

SECTION 4: Standards for Sanitary Sewer Systems



4.0 STANDARDS FOR SANITARY SEWER SYSTEMS

These Standards contain the design criteria and improvement standards for the extensions or connections to the City of Kent Sanitary Sewer System. The conditions apply to all improvements made by both public agencies and private developers. These improvements may include the following:

- Sewer main extensions, modifications and replacements
- Side sewer connections to City mains
- Sewer Lift Stations

4.1 EASEMENTS AND RIGHTS-OF-WAY

Permanent on-site easements for access, maintenance, and construction are required for all sanitary sewer extensions located outside of public right-of-way. Whenever an easement or right-of-way is fenced, a gate shall be installed matching the width of the easement and a City lock must be placed in "series" to facilitate access by the City. When easements are required, legal descriptions shall be prepared by a Professional Land Surveyor licensed by the State of Washington. A title report, dated within thirty (30) days, for all properties to be encumbered by the easements shall accompany the description.

When off-site and/or on-site easements for the extension of approved comprehensive sanitary sewer plans are required, these easements shall be approved and recorded by the City before any civil construction permit is issued, unless the easements are being dedicated to the City as a part of the final recorded subdivision.

Private improvements such as buildings, fences, garages, carports, retaining walls, utilities, signs, light standards, etc., are not allowed in public easements and rights-of-way. Where an encroachment occurs, the Developer shall remove and relocate the conflicting private improvement immediately upon direction from the Engineer and restore the area to a condition compatible for the intended use of the Easement by the City.

4.1.A Easement Requirements

Easements shall be accessible for construction equipment normally used for the operation and maintenance of the facility. Cross slopes exceeding 5 percent will require a deviation approval of the Engineer. The minimum easement widths, centered on the utility system are as follows:

1. Sanitary Sewers 0'-5' deep: 15' wide
2. Sanitary Sewers 5'-9' deep: 25' wide
3. Sanitary Sewers over 9' deep – The formula for half of the width of the Easement shall be the sum of the total depth from the top of pipe to the surface, plus the pipe diameter, plus 3', rounded to the nearest even foot to a maximum of 50' total width.

4. Special conditions or installation requirements may require greater easement widths as determined by the Engineer.
5. In easements with multiple utility systems, the easement width shall be increased by the minimum separation distance between the lines.

4.1.B Right-of-Way

Where possible, utility system extensions shall be located within City right-of-way. Work inside adjacent Cities, County and State right-of-way requires special permits from the appropriate agencies. City, County and State right-of-way permits must be obtained by the Developer or the City if required by franchise prior to Engineering Plans approval by the City.

4.2 PLAN APPROVAL AND PERMITS

The construction of sanitary sewer extensions within the City and approved franchise service areas requires the approval of the City, DOE, and KC/DNR-WTD. No construction shall be permitted until the Engineering Plans have been reviewed and approved by these agencies. Said construction is also subject to City permit and plan review fees. Contact the Permit Center for a current fee schedule.

4.3 SANITARY SEWER SYSTEM DESIGN REQUIREMENTS

4.3.A General

All sanitary sewer systems shall conform to the design requirements of the Criteria for Sewage Works Design issued by DOE and the WSDOT Standard Specifications as shown in Section 1.6 References. All work shall comply with the design requirements of KC/DNR-WTD when connections are made to their system.

4.3.B Comprehensive Sanitary Sewer Plan

The City has developed a comprehensive sewer plan to allow the orderly and cost effective development of sewerage facilities to serve existing and future users of the Kent sewer system.

The Comprehensive Sanitary Sewer Plan includes a map of proposed sewer extensions to service areas presently not served by the City. The plan shows the general location of interceptor and trunk sewers, intended to provide the framework of the collection system for the service area. All proposed sewer improvements and extensions shall be consistent with the Comprehensive Sanitary Sewer Plan.

4.3.C Service Area Considerations

All sewer extensions shall be designed for the ultimate development of the service area in accordance with current land use plans. The determination of the tributary area shall be based on the Comprehensive Sanitary Sewer Plan and detailed studies of the areas affected. The Engineer shall assist in the determination of the tributary area and must approve the service area plan prior to detailed design of the sewer system.

New sewer systems shall be designed on the basis of per capita flows or other methods as approved by the City and DOE detailed design calculations and service area maps shall be required for the system design.

Special considerations must be given to sanitary sewer extensions for industrial districts. The potential for pre-treatment requirements, excessive sewage flows, protection of new or existing manholes from corrosive discharge, special flow metering or sampling requirements must be considered in the industrial sewer collection system design.

4.3.D Extent of Sanitary Sewer Improvements

The sanitary sewers shall be extended to the limits of the respective property being served in accordance with the Comprehensive Sanitary Sewer Plan. The extension shall be of the size and profile grade necessary to be extended to other properties upstream in the future. In cases where the plan does not require future extension, the sewer system shall be extended as necessary to serve the affected property.

4.4 DESIGN STANDARDS

4.4.A Diameter

The minimum diameter sanitary sewer main shall be 8". Larger diameters may be required to accommodate capacity or to minimize grades.

4.4.B Velocity and slope

All sanitary sewers shall be designed and constructed to provide a minimum velocity of 2 fps flowing full. The maximum non-restrained pipe allowable velocity shall be 10 fps. For velocities exceeding 10 fps, pipe anchors shall be required with a detailed drawing submitted to the City for approval by the Engineer. Velocities over 30 fps are to be avoided and may require odor control facilities to be installed by the Developer at the direction of the Engineer.

The following are the minimum, acceptable slopes for sanitary sewers as permitted by DOE and the City:

Table 4.1

Sewer Size (Inches)	Minimum Slope *
4"	2.00% – Private Side Sewer
6"	1.00% – Private Side Sewer
8"	0.40%
10"	0.28%
12"	0.22%
15"	0.15%
18"	0.12%
21"	0.10%

* Based on Mannings "n" value of 0.013.

4.4.C Alignment and Grade

All sewers shall be designed and constructed with a straight alignment and continuous Profile Grade between manholes.

4.4.D Depth

All sewer mains shall be buried deep enough to prevent freezing, breakage, and provide adequate depth to service the lowest fixtures on the properties served. The minimum cover for PVC sewer pipe (minimum SDR 35) is 3' or manufacturer's recommendation, whichever is greater.

4.4.E Location

All sanitary sewers shall be located at least 10' horizontally, on each side of the pipe, from the outside edge of an existing or proposed watermain. Any deviation from this requirement shall meet DOE requirements and will be allowed only upon approval from the Engineer. Sanitary sewer crossings under watermains shall be laid at such an elevation that the outside top of the sewer pipe is at least 18" below the outside bottom of the watermain. Where sanitary sewer mains have less than 10' of horizontal and 18" of vertical separation, the sanitary sewer main shall be constructed with PVC C900 or Class 50 ductile iron pipe. The pipe shall be one continuous length of pipe 18' or longer, centered across the water line.

