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SECTION 500 – SANITARY SEWER STANDARDS

501 GENERAL

The standards established by this chapter are intended to represent the **minimum** standards for the design and construction of sanitary sewer facilities. Greater or lesser requirements may be mandated by the City due to localized conditions. The following design and construction considerations shall apply.

It is the intent of the City of Bonney Lake to have all buildings connected to a gravity sewer collection system. Line extensions may be required to provide service to developments instead of septic systems. **It is the intent of these Standards to implement improvements to the City's sanitary sewer system consistently with the most recent City of Bonney Lake Sanitary Sewer Comprehensive Plan. Unless otherwise approved by the City, sanitary sewer lift stations will only be allowed as provided in the most recent City of Bonney Lake Sanitary Sewer Comprehensive Plan. Therefore, longer routes may be required to avoid lift stations and pressurized main lines.** The City will support right-of-way acquisitions and cost recovery agreements to facilitate the intent.

502 GENERAL REQUIREMENTS

1. Procedural Notes:
 - a. At the time that the preliminary proposal is submitted to the City, a letter requesting the availability of sewer service should be submitted to the City for approval. A map showing the area to be served should accompany this request. The City shall be required to evaluate the capacity of the system downstream of a proposed sewer main extension. The Developer shall reimburse the City for all costs it incurs to evaluate the downstream system.
 - b. Prior to the design review of sewer mains a Developer's Agreement for Sewer Main Extensions must be signed by the Developer, and approved by the City Council. The Agreement should be accompanied by an application fee in the amount as set forth by current City ordinance. After the agreement is approved by the City Council, the Developer may authorize his/her consulting engineer to proceed with design and furnish the City six copies of the preliminary drawings. After review and approval by all applicable agencies the Developer's engineer shall provide six copies of the final sewer system extension design to the City.
2. Sewer plans shall be consistent with the requirements specified in Section 200. Additional plan requirements are as follows:
 - a. Ground surface, pipe type, class and size, manhole stationing, invert and surface elevation at each manhole, and grade of sewer between adjacent manholes. All manholes shall be numbered on the plans and correspondingly numbered on the profile. Where there is any question of the sewer being sufficiently deep to serve any residence, the Developer shall indicate building and basement floor elevations in the profile.

- b. Details (to scale drawings) which clearly show special sewer joints, connections, and cross-sections, and sewer appurtenances such as manholes and related items and all other items as required by the City to clearly identify construction items, materials, and/or methods.
3. Construction of new sewer systems or extensions of existing systems will be allowed only if the existing and downstream receiving systems are capable of supporting the added hydraulic load. Sewer facilities shall be designed and installed to service tributary areas.
4. Analyses required to evaluate the capacity of the system downstream of a proposed sewer main extension shall be conducted by the City. The Developer shall reimburse all costs incurred by the City to perform said analysis.
5. Work shall be performed only by Washington State licensed and bonded contractors with demonstrated experience in constructing public sewer systems of the type being proposed for construction. No contractor shall perform work prior to obtaining a City business license.
6. Prior to any work being performed, the Contractor shall contact the City Engineer to set forth his/her proposed schedule.
7. Contractor shall obtain approval of materials to be used from the City prior to ordering or delivery of materials.
8. Sewer pipelines shall be installed within public rights of way, tract areas that will be dedicated to the City or easements that will be granted to the City and are consistent with the requirements in Section 300. The City shall reserve the right to determine where easements will be provided in lieu of tract areas.
9. All side sewer laterals shall be of the same material as the main line and shall be provided with a 6 inch by 6 inch tee with an approved watertight cap located within the public right-of-way to be utilized as a clean out. A watertight 6-inch capped stub shall be installed, which extends vertically from the 6 inch by 6 inch tee to within 18 inches of finished grade. **All side sewer laterals shall be privately owned and maintained.**
10. Each side sewer lateral shall have an approved watertight cap at the termination of the stub; it shall be adequately “blocked” to satisfactorily resist the air pressure testing.
11. Each side sewer lateral shall have a treated 2-inch by 4-inch wood “marker” at the termination of the stub. The “marker” shall extend from the bottom of the trench to 24 inches above finished grade. Above the ground surface, it shall be painted “white” with “S/S” and the depth (in feet) stenciled in 2-inch-high black letters.
12. Front lot corners shall be staked prior to construction for side sewer tee location.
13. All side sewers shall be a minimum of 5 feet below finished grade and extended a minimum of 5 feet past the street right-of-way line (or property line).
14. Each Side Sewer shall provide service to no more than one building structure.

15. Side sewer connections directly into manholes shall not be allowed unless approved by the City Engineer. If allowed directly into manholes, shall be constructed to match the sewer main crown (outlet) and the manhole channeled accordingly.
16. Manholes, where sewer extension may occur in the future, shall be provided with either a knock-out(s) and channeled accordingly.
17. Manholes shall be provided with a 0.10-foot drop across the channel.
18. Locking lids shall be provided for all manholes located outside pavement areas, and all manhole lids shall have the word “sewer” cast integrally onto its surface.
19. Pipe connections to **existing** manholes shall be as follows:
 - a. PVC Pipe: Cast or grout a watertight manhole coupling into manhole wall.
 - b. D.I. Pipe: Bell and spigot joint or flexible coupling; either shall be 12 inches maximum distance from manhole wall.
 - c. PVC and D.I. Pipe (Optional): Core the manhole and connect sewer pipe with a watertight flexible rubber boot in manhole wall; Kor-N-Seal boot or equal. Special approval by the Operations and Maintenance Supervisor required.
20. Provide the City Engineer a copy of the cut sheets prior to construction.
21. Pipe trenches shall not be backfilled until pipe and bedding installation has been inspected and approved by the City’s Inspector.
22. Final air testing shall not be accepted until after the asphalt treated base or first lift of finished paving is accomplished, all other underground utilities have been installed, and the lines have been satisfactorily flushed, cleaned, deflection tested and television inspected.
23. Manhole rim and invert elevations shall be field verified after construction by the Developer’s engineer(s) and the “as constructed” drawings individually stamped by a Washington State licensed professional engineer, which shall attest to the fact that the information is correct. As-built datum shall be per the horizontal and vertical datum criteria established in Section 205 “As-Built Plans.” As-builts shall be submitted in a format as outlined in Section 300, “Public Works Considerations.”
24. Prior to final inspection, all pipelines shall be tested, flushed, and cleaned and all debris removed and disposed of at a location approved by the City. A pipeline “cleaning ball” of the proper diameter for each size of pipe, shall be flushed through all pipelines, or the pipe shall be cleaned with a jet truck prior to final inspection. Hydrant meters shall be acquired from the City and utilized by the Contractor for all water withdrawn from the City’s system for flushing and cleaning purposes.
25. Before sewer lines are accepted, the Contractor/Developer shall perform a complete video inspection of the sewer pipe and appurtenances and shall provide to the City a recording on a digital video disc(s) (DVD). The recording shall be the final product and must be edited by the Contractor/Developer such that the recording progresses in a consistent manner from start to

finish throughout the improvements. All equipment and materials shall be compatible with existing City equipment. It shall be the Contractor/Developer's responsibility to confirm equipment compatibility with the City prior to inspection.

26. Prior to acceptance, the Developer/Contractor shall verify that the line and grade of the main meets the standards herein. Immediately prior to starting the video inspection, the Developer/Contractor shall flush the mains and insert a visible dye (color as approved by the City) into the mains to aid in identifying the depths of any ponds encountered during the inspection. Ponded depths that exceed 1/2 inch will require the main to be repaired unless otherwise approved by the City. Television inspections and taping may be conducted prior to paving but not prior to completion of all backfills.
27. At all times during the televised inspection process, the City's Inspector shall be present. The City Engineer shall be notified 48 hours prior to any televised inspection.
28. After all other work is completed and before final acceptance, the entire roadway, including the roadbed, planting, sidewalk areas, shoulders, driveways, alley and side street approaches, slopes, ditches, utility trenches, and construction areas shall be neatly finished to the lines, grades, and cross sections for a new roadway consistent with the original section.
29. The Developer shall be required, upon completion of the work and prior to acceptance by the City, to furnish the City with a maintenance bond as specified in Section 300, "Public Works Considerations," of these standards.

