A 1-pound magnesium anode shall be buried with the pipe every 1,000 linear feet maximum for cathodic protection of the wire. Toning wire splices and connections to anodes shall join wires both mechanically and electrically and shall employ epoxy resin or heat-shrink tape insulation. Toning wire shall be tested prior to acceptance of the pipe system. A written notice from the contractor to the City two days prior to the test is required. On a curvilinear sewer, the wire shall be brought up, bared, and wrapped three times around the manhole ring. Tape shall be Terra Tape "D" or approved equal. The tape and wire shall be furnished and installed by the contractor.

10. Bedding of the sewer main and compaction of the backfill material shall be required in accordance with the above-mentioned specification (See [General Note 1](#)).
11. All manholes or cleanouts outside the paved area shall be installed in accordance with Standard Drawings 7-3 and 7-5.
12. When temporary street patches are allowed by the City, cold mix asphalt shall be placed and compacted to a maximum depth of 2 inches. Contractor shall be responsible for maintenance as required by the City.
13. Erosion control measures conforming to the requirements of the [Drainage Design and Erosion Control Manual for Olympia](#) shall be taken by the contractor during construction to prevent infiltration of existing and proposed storm drainage facilities and roadways.
14. The contractor shall be responsible for all traffic control in accordance with the [Manual on Uniform Traffic Control Devices \(MUTCD\)](#) as required. Prior to disruption of any traffic, the City shall approve traffic control plans prepared and submitted by the contractor. No work shall commence until all approved traffic control is in place.
15. It shall be the responsibility of the contractor to have a copy of the approved construction plans on site at all times.

16. Any changes to the design shall first be reviewed and approved by the developer's project engineer and the City Engineer.
17. After backfilling, but prior to paving, all mains and appurtenances shall be inspected and approved by the City of Olympia Construction Inspector. Approval does not constitute final acceptance of the sewer line. The contractor shall retain the responsibility to repair all deficiencies and failures revealed during all required testing for acceptance and through the duration of the warranty. It shall be the contractor's responsibility to notify the City of Olympia for the required inspections. Any main or appurtenance backfilled prior to inspection shall be re-excavated for inspection.
18. All safety standards and requirements shall be complied with as set forth by [OSHA](#), [WISHA](#) and [Washington State Department of Labor and Industries](#).

GRAVITY SEWERS

1. Gravity sewer mains will meet the following:
 - A. PVC pipe conforming to [ASTM](#) D 3034 SDR 35, ASTM F 794, or ASTM F 679 Type 1 with joints and gaskets conforming to ASTM 3212 and ASTM F 477.
 - B. When approved for use, ductile iron pipe shall conform to [ANSI](#) A 21.51 or [AWWA](#) C151 and shall be mortar-lined, push-on joint, or mechanical joint. The ductile iron pipe shall be Class 50. Joints for ductile iron pipe shall be rubber gasketed, conforming to the requirements of ANSI A 21.11 or AWWA C111.
2. Precast manholes will meet the requirements of ASTM C478. Manholes will be Type 1-48 inches unless otherwise specified on the plans. Joints will be rubber gasketed, conforming to ASTM C443 and will be grouted from the inside. Lift holes will be grouted from the outside and inside of the manhole. ([See General Note 1.](#))
3. Side sewer services will be PVC, ASTM D 3034 SDR 35 with flexible gasketed joints. Side sewer connections will be made by a tap to an existing main or a wye branch from a new main connected above the springline of the pipe. Side sewer services will be installed according to applicable standard detail(s).
4. All lines will be high-velocity cleaned and subjected to a low-pressure air test pursuant to current [WSDOT/APWA Specifications](#) after backfilling, but prior to paving (see [General Note 1](#)). Hydrant flushing of lines is not an acceptable cleaning method. Testing of the sanitary sewer main will include television inspection of the main by the City at the expense of the

contractor. Immediately prior to television inspection, enough water will be run down the line so it comes out the lower manhole and the line is flushed clean. Acceptance of the line will be made after the television inspection record has been reviewed and approved by the inspector. Additional television inspections will be at the expense of the contractor. At the City's discretion, the contractor can have the City perform the additional television inspection and reimburse the City for all associated labor and materials; or the contractor may perform the television inspection under the direct supervision of the City. A test of all manholes in accordance with Olympia standards is also required. Testing will take place after all underground utilities are installed and compaction of the roadway subgrade is completed.

STEP

1. All buried power for STEP systems will be installed with continuous tracer tape installed 12 inches above the buried power. The marker will be plastic non-biodegradable metal-core backing marked "power." Tape will be furnished by contractor.
2. All STEP mains will be hydrostatically tested at 100 PSI over operating pressure and in no case less than 200 psi according to the methods for hydrostatic testing of water lines in the current version of the [WSDOT/APWA Specifications](#). All materials and labor will be provided by the contractor. In addition, all STEP mains will be pigged in the presence of the City Inspector prior to placing the STEP main in service.

LIFT STATION AND FORCE MAIN

1. All workmanship, materials and testing shall be in accordance with the most current [WSDOT/APWA Standard Specifications for Road, Bridge and Municipal Construction](#), [National Electrical Code](#), [National Fire Code](#) and City of Olympia Development Guidelines unless otherwise specified below. In cases of conflict the most stringent standard shall apply. When the most stringent standard is not clear, the City Engineer will make the determination. The Electrical Contractor shall be familiar with all above stated publications and guidelines as they will be strictly enforced by the City.
2. A pre-construction meeting shall be held with the City of Olympia Construction Inspector prior to the start of construction.
3. Any changes to the lift station or force main design shall first be reviewed and approved by the project engineer and the City of Olympia.

4. 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.
5. Prior to backfill, all mains, dry well, wet well and vaults shall be inspected and approved by the City of Olympia 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 Olympia for the required inspections.
6. All work shall be done per [National Electrical Code \(NEC\)](#) and The City of Olympia Standards. The City of Olympia Standards may exceed the NEC. The Developer shall obtain all permits and arrange inspections.
7. 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 lift stations serving commercial properties or developments.
8. Prior to testing and start-up of the lift station, five (5) copies of the Operation and Maintenance Manual, together with the number of approved copies required by the Developer, shall be submitted to the City for review and approval.
9. The Developer, at its own expense, with the Design Engineer, shall arrange for an authorized factory-trained representative of the company or companies supplying the various items of equipment to check the installation, and to adjust and test the equipment furnished before the acceptance of the work by the City. The factory representative shall be responsible to check and resolve any unacceptable vibration of the pump assemblies. Furthermore, the Developer shall assist and instruct the City's operating staff in adjusting and operating the equipment during the initial start-up period. Said representative shall be experienced and knowledgeable of the equipment being tested.
10. The Developer at its own expense shall conduct an instruction program for up to five (5) personnel designated by the City. Developer shall furnish the services of qualified instructors from the various equipment manufacturers. Program shall include instruction covering basic system operation theory, routine maintenance and repair, and "hands on" operation of equipment. Training shall not proceed until all Operation Maintenance Manuals are complete and accepted by the City.
11. All equipment shall be tested and Developer shall demonstrate to City personnel that proper operation and capacity have been fully obtained.

The City will not accept any facility until successful full operation of all components has been demonstrated by the Developer.

12. It is the Developer's responsibility to construct and start-up a complete and trouble-free system. The Developer shall be responsible for correcting all design errors and/or construction defects that are discovered in the start-up or during the warranty period of the agreement with the City.
13. Developer shall give initial lubrication to all equipment as required by the part or component manufacturer.
14. Wet well shall have safety net installed under hatch opening prior to start up and acceptance.
15. Lift station and generator, site, driveway, access, concrete areas, lighting and water service shall all be completed prior to start up request and inspection.
16. Generator and fuel storage tank shall be mounted on concrete pad. Generator shall have weather-proof, sound dampening enclosure, or approved wooden shed, block heater, battery charger, auto exerciser, radiator louvers or protection. See [Section 7D.040](#).
17. Telemetry shall consist of a RUGID PLC and other accessories listed in [Section 7D.030](#). Prior to ordering the above equipment, the developer will contact the [Pump Stations Supervisor](#), City of Olympia Public Works, for complete ordering specifications for the above telemetry. Nominal lead time is 12 weeks.
18. Spare parts shall be provided for the station at time of startup acceptance.
 - One set mechanical seals, filters and Vulute gaskets.
 - One set of pump wear rings.
 - Four sets of Operation and Maintenance Manuals.
 - A list of the nearest dealers for spare parts and repair will be provided. Additionally, any special tools specific to the pump manufacturer shall be provided to the City of Olympia at startup.
19. A 6-inch thick concrete collar shall be installed around all valves. [Standard Drawing 6-12](#), Standard Valve Box, detail shall be used.
20. All force main will be installed with continuous tracer tape installed 12 inches to 18 inches under the proposed finished subgrade. In addition to the tracer tape, UL listed, Type UR, 14-gauge coated copper green toning (tracer) wire will be installed over all force main pipe. Toning wire will be taped to the top of the pipe to prevent movement during backfill. The wire will be laid loosely enough to prevent stretching and damage. The wire will

be brought up and tied off at valve body or at the location within dry well approved by the City Inspector.

A 1-pound magnesium anode will be buried with the pipe every 1,000 linear feet maximum for cathodic protection of the wire. Toning wire splices and connections to anodes will join wires both mechanically and electrically and will employ epoxy resin or heat-shrink tape insulation. Toning wire will be tested prior to acceptance of the pipe system. A written notice from the contractor to the City two days prior to the test is required.