4.4.F Access Roads

Access roads to all manholes are required for maintenance. Access and/or maintenance roads (where required) shall be 15' wide and shall accommodate turning movements for a BUS-40 design vehicle. Access and/or maintenance roads will require an approved all-weather surface, and shall be designed to support an HS-20 vehicle load. The profile grade of an access road shall not exceed 15 percent. Access roads with grades exceeding 12 percent shall be paved. All access roads longer than 150' from the nearest face of curb or edge of pavement of the connecting street shall have a standard hammerhead turnaround per Standard Plan 6-21, or shall be looped to connect back to a public street. Whenever an easement or right-of-way is fenced, a gate shall be installed matching the width of the easement and a City lock must be placed in "series".

4.4.G Garbage areas, enclosures and car washes

Garbage areas and enclosures, and community car wash areas exceeding 200 square feet, shall be covered and discharge to the sanitary sewer system, not the storm drain.

4.4.H Casings

Where a sewer line passes under or through a retaining wall or is attached to a bridge structure, the pipe shall be cased in steel pipe at least 4" larger than the largest outer diameter of the bell or joint of the sewer line. No pipe joints will be allowed within the casing, except on bridge structures or unless otherwise approved by the Engineer. The casing shall extend on either side of the wall a distance equal to the highest height of the retaining wall at the wall penetration, plus 4'. All voids within the casing shall be filled with blown sand except on bridge structures. Casing spacers shall be Cascade Waterworks Manufacturing Company stainless steel casing spacers or approved equal. The casing spacers shall be installed such that the watermain is centered and restrained within the casing and spaced such that a uniform Profile Grade will be maintained within the casing.

4.5 SANITARY SEWER MANHOLES

4.5.A Locations

Sanitary sewer manholes are required at the following locations:

1. At the end of all sewer mains 8" and larger in diameter. When the main is to be extended in the future, the end of the line shall be a bell, plugged and marked with a 2" x 4" stake. Cleanouts are not acceptable in main line installations, except at the end of a dry or inactive sewer line which will be connected or extended in the future.

2. All changes in slope.
3. Changes in sewer main pipe diameter.
4. All connections to the main line 8" and larger.
5. Changes in sewer alignment.
6. Manholes shall be located at no more than 400' intervals.

4.5.B Diameter

The minimum diameter of sewer manholes shall be 48" for sewer pipes up to 18" in diameter. Larger diameter manholes will be required for special configurations and sewer pipe larger than 18".

4.5.C Cones

All standard City manholes shall have pre-cast eccentric cones except for special shallow manholes which may have concentric cones. All manholes shall be equipped with City approved drop rung type safety steps. Flat slabs shall not be used unless approved by the Engineer. See Standard Plan 4-1.

4.5.D Drop Connections

Outside drop connections shall be avoided whenever possible. When no other alternative is feasible, an outside drop connection will be required at all locations where the entering sewer is 24" or more above the outfall invert elevation. Line connections to manholes, or to stubs integral to a manhole, shall be made with approved flexible joints. See Standard Plan 4-6. Inside drop connections are not allowed, unless the diameter of the manhole is increased an equal amount to compensate for the inclusion of the drop inside the manhole.

4.5.E Channels

The sanitary sewer manholes shall be fully channeled to conform to the inside diameter of the sewer line from invert to spring line, then the channel shall be vertical to the top of the pipe. The top edge of the channel shall have a radius of 1/2" to 3/4". The shelves shall slope at 2 percent to the top of the channel. All manhole section joints and pick holes shall be filled with grout and smooth finished outside and inside after installation. See Standard Plans 4-1 and 4-2.

4.5.F Downstream Invert

A minimum of a 0.1' drop from invert to invert across manholes is required. Where diameters change, the downstream invert shall be lowered so that the elevation of pipe crowns match. The maximum drop from invert to invert across manholes shall be 1'.

4.5.G Soil Pressure

Care must be taken to insure that pressures exerted on the soils beneath the manholes and the adjacent mains are approximately uniform. Unequal soil pressures may result in uneven settlement at manholes. A spread foundation or other measures may be required to reduce the unit load imposed by the manhole. All manholes shall be provided with KOR-IN-SEAL type flex joints or sand collars meeting ASTM D-303H-78 SDR35 specifications or other materials as approved by the Engineer to allow slight differential movement.

4.5.H Street Grade

No less than 4" or greater than 16" shall be provided between the top of the cone and the underside of the manhole frame for adjustment to street Profile Grade or ground surface. Final elevation of the frame and cover shall conform to the restored street or ground surface. All joints in the brick or ring adjustment shall be filled with grout and the castings shall be seated in grout placed on the ring or brick. A 3/8" mortar lining shall be installed inside and outside of the adjustment section to form a smooth watertight finish.

4.5.I Locking Rings

All manholes in public areas shall have locking rings and covers with the City logo on the lid. There should be no logo on private sewer manhole lids. See Standard Plans 4-3 and 4-4.

4.5.J Corrosion Protection

Where the possibility of odors, gasses or corrosive discharges could be present in the sewer line, or where required by the Engineer, corrosion protection of the inside of the manhole may be required. Based on the material to be discharged, the Engineer will determine the particular type of corrosion protection in the manhole. Sealed manhole covers shall be required for this type of installation. Depending on the size of the sewer line, and in the event that odor is a concern, as determined by the Engineer, an odor control system may be required to be designed and constructed for the sewer system affected.

4.6 PRIVATE SIDE SEWER SYSTEMS

Sanitary sewer service lines that extend from the mainline are considered private side sewers. Side sewers are to be constructed and maintained by the property owner in accordance with the KCC 7.04.

4.6.A Sewer Permit

Prior to construction, replacement, repair, connections or additions to a side sewer, the Developer or authorized agent must obtain a

sewer permit from the City. A separate sewer permit is required for each lot. Accessory structures such as accessory dwelling units and portables may be served by the sewer service to the primary building as long as that service was approved and installed per the requirements for side sewer connections. The City shall review the application, require or make changes if needed, approve the side sewer plan, and assess the Developer for applicable latecomer charges, charge in lieu of assessments, traffic mitigation fees, permit fees, tapping charges, performance guarantees and other charges as required. Contact the Permit Center for application forms and a current fee schedule.