503 DESIGN STANDARDS

The design of sanitary sewer systems shall be dependent on local site conditions. The design elements of sanitary sewer systems shall conform to minimum City Standards set forth herein.

1. The sewage facilities shall be constructed in conformance with standards herein and current amendments thereto, and other applicable standards as allowed by the City.
2. If future extensions of the system are deemed probable by the City, the proposed systems shall be designed and sized to service tributary areas and also be extended to "far" property line(s) so as to provide access to future development. Easements shall be provided to facilitate same.
3. Collection and interceptor sewers shall be designed and constructed for the ultimate development of the tributary areas and as may be further established in the City's Sewer Comprehensive Plan.
4. Sewer systems shall be designed and constructed to achieve total containment of sanitary wastes and maximum exclusion of infiltration and inflow. Sewers installed below water table shall require special design and inspections.
5. Computations and other data used for design of the sewer system shall be submitted to the City for approval.
6. All sewers shall be designed to prevent damage from superimposed loads. Proper allowance for loads on the sewer because of the width and depth of trench should be made. When

standard-strength sewer pipe is not sufficient, PVC C900 or ductile iron sewer pipe shall be used. Pipe material specifications shall be as stated herein.

7. All pipes shall be laid in straight lines and at uniform rate of grade between manholes. Variance from City's approved established line and grade shall not be greater than 1/2 inch, provided that such variation does not result in a level or reverse sloping invert. Any corrections required in line and grade shall be reviewed by the City Engineer and shall be made at the expense of the Developer and/or Contractor.
8. The sewer pipelines shall be located in roadways when at all possible 5 feet southerly or westerly of street centerline. The sewer main shall maintain a minimum 10-foot-horizontal separation from proposed or existing water mains.
9. The maximum distance between manholes shall be 400 feet unless specifically approved otherwise by the City Engineer.
10. The allowable cover (finished grade) for the various types of pipe are:

PVC Pipe:	3 feet to 25 feet
PVC C900 or D.I. Pipe:	2 feet to 3 feet (if allowed) 25 feet and above
HDPE	Slopes of 18 percent or greater Force Mains

All pipe shall have a minimum of 36 inches of cover (24 inches in the case of a side sewer on private property), unless otherwise approved by the City.

11. Minimum Slope:
 - a. The minimum slope for 6-inch side sewer laterals shall be 2.0 percent.
 - b. The minimum slope for 8-inch gravity mains shall be 0.5 percent.
 - c. The minimum slope for 10-inch gravity mains shall be 0.4 percent.
 - d. The minimum slope for 12-inch gravity mains shall be 0.3 percent.
12. Minimum slope shall be maintained unless specifically waived by the City Engineer. All mains shall be designed to have a minimum scouring velocity of 2 feet per second (fps) with planned flows.

504 MATERIALS AND TESTING

1. All work shall be constructed in conformance with the most current *Standard Specifications for Road, Bridge and Municipal Construction* and current amendments thereto, State of Washington revised as to form by the APWA Supplement to make reference to local governments, herein referenced to as "Standard Specifications" and the "Conditions and Standards" as adopted by the City, shall be included as part of the "Specifications." Where the Standard Specifications and the "Conditions and Standards" conflict with one another, the "Conditions and Standards" shall take precedence.

2. Sewer Mains: PVC pipe shall be a minimum Class S.D.R. 35, be **green** in color, and be manufactured in accordance with the Standard Specifications. The pipe and fittings shall be furnished with bells and spigots, which are integral with the pipe wall. Pipe joints shall use flexible elastomeric gaskets conforming to the Standard Specifications. Nominal laying lengths shall be 20 feet.

Ductile iron (D.I.) pipe shall be Class 50 and conform to the standard specifications and current amendments thereto. Nominal laying length shall be 18 feet.

Restrained joint pipe, where required, shall be push-on joint pipe with “Fast Tight” gaskets as furnished by U.S. Pipe (or equal) for 12-inch-diameter and smaller pipe, and “TR FLEX” as furnished by U.S. Pipe (or equal) for 16-inch- and 24-inch-diameter pipes. Mechanical joint pipe with retainer glands (grip rings) as manufactured by “Romac” may also be required at the discretion of the City. The restrained joint pipe shall meet all other requirements of the non-restrained pipe.

The sewer pipe, unless otherwise approved by the City Engineer, shall be laid upgrade from point of connection on the existing sewer or from a designated starting point. The sewer pipe shall be installed with the bell end forward or upgrade. When pipe laying is not in progress, the forward end of the pipe shall be kept tightly closed with an approved temporary plug. Wherever movable shoring (steel box) is used in the ditch, pipe shall be restrained by use of a winch mounted in the downstream manhole and a line of sufficient strength threaded through the pipe and set tight before each move. Any indication that joints are not being held shall be sufficient reason for the City to require restraints, whether or not movable shoring is being used.

For the joining of dissimilar pipes, suitable adapter couplings and gaskets shall be used which have been approved by the City Engineer.

All gravity sewer pipe shall be bedded with material and to the depths indicated in the Standard Details.

Clay or Bentonite dams shall be installed across the trench and to the full depth of the granular material in all areas of steep slopes, stream crossings, and wetlands to prevent migration of water along the pipeline as directed by the City Engineer.

All backfill shall be placed and compacted in accordance with City, County, or State requirements as may be applicable. Unless otherwise approved in writing by the City Engineer, compaction of trench material is required. The density of compacted backfill material shall meet requirements outlined in the Standard Specifications, or as otherwise approved in writing by the City Engineer. The City will employ an independent soils laboratory to perform density test of areas specified by the City. **The Developer shall pay all costs incurred by the City to employ the soils laboratory.** In areas where it is demonstrated that the compaction standards have not been met, the area shall be excavated and re-compacted to the satisfaction of the City Engineer.

3. Manholes: Manholes shall be of the offset type and shall be precast concrete sections. Joints between precast wall sections shall be confined O-ring, or as otherwise specified.

For connections to existing systems, a concrete coring machine, suitable for this type of work, shall be utilized in making the connection. The existing manhole shall be rechanneled, steps

realigned, top cone section rotated, etc., all as required for a suitable installation. The new pipe connection shall be plugged (watertight) until the new pipe system has been installed, tested, and approved. The Contractor shall be responsible for any existing defects in the existing manhole unless these defects are witnessed by a representative of the City prior to any work being performed to make the connection. The Contractor shall be required to remove any and all deleterious material in the existing manhole and downstream reaches as a result of his/her work.

- a. Manhole Sections: Manhole sections shall be placed and aligned so as to provide vertical sides and vertical alignment of the ladder steps. The completed manhole shall be rigid, true to dimension, and be watertight. Rough, uneven surfaces will not be permitted.

The mortar used between the joints in the precast sections and for laying manhole adjusting bricks shall be composed of one part cement to two parts of plaster sand. All joints shall be thoroughly wetted and completely filled with mortar, with a brushed finish on the inside and smooth on the outside to ensure watertightness.