21. All force mains shall be hydrostatic tested according to the methods for hydrostatic testing of water lines in the current version of the [WSDOT/APWA Specifications](#). In addition, all force mains shall be pigged in the presence of the City Inspector prior to placing main in service.

7B GRAVITY SEWER

7B.010 General

All sewers will be designed as a gravity sewer whenever physically and/or economically feasible or as outlined in the Sewer Disposal Master Plan.

7B.020 Design Standards

The design of any sewer extension/connection will conform to City Standards, [Department of Ecology's Criteria of Sewage Works Design](#) (most current edition), and any applicable standards as set forth herein.

The layout of extensions will provide for the future continuation of the existing system as determined by the City. 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. Sewer lift stations shall be designed and located to optimize the service area to provide regional service. Temporary or interim lift stations will not be permitted. See [Chapter 3](#) for utility extension information.

New gravity sewer systems will be designed on the basis of an average daily per capita flow of sewage of not less than 100 gallons per day. See [Table 2, Criteria for Sewage Works Design](#). This figure is assumed to cover normal infiltration, but an additional allowance will be made where conditions are unfavorable. Generally, laterals and submain sewers should be designed to carry, when running full, not less than 400 gallons daily per capita

contributions of sewage. When a deviation from the foregoing per capita rates is requested, in addition to the criteria described in [Section 1.050](#), a description of the procedure used for sewer design will be included in the submittal to the City Engineer for review and approval.

The minimum size for submains and mains will be 8-inch nominal diameter. The minimum size for a lateral within the street right-of-way will be 6 inches. See definitions in [Chapter 2, Section 2.020](#).

Table 2: Criteria for Sewage Works Design
Source: Washington State Department of Ecology

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 with showers and cafeteria	per person	16	0.04	0.04	8
Schools without showers and with 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
Interstates 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-hour shift	15-35	0.03-0.07	0.03-0.07	Operating Period
Shopping centers	per 1,000 square feet 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 square feet	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 and night, with limited plumbing	per campsite	50	0.05	0.05	24
Luxury camps with flush toilets	per campsite	100	0.1	0.1	24

7B.030 Main Line Gravity

- A. Main line sewers, unless otherwise approved by the City Engineer, will be constructed using materials conforming to one of the following:
1. PVC pipe, 6-inch to 15-inch diameter, must meet either [ASTM D 3034](#), SDR 35 solid wall pipe or ASTM F 794 for solid seamless profile pipe.
 2. PVC pipe, 18-inch to 27-inch diameter, will conform to ASTM F 679 Type 1 only.

All joints for PVC pipe will conform to ASTM D 3212 with rubber gaskets conforming to ASTM F 477. Ribbed pipes will not be allowed for use in the sanitary sewer system.

- B. Gravity sewer will maintain a minimum depth of 5 feet, unless otherwise approved, to provide gravity service to adjoining parcels, adequate head room within manholes for maintenance personnel, future areas to be served, and vertical clearance between water and sewer lines. Actual depth will be determined by slope, flow, velocity, and elevation of existing system.
- C. All building sewer connections to the main will be made with a sanitary tee (wye) connection. A cleanout assembly will be provided at the edge of the right-of-way, as shown in Standard Drawing 7-19, for all new and rehabilitated sewer laterals. Backflow prevention devices will be provided as required by the most recent edition of the U.P.C. All new mains connecting to existing mains, if not made at an existing manhole, will require the installation of a new manhole.
- D. All sewers will be designed and constructed to give mean velocities, when flowing full, of not less than 2.0 feet per second based on Manning's formula using an "n" value of 0.013. Use of other practical "n" values may be permitted by the City if deemed justifiable on the basis of research or field data submitted. The following minimum slopes should be provided; however, slopes greater than these are desirable.

Table 3: Sewer Size and Minimum % Slope

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

Under special conditions, slopes slightly less than those required for the 2.0 feet per second velocity may be permitted by the City Engineer. Such decreased slopes will only be considered where the depth of flow will be 30 percent of the diameter or greater for design average flow. Whenever such decreased slopes are proposed, the design engineer will furnish with the plans his/her computations of the depths of flow in such pipes at minimum, average, and daily or hourly rates of flow. Larger pipe size will not be allowed to achieve lesser slopes.

Sewers will be laid with uniform slope between manholes. The allowable tolerance for sags or bellies in a newly installed pipe shall be 0.5 inches or less.

- E. Gravity sewers will be designed with straight alignment between manholes. All pipe and services will be installed with continuous tracer tape installed 12 inches to 18 inches under the proposed finished subgrade. The marker will be plastic, non-biodegradable metal core or backing, marked “sewer” that can be detected by a standard metal detector. Tape will be Terra Tape “D” or approved equal. If visibility cannot be maintained between structures along the straight alignment of a sewer, toning wire will be installed above the sewer line at a depth no greater than 48 inches.

If toning wire is required, it will be green, UL listed, Type UF, 14-gauge copper taped to the top of the pipe to prevent movement during backfilling. The wire will be laid loosely enough to prevent stretching and damage. The wire will be wrapped to manhole or cleanout rings on gravity

sewers or valve body on STEP mains and will be accessible from ground level.

A 1-pound magnesium anode will be buried with the pipe every 1,000 linear feet maximum for cathodic protection of the wire. Toning wire splices and connections to anodes will join wires both mechanically and electrically and will employ epoxy resin or heat-shrink tape insulation. Toning wire will be tested prior to acceptance of the pipe system. A written notice from the contractor to the City two days prior to the test is required. On a curvilinear sewer, the wire will be brought up, bared, and wrapped three times around the manhole ring.

7B.040 Connection to Existing System

- A. At connection to existing system, all new sewer connections will be physically plugged until all tests have been completed and the City approves the removal of the plug.
- B. Connection of new pipelines to existing manholes will be accomplished by using cored holes drilled for the connection. The transition of connecting channels will be constructed so as not to interrupt existing flow patterns. All connections will utilize Kor-N-Seal fittings.
- C. Connection of a pipeline to a system where a manhole is not available will be accomplished by pouring a concrete base and setting manhole sections. The existing pipe will not be cut into until approval is received from the City.
- D. Connections to manholes requiring a drop will follow the criteria as outlined in Section 7B.050.
- E. Connections where an existing stub-out is not available or where a new building sewer is the same size as the existing main will be accomplished by the installation of a new manhole.
- F. Taps will be done by use of a core drill and will not be allowed to protrude into the existing main. A City Inspector will be notified 48 hours (two working days) prior to any tap of a city sewer and will be present to witness the tap. The inspector will collect all tapping cores from the contractor or will be informed if the cores were washed into the sewer.

7B.050 Manholes

Precast manholes will meet the requirements of [ASTM C 478](#) with either a precast base or a cast-in-place base made from 4,000 psi structural concrete. Manholes will be Type 1, 48-inch diameter minimum. The minimum manhole frame opening will be 24 inches. Joints will be rubber gasketed, conforming to ASTM C 443 and will be grouted from the inside. Lift holes will be grouted from the outside and inside of the manhole. Manholes constructed of other materials may be approved by the City Engineer, provided they meet the requirements of Chapter C1 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 Standard Drawings 7-1 and 7-2 for details.

Eccentric manhole cone will be offset so the manhole cover will not be located in the tire track of a travel lane.

Manhole frames and covers will be cast iron casting marked "Sewer," conforming to the requirements of ASTM A-30, Class 25, and will be free of porosity, shrink cavities, cold shuts or cracks, or any surface defects that would impair serviceability. Repairs of defects by welding or by the use of smooth-on or similar material will not be permitted. Manhole rings and covers will be machine-finished or ground-on seating surfaces so as to assure a nonrocking fit in any position and interchangeability. Manholes located in areas subject to inflow will be equipped with East Jordan Watertite castings or approved equal.

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

All castings will be coated with a bituminous coating prior to delivery to the job site.

Safety steps will be fabricated of polypropylene conforming to an [ASTM D-4101](#) specification, injection molded around a 2-inch ASTM A-615, Grade 60, steel reinforcing bar or hot dipped galvanized bar with antislip tread. Steps will project uniformly from the inside wall of the manhole. Steps will be installed to form a continuous vertical ladder with rungs equally spaced on 12-inch centers.

Manholes will be provided at a maximum of 400-foot intervals, at intersections and at changes in direction, grade, or pipe size.

Slope through the manhole will be a minimum 1/10 of 1 foot from invert in to invert out, unless otherwise approved by the City Engineer.

Where a smaller sewer joins a larger one, the invert of the larger sewer should be lowered sufficiently to maintain the same energy gradient. An approximate method for securing these results is to place the 80 percent depth point of both sewers at the same elevation.

Pipe material will be consistent between manholes. Straight grades between invert out of last manhole and connection to existing are preferred over drops whenever possible. Care must be taken when designing steep grades so as not to create a situation of excessive velocity or excavation. Grade changes associated with “sweeps” will not be allowed.

The angle between the line(s) entering a manhole and the line leaving will be no less than 90 degrees.

An outside drop connection will 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 will be filleted to prevent solids deposition.

All manholes that are to be owned and maintained by the City will be accessible at all times to operations and maintenance equipment and vehicles. At the discretion of the City Engineer, access drives may be required to provide a sufficient driving surface for City vehicles.

Inside drop connections will only be allowed when approved by the City Engineer. When approved, inside drops shall not exceed 8 inches in diameter and shall include a RELINER Inside Drop Bowl or approved equivalent.

Outside drop structures will be constructed pursuant to [Standard Drawing 7-4 \(Chapter 7 Drawings\)](#).