4.6.B Side Sewer Design Standards

1. The minimum diameter of a side sewer shall be no less than 6" within the right-of-way, and then may be reduced to no less than 4" for services to a single-family residence, from the right-of-way or easement line to the building. All side sewers 8" in diameter shall be designed in accordance with the requirements of Sections 4.3 thru 4.5 and 4.7 thru 4.8.
2. All side sewers shall be laid in a straight alignment and have cleanouts located on the straight run, after each total 90-degree change of horizontal direction, after each vertical change in slope, and at the termination of the sewer within 5' outside of the building. The maximum length of 6" side sewer between manholes is 400' with cleanouts required every 100' minimum.
3. The maximum deflection for 4" and 6" diameter pipe permissible at any one fitting shall not exceed 45 degrees (1/8 bend), unless straight pipe of no less than 2.5' in length is installed between adjacent fittings, or unless one such fitting is a wye fitting with a cleanout provided on the straight leg.
4. Side sewers, where possible, shall not be less than 30" from any building, have 6' cover at the property line, and a minimum of 2' of cover on private property.
5. Joints shall be tight and waterproof. All side sewers shall be tested the full length in compliance with the City standard air or hydrostatic test and in the presence of the Inspector.
6. Sanitary sewer and domestic water lines shall not be laid in the same trench. Parallel water and sewer lines shall be laid at least 10' apart horizontally. Wherever it is necessary for sewer and water lines to cross each other, the crossing should be at an angle of approximately 90 degrees, and the top of the sewer pipe shall be located at least 18" below the bottom of the water line, or be constructed of PVC C900 or Class 50 ductile iron pipe with water tight joints. The PVC C900 or ductile iron pipe shall be one continuous length of pipe 18' or longer and centered across the water line.

7. Side sewers installed in filled or unstable ground shall be constructed of PVC C900 or Class 50 ductile iron pipe, except that PVC pipe may be accepted if laid on a suitable concrete bed or cradle as approved by the Engineer.
8. Installation of sewer pipe shall be accomplished to line and profile grade only after the trench has been dewatered and the foundation and/or bedding have been prepared. Mud, silt, and gravel and other foreign materials shall be kept out of the pipe and off the jointing surfaces. All pipe laid shall be retained in position so as to maintain alignment and joint closure until sufficient backfill has been completed.
9. The sewer pipe shall be laid up grade from the point of connection on the existing sewer or from a designated starting point. The sewer pipe shall be installed with the bell upgrade unless otherwise approved by the Engineer.
10. Cleanouts are required at the right-of-way or easement line. See Standard Plans 4-7 and 4-8.
11. All cleanouts within 5' of the right-of-way line shall be brought up to grade. Cleanouts within private property in grass or landscaped areas may be buried a maximum of one foot.
12. Cleanouts installed under concrete, asphalt or other permanent surfaces shall be extended to finish grade with the same size and type of pipe and fittings as required for the side sewer. A cast iron ring and cover shall be installed to provide access and protection from traffic. See Standard Plan 4-7.
13. All side sewers shall function on a gravity basis, unless a specific deviation is approved by the Engineer.
14. In new projects where street improvements are to be made, each service shall be marked by a "SS" in the curb where it crosses perpendicular to the curb. The marking shall be done at the time the curb is installed and shall be as-built by stationing. Lettering shall be 3" high and a minimum ¼" deep.
15. Existing building side sewers may be used in connection with new side sewers only when they are found, on examination and test performed by the Developer and reviewed by Engineer, to meet all of the applicable requirements of these Standards.

4.6.C Connections

Each legally defined property shall be serviced by a separate side sewer stub connected to the City sewer main. For multi-tenant sites such as multi-family or commercial uses, each building shall have a separate minimum 6" side sewer. The maximum number of individuals permitted on a 6" diameter sewer shall be 30 persons. In general, up to 10 units in a multi-family dwelling may be serviced by a single 6" diameter side sewer.

4.6.D Grinder Pumps

Where gravity flow for side sewer is not possible, a privately owned and maintained grinder pump system to service individual structures requires specific deviation by the Engineer. The pumping system shall be designed in accordance with Section C1-10.1 of DOE's "Criteria for Sewage Works Design". These assemblies shall be located adjacent to the structure, and shall be equipped with both high level and pump failure alarms. The alarms shall be both audio and visual, and be on a separate circuit from the pump.

Residential systems will be a package-type system Hydromatic TL-Pro System using a HPGR 200 submersible sewage grinder pump or approved equal. Each pressure system shall have an individual connection to the City sewer. Lift systems for commercial and multi-family structures require special maintenance agreements and specific deviation by the Engineer. Deviation approval is required for each permit prior to approval. Solid handling waste pumps are not allowed. Refer to Section 4.8.C for air testing force main systems. See Standard Plan 4-10.

4.6.E Connection to City Sewer System

All lots adjacent to a new City sewer main or extended City sewer main shall be serviced with a 6" side sewer stubout extended to the property line. The location of sewer stubouts shall be marked with a 2" x 4" post and tracer wire. The Development shall be designed to utilize the stubout as installed. See Standard Plans 4-8 and 4-9.

The City maintains records concerning the location and approximate depth of recent side sewer stubouts. These records are for informational purposes only and it shall be the Developer's responsibility to verify the location and depth of existing services.

In cases where a stubout has not yet been installed, the Developer shall connect directly to the City main in accordance with the Standard Plan 4-9. The Developer shall assume all cost for said connection, including, but not limited to, street repairs, tapping charges, permits, all associated system charges as appropriate, including but not limited to systems development charge, King County capacity charges, etc. The actual tap to the main shall be accomplished by the City of Kent Utilities Section, after the Developer has prepared the trench and provided an access to the tapping area for a truck and crew. OSHA trench safety requirements shall apply for shoring. Contact the Permit Center for a current fee schedule.

4.6.F Waste Discharge Approval

Storm water, surface water, ground water, cooling water and industrial processes that have been polluted as determined by the Engineer and KC/DNR-WTD are required to be discharged to the City sewer main through an approved pretreatment system and

metering method. Pretreatment requirements of the discharge shall be determined and approved by KC/DNR-WTD.

Metering, billing and authorization to discharge shall be determined and approved by the Engineer. A sewer permit shall be required from the City and can be obtained as outlined in Section 4.6.A Sewer Permit. The City will not issue a sewer permit without prior discharge approval from KC/DNR-WTD.

Metering methods shall be determined and approved by the Engineer on a case-by-case basis. See Section 3.14 Sewer Rate Meter.

The type and size of grease interceptor(s) when required shall be approved by the Engineer. Combined grease interceptors shall not be allowed. Each business requiring a grease interceptor shall have its own grease interceptor, unless otherwise directed by the Engineer. Annual maintenance reports shall be provided on all grease interceptors to Public Works Operations located at 5821 South 240th Street, Kent, WA 98032. See Standard Plan 4-11.

4.6.G Inspection Before Trenches are Filled

No trench shall be filled or any connecting sewer covered, until the Work from the point where the side sewer connects with the public sewer or other outlet to the point where it connects with the plumbing of the building or premises has been inspected and approved by the Inspector.

4.6.H Excavation in Streets to be Protected

All excavations made within the limits of any right-of-way or other public place shall be protected at all times by fencing, covering with steel plates, or other means approved by the Inspector.