- b. Manhole Steps: Manhole steps shall be polypropylene, Lane International Corp. No. P13938, or equal. Ladders (maximum 3-foot length) shall be polypropylene Lane International Corp., or equal, and shall be compatible with steps.
- c. Grade Adjustment: Not less than 18 inches, or more than 26 inches, shall be provided between the top of the cone or slab and the top of the manhole frame. Masonry units (manhole adjusting brick) shall conform to the ASTM C32, Grade MA. The outside and inside of manhole adjusting bricks and the joints of precast concrete sections shall be plastered and troweled with 1/2 inch (minimum) of mortar in order to attain a watertight surface. The mortar finish shall be brushed on the inside and smooth on the outside.
- d. Channels: Channels shall be as shown in the Standard Details, made to conform accurately to the sewer grade, and shall be brought together smoothly with well-rounded junctions, satisfactory to the City Inspector.
- e. Drop Manholes: Drop manholes shall be as specified in the Standard Details.
- f. Lift Holes and Steel Loops: All lift holes shall be completely filled with expanding mortar, smoothed both inside and outside, to ensure watertightness. All steel loops shall be removed, flush with the manhole wall. The stubs shall be covered with mortar and smoothed. Rough, uneven surfaces will not be permitted.
- g. Frames and Covers: Frames and covers shall be as specified in the Standard Plans. Castings shall be free of porosity, shrink cavities, cold shuts or cracks, or any surface defects that would impair serviceability. Repair of defects by welding, or by the use of “smooth-on” or similar material, will not be permitted. Frames and covers shall be machine finished or ground on seating surfaces so as to assure nonrocking fit in any position and interchangeability of covers. Frames and covers outside of paved areas shall be provided with three-bolt locking lids. In unpaved areas, rings and covers shall be positioned so one of the three locking bolts is located over the manhole steps and shall be adjusted to conform to the final finished surface grade of the street or easement to the satisfaction of the City or agent for the City. Manhole frames and covers shall be as specified in the Standard Details.

4. Side Sewer Lateral: A side sewer lateral is considered to be that portion of a sewer line that will be constructed between a main sewer line and a property line or easement limit line.

Side sewers shall be for a single connection only and be a minimum 6-inch-diameter pipe. Side sewers shall be connected to the tee, provided in the sewer main where such is available, utilizing approved fittings or adapters. The side sewer shall rise at a maximum of 45 degrees and a minimum of 2 percent from the sewer main to provide each lot with the deepest sewer possible.

Where no tee or wye is provided or available, connection of a side sewer shall be made by machine-made tap and saddle in accordance with the standard details. The City shall review the exact location and material list in evaluating proposed connections. The maximum bend permissible at any one fitting shall not exceed 45 degrees. The maximum bend of any combination of two adjacent fittings shall not exceed 45 degrees (1/8 bend) unless straight pipe of not less than 3 feet in length is installed between such adjacent fittings. Fittings shall be avoided where possible. Cleanouts are required at all bends greater than 11.25 degrees.

5. Private Side Sewers: Private side sewers are the extension of side sewer laterals located outside of the public rights-of-way or easements granted to the City.
 - a. Side sewer pipe located on private property shall be 4 inches minimum, ductile iron, or PVC ASTM 3034 (green in color), and shall be installed at 2 percent minimum grade (1/4 inch fall per foot), per the Standard Detail. Construction on private property may be performed by owner, but requires a permit.
 - b. Pipe shall be bedded with pea gravel or clean, free draining sand.
 - c. Private yard sewers shall be installed per the Uniform Plumbing Code.
 - d. Side sewer shall be inspected by the City's Representative/Inspector prior to backfilling. Side sewer shall be plugged and tested in the presence of the City Inspector by filling with water. Leakage rate shall not exceed 0.31 gallon per hour for 4-inch pipe and 0.47 gallon per hour for 6-inch pipe, per 100 feet of pipe.
 - e. On private property, minimum cover shall be 24 inches over top of pipe from the point which is 30 inches out from house and continuing to the connection with the City's sewer system.
 - f. Parallel water and sewer lines shall be 10 feet apart horizontally wherever possible and have a vertical separation of 18 inches if a vertical crossing is necessary.
 - g. No more than 100 feet is allowed between cleanouts. Cleanouts are required for bends equal to or greater than 45 degrees. Cleanout shall be a watertight plugged gasketed tee or wye lateral.
 - h. Provide "grease trap" of a size and type approved by the City at all such locations as may be deemed necessary by the City. Grease trap shall be sized and stamped by Developer's Engineer. Design Calculations shall be provided to the City upon request.
 - i. A cleanout shall be installed for maintenance purposes.

- j. Private grinder pump installations shall require the following:
 - An interior failure alarm.
 - Be equipped with an exterior main disconnect switch.
 - Pass a pressure test to the 6 inch cleanout at the right-of-way line.
- k. Provide the City with an as-built drawing(s) in conformance with these standards (see Section 300, “Public Works Considerations”).
- l. Unless otherwise approved by the City Engineer, private side sewers shall be television inspected upon completion in accordance with Section 506 below.

505 TESTING GRAVITY SEWERS AND MANHOLES FOR ACCEPTANCE

The Contractor and/or Developer shall furnish all facilities and personnel for conducting tests under the observation of the City Engineer or City Inspector. Prior to testing, the completed gravity sewer, including side sewer stubs after completion of backfill and cleaning, shall be television inspected (see Section 506 below). The following tests shall be completed to the satisfaction of the City Engineer prior to acceptance of the sanitary sewer improvements:

1. Gravity Sewer Main Tests:

- a. Low-Pressure Air Test: A low-pressure air test shall be conducted in conformance with the Standard Specifications. All testing must be completed in the presence of the City Engineer or his/her representative(s). Testing shall not be conducted until after a successful television inspection has been conducted and the City has approved compaction reports provided by the Contractor.
- b. Deflection Test: A deflection test for thermoplastic pipe shall be conducted in conformance with the Standard Specifications. All testing must be completed in the presence of the City Engineer or his/her representative(s). If preapproved by the City, deflection testing can be completed in conjunction with the television inspection.

2. Manhole Tests:

- a. Manhole Test: All manholes shall be tested for leakage and all tests shall be witnessed by the Inspector. The approved test shall be either the Water Leakage Test or Vacuum Test and shall be conducted with all sewer mains leading into or out of the manhole tightly plugged. The approved test shall be carried out in the following manner:
 - (1) Water Leakage Test: The manhole shall be filled with water to a level at least two inches (2") above the uppermost step. The water shall be allowed to stand for two (2) hours to allow for normal water absorption into the manhole material. At the end of the two (2) hour stabilization period, if the water level in the manhole has dropped below the top step, additional water will be added to bring the level above the step as before. A one (1) hour test period shall then commence. Any visible external leakage or drop in water level

noted within the one (1) hour test period shall constitute failure and the contractor shall repair or replace the defective work and retest.

- (2) Vacuum Testing: At the option of the contractor, a Vacuum Test of the installed manholes may be used instead of the Water Leakage Test. The test head shall be placed at the top of the manhole and the seal inflated in accordance with the manufacturer’s recommendation. A vacuum of 10-inches of mercury shall be drawn on the manhole, the valve on the vacuum line of the test head shall be closed, and the vacuum pump shut-off. The time shall be measured for the vacuum to drop to 9-inches of mercury. The manhole will be declared unacceptable if the time to drop from 10- inches of mercury to 9-inches of mercury is less than the time shown in the following table:

Maximum Vertical Depth of Manhole (feet)	Time in Seconds		
	48” Diameter	60” Diameter	72” Diameter
8	20	26	33
10	25	33	41
12	30	39	49
14	35	46	57
16	40	52	65
18	45	59	73
20	50	65	81
22	55	72	89
24	60	78	97
26	65	85	105
28	70	91	113
30	75	98	121

- b. The City will not accept results of a manhole test prior to the completion of the first lift of final pavement (or asphalt treated base). Therefore, the City encourages the Developer/Contractor to perform preliminary tests as needed to provide assurance of a successful test upon completion of the first lift of final pavement. The City does not need to be present for the completion of preliminary testing and will not accept the results of any preliminary testing in lieu of a satisfactory final test.