Manhole sizing will be determined by the following criteria:

A. 48-inch Manhole

1. Two connecting pipes, 8-inch to 12-inch diameter.
2. Three connecting pipes, 8-inch to 10-inch diameter, perpendicular.
3. Four connecting pipes, 8-inch diameter, perpendicular.

B. 54-inch Manhole

1. Two connecting pipes, 8-inch to 12-inch with more than 45° deflection.
2. Three connecting pipes, 10-inch to 12-inch diameter, perpendicular.
3. Four connecting pipes, 10-inch to 12-inch diameter, perpendicular.

C. 60-inch Manhole

1. Two connecting pipes, 15-inch to 18-inch diameter with less than 45° deflection.
2. Three connecting pipes, 15-inch diameter, perpendicular.
3. Four connecting pipes, 15-inch diameter, perpendicular.

In the above criteria, “deflection” refers to the angle between any two pipe channels in the manhole.

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

The above configurations will provide adequate shelves and room for maintenance and TV inspections.

7B.060 High-Velocity Protection

Where velocities greater than 15 feet per second are expected, special provisions such as thrust blocking, pipe anchors, and piping materials will be made to protect against displacement by erosion and shock and the presence of hydrogen sulfide gas.

7B.070 Cleanouts

Cleanouts are not an acceptable substitute for manholes; however, they may be used in lieu of manholes at the end of 8-inch-diameter lines of not more than 150 feet in length. Location of cleanout for building sewers are governed by the *Uniform Plumbing Code* as adopted.

Cleanouts on large diameter pipes are acceptable as a temporary structure for pipe lengths less than 150 feet. Requests for large diameter cleanouts will only be considered on the sewer lines that will be extended in the future. At no

time will a cleanout be substituted where a manhole is required as defined in [Section 7B.050](#).

All cleanouts in City right of way will be extended to grade. See Standard Drawing 7 5.

7B.080 Building Sewer

A building or side sewer refers to the extension from a building sewer beginning 5 feet outside the outer foundation wall at the structure to the sanitary sewer main. Building sewers from the main to the right-of-way line will be minimum 6-inch diameter.

Each separate building will be served by an individual building sewer. In addition, both units of duplexes will be served by separate laterals. Maintenance of the building sewer, up to and including the connection point at the sewer main, will be the responsibility of the property owner.

Prior to connection of a building sewer to the public sewer, a connection permit must be obtained from the City. Materials and design criteria for a building sewer are covered by the *Uniform Plumbing Code* (UPC) as adopted. Inspection of the building sewer from 5 feet outside the structure to the sewer main will be the responsibility of the [Community Planning and Development Department](#) Inspectors.

7B.090 Request for City Ownership of Private Sewers

The owner(s) of a private sewer system, as defined in [Chapter 2](#), Building Sewers and Laterals Excluded, may request the City to assume ownership of a private system. The procedure for this request is as follows:

- A. The owner will submit a written request to the Community Planning and Development Department identifying the private sewer system to be considered.
- B. The Community Planning and Development Department will process and review the request, analyze the system record drawings, and evaluate the public benefit received from City assumption of the private system.
- C. If the result of the private sewer system analysis shows City assumption provides public benefit, testing of the sewer will be conducted at the expense of the owner(s) of the private sewer. All tests applicable to new sewers will be performed (refer to [Section 7A.070](#)). If it is determined that the public receives no benefit from the assumption of a private system, the

City will provide a letter denying the request with specific information stating the reason(s) for denial.

- D. If the result of the testing shows the system conforms to current City Standards, the City will provide a letter of acceptance with directions to the owner to provide the City with the appropriate transfer documents; i.e., bill of sale and easements if necessary.
- E. If the inspection reveals deficiencies with the system, the owner of the private system may elect to make the repairs specified by the City. After the owner notifies the City of the repairs, the City will retest the system to verify that the line conforms to current standards.

7C FORCE MAINS

7C.010 General

This section provides general information applicable to all force mains. Lift station force mains are addressed further in [Section 7D](#). STEP systems are addressed separately in [Section 7E](#). Grinder systems are addressed separately in [Section 7F](#).

7C.020 Design Standards

The design of any sewer extension/connection will conform to City standards, [Department of Ecology's Criteria of Sewage Works Design](#), and any applicable standards as set forth herein and in [Chapter 3](#), Sections 3.010 through 3.040.

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

The system will be designed at full depth of flow on the basis of an average daily per capita flow as shown on the table in [Section 7B.020](#). A coefficient of friction of 120 will be used for the Hazen-Williams "C" value, or 0.013 for Manning's "N" value.

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

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

Grinder system pressure mains shall not be combined with or connected to STEP pressure sewer mains. Grinder and/or STEP sewers may be allowed to connect to gravity sewer mains.

Minimum pressure sewer pipe size for lift stations shall be 4-inch diameter.

The applicable General Notes in [Section 7A.080](#) will be included on any plans dealing with pressure sanitary sewer design.

7C.030 Sewer Force Main

Sewer force mains, unless otherwise approved by the City Engineer, will be constructed using materials conforming to one of the following:

1. Pressure polyvinyl chloride (PVC) pipe shall be rigid plasticized PVC suitable for use as a pressure conduit for conveyance of domestic sewage. PVC pipe shall conform to the requirements of ASTM D2241, pressure class 200 or better. The PVC pipe shall be in a white or green hue, not blue, yellow, or orange. Joints for pipe and fittings shall use sewage-resistant synthetic rubber gaskets conforming to the requirements of ASTM F477.
2. Pressure high density polyethylene (HDPE) pipe and fittings shall be PE 3608 HDPE meeting cell classification 345464C for black per ASTM D3350. HDPE pipe shall be manufactured in accordance with ASTM F714 and AWWA C906 (IPS), with a minimum wall thickness of DR11.

7C.050 Air/Vacuum Valves

Air release valves and air/vacuum valves will be constructed as shown in Standard Drawing 7-8A and located at the high points of the line within a manhole or approved vault that provides 18 inches of clearance on all sides between the assembly and the walls. Air release valves will be fitted with an activated carbon canister as manufactured by Orenco Systems to prevent the release of disagreeable odors to the surrounding area. Grades will be designed to minimize the need for air/vacuum valves when practical. Vehicular access to valve is required for maintenance.

7C.060 Force Main Drain

Provisions to drain a force main to facilitate repairs or to temporarily remove force main from service will 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, with isolation valves on both sides of the tee along the main. A manhole will be set over the force main at the valved tee.

7C.070 Thrust Blocking

Location of thrust blocking will be shown on plans. Thrust block concrete will be Class B, 3000 psi, poured against undisturbed earth. A plastic barrier will be placed between all thrust blocks and fittings.

See Standard Drawings 6-14 and 6-15 in [Chapter 6](#). Restraining joint systems may be allowed in lieu of thrust blocking when designed by a licensed engineer and approved by the City Engineer. Restraining joint brand, type, and size will be specified on the plans.

7C.080 Force Main Termination

Hydrogen sulfide odors (H_2S) and the buildup of sulfuric acid (H_2SO_4) occur in the operation of a force main. To mitigate these conditions, some type of control method(s) will be used. This may include chemical addition at the pump station and/or near the terminus.

The abatement of odors attributable to pressurized sewer systems is an ongoing problem throughout the City of Olympia. Citizens, rightfully, have the expectation to live in an environment, by and large, free of sewer odors. Therefore, to mitigate odors, development must anticipate the provision of odor control method(s). At a minimum, a preliminary design for odor control equipment addressing the potential method(s) will need to be provided prior to permitting. Only proven technologies for the control of sewer odors will be approved by the City. The preliminary design will need to discuss the feasibility of the method(s) proposed, provide construction design for any components to be installed beneath the paved areas, designate location(s) for placement of equipment and provide an engineer's estimate for the cost of designing, installing and maintaining the proposed odor control methods. The developer shall enter into an agreement with the City of Olympia Public Works Director to design and install odor control equipment, should it become necessary. A bond or other allowable security in an amount equivalent to 125 percent of the value estimated for the design and installation of the odor control equipment will be required by the City to guarantee the provision of the odor control equipment, should it become necessary. The necessity for

installation of the odor control equipment will be predicated on whether complaints regarding odors are received from citizens and confirmed by City staff to be attributable to the pressurized sewer. The duration of the agreement and surety shall extend two (2) years beyond the occupation of seventy-five percent (75%) of the residences or commercial space served by the pressure sewer.

The outfall manhole (point of connection where force main discharges into gravity sewer) and the next downstream manhole on the gravity sewer will be lined with PVC to protect the system against corrosion. Spray-on coatings will not be accepted for new construction. The PVC lining will be cast into the walls and floor of the manhole. No exposed concrete will be permitted. All work will be done in accordance with manufacturer's recommendations and must be approved by the City. If a new outfall manhole and subsequent downstream structures are installed as part of the new system design, the configuration will be approved by the City. Spray-on coating of existing manholes, if approved by the City, shall be a [Spraywall system](#), including a moisture resistant primer coat. The downstream gravity sewer line pipe connecting these manholes will also be protected from the effects of hydrogen sulfide in a manner approved in writing by the City.

7D LIFT STATIONS

7D.010 General

All lift stations will be designed to serve the appropriate basin as identified in the Waste Management Plan or as determined by the City Engineer. All sewer lift stations shall be designed and located to optimize the service area to provide regional service. Temporary or interim lift stations will not be permitted. For basins that will serve more than 50 ERUs when fully developed to the zoned densities and that are unable to be served by gravity service, the Developer shall design and provide a lift station complying with the following minimum standards.