4.7 SANITARY SEWER SYSTEM MATERIALS

4.7.A Standards

All materials used for construction of City sewer mains, side sewers, and appurtenances, shall be new and undamaged. All materials to be used shall be subject to inspection by the Engineer prior to use. The Developer shall provide the Engineer with shop drawings and certificate of materials, as requested. All materials and equipment shall be installed in accordance with the manufacturer's recommended installation procedures and these Standards.

4.7.B Gravity Sewer Pipe

Unless otherwise approved, all sewer pipes shall be solid wall PVC SDR 35, conforming to ASTM 3034 or 3035 specifications, PVC C900 ASTM D1784, or ductile iron pipe Class 50 for force mains.

The sewer pipe shall be clearly marked with the type, class, thickness, and manufacturer. The lettering shall be legible and printed at the factory.

4.7.C Fittings

All sewer pipe fittings shall be of the same material as the pipe. The size of the cleanout shall be the same size as the sewer pipe. All fittings shall have rubber gaskets with manufactured pipe stops, integrally formed. Where dissimilar pipe materials cannot be avoided Romac couplings shall be utilized.

4.7.D Manholes and Covers

Sanitary sewer manholes shall be pre-cast concrete units constructed in accordance with the WSDOT Standard Specifications. See Standard Plans 4-1 and 4-2.

Manhole frames and covers shall be cast gray or ductile iron. Locking type lids are required. See Standard Plan 4-3.

4.7.E Pipe Bedding

Pipe bedding shall be placed 6" under and all around the pipe and shall meet the requirements of gravel backfill for pipe zone bedding per Section 9-03.12(3) of the WSDOT Standard Specifications, latest edition. It shall be compacted in layers around the pipe and to a sufficient height above the pipe to adequately support and protect the pipe to 95 percent compaction ASTM D-1557. See the WSDOT Standard Plans and Kent Standard Plan 3-22.

Where it is determined necessary by the Engineer, ballast material shall be used below the bedding to stabilize the trench. This ballast shall meet the requirements of shoulder ballast per Section 9.03.9(2) of the WSDOT Standard Specifications.

4.7.F Backfill

Pipe trench backfill shall be Crushed Surfacing Top Course (CSTC) under all arterial classifications of roadways and those local streets adjacent to commercial or industrial land uses. Gravel borrow shall be used for pipe trench backfill in all other locations if, in the opinion of the Engineer, existing trench excavation soils are unsuitable. CSTC or gravel borrow shall be from a pit approved by the Engineer and shall meet the requirements of CSTC per Section 9.03.9(3) or gravel borrow per Section 9.03.14(1) of the WSDOT Standard Specifications. Each layer shall be compacted to 95 percent in paved areas and 90 percent in unpaved areas in accordance with ASTM D 1557, in lifts not to exceed 18". The maximum particle size shall not exceed 6" or 2/3 the depth of the layer being placed, whichever is less.

Pipe trench backfill for lateral runs crossing existing or proposed improved City streets, shall be CSTC meeting the requirements of Section 9.03.9(3) of the WSDOT Standard Specifications.

In paved areas, the trench patching shall be in accordance with Standard Plans 6-64 through 6-69.

4.8 SANITARY SEWER SYSTEM INSTALLATION

4.8.A Connection to Existing Sewer System

The connection between the new sanitary sewers and the existing sewer mains shall be plugged and tied off to the top manhole step, and left in place until the new piping and the plugged manhole has been cleaned, pressure tested, TV camera inspected, and is ready for acceptance.

4.8.B Cleaning

All sewer pipes shall be thoroughly cleaned by jet cleaning and cubing to remove any solids or construction debris that may have entered the pipe during construction, as approved by the Inspector.

The Developer shall be responsible to insure that material flushed from sewers are trapped, and do not enter the existing downstream system. The Inspector shall approve the Developer's method prior to cleaning sanitary sewer mains. The rate of flushing shall be such that the flow will not overload the downstream sewer system. The flushing of a sewer main tributary to a downstream lift station shall be coordinated with the City to insure that the lift station is not overloaded. In the event that the City finds debris in the downstream sanitary sewer system, the Developer shall be responsible for the removal and subsequent cleaning upon direction of the Engineer.

City water used for cleaning sewer lines is metered and shall pass through an approved hydrant meter and DCVA.

4.8.C Pressure and Leakage Tests

All new sanitary sewer mains, extensions of existing mains, appurtenances and sewer services shall be pressure tested for leakage in accordance with Sections 7-17.3(2)E/F/G of the WSDOT Standard Specifications. All testing shall be observed by the Inspector.

All Costs for re-testing, including the Inspector's time to come back due to "not being ready," will be the responsibility of the Developer. Costs shall include labor at overtime rates, overhead, equipment, material and any other associated charges. The costs shall be based on the latest cost schedule prepared and approved annually by the Engineer.

4.8.D Television Inspection

All new sanitary sewer extensions will be TV camera inspected by the City prior to acceptance.

Prior to TV camera inspection:

1. Sewer lines must be cleaned
2. All construction must be completed and approved by the Inspector.
3. All manholes shall be channeled, and grade rings set in place.
4. The casting and top grade rings do not have to be mudded in until after the finished grade is established.
5. The Developer shall bear all costs for correction of deficiencies found during TV inspection, including all costs for subsequent TV inspections to verify the correction of deficiencies.
6. The Developer shall schedule TV inspections no less than five (5) working days prior to being ready. If the system is not ready, the Developer shall notify the City no later than 24 hours prior to the scheduled time. If the Developer fails to notify the City that they are not ready and the TV inspection crew shows up at the site, the Developer will be responsible for all costs of additional TV inspections to verify the system.
7. All costs for re-inspections, including the Inspector's time to come back due to "not being ready," will be the responsibility of the Developer. Costs shall include labor at overtime rates, overhead, equipment, material and any other associated charges. The costs shall be based on the latest cost schedule prepared and approved annually by the Engineer.
8. Sags in sanitary sewer lines indentified during the TV inspection greater than 0.5" shall be repaired by the contractor by removal and re-laying of the pipe. Repaired sections of pipe shall be TV inspected for verification prior to final inspection at the cost of the Developer as described above.

4.8.E Vacuum Testing Sanitary Sewer Manholes

All new sanitary sewer manholes shall be vacuum tested by the City prior to acceptance to ensure that the manhole is air-tight and not susceptible to infiltration. On projects with more than one manhole, the Developer shall have all of the manholes ready for testing at finish grade and have access, by truck, to each manhole prior to scheduling the vacuum testing with the Inspector.

Manholes shall not be considered ready for testing until all grouting has been performed and the frame and cover have been grouted into place. It is the responsibility of the contractor to ensure all

manholes are ready for testing prior to scheduling with the Inspector. Manholes not ready shall receive a failing mark and a retest shall be required once the manhole is ready.