506 VIDEO TAPING

Upon completion, all sewer mains and side sewer laterals shall be internally televised by a qualified firm providing said services. The recording shall be the final product and must be edited by the Contractor/Developer such that the recording progresses in a consistent manner from start to finish throughout the improvements. All equipment and materials shall be compatible with existing City equipment. It shall be the Contractor’s/Developer’s responsibility to confirm equipment compatibility with the City prior to inspection. A DVD, together with a written log of the television inspection, shall be submitted to the City for their review and approval, and if accepted, shall be retained in the City’s files. This work can be performed prior to paving. The City’s inspector shall be notified of the date of the television inspection to ensure his availability and on-site witnessing of the event during this time.

The City requires the use of a test ball or test slug (1 inch in diameter, graduated with 1/4-inch markings) to identify the depth of any ponding encountered during the television inspection. A maximum of 1/2 inch of ponding is acceptable. Immediately prior to the video inspection, a minimum of 10 gallons of dyed water shall be run through the pipe that will subsequently be videotaped.

After a period of no less than 18 months, but prior to 2 years, the Developer is required to perform an additional internally televised inspection of all sewer mains and side sewer laterals. The recording shall be delivered to the City's satisfaction as provided above. The City will not release the maintenance bond issued for the sanitary sewer improvements until a second television inspection has been successfully performed and any defects found during the inspection are corrected by the Developer and accepted by the City.

507 CROSSINGS

All state highways, stream crossings, and other road crossings when directed by the City, shall be encased with a steel casing, as approved by the City and prevailing regulatory agencies. The welded steel casing or sleeve shall be of sufficient diameter size and strength to enclose the sewer pipe and to withstand maximum highway or railroad loading. Sizing and wall thickness of casing is subject to approval by the City Engineer. Casing spacers and end seals (Cascade or equivalent) shall be required.

508 STAKING

All surveying and staking shall be performed by an engineering or surveying firm employed by the Developer and capable of performing such work. The engineer or surveyor directing or performing such work shall be currently licensed by the State of Washington to perform said tasks.

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

Unless otherwise approved by the City, the minimum staking of sanitary sewer systems shall be as follows:

1. Stake centerline alignment at a minimum of 50 foot intervals unless otherwise approved by the City.
2. Stake location of all manholes and side sewer laterals for grade and alignment.
3. Stake all property corners.
4. Provide a copy of "cut sheets" to City inspector.
5. Stake finished manhole rim elevation and invert elevations of all pipes in manholes.

509 TRENCH EXCAVATION

1. Clearing and grubbing (where required) shall be performed within the easement or public right-of-way as permitted by the City and/or governing agencies. Debris resulting from the clearing and

grubbing shall be disposed of by the owner or contractor in accordance with the terms of all applicable permits.

2. Trenches shall be excavated to the line and depth designated by the City to provide a City-approved minimum of cover over the pipe. Except for unusual circumstances where approved by the City, the trench sides shall be excavated vertically and the trench width shall be excavated only to such widths as are necessary for adequate working space as allowed by the governing agency and in compliance with all safety requirements of the prevailing agencies. The trench shall be kept free from water until joining is complete. Surface water shall be diverted so as not to enter the trench, and under no circumstances is water (either groundwater or surface water) to be allowed to enter the pipe. The owner shall maintain sufficient pumping equipment on the job to ensure that these provisions are carried out.
3. The contractor shall perform all excavation of every description and whatever substance encountered; and boulders, rocks, roots and other obstructions shall be entirely removed or cut out to the width of the trench and to a sufficient depth below sewer line grade. Where materials are removed from below pipe grade, the trench shall be backfilled to grade with material satisfactory to the City and thoroughly compacted.
4. **Trenching and shoring operations shall not proceed more than 100 feet in advance of pipe laying without approval of the City, and shall be in conformance with all state and federal regulations.**
5. When after excavating to the foundation level, the material remaining in the trench bottom is determined to be unsuitable by the City, excavation shall be continued to such additional depth and width as required by the Design Engineer. Unsuitable foundation materials shall be disposed of at a suitable site. The trench foundation shall be backfilled to the bottom of the pipe zone with gravel backfill for foundations, gravel backfill for pipe zone bedding, or other suitable material and compacted to form a uniformly dense, unyielding foundation.

510 BEDDING

Gravel backfill for pipe bedding shall be installed in conformance with the Specifications herein, or other approved applicable standards approved by the City.

1. Bedding for Sewer Pipe: Gravel backfill for pipe bedding shall be per the standard details.

511 STREET PATCHING AND RESTORATION

See Section 600, "Streets."

512 ADJUSTMENT OF NEW AND EXISTING UTILITY STRUCTURES TO GRADE

This work consists of constructing and/or adjusting all new and existing utility structures encountered on the project to finished grade.

1. Asphalt Concrete Paving Projects: On asphalt concrete paving projects, the manholes shall not be adjusted until the pavement is completed, at which time the center of each manhole lid shall be relocated from references previously established by the Developer and/or Contractor. The pavement shall be cut as further described and base material removed to permit removal of the cover. The manhole shall then be brought to proper grade.

Prior to commencing pavement operations, a plywood and Visqueen cover (as approved by the City Inspector) shall be placed over the manhole base and channel to protect them from debris.

The asphalt concrete pavement shall be cut and removed to a neat circle, the diameter of which shall be 18 inches from the outside diameter of the ductile iron frame. The ductile iron frame shall be brought up to desired grade, which shall conform to surrounding road surface and the Standard Details. **In no instance shall the casting be below the asphalt grade.**

Adjustment to desired grade shall be made with the use of concrete or bricks. No cast or ductile iron adjustment rings will be allowed. An approved class or mortar (one part cement to two parts of plaster sand) shall be placed between manhole sections; adjustment rings or bricks, and ductile iron frame to completely fill all voids and to provide a watertight seal. No rough or uneven surfaces will be permitted inside or out. Adjustment rings or brick shall be placed and aligned so as to provide vertical sides and vertical alignment of manhole steps and ladder.

Check manhole specifications for minimum and maximum manhole adjustment and step requirements. Special care shall be exercised in all operations in order not to damage the manhole, frames and lids, or other existing facilities.

As soon as the street is paved past each manhole, the asphalt concrete mat shall be scored around the location of the manhole. After rolling has been completed and the mat has cooled, it shall be cut along the scored lines. The manholes shall then be raised to finished pavement grade, and the annular spaces filled as shown in the Standard Details.

2. Adjustment of Manholes in Easements: Manholes in easement areas shall be adjusted to ensure drainage away from the manhole frame and cover. The manhole frame and cover shall be set approximately 0.1 foot above finished grade. Concrete collars shall be set about the structure, as detailed herein, in all nonpaved areas.
3. Adjustment of Valve Box Castings: Adjustment of valve box castings (force main valving) shall be made in the same manner as for manholes.

513 FINISHING AND CLEANUP

Before acceptance of sewer system construction, all pipes, manholes, catch basins, and other appurtenances shall be cleaned of all debris and foreign material. After all other work on this project is completed, and before final acceptance, the entire area including the roadway, planting, sidewalk areas, shoulders, driveways, alley and side-street approaches, slopes, ditches, utility trenches, and construction areas shall be cleaned and neatly finished to the lines, grades, and cross sections of a new roadway consistent with the original section, and as hereinafter specified.

On sewer construction where all or portions of the construction is in undeveloped areas, the entire area which has been disturbed by the construction shall be shaped so that upon completion, the area will

present a uniform appearance, blending into the contour of the adjacent properties as indicated in the approved plans. All other requirements outlined previously shall be met.

All excavated material at the outer lateral limits of the project shall be removed entirely. Trash of all kinds resulting from clearing and grubbing or grading operations shall be removed and not placed in areas adjacent to the project. Where machine operations have broken down brush and trees beyond the lateral limits of the project, the Developer and/or Contractor shall remove and dispose of same and restore said disturbed areas at his/her own expense.