7D.020 Lift Station Design Report

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

area shall be the entire area which could be served by the installation of the lift station(s).

The design of any lift station will conform to City of Olympia standards, Department of Ecology's [Criteria of Sewage Works Design](#), Chapter C2 Sewage Pump Stations (most current edition), and applicable standards as set forth herein.

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

- Vicinity map and preliminary site plan layout
- Basin description, showing existing, new, and future planned development and improvement
- Analysis of existing flow, including I/I if there is flow data
- Population projection, flow projection, capacity requirements based on overall data collected
- Peaking factor (PF) from Battelle Laboratories Equation
- Pump selection based on system curve (TDH calculation) and pump curve analysis
- Run time calculation and cycle time
- Mechanical systems including HVAC
- Electrical system including lighting, power, communications, security, controls, instrumentation, and SCADA
- Force main size, length and material (see [Section 7D.050](#))
- Force main flow velocities based on minimum and maximum head conditions
- Surge analysis and protection, if any
- Wet well sizing and details
- Wet well and dry well buoyancy analysis using site-specific soil and groundwater information
- Geotechnical analysis for wet well and lift station site and backfill and compaction specifications
- Connection point with downstream capacity
- Second power source or generator sizing
- Electrical requirements
- Odor and corrosion control
- Noise control
- For projects to expand or replace existing facilities: An approach and plan to maintain pump station operations during construction

7D.030 Lift Station Special Requirement

The following equipment and special modifications are standard requirements for all permanent wastewater lift stations constructed within the City of Olympia. City wastewater lift stations will comply with City of Olympia landscaping standards. The following requirements are minimum standards and not all-inclusive.

- A. The proponent is required to provide the City of Olympia a fee simple site outside existing right-of-way for construction of the lift station. The site will have sufficient area with dimensions that allow for easy and safe access to the lift station.
- B. A concrete slab a minimum of 6 inches in depth will surround the pump station wet wells and dry wells and on-site generator, with a minimum of 2 feet side exposure for all openings. The slab will be continuous between the wet well and the dry well and will be installed at ground level as pursuant to Standard Drawing 7-18B.
- C. An access road, with minimum 20-foot wide easement that will support 20,000-pound axle loads throughout the year, will be provided from the nearest public road to the station to allow for maintenance of the station.
- D. Wet well will be provided with full-depth (to bottom of cone) polypropylene steps (refer to [Section 7B.050](#)) or a permanent, attached, internal stainless steel or polypropylene-coated ([Lane International Corporation](#) or approved equal) access ladder, impervious to corrosion.
- E. Entry lid to the station wet well will be located over the full depth portion of the wet well closest to the access drive. The lift station will be accessible at all times to operations and maintenance equipment and vehicles. The entry lid shall conform to the standards for castings and frames in [Section 7B.050](#).
- F. Entry lid to the station dry well will be constructed of fiberglass or aluminum.
- G. Station entry access will be keyed to match all other City package stations. The Best Lock key system with single-key operation of the mechanism will be supplied. For all other lock points and padlocks, a blank tumbler will be supplied, and the City will key to the desired code.
- H. Dry wells will be a minimum of 9 feet in diameter with a forty-four inch (44") inside diameter entrance tube.

- I. The dry well will be vented with an exhaust fan to meet state safety standards and provide a minimum of six air changes per hour.
- J. Dry wells will be provided with an automatic sump pump plumbed to the lift station wet well.
- K. Dry wells will be provided with dehumidifier equipment appropriately sized to remove moisture from the dry well.
- L. Safety guards will be provided for all exposed drive lines and couplings.
- M. Spare parts will be provided as recommended by the manufacturer, with a minimum of one spare impeller (as designed), one complete set of seals, filters, and one set of volute gaskets. Four complete sets of operation and maintenance manuals and a list of the nearest dealers for spare parts and repair will be provided. All replacement parts will be readily available from a distributor in the U.S.A.
- N. The pumps, motors, and wet well will be in compliance with current engineering practices. They will be fully compatible as an assembly and will be engineered for the specific basin.
- O. The station will be designed to have an isolation valve located in the discharge line between the station and the pumping bypass port no less than 12 pipe diameters from the dry well.
- P. The station will be designed to have a magnetic flow meter with remote transmitter and wall mounting. The flow meter will be an ABB MagMaster MFF Series or City approved equal. The flow meter flow tube will typically be located on the common vertical discharge pipe within the dry well.
- Q. Hydrostatic level-measurement for pump control will be provided by a pressure transducer. For protection from grease and debris, the pressure transducer will be installed within a PVC tube a minimum of 1-inch larger in diameter than the transducer. The PVC tube will be made accessible immediately below the wet well lid and will extend to the full depth of the wet well.
- R. City water will be provided to the station for hose down and pump seal supply. An approved backflow prevention device will be provided on the water supply line outside the dry well to protect the public water system. The backflow device will be tested and certified by the [City's Cross-Connection Specialist](#) prior to acceptance of the system. The backflow device will be covered by a hot box to prevent freezing.

- S. A 100-amp minimum 480/277-volt, 3-phase, 4-wire main service will be provided pursuant to plans.
- T. All electrical equipment will be enclosed in a free-standing, vandal-proof, all-weather, NEMA 3R or better stainless steel traffic-control-type enclosure with factory-installed back panels and accessories. (Refer to Standard Drawing 7-18A.) Accessories should include internal fluorescent fixture, intrusion switch, panel heater and thermostat, double-entry doors with three-point door latch system. Door latch will be keyed to the City standard lock system.
- U. A 100-amp minimum, 480-volt, 3-phase emergency power hookup will be provided. The transfer switch will be sized to accommodate the load with a 100-amp minimum. The receptacle will be Crouse-Hinds AREA-10314 or Appleton ADR-1033 4-wire, 3-pole with male pins.
- V. The electrical equipment will include a 5 KVA minimum transformer in the dry well for the 120-volt, single-phase equipment.
- W. Wiring will be THHN stranded copper.
- X. Lift station telemetry will consist of a RUGID PLC, as manufactured by [RUGID Computer](#), with a SCADAMAX Powerfly DC-UPS as manufactured by [Calvert Technical Services](#) (Phone: (509) 244-1839, no substitutions will be acceptable), Metriicom, Utilinet IWR Series II, 900 MHz radio, antenna cable with lightning arrestor, and 6dB gain stick antenna that will be supplied and installed by the contractor. Alarm and station status points will be pursuant to attached list. The telemetry will be enclosed in a NEMA 1 enclosure within the electrical cabinet. Prior to ordering the above equipment, the contractor will contact the [Pump Stations Supervisor](#), City of Olympia Public Works, for complete ordering specifications for the above telemetry. Nominal lead time is 12 weeks.
- Y. Pump control system will be of the solid state programmable logic controller (PLC) type, [RUGID](#) Model 9 or approved equivalent. The system will possess a solid state liquid level sensing device of the 4-20ma analog design. The controller will be compatible with all established city systems and will be accessible for ease of maintenance.
- Z. The program for the pump controls will be furnished and installed by City of Olympia personnel. For assistance contact the [Pump Stations Supervisor](#) at 753-8588.
- AA. Pump motors will be 3-phase, 480-volt, and be provided with elapsed time meters.

BB. Inspection and verification of operating parameters and standard requirements by a representative from the Public Works Department in addition to an electrical inspection, is required prior to acceptance of all lift stations.

CC. Wet Well Sizing Criteria:

1. Provide wet well operating volume pursuant to [DOE Criteria for Sewage Works Design](#), Chapter C2. For constant speed pumps, the minimum volume between pump on and off levels can be calculated using the following general formula:

$$V = tQ/4, \text{ where}$$

V = minimum volume (gallons)

t = minimum time between pump starts

Q = pump capacity (gallons/minute)

2. Provide for a minimum of 45 seconds pump run time per pump cycle and a maximum of six (6) pump cycles per pump per hour.

DD. Lift Station Emergency Storing Criteria:

1. Emergency storage will be provided for 2 hours of design average flow using a peaking factor of 2. This calculation is to be submitted with the system design and approved by Public Works staff.

Note: The 2-hour time was determined as an average response time by a City crew. The peaking factor was set at 2, as opposed to 3 or 4, due to typical emergency being caused by power outage.

2. All volume above area basements and below the hydraulic gradient may be used as emergency storage; i.e., wet well, conduit, manholes. This condition must be verified by calculation and submitted for approval by Public Works staff.

EE. All lift stations will be provided with an on-site diesel emergency power generator in accordance with [Section 7D.040](#).

FF. The program for the pump controls will be furnished and installed by City of Olympia personnel. For assistance contact a [Remote Systems Technician](#) at 753-8588.

GG. Lift stations shall be factory-built [Smith & Loveless Custom Series](#), wet well-dry well type, or City-approved equal. The lift station shall have, as a minimum, two vertical close-coupled, motor driven, non-clog ([Smith & Loveless X-peller](#), when possible) sewage pumps with single mechanical

seals. The pumps shall have sufficient capacity and capability to efficiently handle the peak design flow with one pump out of service and to ensure a minimum velocity of 3 feet per second in the force main.