The Developer shall schedule the vacuum testing no less than five (5) working days prior to being ready. If the manholes are not ready, the Developer shall notify the City no later than 24 hours prior to the scheduled time. If the Developer fails to notify the City that they are not ready and the vacuum testing crew shows up at the site, the Developer will be responsible for all costs of additional testing to verify the system.

All costs for re-testing, including the Inspector's time to come back due to "not being ready," will be the responsibility of the Developer. Costs shall include labor at overtime rates, overhead, equipment, material and any other associated charges. The costs shall be based on the latest cost schedule prepared and approved annually by the Engineer.

The Developer shall bear all costs for correction of deficiencies found during the vacuum testing and for all costs for additional testing by the City to verify correction of the deficiencies.

4.9 SEWAGE PUMP STATIONS

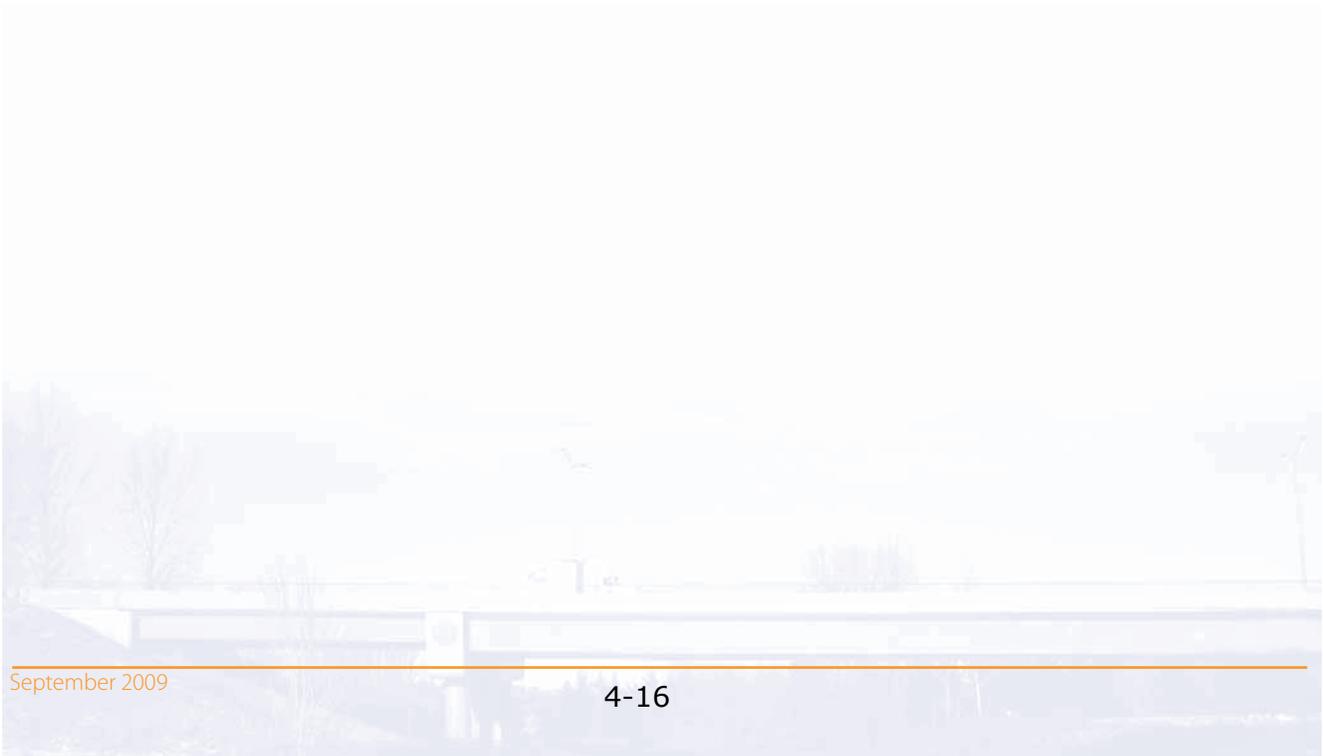
4.9.A General

Sewage pump stations will be approved on an individual basis. The proposed pump station must be designed with adequate capacity to provide service for the ultimate development of the potential service area. The service area for any proposed pump station shall not be less than 75 acres, or provide service to less than 250 potential single-family residences or its equivalent in revenue. A pre-design meeting will be required with Public Works Operations to review current equipment and design requirements.

4.9.B Design Requirements

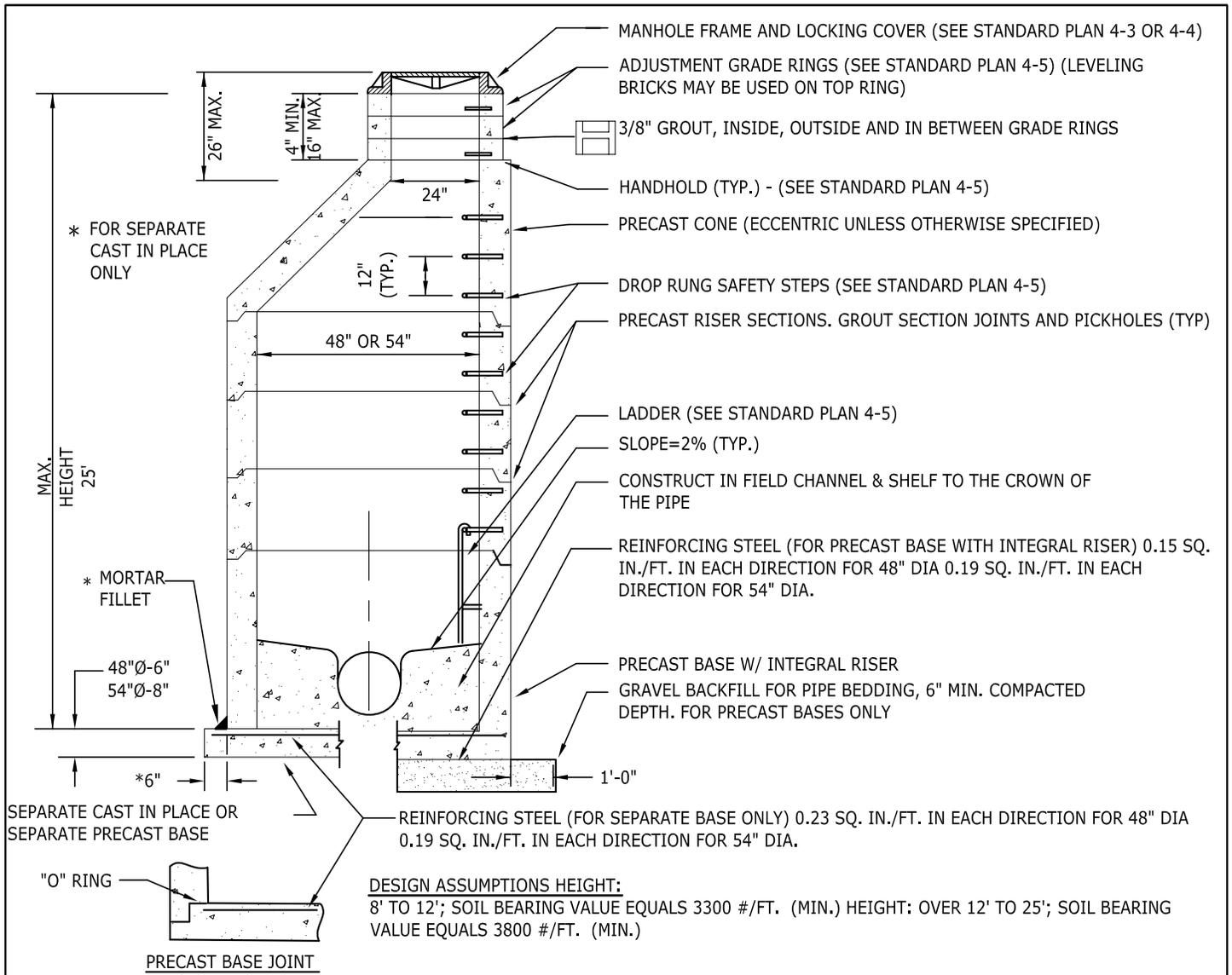
1. All sewage pump stations shall be designed in accordance with DOE's design requirements for sewage pump stations and force mains. The pump stations shall also be designed to meet the City of Kent's Pump Station Standards.
2. Pump stations shall be manufactured by Smith and Loveless (or approved equal), and have separated wet well and dry well structures.
3. All stations shall have an on-site emergency power supply with automatic switching capacity.
4. All stations shall be equipped with a telemetry system compatible with the existing City equipment.