All pavements and oil mat surfaces, whether new or old, shall be thoroughly cleaned. Existing improvements, such as Portland cement concrete curbs, curb and gutters, walls, sidewalks, and other facilities which have been sprayed by the asphalt cement shall be cleaned to the satisfaction of the City Inspector and/or City Engineer.

Castings for manholes, valves, lamp holes, vaults, and other similar installations, which have been covered with the asphalt material, shall be cleaned to the satisfaction of the City.

514 PRESSURE SEWER SYSTEMS

Pressure sewer systems, when allowed by the City, shall be designed in conformance with the most current Washington State Department of Ecology regulations and all applicable City, State, and Federal regulations. The following are additional requirements for pressure sewer systems.

1. General: Low pressure grinder pump systems shall only be considered for exceptional situations. Step systems or septic tank effluent pump systems shall not be allowed, except for special or exceptional situations. The City shall be the sole judge in determining allowance for same.
2. Design Standards: The design of systems shall provide for the future expansion of the system to serve tributary areas as determined by the City. Consequently, main extensions shall be extended to far property lines to facilitate future extensions. Mains shall be designed and sized for upstream flows/capacity as well. Easements shall be so granted to the City for this purpose.

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

3. Material: Pressured sewer lines shall be HDPE having a minimum pressure class rating of SDR 11 or as approved by the City, PVC C900 having a minimum pressure class rating of DR 18 with ductile iron fittings and gasketed joints, or ductile iron AWWA C151 Class 52 in special circumstances and if specifically approved by the City,. All ductile iron pipe and fittings shall be epoxy coated or PE lined and designed for use with corrosive materials. Pipes shall have a minimum 42 inches of cover.
4. Sizing: Pressure sewer lines shall be sized such that planned flows in the pipe have a minimum velocity of 2fps and do not exceed 8 fps.
5. Air/Vacuum Valves: Air release valves and air/vacuum valves shall be located at the high points of the line within a standard 48-inch manhole or a comparable sized, approved vault. Air release

valves shall be fitted with an activated carbon canister to absorb compounds with disagreeable odors prior to releasing the air to the surrounding area. Grades shall be designed to minimize the need for air/vacuum valves when practical. Valve stations shall be located in public right-of-way.

6. Main Drains: Provisions to drain a pressure system to facilitate repairs or to temporarily remove line from service shall be provided at all low points. This is accomplished through the use of a three-valved tee connected to a sump manhole at the low point of the line. A manhole shall also be set over the force main at the valved tee.
7. Thrust Blocking: Location of thrust blocking shall be shown on plans. Thrust blocks shall be sized and constructed to meet City standards shown in details W4 and W5. A plastic barrier shall be placed between all thrust blocks and fittings.

Restraining joint systems may be allowed in lieu of thrust blocking when approved by City Engineer. Restraining joint brand, type, and size shall be specified on the plans.

8. Line Termination: Design of line termination should provide for a smooth transition between force main (pressure flow) and gravity to reduce turbulence and odors.

At a minimum, the manhole at the terminus and the first manhole downstream of the terminus shall be coated with a spray on type of polyurethane coating. The Polyurethane coating shall be Spraywall by Spray Roq or approved equal which is resistant to sulfuric acid and hydrogen sulfide. When applied, minimum coating thickness shall be 125mm.

9. Odor Control Systems: The City may require an odor control system at the end of the pressure main if it is determined that significant hydrogen sulfide odors (H₂S) or the buildup of sulfuric acid (H₂SO₄) may occur in the operation of main. This may include chemical addition at the pump station.
10. Grinder Pump System: Operation and maintenance of the tank, grinder pump, pump controls, check valves, and line to main sewer line shall be the responsibility of the property owner.
11. Final Inspection and Testing: Pressure sewer lines shall be inspected and approved prior to testing. Pressure sewer pipe mains shall be pressure tested following the methods used in WSDOT Standard Specifications for water mains, 7-09.3(23) Hydrostatic Pressure Test. The minimum testing pressure in sewer force main shall be 100psi at the lowest elevation section of the force main.

515 SANITARY SEWER LIFT STATIONS

1. General Requirements:

- a. General:

- (1) Unless otherwise approved by the City, sanitary sewer lift stations will only be allowed in the locations indicated in the most recently adopted Sanitary Sewer Comprehensive Plan. If the proposed project will convey sewage to a location indicated in the Comprehensive Plan, the City recommends that the Developer contact the City as early as possible to begin the design process.

- (2) The City may require the Developer to provide detailed plans for the installation of pressurized sewer mains from a sanitary sewer lift station to an approved connection to an existing or proposed gravity system. The City will determine the pressurized sewer main diameter and material specifications. The preparation of said plans shall be in conformance with the Specifications above and Section 300, "Public Works Considerations." All plans must be approved by the City prior to construction.
 - (3) Upon payment from the Developer to the City as compensation for the design and plan preparation, the City will furnish Plans and Specifications to the Developer for construction. It will be the Developer's responsibility to retain the services of a licensed and bonded Contractor qualified to perform the work required in the approved Plans. During construction, all materials must be approved by the City or its representatives prior to installation. The Developer is responsible for the installation of all components shown in the approved Plans. The City, at the Developer's expense, will program and start up the telemetry system.
 - (4) Sanitary sewer improvements will not be accepted until all facilities, including sanitary sewer lift stations, are complete. **Completion of a sanitary sewer lift station includes the successful start-up of the facility and activation of the remote telemetry system.**
- b. Review Process: Each submittal shall consist of a minimum of three (3) copies of all documents to be used in the City review process, based on one copy for City files, one copy for City's review engineer file, and one copy to be returned to the Developer.
- (1) Preliminary Design Review Meeting: The Developer shall schedule a preliminary design review meeting at the City. The purpose of the preliminary design review meeting will be to confirm the design parameters (flow parameters, force main sizing, etc.), equipment requirements, lift station siting, and force main alignment. At least four (4) weeks prior to the meeting date, the Developer shall submit the following documents to the City for review:
 - Preliminary flow and pumping head calculations and associated reports.
 - Conceptual siting plan.
 - Preliminary process diagram.
 - Preliminary equipment list.
 - Proposed force main alignment.
 - (2) Design Review: Upon completion of the preliminary Design Review meeting, the Developer shall prepare plans and calculations in accordance with these Standards and Section 200 of the City of Bonney Lake Development Policies and Public Works Design Standards. Any City comments shall be responded to, in writing, for review in the subsequent submittal. Depending on the scope of the City's comments, the City may schedule a Design Review meeting. The Design Review processing fee allows for the following maximum number of submittals:

- (a) Submittal 1 – Concept Design: Includes site layout, equipment list, process and instrumentation diagram, and preliminary mechanical and electrical plans.
- (b) Submittal 2 – Final Design: Includes final calculations and detailed design drawings and specifications for the lift station, incorporating the earlier comments from the City.
- (3) Final Plans for Approval: The Developer shall address each of the City’s comments to the City Engineer’s satisfaction and submit final drawings, specifications, and design calculations, each sealed by a professional engineer in the state of Washington, for approval by the City Engineer. A minimum of three (3) copies of the sealed drawings shall be included with the signed documents. One set of the sealed drawings will be returned to the Developer, at which time a preconstruction meeting may be scheduled. No work shall commence until all necessary permits have been obtained, a deposit in the amount determined by the City Engineer for inspection fees has been delivered to the City, and the preconstruction conference has been completed.
- c. Applicable Standards: Sewage lift stations shall be designed in accordance with applicable City of Bonney Lake and Washington State standards. In addition, lift stations shall be designed in accordance with the following standards:
 - (1) Department of Ecology’s *Criteria of Sewage Works Design* (most current edition).
 - (2) EPA-430-99-74-001 *Design Criteria for Mechanical Electric, and Fluid System and Component Reliability*.
 - (3) International Building Code 2003 (or most current edition).
 - (4) National Electric Code (most current edition).
- d. Standard Design Functionality and Components: The functionality and components of each sewage lift station shall be in conformance with the standard process and instrumentation diagrams shown in the Sanitary Sewer Standard Details.
- e. Design Life: Lift stations shall be designed for a 20-year minimum design life for all mechanical and electrical components. The building and wet well shall be sized for a 40-year design life, unless otherwise approved by the City.
- f. Design Flow: Design flow for the station shall be 20 years minimum with one pump off line and in accordance with the City’s most current revision of its Sewer Comprehensive Plan.
- g. Reliability and Redundancy: Lift stations shall provide Class I Reliability in accordance with EPA-430-99-74-001 *Design Criteria for Mechanical Electric, and Fluid System and Component Reliability*, as recommended by the Department of Ecology’s *Criteria of Sewage Works Design*.
- h. Wet Well Storage: The lift station wet well shall be designed for adequate storage while minimizing solids deposition. It shall be capable of storing a volume above the high wet well