- HH. Plans and specifications must be submitted and approved in writing prior to ordering a package lift station.
- II. RUG9 programmable logic controller card alarm and station status points and associated wiring colors:

Table 4: RUG9 Programmable Logic Controller Card Alarm and Associated Wiring Colors

Card # 3	
2 Flow	White/Blue
1 Wet well level (probe)	Blue
0 Common	Black
Card #4	
7 High-high wetwell	Red/Black
6 Pump #2 fail	Red/Green
5 Pump #1 fail	Red/Yellow
4 Pump #2 run (fb)	Red/Green
3 Pump #1 run (fb)	Red/Yellow
2 Pump #2 auto	White/Green
1 Pump #1 auto	White/Yellow
0 Common 24V-	Black
Card # 5	
8 A/C power fail	Red
7 Generator run	Purple
6 Generator fail	White/Black
5 Low wetwell	Internal
4 High wetwell	Red/Black
3 Dry well flood	Pink
2 Intrusion	Brown
1 Fire	Orange
0 Common 24V-	Black
Card # 6 Relays Outputs	
8 Generator (start)	Tan
2 Pump #2 call (start)	Gray
1 Pump #1 call (start)	Yellow
0 Common 24V-	Black
12 V power	Red/White

The contractor will supply and install all sensors for the above alarm points and connect them with the appropriate wire size and color to an alarm terminal strip. The alarm points terminated on the terminal strip will be identified by number and a label showing the number, and an alarm will be provided adjacent to the terminal strip. From the terminal strip to the telemetry terminal strip, all points will be connected by a single multiconductor-shielded cable encased in a single conduit. The following note will be added to all lift station plans:

Prior to ordering and wiring of telemetry components, the contractor will contact the City of Olympia's [Pump Stations Supervisor](#) at 753-8588.

7D.040 Auxiliary Power System

General:

Diesel emergency 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 and will operate the lift station in the event of a power outage. The Developer shall provide the City of Olympia the design load calculations during the submittal process.

The auxiliary power unit shall include, but not be limited to, the following:

- A. Generator, control panel and circuit breaker.
- B. Engine, radiator and exhaust system.
- C. Fuel tank (capacity for 24 hours full load, plus 25% with minimum volume of 200 gallons).
- D. Locking generator enclosure, keyed with City of Olympia standard Best Lock key system with single-key operation of the mechanism, a blank tumbler will be supplied, and the City will key to the desired code.
- E. Automatic transfer switch.
- F. Radiator protection (as approved by the City) or automatic louvers.
- G. Block heater connected to power supply and not generator.
- H. Battery and rack.
- I. Battery charger connected to power supply and not generator.
- J. Conduit, wire and piping.
- K. Coolant recovery system.

The generator set and transfer switch shall be [Cummins/Onan](#), or City approved equal complying with the latest edition of Onan Corporation standard specifications and with City standards.

The generator set shall include the following:

Engine:

- Single phase, 1500 watt coolant heater - 115 volt or 240 volt sized accordingly for the engine and climate conditions

Generator Set:

- Mainline circuit breaker
- Weather-protective/sound dampening enclosure with mounted silencer (maximum noise level per OMC Chapter 18.40.080).
- 5-year basic power warranty

Accessories:

- Batteries
- Battery charger, 2 AMP, 12 VDC, 120 VAC input (Shall maintain a float charge)
- 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 (maximum noise level per [OMC Chapter 18.40.080](#))

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 ½-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 LED

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:

- 4 pole

Frequency:

- 60 Hertz

Application:

- Application - Utility to genset

System Operation:

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

Enclosure:

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

Listing:

- Listing - UL 1008

Programmed Transition:

- Program Transition - 1-60 seconds

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. Inspection and verification of operating parameters and standard requirements by a representative from the Public Works Department in addition to an electrical inspection, is required prior to acceptance of a generator.

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

Generator manufacturer shall provide three (3) copies of the maintenance and operation manual. These manuals shall be complete and shall include all information necessary to all City personnel to maintain the generator.

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.

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

7D.050 Lift Station Force Main

A. Material. See 7C.030, Sewer Force Main.

- B. Depth. Force mains will have a minimum 30 inches of cover to top of pipe. See [Section 7A.020](#) for sanitary sewer/water main crossing requirements.
- C. Velocity. The minimum velocity allowed is 3 feet per second (fps) at average dry weather flow. Three fps is required to scour settled solids. Maximum velocity allowed will be 6 fps.
- D. Surge protection. PVC pipe is subject to fatigue failure due to cyclic surge pressures. Lift stations will be constructed to minimize rapid changes in velocities and a properly sized surge tank and “soft start and stop” pump controls.

7E STEP SYSTEM

7E.010 General

A Septic Tank Effluent Pump (STEP) system may be installed to serve residential and light commercial locations only where approved by the City. A STEP application with a proposed site plan is required for each individual on-site system.

Any new single-family subdivision designed with STEP sewers will include an easement on the face of the plat for access to all lots.

A STEP 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.

Only sanitary wastewater will be discharged into the tank. Roof drains and other stormwater sources will be strictly excluded.

When a property served by a STEP system has a transfer of ownership, the STEP system will be pumped out and inspected in the presence of City personnel. This work will be conducted at the owner’s expense.

Operation and maintenance of the tank, pump, and pump controls will 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. 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 contractor will submit record drawings for review and acceptance by the City. Service will not be provided to the customer until record drawings are accepted by the City. Once

the drawings are accepted, the City will retain them and revise them as needed.

Power and telephone service (when applicable) will be provided and paid for by the customer. Property owners will be responsible for the operation and maintenance of their generator transfer switch. The generator transfer switch for all STEP systems shall be accessible without opening the control panel. The customer will be responsible for notifying the City when the control panel alarm buzzer is activated. All sewer pipe, drains, and plumbing between the tank and the building will be the responsibility of the customer. The customer will be responsible for curtailing water usage until City forces respond to the customer's notification. The City will accept no responsibility for damages resulting from a plumbing backup, such as may occur if water usage is not curtailed during an alarm condition or if the alarm is disabled prior to the response of City forces. The audible alarm may be silenced after City forces have been properly notified of the alarm condition. Service shall not be provided in cases where the STEP tank and/or controls are made inaccessible by the installation of fences or other impediments.

Service shall not be provided to systems that have situations where a dangerous or potentially dangerous situation exists.

Currently, only the [Orenco STEP Pump System](#) shown in [Standard Drawing 7-7 \(Chapter 7 Drawings\)](#) has been approved by the City. However, other suppliers of STEP system components will be considered if equal to the Orenco product. The specifications must be submitted to the City for review and approval.

7E.020 Design Standards

The design of any STEP sewer system will conform to City standards, [DOE Criteria for Sewage Works Design](#), Chapter C1 and any applicable standards as set forth herein and in [Chapter 3](#), Sections 3.010 through 3.040.

The layout of STEP force main extensions will provide for the future continuation of the existing system as determined by the City. In addition, main extension will be extended to and through the side of the affected property fronting the main. Individual service boxes will be located near the right-of-way line at the property corner opposite to the location of water meter.

Pipeline sizing will conform to the criteria as set forth in the most recent version of the [Olympia Wastewater Management Plan](#).

The applicable General Notes in [Section 7A.080](#) will be included on any plans dealing with pressure sanitary sewer design.

Aerators may be required for each five residential installations or commercial/multifamily installations with 50 gpm or greater average discharge.

A. Pipeline design information/calculations. The following information will be submitted to the City for review:

1. Map showing contributing area for each pipe.
2. Flow generation assumptions, including

Units per acre

Gallons per capita per day

Population per unit

Average flow

Design flow - the minimum peak flow equal to or greater than the following:

$$Q = 15 + .5D \text{ or}$$

$$Q = 15 + .15P$$

Where:

Q = Design peak flow, gpm

D = Number of equivalent dwellings

P = Population

Peak flow is defined as an event that lasts about 15 minutes

Average and design flow velocities

Slope of hydraulic grade line (ft./ft.)

Total head loss (ft.)

Site-specific calculations verifying tank resistance to buoyancy forces

B. Commercial/multifamily STEP submission requirements:

All commercial/multi-family systems must meet or exceed all criteria set forth for single-family residential installations. All design calculations are required as part of the submittal. Tanks placed in series to provide the required storage capacity will be strictly prohibited. Tanks placed in parallel will be allowed when approved by the City. Electrical service will be sized appropriately to serve the equipment installed.

A STEP tank shall contain detention volume, working volume, and storage volumen. The minimum STEP tank size shall be 1,500 gallons. Detention

volume is defined as the volume of liquid below the “OFF” switch (STEP). Tanks that serve multiple structures or structures with commercial wastewater discharge shall be sized in accordance with the following equations:

$$V = 1.5Q \text{ (residential strength waste)}$$

$$V = 2.0Q \text{ (nonresidential strength waste)}$$

Where:

V = Liquid volume (gallons)

Q = Peak day flow for the structure being served (gallons per day)

The equation provides the minimum liquid volume within the STEP tank. The tank shall also contain sufficient working volume and storage volume. Liquid volume shall be approximately 65 to 75 percent of the total tank volume.

Working volume is defined as the volume between the “ON” and the “OFF” switch. The working volume shall be greater than the difference between the peak influent flow and the discharge of the STEP or grinder pump over a period of time estimated to be the peak duration (typically 15 minutes).

STEP tanks shall have a minimum of 24 hours of emergency storage volume. Tanks without 24 hours of storage shall be installed with a power transfer switch with an emergency generator plug or other device for allowing emergency power connection, or shall have reserve volume provided with a separate vessel. Storage volume is defined as the volume between the “OFF” switch and the top of the tank.

The following information shall be submitted to the City for review:

Tank Sizing Calculations:

Maximum hydraulic gradelines (mainline, service line, and minor friction losses based on peak flow shall be no greater than the installed elevation of a STEP pump plus 85 percent of the total available head of the pump.