5. No discharge from a new pump station shall be discharged to an existing City pump station.
6. The Developer shall provide a financial guarantee per Section 1.12 to cover the estimated costs of operation and maintenance of the new pump station during the first year of service.



4.10 SANITARY SEWER SYSTEM STANDARD PLANS

- 4-1 Manhole Type I 48" & 54"
- 4-2 Special Shallow Manhole
- ~~4-3 Standard Manhole Frame and Locking Cover~~
Use WSDOT Standard Plan B-30.70-03 Type 2
- 4-4 Private Manhole Cover
- 4-5 Manhole Grade Ring, Safety Steps Ladder
- 4-6 Ductile Iron Drop Connection
- 4-7 6" Cleanout
- 4-8 Side Sewer Stub Connection
- 4-9 Residential Side Sewer Connection
- 4-10 Low Pressure Grinder Pump
- 4-11 1,500 Gallon Grease Interceptor



DESIGN ASSUMPTIONS HEIGHT:
 8' TO 12'; SOIL BEARING VALUE EQUALS 3300 #/FT. (MIN.) HEIGHT: OVER 12' TO 25'; SOIL BEARING VALUE EQUALS 3800 #/FT. (MIN.)

NOTES:

1. MANHOLES TO BE CONSTRUCTED IN ACCORDANCE W/ AASHTO M-199 & (ASTM C 478) UNLESS OTHERWISE SHOWN ON PLANS OR NOTED IN THE WSDOT STD. SPECS.
2. PRECAST BASES SHALL BE FURNISHED WITH CUTOUTS OR KNOCKOUTS. KNOCKOUTS SHALL HAVE A WALL THICKNESS OF 2" MINIMUM.
3. KNOCKOUT OR CUTOUT HOLE SIZE IS EQUAL TO PIPE OUTER DIAMETER PLUS MANHOLE WALL THICKNESS. MAX. HOLE SIZE IS 36" FOR 48" MANHOLE , 42" FOR 54" MANHOLE. MIN. DISTANCE BETWEEN HOLES IS 8".
4. MANHOLE RINGS & COVERS SHALL BE IN ACCORDANCE WITH WSDOT STANDARD SPECIFICATIONS & MEET THE STRENGTH REQUIREMENTS OF FEDERAL SPECIFICATION RR-F-621D. MATING SURFACES SHALL BE FINISHED TO ASSURE NON-ROCKING FIT WITH ANY COVER POSITION.
5. ALL BASE REINFORCING STEEL SHALL HAVE A MIN. YIELD STRENGTH OF 60,000 PSI & BE PLACED IN THE UPPER HALF OF THE BASE WITH 1" MIN. CLEARANCE.
6. ALL SANITARY SEWER MANHOLES SHALL BE VACUUM TESTED.
7. MORTAR 3/8" LINING OUTSIDE, INSIDE, AND IN BETWEEN THE ADJUSTMENT SECTION TO FORM A SMOOTH WATERTIGHT FINISH.
8. GROUT ALL MANHOLE SECTION JOINTS AND PICKHOLES OUTSIDE AND INSIDE TO A SMOOTH FINISH.

NOTE: THIS PLAN IS NOT A LEGAL ENGINEERING DOCUMENT BUT AN ELECTRONIC DUPLICATE. THE ORIGINAL, SIGNED BY THE ENGINEER AND APPROVED FOR PUBLICATION IS KEPT ON FILE AT THE CITY OF KENT. A COPY MAY BE OBTAINED UPON REQUEST.



		CITY OF KENT ENGINEERING DEPARTMENT	
		MANHOLE TYPE 1 48" & 54"	
DESIGNED <u>DMW</u>	SCALE <u>NONE</u>	4-1	
DRAWN <u>BB</u>	DATE _____		
CHECKED _____	ENGINEER _____		
APPROVED _____			

DROP RUNG SAFETY STEPS
(SEE STANDARD PLAN 4-5)

3/8" GROUT, INSIDE, OUTSIDE AND IN BETWEEN

GRADE RING (SEE STANDARD PLAN 4-5)

CASTING (SEE STANDARD PLAN 4-3 OR 4-4)

ADJUSTMENT SECTION MIN. 4" - MAX. 16"

HANDHOLD (TYP.), SEE STANDARD PLAN 4-5

18" SHORT CONE

DROP RUNG SAFETY STEPS (TYP.),
SEE STANDARD PLAN 4-5

SLOPE=2% (TYP.)

CONSTRUCT IN FIELD CHANNEL & SHELF TO THE
CROWN OF THE PIPE

PRECAST BASE W/ INTEGRAL RISER

GRAVEL BACKFILL FOR PIPE BEDDING, 6" MIN.
COMPACTED DEPTH. FOR PRECAST BASES ONLY

5' MAX.

* MORTAR
FILLET

48"Ø-6"
54"Ø-8"

* 6"

1'-0"

* FOR SEPARATE CAST IN
PLACE ONLY

SEPARATE CAST IN PLACE OR
SEPARATE PRECAST BASE

REINFORCING STEEL (FOR PRECAST BASE WITH INTEGRAL
RISER) 0.15 SQ. IN./FT. IN EACH DIRECTION FOR 48" DIA 0.19
SQ. IN./FT. IN EACH DIRECTION FOR 54" DIA.