level equal to that of the force main. The wet well storage shall also be sized to prevent an excessive number of pump motor starts per hour, meeting NEMA and the pump manufacturer's requirements. To minimize solids deposition, the side slopes in the wet well design must be a minimum of 60 degrees from horizontal, and the flat area at the bottom of the wet well shall be no larger than the pumps and discharge elbow base plus 8 inches of clearance.

i. Major Components of a "Standard Sanitary Sewer Lift Station" shall include the following:

- (1) Wet well with locking access hatch and safety grate fall protection system.
- (2) Submersible sewage pumps.
- (3) Valve vault with locking access hatch.
- (4) Station flow meter with vault with locking access hatch.
- (5) Pig launch system.
- (6) Pole-mounted exterior lighting located over wet well and valve vault.
- (7) Standby diesel generator with a weatherproof and sound attenuated enclosure.
- (8) Building:
 - (a) Construction: smooth face (exterior side) concrete masonry units (CMU) walls with a metal roof.
 - (b) 480 V electric power system including service entrance panel, automatic transfer switch, and distribution panels.
 - (c) Control panel for pumping system complete with radio telemetry system.
 - (d) Storage closet with 16 square feet (minimum) of floor space.
 - (e) Water system with backflow preventer, freeze-proof wall hydrant to exterior of building, utility sink with hot and cold heater sources, and splash guard to protect nearby electrical equipment.
 - (f) HVAC system including unit heater for freeze protection and ventilation fan system. Air conditioning shall be required on a case-by-case basis and determined by the City Engineer.
- (9) Site fencing with security barb wire along top.
- (10) Station utility power transformer.
- (11) Paved parking and access.

2. Site Construction:

- a. Fencing: The lift station site shall be fully fenced with chain-link fencing that is both galvanized and powder coated (color shall be as directed by the City) with multiple strand barb wire along top. Fencing shall be 8 feet high and above grade. Pipes for posts, rails, braces, and gate frames shall be Schedule 40 and shall conform to ASTM 120. Fencing shall conform to COBL Standard, M1.
 - b. Truck Access and Parking: The lift station shall have an access road with easement capable of supporting 20,000-pound axle loads throughout the year. This road shall connect to the nearest public road and will be used for the maintenance of the station. Access shall be designed to allow a City service truck with hoist to be appropriately situated to lift the pumps from the wet well. On-site parking shall be provided for a minimum of two vehicles.
 - c. City Water: City water shall be provided to the station for hose-down purposes. A wash-down system shall be sized for 20 gallons per minute minimum. A Washington-State-Department-of-Health-approved backflow prevention device shall be provided on the water supply line to protect the public water system. The backflow device will be tested and certified by the City's Cross-Connection Specialist prior to the acceptance of the system. The backflow device shall be located inside the building to prevent freezing, and provided with a drain and appropriate clearances to avoid damage to other equipment and to conform to inspection requirements.
3. Concrete:
- a. Wet Well Coating: Wet well shall be provided with a coating suitable for the application shall be coated with a spray on type of polyurethane coating. The Polyurethane coating shall be Spraywall by Spray Roq or approved equal which is resistant to sulfuric acid and hydrogen sulfide. When applied, the minimum coating thickness shall be 250 mils. If required by the City Engineer, after completion of coating, the Contractor shall be responsible to have a certified inspector complete a high voltage test of the surface. The City shall accept the coating after the certified inspector approves test results.
 - b. Vaults: Valve and flow meter vaults shall be precast concrete with an exterior coating and ladder steps. The exterior coating shall be One Coat Hi-Mil Sher-Tar Epoxy or approved equal. Ladder Steps shall include an extension handle for access. Vaults shall have lockable aluminum access hatches with H-20 rating.
4. Masonry:
- a. Concrete Masonry: The building shall be constructed of smooth-face (exterior side) concrete masonry units (CMU).
5. Metals:
- a. Miscellaneous and Structural Steel: Metal structures and supports within the building or on site shall be galvanized steel, except in the wet well where these items shall be Type 316 stainless steel.
6. Woods and Plastics:
- a. Sheathing: If used, wood sheathing shall be minimum 15/32-inch-thick CDX or better.

- b. Trusses and Cross Bracing: If used, prefabricated trussed and cross-bracing shall be designed and certified by the truss manufacturer to meet the design loads.
7. Thermal and Moisture Protection:
- a. Roofing: Metal roofing system shall consist of 24-gauge, or thicker, factory formed, prefinished panels with major ribs not less than 1-5/8 inches in height.
 - b. Insulation: Interior ceiling insulation Kraft paper faced bats, R-value of 38 minimum, and shall meet current building code requirements.
8. Doors and Windows:
- a. Doors: Exterior doors shall be weathertight, flush construction, fabricated from 16-gauge minimum, galvanized steel, 1-3/4 inches thick, and insulated with solid polyurethane or urethane foam core. Door shall have key cylinders and dead-bolt keyed to City's standard core.
 - b. Access Hatches:
 - (1) The access hatch for the wet well, valve vault, and flow meter vault shall be constructed of stainless steel hardware and shall have a diamond plate cover and recessed padlock hasp. The hatch shall be have a spring-assisted operator that reduces the lifting force to a maximum of 15 pounds. The hatch shall be rated for H-20 loading.
 - (2) Wet Well Access Hatch: The hatch shall be double leaf and have shall be provided with hinged safety grate for a fall protection system by Halliday Products Series X Retro Grate or approved equal.
9. Finishes:
- a. Painting: Before beginning any painting or coating, a list of coating and manufacturers shall be submitted for review and approval by the City.
 - (1) General Colors:
 - (a) Building exterior coating:
 - (b) Exposed DIP piping:
10. Specialties:
- a. Signage: There shall be signage on the fence and building consistent with City Standards.
 - b. Design Data: Lift Station Design Data per Standard Detail SS24 shall be included in the construction and as-built plans.
11. Equipment:

- a. Identification Numbering:
 - (1) All equipment and valves shall be numbered and shall include stainless steel nameplates.
 - (2) The wet well cover shall include permanent labels identifying each pump number.
 - (3) Containers for spare parts shall be labeled with equipment name and number.
- b. Pumps: Sewage pumps shall be Flygt submersible with permanent stainless steel guide bars and accessories for automatic connection to the discharge elbow as the pumps are lowered into place. Pumps shall pass a minimum 3-inch spherical solid and shall be designed for pumping raw sewage. Pumps shall include moisture and over-temperature protection module. Pump motor shall be 480 V, 3-phase. Pump cables shall extend to a disconnect hand hole vault located on exterior of station building.

12. Furnishings:

- a. Shelving: Permanently mounted shelving shall be provided and shall be suitable for storage and easy access to all operation and maintenance manuals and spare parts.