Pump Operation Criteria and Sizing Calculations:

Pump time per cycle

Total volume pumped per cycle

Pumping cycles per day

Total pumping time per day

Total dynamic head

Pump size

Standby or alternate pump requirements

Auxiliary power generating equipment requirements

7E.030 STEP Force Main

- A. Mainline. The minimum pipe size used is 2 inches nominal diameter. This is based on maintenance requirements rather than flow. Pipe will be PVC, [ASTM D2241](#), SDR 21 (200) with rubber gasketed joints. Gaskets will comply with ASTM D 1869. STEP mains will have a minimum 36 inches of cover to top of pipe. See [Section 7A.020](#) for sanitary sewer/water main crossing requirements. STEP main lines will be the following diameters: 2, 3, 4, 6, 8, 10, 12.

The outfall manhole (point of connection where STEP main line discharges into gravity sewer) and the next downstream manhole on the gravity sewer will be lined with PVC to protect the system against corrosion. Spray-on coatings will not be accepted for new construction. The PVC lining will be cast into the walls and floor of the manhole. No exposed concrete will be permitted. All work will be done in accordance with manufacturer's recommendations and must be approved by the City. If a new outfall manhole and subsequent downstream structures are installed as part of the new system design, the configuration will be approved by the City. A concrete slab a minimum of 6 inches in depth will surround the pump station wet wells and dry wells and on-site generator, with a minimum of 2 feet side exposure for all openings. The slab will be continuous between the wet well and the dry well and will be installed at ground level as pursuant to Standard Drawing 7-18B.

- B. Service line. Service connection pipe will be minimum 1-inch diameter, Schedule 80 PVC water pipe, solvent weld joint located at 90 degrees to the main line when possible. Solvent cements and primer for joining PVC pipe and fittings will comply with [ASTM D 2564](#) and will be used as recommended by the pipe and fitting manufacturers.

Services will have a minimum 24 inches cover to top of pipe. Pressure services crossing over any waterline will follow [Department of Ecology](#) requirements.

- C. Building sewer. The gravity building sewer between the building and the tank will be designed and installed in accordance with the Uniform Plumbing Code as adopted by the City. The owner will be responsible for maintenance of the building sewer.
- D. All pipe will be installed with continuous tracer tape installed 12 to 18 inches under the proposed finished grade. The marker tape will be marked

“sewer” and be plastic, non-biodegradable metal core or backing that can be detected by a standard metal detector. Tape will be Terra Tape “D” or approved equal. In addition to tracer tape, install 14-gauge-coated copper wire wrapped around the pipe, brought up and tied off at the valve boxes.

A 1-pound magnesium anode will be buried with the sewer line every 1,000 linear feet for cathodic protection of the wire. Toning wire splices and connections to anodes will join wires both mechanically and electrically and will employ epoxy resin or heat-shrink tape insulation. Furnishing and installing the tracer wire and anodes will be incidental to pipe installation.

7E.035 Fittings

All pipe fittings will have a minimum working pressure rating equal to 150 psi. Fittings will be PVC 1120, rubber joint complying with [ASTM D-1784](#), [D-2466](#), or [D-2467](#) for pipe larger than 1 inch. Solvent weld fittings for 1-inch pipe will be socket-type Schedule 40 and will comply with [ASTM D-1784](#) and [ASTM D-2466](#).

7E.040 Valves

- A. Ball and gate valves. All 1-inch valves will be PVC ball valves with preloaded EPDM stem seals, micro finished PVC ball, and self-adjusting polyethylene ball seat to compensate for wear and prevent over tightening. Valves will be designed for use with corrosive fluids, for low-torque manual operation, and for a working pressure of 150 psi. One-inch valves will be LT-1000-S as manufactured by KBI ([King Brothers Industries](#)) or GF500 as manufactured by [George Fisher Signet, Inc.](#)

Two-inch and larger valves will be M&H Valve Company or American Flow Control Series 2500 resilient wedge gate valves with an epoxy coating to resist corrosion. A ball or gate valve will be located at every intersection and at a maximum of every 500 feet. Valves may be installed in conjunction with required pigging ports.

- B. Air/vacuum valves. Air release valves and air/vacuum valves will be located at the high points of the line. Profiles for each pipe run will be submitted with the hydraulic grade line for both static and dynamic flow conditions to show where the critical points are for air release valves. Vehicular access to air/vacuum valves is required for maintenance.

Because the air released by these valves will contain hydrogen sulfide, the valves and their enclosures have to be constructed of corrosion-resistant materials. The valve vaults will also have insulated lids to prevent freezing. The air released from the valve will be quite odoriferous; thus, each vent

will be equipped with an odor-control system such as activated carbon filters impregnated with sodium hydroxide.

- C. Check valves. Check valves used on service lines will be a tee or wye pattern swing check, PVC. It will have a working pressure of 150 psi. Valves will be designed for use with corrosive fluids. A check valve will be installed at the end of the service stub-out at the property line and installed in a valve box pursuant to Standard Drawing 7-12, located near a front corner of the lot. Check valves will be [King Brothers](#), KSC, Spears, or approved equal.
- D. Pressure-sustaining valve assembly. Pressure-sustaining valves are sometimes required in the design of STEP systems to keep the pipeline full during periods of low or no flow or when siphoning conditions exist.

The pressure-sustaining valve will maintain inlet pressure at a predetermined set point, as determined by the City. It will open as pressure starts to increase above the set point and close as pressure falls below the set point. In the open position, flow will enter the valve in a direction axial to the pipe, turn radially outward through a slotted grillwork, and then inward to the former inlet axial direction. The valve will be constructed of two parts; a 316 stainless steel body and an elastometric liner or control element. The valve will be a Roll Seal Valve as manufactured by the [Cla-Val Valve Company](#), or approved equal.

- E. Pressure-sustaining valve vaults. Pressure-sustaining valve vaults will be precast reinforced concrete vaults with spring-assisted hinged galvanized steel doors that open to a minimum of 36-inch by 60-inch clear opening and will be marked "sewer." The entire unit will be rated for H-20 traffic load and have extensions as needed.
- F. Pressure tank. The pressure tank will consist of a steel tank containing a sealed-in-place heavy-duty diaphragm that separates air from the water. The portion of the tank where water is stored will be coated with an FDA-approved fusion-bonded polymeric lining material that isolates water from the metal tank and protects the tank from corrosion. The tank will be suitable for direct bury or continuous operation in a damp environment. The tank will be similar in all respects to an Aqua-Air V-45B as manufactured by [A.O. Smith, Consumer Products Division, Inc.](#), or approved equal.
- G. Pressure gauge. The pressure gauge will be capable of measuring the pressure of water from 0 to 30 psi within a 1 percent full-scale accuracy. The gauge will have a 22-inch face and will be corrosion- and weather-resistant, suitable for outdoor installation.

- H. Valve stand. Valve stands will include, as the top portion, an adjustable stanchion type support with at least 4 inches of adjustment. They will comply with [Federal Specifications](#) WW-H-171E (Type 39) and [Manufacturers Standardization Society](#) SP-69 (Type 38). They will be similar in all respects to Figure No. 264, as manufactured by Grinnell, Inc., or equal approved by the engineer. The bottom portion will be manufactured as shown on [Standard Drawing 7-17 \(Chapter 7 Drawings\)](#).
- I. Valve box lids. Valve box lids will be specified to be marked with “sewer” so they can quickly be distinguished from valves in the water system.

All service connection boxes will be Carson Model 1419 with hinged bolt-down cover and 1419E extension box as required, or approved equal.

All main line valve boxes will be Rich No. 940, or approved equal.

7E.050 STEP/Grinder 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 will be located outside the paved area but within right of way as shown in Standard Drawings 7-13 and 7-13A.

Pigging ports may be required:

- A. At a change in pipeline size;
- B. At the end of every dead end line; and
- C. No farther than every 3,000 feet.

These locations are subject to review and approval by the City.

7E.060 STEP System Septic Tank

The City maintains a list of approved STEP tanks. Proponents should submit plans specifying only approved tanks. The list is updated annually; submittals must be received by November 1 of the previous year. A tank may be designed for a site-specific application and meet all requirements within this section.

Tanks for single-family residential use will be rectangular precast concrete or fiberglass, two-compartment, and will have been designed by a registered structural engineer. Tank liquid volumes will be sized as follows:

Single Family Residential Homes or Duplexes: 1,500 gallons.

Tank sizes for applications other than those noted, including commercial uses, will be approved by the City.

STEP tank maximum depth shall be 4 feet (as measured by the pump riser length). Deeper installations, if required by local conditions and approved by the City, will require special access modifications.

All tanks will be manufactured for acceptance of pump assemblies or effluent filters and have a precast groove 1-inch wide by 2 inches deep, 30 inches in diameter, to allow positive attachment of the riser. The manufacturer will provide the structural design and certification to the City for review. Concrete or fiberglass manufacturers not yet approved or approved manufacturers seeking approval for a new tank design are subject to an independent structural analysis if required by the City Engineer. The manufacturer will bear the expense of this analysis. The design or analysis will be in accordance with accepted engineering practice. Tanks 0 to 4 feet in depth will be designed for the following loading conditions:

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

Deeper installations, if required by local conditions, will require special consideration, as will tanks located where a vehicle might be driven over them. Tanks approved as traffic-bearing tanks will be designed to withstand an H-20 live load with a minimum soil cover of 18 inches.

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

Systems installed on a site where an existing septic tank exists may not use the existing tank. The existing tank must be removed or abandoned pursuant to DOH and/or [Thurston County Environmental Health Department](#) requirements.