13. Special Construction (Not Used)

14. Conveying Systems:

- a. Pump Lifting Mechanisms: Pumps shall be provided with SST cables, rather than chains, to assist the pump removal process. The pump shall be capable of being lifted by the standard Bonney Lake truck hoist and lifting mechanism.

15. Mechanical:

- a. General: See Lift Station Standard Details.
- b. Isolation Valves: All sewage isolation valves for the lift station and force main shall be eccentric plug valves with 100% adjacent full pipe area opening, unless otherwise shown in the City standards.
- c. Building and Vault Drains: Floor drains with p-traps shall be provided for the building and the vaults. Air separation shall be provided between the wet well and the vaults and between the wet well and building. This shall be accomplished in one of the following ways:
 - (1) Sump pump(s) that discharge(s) from the floor drains system(s) to the wet well.
 - (2) Provision of a deep seal p-trap, duckbill style, ProSet Trap Guard, or equal, for each cast iron floor drain that drains directly to the wet well.
- d. Wet Well Flush Pipe: A 4-inch wet well flush pipe with an isolation valve shall be provided at the lift station to recycle sewage from the valve vault piping back to the bottom of the wet well.

- e. Pig Launch: The pig launch shall be provided, separated from the force main using isolation valves on the upstream and downstream side of the pig launch piping. It shall have a 4-inch drain line that drains directly into the wet well and is controlled by an isolation valve. The pig launch shall be one pipe size larger than the force main. The pig launch shall have a flanged end with blind flange that can be removed for temporary bypass.
- f. Odor Control Scrubber: If required by the City Engineer the station shall include a Biocube odor-control unit. The size of the unit shall be approved by the City. At a minimum, the blower on the unit shall provide air flow of 100 feet per minute through the influent pipe during low flows and maintain a negative pressure in the wet well.
- g. HVAC:
 - (1) Provide wall-mounted unit heater sized to maintain the room at a minimum of 50 degrees F in the coldest expected weather. Provide wall-mounted thermostats for each unit.
 - (2) Provide an exhaust-fan ventilation system with wall-mounted operator-accessible 24-hour timer. Ventilation system shall include a wall type louver with backdraft damper and rack filter.
 - (3) If required by the City Engineer the Electrical Room in the building shall be air-conditioned and sized to maintain room temperature below 70 degrees F during the hottest expected weather and full-load operation at the pump station. Provide wall-mounted thermostats for each unit.
- h. Backflow Preventer: The backflow preventer shall be provided in the Control Building for freeze protection. Unit shall be Watts Series 009, model number updated as required to meet current listing and standards from Washington State Department of Health.
- i. Swing Check Valves: Check valves shall be full-port and full-face flanged. The valves shall have an external level and weight or level and spring. Check valves shall comply with AWWA C508, Swing Check Valves for Waterworks. Provide factory-installed magnetic proximity limit switch rated for Class 1, Division II. Valves shall be CCNE 8000.
- j. Vacuum Relief: Unless demonstrated as not required, each force main system shall be provided with two vacuum-relief valves, GA FIG 991, or City approved equal, to assist with water hammer protection.
- k. Wash Down Hydrant: Each pump station shall be provided with a 1-inch outdoor freeze proof wall hydrant. Install hydrant through a CMU wall in the building and provide shut-off valve inside building. Include 1-inch hose long enough for wash-down of all equipment at the pump station, including the wet well. Provide wall-mounted stainless steel hose rack.
- l. Utility Sink: Each pump station shall be provided with a utility sink in the building with hot and cold water.

16. Electrical:

- a. General:
 - (1) All electrical equipment, including controls, shall have Testing Organization Approval as required by Washington State Labor and Industries.
 - (2) All junction boxes shall be labeled with circuit number and duty.
 - (3) Connecting wires in junction boxes and hand holes shall be of similar color.
 - (4) Wires/conductors in junction boxes, hand holes, and all panels shall be clearly labeled with sleeve-type wire markers with numbers as shown on the electrical drawings.
- b. Standby Generator: Each lift station shall be provided with a standby diesel engine generator and fuel tank in an enclosure designed for outdoor use and noise control. The fuel tank shall be double-walled with leak detection and shall be sized for both pumps running for 24 hours at 75 percent of full load. The top of the display on the control panel for the generator shall be no higher than 6 feet 6 inches. The generator:
 - (1) Shall be diesel powered, rated to provide 480 V at 60 Hz with a power output rating to operate all raw sewage pumps simultaneously.
 - (2) Shall be located outdoors and shall have sound-attenuated, weatherproof enclosures. Enclosure shall be rated for 73 dBA maximum at 7 meters.
 - (3) Assembly shall be UL 2200 rated.
 - (4) Shall provide the following status and alarm contacts to the telemetry system: Running, Trouble, Failure (Shutdown), and Low Fuel.
- c. Automatic Transfer Switch: The station shall be provided with an automatic transfer switch with microprocessor-based controller to provide transfer on loss of power and scheduled testing. Include manual bypass switch, ASCO 7000 or approved equal.
- d. Motor Control: Pump motor starters and circuit breakers may be located in a common motor control center or in the pump control panel.
- e. Pump Disconnect Switches: A lockable (both positions), 3-phase, 316 stainless steel disconnect switch shall be provided for each raw sewage pump. The submersible pump cables shall be terminated in the disconnect switches. The cables shall be protected from vandalism by installing a sight-proof louver over the exposed pump cable. Louver shall be installed with anti-vandalism screw fasteners.
- f. Raceways and Conductors:
 - (1) All conduits shall be Schedule 40 minimum wall thickness unless otherwise noted.
 - (2) EMT will be allowed only when used within the building CMU walls.
 - (3) PVC conduit will be allowed for floor slabs.

- g. Low-Voltage Wire and Cable:
 - (1) Power – No. 12 AWG and larger stranded copper for motor and power circuits.
 - (2) Control – No. 14 AWG and larger stranded copper for control and alarm circuits.
 - (3) Lighting – No. 12 and No. 10 AWG solid copper for lighting circuits.
 - (4) Instrumentation Wiring:
 - (a) All single analog signal cables shall be two-conductor or three-conductor No. 16 AWG minimum stranded copper with 90 degree C, 600 V rating.
 - (b) Multi-pair cables shall be No. 20 AWG minimum with cable rating of 90 degrees C, 600 V.
 - (5) All field and control panel conductors shall be clearly labeled with sleeve-type wire markers with numbers as shown on the electrical drawings.
- h. Outdoor Enclosures and Boxes: Shall be NEMA 4X, 316 SS.
- i. Lighting Panel Board: A wall-mounted 120/240 V panel board shall be provided in the building to power the station electrical power and lighting loads.
- j. Lighting:
 - (1) Interior Lighting:
 - (a) Interior lights shall be LED lamps with surface or pendant mounted, 4 feet in length long.
 - (b) Provide a minimum of one surface-mounted emergency fixture with battery pack.
 - (2) Exterior Lighting:
 - (a) All exterior lights shall be controlled from a common photo cell. A lighting control panel with a HAND-OFF-AUTO selector switch to control all exterior lights shall be located in the Control Building.
 - (b) Exterior wall mounted lights shall be LED lamps with a minimum input wattage of 40W.
 - (c) Provide pole-mounted light(s) directly over the wet well and valve vault. The lights shall be constructed of tapered aluminum with black epoxy coating and be equipped with LED lamps having a minimum input wattage of 200W. Lights shall have ON-OFF switches located in the adjacent Control Building and shall be clearly labeled with 1-inch by 3-inch engraved nameplates identifying the service.

- k. Building Heater(s): Space (unit) heaters shall be 480 V, 3-phase powered, ceiling-mounted complete with 480 V contactor, disconnect switch, and thermostat.

17. Instrumentation and Controls:

a. General:

- (1) The lift station control system designs shall conform to the Piping and Instrumentation Drawings found in the Sanitary Sewer Standard Details.