- E. All STEP tanks shall be located within 20 feet of the roadway fronting the home served by the system. Tanks shall be accessible at all times. Enclosing STEP tanks with fencing, shrubbery, or other obstructions is not permitted. An exception to this standard may be granted for sewerage existing structures where in the opinion of the City Engineer it is not practical or feasible to maintain the standard.

7E.062 Concrete Tank

Concrete material and construction will meet the requirements of Section 6-02 of the [WSDOT/APWA Standard Specifications for Road, Bridge and Municipal Construction](#), most current edition.

Walls, bottom, and top of reinforced concrete tanks will 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 will be poured monolithically. Concrete will achieve a minimum compressive strength of 5000 psi in 28 days.

Reinforcing steel will be [ASTM](#) A-615, Grade 60, $f_y = 60,000$ psi. Details and placement will be in accordance with ACI 315 and ACI 318. The concrete mix will not be modified unless the mix design is reviewed and approved by the City.

Tanks will be protected by applying a heavy cement-base waterproof coating, [Thorseal](#) or equal, on both inside and outside surfaces.

Tanks will be manufactured and furnished with an 18-inch-diameter access opening over each compartment. Modification of completed or existing tanks will not be permitted for structural, warranty, and liability reasons. Tanks will be furnished without concrete access hole lids. In order to demonstrate water tightness, tanks will be tested prior to acceptance. Each tank will be tested at the factory by filling with water to the base of the riser and letting stand. After 24 hours, the tank will be refilled to the soffit and the exfiltration rate will be determined by measuring the water loss during the next two hours. The two-hour water loss will not exceed 1 gallon.

Tanks will not be moved from the manufacturing site to the job site until the tank has cured for seven days and has reached two-thirds of the design strength.

7E.064 Fiberglass Tank

The tank will be constructed with a glass fiber and resin content specified by the manufacturer and with no exposed resin-coated glass fibers. The manufacturer must be approved by [Orenco Systems](#), 814 Airway Ave Sutherlin, Oregon 97479, and by the City Engineer. The manufacturer will supply to the City, without charge, satisfactory evidence of testing by an approved laboratory showing compliance with IAPMO ICC 3-74, excepting as herein modified. Any metal part will be 300 series stainless steel.

Inspections may be made by the City Inspector in the supplier's yard within the plant, upon delivery, and again after installation. The wall thickness will average at least 3 inches for 1,000 gallons. When less than 3/16-inch in thickness, or if any delamination is suspected within any portion of the tank, the inspector may drill a 3/16-inch-diameter hole through the tank wall for inspection purposes. If the required minimum 3/16-inch thickness is not found, repair, if feasible, will be the responsibility of the contractor. If repair is judged not feasible, the tank will be rejected. If the required minimum 3/16-inch thickness is found and no delamination is present, the repair will be the responsibility of the City.

Holes specified for the tank will be provided by the manufacturer. Resin will be properly applied to all cut or ground edges so that no glass fibers are exposed and all voids are filled.

Ty-Seal neoprene gaskets or equal will be used at the inlet to join the tank wall and the ABS inlet piping. ABS Schedule 40 pipe and fittings will be used at the inlets.

Each tank will be water tested on the project site after assembly and prior to backfill by the contractor and witnessed by the inspector. Every tank will be assembled by the contractor and water raised to the brim of the access opening for a minimum of two hours. The tank will show no leakage from section seams, pinholes, or other imperfection. Any leakage is cause for rejection.

Fiberglass tanks will be handled, stored, and installed as recommended by the manufacturer. Backfill will include a minimum 6-inch-thick envelope of pea gravel completely around the tank.

Concrete of sufficient volume to address buoyancies forces shall be placed above the gravel envelope between the riser ports on the top of the tank. A layer of 6-mil. plastic will be placed between the concrete and the gravel to prevent bonding. The concrete cap will be rough formed in sections not

exceeding 10 cubic feet each. Adequate reinforcing steel will be placed to form lifting handles in each section to allow removal to gain access to the tank for maintenance or replacement.

7E.066 General Installation

Tanks will be bedded on 6-inch sand or pea gravel. Backfill for all tanks shall include a minimum 6-inch thick envelope of pea gravel completely around the tank to at least half way up the side of the tank. Sides will be compacted in 1-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 backfilling, each tank will be tested by filling the tank to 2 inches above the base of the riser for a 2-hour period. Water loss will not exceed 1 gallon over the 2-hour period.

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

Tank excavation will be backfilled with select material free of boulders and compacted to a dry density equal to or greater than that of the adjacent, undisturbed soil. Finish grading, cleanup, and restoration will be completed prior to final acceptance by the City.

7E.070 Tank Riser

Pump chamber risers will be 30-inch-diameter fiberglass or ribbed PVC as manufactured by [Orenco Systems, Inc.](#), or approved equal. Solids compartment riser will be as shown on the engineering drawings and have a diameter of 24 inches. Pump chamber risers will be factory equipped with the following:

- A. Two 1-inch or one 3-inch-diameter (IPS) neoprene grommets, one for the pump discharge, installed between 8 to 12 inches from the top of the riser, and one for the splice box conduit.
- B. A PVC splice box with 4 cord grips and 1-inch outlet fitting, Orenco Model No. SB4i or approved equal.
- C. A lid will be furnished with each riser. It will be latching and will be constructed of fiberglass with an aggregate finish. Riser and lid combination will be able to support a 2,500 pound wheel load. This does

not imply that PVC risers are intended for traffic areas. All valves and unions shall be no more than 12 inches deep in riser.

- D. Each riser will be bonded to the top of the concrete tank with a two-part epoxy that will be supplied with the riser by the manufacturer. The epoxy will be applied in accordance with the manufacturer's recommendations. A generous bead of epoxy will be laid completely around the bottom of the riser prior to mounting the riser on the top of the tank. After the riser is in place, a generous fillet will be run completely around the inside base. The epoxy will be allowed 4 hours curing time at 64° F; otherwise a greater time will be allowed based on the manufacturer's recommendations before backfill is placed over tank. Care will be exercised during the curing period to avoid dislodging the riser or disrupting the watertight seal between the riser and tank.

7E.080 Pumping Tank Equipment

Pumps will be stainless steel, thermoplastic, or coated inside and out with baked-on epoxy paint, UL listed for use in effluent. All pumping systems will be [Orenco Systems](#) Model Series P100511 High Head Pumping Assemblies or approved equal comprised of:

- A. Standard vault: 12-inch by 54-inch Biotube pump vault with external flow inducer, Orenco Model No. PVU 54-1819, with eight 1 3/8-inch-diameter inlet holes; 19 inches from base; with an 18-inch tall Biotube filter cartridge or approved equal.
- B. Hose and valve assembly: Includes 1-inch-diameter flexible PVC hose with quick-disconnect fittings and PVC ball valve. Orenco Model No. HV 100 BFC or approved equal.
- C. Mercury switch float assembly: Model MF-ABR, or approved equal, with three mercury floats mounted on a PVC stem that attaches to vault and shall be wired to the control panel using #14 AWG THHN Standard wire as a minimum and follows the manufacturer's color coding.
- D. Pump: OSI High Head, 1/2 hp, 115-volt, single-phase, Model P100511 high head, with 8-foot cord and 1/8-inch bypass orifice for effluent application, or approved equivalent. Higher head or discharge pumps may be allowed under certain circumstances with prior approval. Wiring to the control panel shall be #12 AWG THHN stranded wire as a minimum and follow the manufacturer's color coding.

All pumping systems will be installed in accordance with the manufacturer's recommendations. Wire type and color shall conform to the control panel

manufacturer's recommendations. Marking wire with tape or labels in lieu of recommended wiring colors will not be accepted. Pumps will be accessible for operation and maintenance from ground level.

7E.085 Gravity Discharge Tank Equipment

Gravity discharge tanks will be equipped with [Orenco Systems](#) Model FT1254-36 Effluent Filter, installed in conformance with the standard plans and composed of the following components:

- A. PVC Vault: 12-inch diameter by 54-inch depth with eight 1 3/8-inch-diameter inlet holes, polyethylene effluent screen, 13-inch-diameter PVC intrusion pipe with overflow screen on top.
- B. 13-inch-diameter PVC discharge fitting with seep ring.
- C. 13-inch-diameter PVC 90 degree elbow for mounting on the bottom of the vault.
- D. 13-inch-diameter flexible PVC hose, a minimum of 60 inches in length, with quick-disconnect fittings on vault end.

7E.090 Controls and Alarms

All residential STEP systems will be wired to a dedicated 25-amp breaker that supplies power to the STEP system control box only. This is required to avoid damage or overload to system and appliances. The homeowner will be responsible for the operation and maintenance of the breaker and feeder wires that serve the STEP system. All buried power will be installed with continuous tracer tape installed 12 inches above the buried power. The tracer tape will be plastic non-biodegradable metal core backing marked "power."

Positions on the PVC 2-float assembly are to be set at the following levels: High tank level alarm is to be set 9 inches below underside of tank top, and "on/off" at 41 inches below alarm and "off" in same float as "on" set 32 inches below underside of the tank top.

Control panels will be [Orenco Systems](#) Model S-IRODS (without redundant off) or approved equal with the following features:

- A. Rating: 1 HP/115 VAC, 2 HP/230 VAC, single-phase, 60 Hz. Motor start contact will be rated for 25 FLA, single-phase, 60 Hz.

- B. Audible alarm panel mount with a minimum of 80 db sound pressure at 24 inches continuous sound. Alarm will be located within sight from the tank and from the street when practical.
- C. Oil-tight visual alarm, red lens, with push-to-silence feature.
- D. Automatic audio alarm reset.
- E. 15-amp motor rated toggle switch, single pole, double throw with three positions: manual (MAN), automatic (AUTO), and center (OFF).
- F. NEMA 4X-rated fiberglass enclosure with gasketed, hinged cover and locking latch. Padlock will be furnished and installed by City at time of City's acceptance of the completed installation and will signify final acceptance.
- G. Alarm circuit will be wired separately from the pump so that if the internal pump overload switch is tripped, the alarm will still function.
- H. A 25-amp power disconnect assembly toggle switch to de-energize entire control panel to permit servicing panel without access to the customer's breaker switches. The pump control panel will be mounted on a pedestal near an exterior garage wall or facing street, within sight of the tank in all cases and in sight of the street where practical. The panel will be between 4 feet and 5 feet above finished grade.
- I. There will be a dedicated 20-amp circuit breaker serving the pump control panel.
- J. Control panel will contain hour meter and event counter bases so the meter and counter may be moved from one installation to another.
- K. In cases where an exterior power disconnect switch is required, it will be installed in a lockable, weatherproof enclosure.

7E.095 Commercial/Multi-family Installations

All commercial/multifamily installations must meet or exceed all applicable residential standards and general conditions. Inspection and verification of operating parameters and standard requirements by a representative from the Public Works Department in addition to an electrical inspection, is required prior to acceptance of all commercial/multifamily installations.

The following features will be added and provided by the proponent:

- A. Telemetry. Commercial STEP system telemetry will consist of a RUGID PLC, as manufactured by [RUGID Computer](#) with a SCADAMAX Powerfly DC-UPS as manufactured by [Calvert Technical Services](#) (Phone: (509) 244-1839, no substitutions will be acceptable), Metricom, Utilinet IWR Series II, 900 MHz radio, antenna cable with lightning arrestor, and 6dB gain stick antenna that will be supplied and installed by the contractor. Alarm and station status points will be pursuant to [Section 7D.030 \(HH\)](#). The telemetry will be enclosed in a NEMA 1 enclosure within the electrical cabinet. Prior to ordering the above equipment, the contractor will contact a [Remote System Technician](#), City of Olympia Public Works Department, for complete ordering specifications for the above telemetry. Nominal lead time is 12 weeks.
- B. Pump control system will be of the solid state programmable logic controller (PLC) type, RUGID Model 5 or approved equivalent. The system will possess a solid state liquid level sensing device of the 4-20ma analog design. The controller will be compatible with all established city systems and will be accessible for ease of maintenance.

The program for the pump controls will be furnished and installed by City of Olympia personnel. For assistance contact the [Pump Stations Supervisor](#) at 753-8588.

- C. Alternate power source. Property owners are responsible for providing an alternative power source for commercial STEP systems during power outages. An approved, dedicated generator set is recommended. If building being served has emergency power generators, they will be wired to the STEP system. The transfer switch shall be SD Type 1, Class 3140, double throw or equivalent. If equipped, the motor base receptacle shall be NEMA L14-20, Bryant Catalog #71420-MB and #71420-NC or the equivalent. The property owner shall sign a maintenance agreement indicating their responsibility to curtail water usage and supply, and own and maintain an alternative power source in the event of a power outage. The maintenance agreement shall be recorded at the [Thurston County Auditor's Office](#). The maintenance agreement shall run with the land and be transferred automatically to all subsequent owners.
- D. Electrical enclosures:
1. Electrical enclosures shall be of satisfactory dimensions to install and contain the required equipment. (See Standard Drawing 7-20.)
 2. Enclosures shall be vandal-proof, all-weather, NEMA 3R or better, constructed of stainless steel with intrusion switch, panel heater and thermostat and double-entry doors.

3. Alternative power source transfer switch and receptacle shall be installed within its own electrical enclosure separate from pump and telemetry controllers.
 4. Posts or pedestals necessary to support electrical enclosures shall be of galvanized steel construction.
 5. Electrical enclosures shall open in direct line of site with the tank and pump chamber risers.
 6. The enclosure latch will be keyed with City of Olympia standard Best Lock key system with single-key operation of the mechanism, a blank tumbler will be supplied, and the City will key to the desired code.
- E. Electrical service. Electrical service will be sized appropriately to meet the requirements of the installation and the current NEC. Electrical services other than single-phase, 110-volt must be approved by the City.
- F. Splice box. Pump chamber splice boxes shall be installed within 12 inches of finished grade or external to the riser.
- G. Access. Commercial STEP systems shall be accessible at all times to operations and maintenance equipment and vehicles. STEP systems located within parking lots shall be placed where it is acceptable for vehicle traffic to be restricted for extended periods during the business day. Tank and pump chamber risers shall not be located within parking stalls. STEP systems located within fenced enclosures must be accessible via a City lock. Service will not be provided in cases where the STEP tank and/or controls are made inaccessible by parked vehicles or other impediments.

7F GRINDER PUMP SYSTEM

7F.010 General

Grinder pump system may be installed to serve one or multiple residential and commercial user(s) only where approved by the City. A grinder pump application with approved site plat is required.

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

A grinder system is a facility consisting of a holding tank, grinder pump, and pressure piping system for conveying the wastewater and solids into the sewer system.

Power, including auxiliary power in the event of a power outage, will be provided and paid, as well as owned and maintained, by the customer.

All sewer pipe, drains, and plumbing between the building and force main before discharging to the sewer main will be the responsibility of the customer.

Currently, the City will only accept the Environmental-One (E/One) Grinder Pump System for connection to City-owned gravity or pressured sewer mains.

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

Only sanitary wastewater shall be discharged into the tank; roof drains and other stormwater sources shall be strictly excluded.

7F.020 Design Standards

The developer or builder shall submit a grinder system designed by a licensed engineer for the City's approval. The design of any grinder system shall conform to City standards, [Department of Ecology Criteria for Sewage Works Design](#), Chapter C1 and any applicable standards as set forth herein and in [Chapter 3](#), Sections 3.010 through 3.040.

The layout of grinder system force mains 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 service boxes shall be located near the right-of-way line at the property corner opposite to the location of water meter.

Grinder system tanks shall have a minimum of 24 hours of emergency storage volume (200 gallons per ERU served). Tanks without 24 hours of storage shall be installed with a power transfer switch with an emergency generator plug or other device for allowing emergency power connection, or shall have reserve volume provided with a separate vessel. Storage volume is defined as the volume between the "OFF" switch and the top of the tank.

The following information shall be submitted to the City for review:

- A. Map showing contributing area for each grinder system force main.

B. Flow generation assumptions, including:

Total units served
 Gallons per capita per day
 Population per unit
 Average Flow
 Design Flow - the minimum peak flow equal to or greater than the following:

$$Q = 15 + .5D \text{ or}$$

$$Q = 15 + .15P$$

Where:

Q = Design peak flow, gpm
 D = Number of equivalent dwellings
 P = Population

Peak flow is typically defined as an event that lasts 15 minutes

Average and design flow velocities
 Slope of hydraulic grade line (ft./ft.)
 Total head loss (ft.)
 Site-specific calculations verifying tank Resistance to buoyancy Forces

7F.030 Grinder System Force Main

- A. Mainline. The minimum pipe size used is 2 inches nominal diameter. This is based on maintenance requirements rather than flow. Pipe will be PVC, [ASTM D2241](#), SDR 21 (200) with rubber gasketed joints. Gaskets will comply with [ASTM D 1869](#). Mains will have a minimum 36 inches of cover to top of pipe. See [Section 7A.020](#) for sanitary sewer/water main crossing requirements. Main lines will be the following diameters: 2, 3, 4, 6, 8, 10, 12.
- B. Service line. Service connection pipe will be minimum 1-inch diameter, 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 will comply with [ASTM D 2564](#) and will be used as recommended by the pipe and fitting manufacturers.

Services will have a minimum 24 inches cover to top of pipe. Pressure services crossing over any waterline will follow [Department of Ecology](#) requirements. A ball valve and check valve will be installed at the end of the service stub-out at the property line and installed in a valve box

pursuant to Standard Drawing 7-24, located near a front corner of the lot. Check valves will be Spears, or approved equal.

- C. Building sewer. The gravity building sewer between the building and the tank will be designed and installed in accordance with the *Uniform Plumbing Code* as adopted by the City. The owner will be responsible for maintenance of the building sewer.
- D. All pipe will be installed with continuous tracer tape installed 12 to 18 inches under the proposed finished grade. The marker tape will be marked "sewer" and be plastic, non-biodegradable metal core or backing that can be detected by a standard metal detector. Tape will be Terra Tape "D" or approved equal. In addition to tracer tape, install 14-gauge, green-coated copper wire wrapped around the pipe, brought up and tied off at the valve boxes.

A 1-pound magnesium anode will be buried with the sewer line every 1,000 linear feet for cathodic protection of the wire. Toning wire splices and connections to anodes will join wires both mechanically and electrically and will employ epoxy resin or heat-shrink tape insulation. Furnishing and installing the tracer wire and anodes will be incidental to pipe installation.

- E. Pigging ports shall be provided in accordance with [Section 7E.050](#).

Appendix 1: List of Drawings

Title	Drawing No.
Type 1 Manhole	7-1
Shallow Manhole	7-2
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Pigg Port Cross Section	7-13
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Typical Valve Stand	7-17
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Sanitary Sewer Lateral Service Connection	7-19
Commercial/Multi-family STEP System Electrical Cabinet Layout	7-20
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Typical Grinder System Service Connection	7-24