- b. Control Strategy: The Developer shall provide a detailed narrative of the pump station control strategy. The control strategy shall include a high-level overview plus a description of the operation of each relay and rung in the control system.

c. Control Panel:

- (1) Panel shall be located in lift station building.
- (2) Panel shall be a free-standing (no leg kits), NEMA 12 painted steel. The panel shall have front doors and padlock hasp. Operator controls shall be located on the front door.
- (3) Panel shall be mounted on 4-inch-high curb or pad.
- (4) Panel shall be anchored to the floor and wall and shall meet the requirements of International Building Code. Proposed mounting details with equipment weights shall be submitted to the City for review and approval by the City's structural engineer.
- (5) Panel shall be constructed and labeled per UL-508.
- (6) Panels shall contain a thermostatically controlled fan to circulate air within the enclosure for cooling.
- (7) Control system shall be relay-based unless otherwise approved by the City Engineer.
- (8) Programmable Logic Controllers for telemetry system shall be Allen Bradley model style, Compact Logic, or approved by the City.
- (9) Operator Interfaces (graphic terminals) shall be color touch-screen Allen Bradley PanelView Plus 1000 Color with 128 MB memory minimum and Ethernet communications.
- (10) When future upsizing of pump(s) are planned, motor starters of the size for the future pumps shall be provided as part of the original design. This is to ensure that adequate space and equipment is provided to minimize shutdown and rewiring when the future pump(s) are added.
- (11) The control panel shall have an intrusion circuit with panel-mounted "ON-OFF" selector switch and separate indicating lights for each intrusion switch. The circuit shall sound a siren, mounted on the outside of the building, whenever a door or hatch has been open for

more than 1 minute. The intrusion switch shall only disable the siren. Each limit-switch signal and a horn-sounding alarm shall be sent to the telemetry system for monitoring by the City's SCADA system.

- (12) The control panel shall have an alarm annunciator system with individual lights or illuminated windows for each process alarm and common intrusion alarm and "test and silence" push buttons. The system shall illuminate a vandal-proof red warning light mounted in a conspicuous location on the outside of the building. Each process alarm shall be sent to the telemetry system for remote monitoring by the City's SCADA system.

d. Flow Meters:

(1) Raw Sewage:

(a) Flow Tubes:

- (i) Siemens 5100W flange mounted with Type 316 SS electrodes or approved equal.
- (ii) Connection box shall be potted for moisture protection.

(b) Flow Transmitters:

- (i) Siemens model to match flow tube. Transmitter shall be panel mounted located on the front door of the control panel. Under no condition shall the transmitter be located outside or in underground vaults.
- (ii) Transmitter shall be calibrated to display both flow rate and total flow. The flow rate output signal shall be 4 to 20 mA and be input to the telemetry system.

e. Inside the Wet Well for pump control:

- (1) Float Switches: The float switches shall be Anchor Scientific Roto-Float Type "S" or City-approved equal.
- (2) A submersible level transmitter shall be installed in location as described on the City approved plans. The transduction principle shall be an integrated silicon strain gauge bridge with a two-wire 4-20 mA output signal. A weighted stainless 3/16-inch aircraft cable shall be provided for attachment of level transmitter. The aircraft cable with weight system shall be the length of the wet well depth. The submersible level transmitter shall be a KPSI level transmitter 705 series or equal with cable hanger and aneroid bellows.

f. Limit Switches:

- (1) Intrusion limit switches shall be installed on each building exterior door and the first hatch on all vaults.
 - (a) Vault door limit switches shall be Topworx, GO Switch 10-20 Series magnetic lever-less type rated with screw terminals and Class 1, Div II rating.

(b) Building door limit switches shall be Topworx, GO Switch 10-20 Series magnetic lever-less type rated with screw terminals.

(2) Valve or check valve vault door limit switches shall be magnetic lever-less type rated with screw terminals and Class 1, Div II rating.

g. Pressure Gauges:

(1) 4-1/2-inch minimum nominal diameter liquid filled 1 percent accuracy gauge with 1/2-inch NPT stem.

(2) On raw sewage applications, a Red Valve Model 742 diaphragm seal shall be provided and assembled to back-connected gauge. Pipe to provide water or air back-purging to eliminate solids plugging.

(3) Gauges installed in underground vaults shall include Parker Hydraulic “No-Spill” Quick Couplings between the gauge and Red Valve Model 742 body and oriented 90 degrees from the sensor and positioned to be read from surface grade.

h. Telemetry System:

(1) Communications between the RTU sites and the MTU located at the City’s public works building shall be implemented using an Ethernet data radio. The telemetry system shall include the following components:

(2) The Ethernet radio shall be a Calamp VIPER SC-400 UHF RF Modem, dual port, UHF 450-512 MHz. Programmable to 25, 12.5 and 6.25 KHz bandwidth operation. No Substitutions.

(3) The antenna shall be a Telewave dipole array antenna including all required antenna mounting and termination hardware and LMR400 Coaxial antenna cable.

(4) The PolyPhaser used for lightning arresting shall be a Calamp VHF50HN unit designed for 100MHz-512MHz frequencies.

(5) 24 VDC power supply with DC UPS and battery backup.

(6) Telemetry and Control System Programming:

(i) Programming of the controls or telemetry system at the lift station is the direct responsibility of the Developer.

(ii) Addition of programming to the City’s central SCADA computer will be provided by the City’s Systems Integrator and billed by the City to the Developer’s project.

(7) Telemetry system standards are presently under review by the City. Submit a request to the City Public Services Department for current telemetry system standards and approved equipment list prior to design and/or purchase of the equipment.

516 STANDARD SEWER NOTES

The following notes shall be included in the plans:

1. Prior to any construction activity, the Developer shall arrange and attend a preconstruction conference with the City of Bonney Lake.
2. An approved copy of these Plans must be on the jobsite whenever construction is in progress.
3. All work and materials shall be in accordance with the most current City of Bonney Lake Development Policies and Public Works Design Standards, and the amendments thereto.
4. Work shall not commence until approval is received from the State Department of Ecology.
5. Front property corners shall be set by a land surveyor licensed in the State of Washington prior to the start of construction.
6. Notify the City of Bonney Lake 72 hours (3 working days) prior to beginning construction and for any restarts of work.
7. For aid in utility location, call 811 or 1-800-424-555, 48 hours (2 working days) prior to beginning of construction. Existing utilities, whether shown or not, shall be located prior to construction, so as to avoid damage or disturbance, and the Developer shall assume all responsibility and costs connected therewith to protect, maintain and repair, where necessary.
8. Pipe length, manhole depths, etc., (as shown) are approximate. Developer is responsible for supplying proper quantities of materials.
9. Provide the City's inspector with a copy of all cut sheets prior to construction.
10. Connection to an existing main shall be done so as to prevent any foreign materials from entering existing sewers.
11. A minimum horizontal distance of 10 feet shall be maintained between all sewer and water mains.
12. In the event that an existing utility is damaged during construction, the Developer/Contractor shall notify the City and the Utility Company (if applicable) immediately.
13. All sewer lines shall be cleaned and tested in accordance with City of Bonney Lake Standards and Specifications.
14. Prior to acceptance, the Developer/Contractor shall verify that the line and grade of the main meets the City of Bonney Lake Standards. Immediately prior to starting the video inspection, the Developer/Contractor shall flush the mains and insert a visible dye (color as approved by the City) into the mains to aid in identifying the depths of any ponds encountered during the inspection. Pondered depths that exceed 1/2 inch will require the main to be repaired unless otherwise approved by the City.

15. Manhole covers located in asphalt areas shall not be adjusted until the final lift of pavement is in place.
16. The Contractor shall take all steps necessary to ensure that the existing facilities remain fully operational during all stages of construction.
17. The Contractor shall be responsible for notifying homeowners of the intended construction schedule.
18. The Contractor shall completely restore the site to existing or superior condition prior to moving to another project site.