REINFORCING STEEL (FOR SEPARATE
BASE ONLY) 0.23 SQ. IN./FT. IN EACH
DIRECTION FOR 48" DIA 0.19 SQ. IN./FT.
IN EACH DIRECTION FOR 54" DIA.

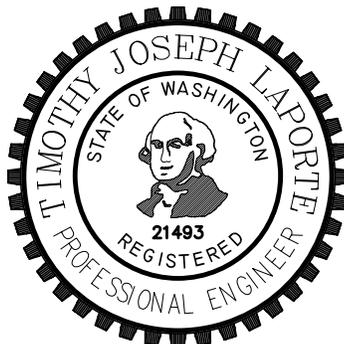
"O" RING

PRECAST BASE JOINT

NOTES:

1. FLAT TOPS MUST BE APPROVED BY THE ENGINEER.
2. GROUT ALL MANHOLE SECTION JOINTS AND PICKHOLES OUTSIDE AND INSIDE TO A SMOOTH FINISH.
3. GROUT FILL RING OR BRICK ADJUSTMENTS ON ALL SIDES. THE CASTING IS TO BE SEATED IN GROUT PLACED ON THE RING OR BRICK.
4. MORTAR A 3/8" LINING OUTSIDE AND INSIDE OF THE ADJUSTMENT SECTION TO FORM A SMOOTH WATERTIGHT FINISH.
5. ALL SANITARY SEWER MANHOLES SHALL BE VACUUM TESTED.

NOTE: THIS PLAN IS NOT A LEGAL ENGINEERING DOCUMENT BUT AN ELECTRONIC DUPLICATE. THE ORIGINAL, SIGNED BY THE ENGINEER AND APPROVED FOR PUBLICATION IS KEPT ON FILE AT THE CITY OF KENT. A COPY MAY BE OBTAINED UPON REQUEST.



CITY OF KENT
ENGINEERING DEPARTMENT

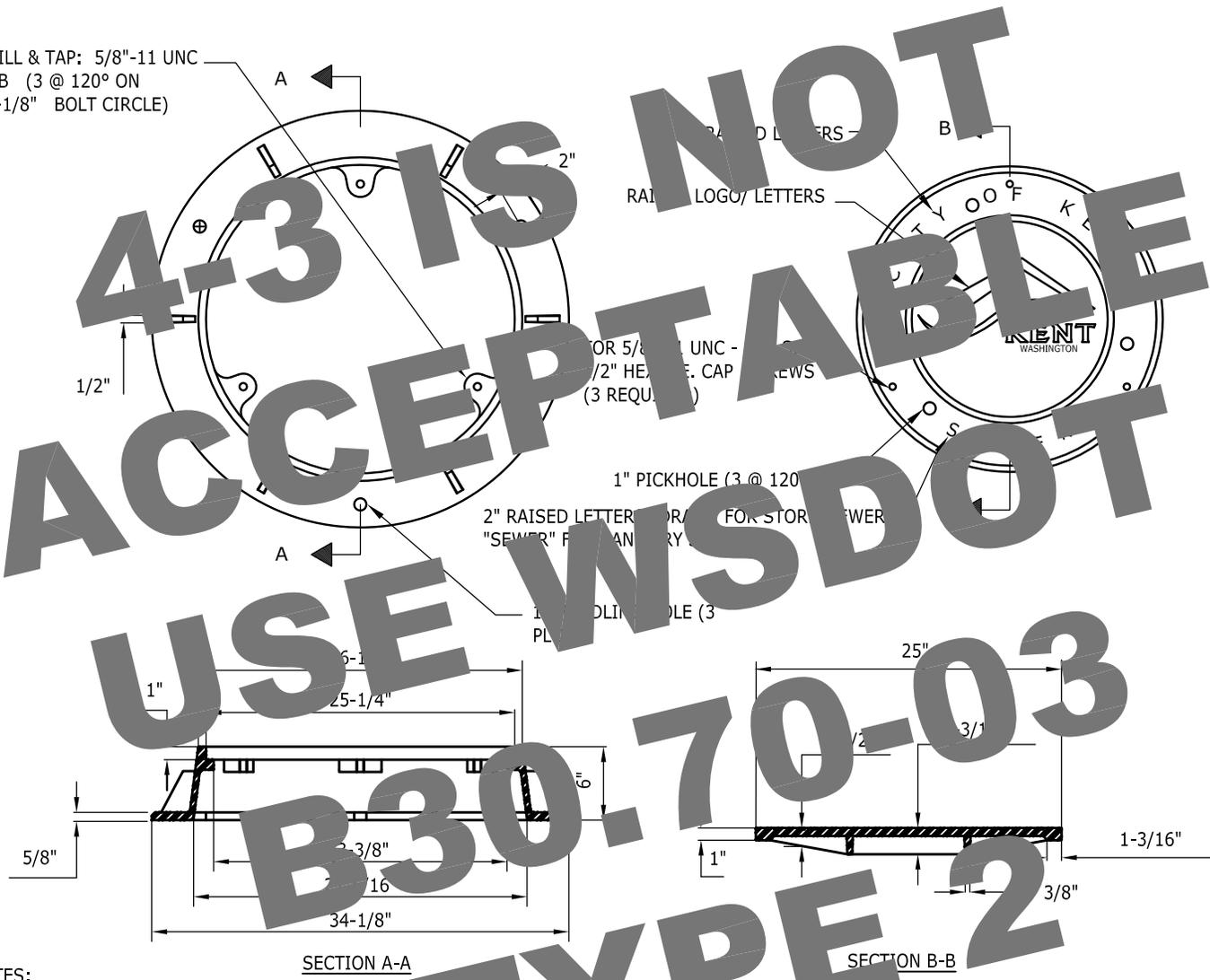
**SPECIAL SHALLOW
MANHOLE**

DESIGNED DMW
DRAWN BB
CHECKED _____
APPROVED _____

SCALE NONE
DATE _____
ENGINEER

STANDARD PLAN
4-2

DRILL & TAP: 5/8"-11 UNC
 - 1B (3 @ 120° ON
 22-1/8" BOLT CIRCLE)



4-3 IS NOT ACCEPTABLE USE WSDOT B-30.70-03 TYPE 2

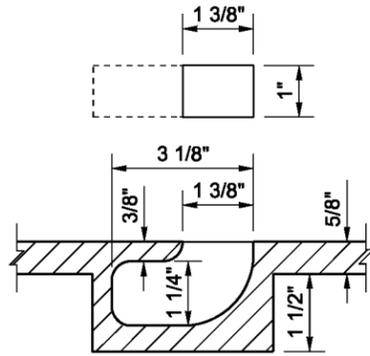
NOTES:

1. MATERIAL USED SHALL BE CAST GRAY IRON OR DI ASTM A536 CL80-55 FOR RING AND DI FOR COVER.
2. SEAT OF COVER & FRAME MACHINED WITH A NON-ROCKING FIT FOR MANHOLE COVERS.
3. MANHOLE COVERS SHALL BE WATERTIGHT AT THE EDGES.
4. ROUND ALL SHARP CORNERS WHERE POSSIBLE.
5. CASTING TO BE SHOT BLASTED AND FREE FROM SURFACE DEFECTS.
6. CASTING TO BE SMOOTH, TRUE TO DIMENSIONS, FREE FROM BLOWHOLES, POROSITY, HARD SPOTS, WARP, OR ANY OTHER DEFECTS WHICH COULD IMPAIR FUNCTION.
7. ALL INSTALLATIONS SHALL BE WATERTIGHT.
8. COVERS LOCATED IN SIDEWALK SHALL UTILIZE AN ALTERNATE NON-SKID PATTERN SEE WSDOT STD. PLAN B-30.70-00.
9. OLYMPIC FOUNDRY PART NO. 11-2945SET AND FASTENERS PRODUCT NO. 00371512 ARE THE PRE-APPROVED PRODUCTS. ALL OTHERS REQUIRE WRITTEN APPROVAL OF THE ENGINEER PRIOR TO INSTALLATION.

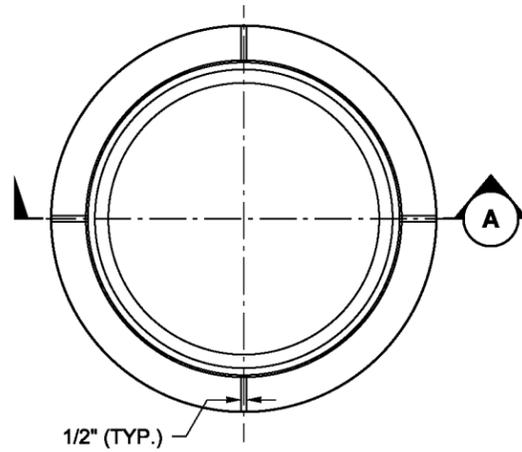
NOTE: THIS PLAN IS NOT A CONTRACT DOCUMENT BUT AN ELECTRONIC COPY. THE ORIGINAL, SIGNED BY THE ENGINEER, APPROVED FOR PUBLICATION IS KEPT ON FILE IN THE CITY OF KENT. A COPY MAY BE OBTAINED UPON REQUEST.



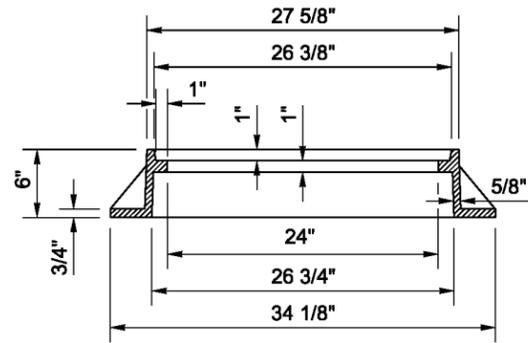
		CITY OF KENT ENGINEERING DEPARTMENT	
		STANDARD MANHOLE FRAME AND LOCKING COVER	
DESIGNED: DMW	SCALE: NONE	STANDARD PLAN	
DRAWN: BB	DATE: _____	4-3	
CHECKED: _____	ENGINEER: _____		
APPROVED: _____			



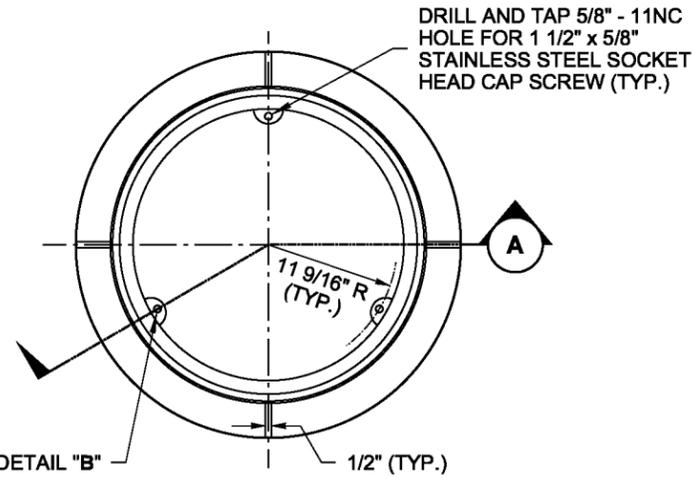
**BLIND PICK NOTCH
DETAIL "A"**



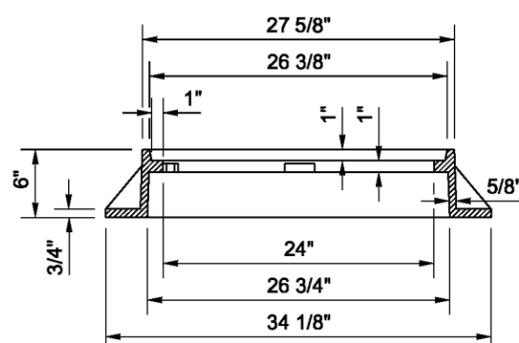
RING PLAN



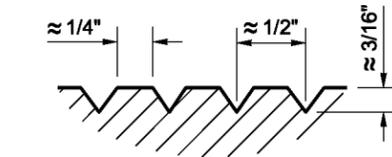
RING SECTION A



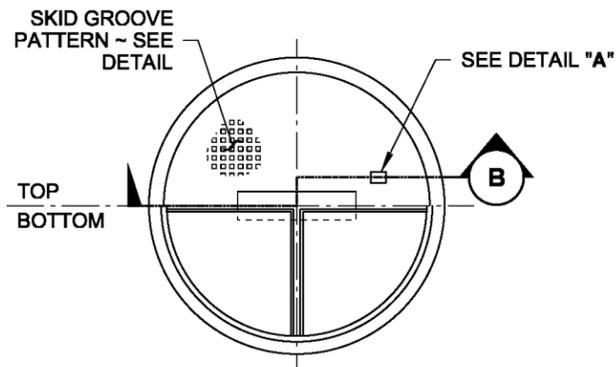
RING PLAN



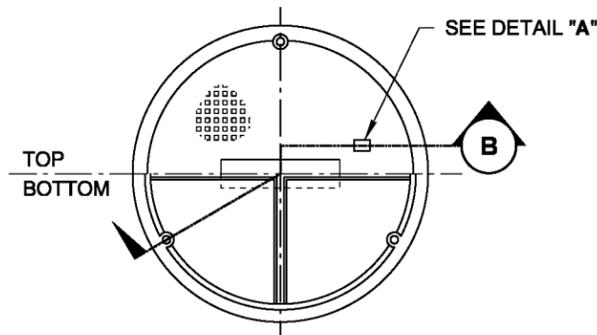
RING SECTION A



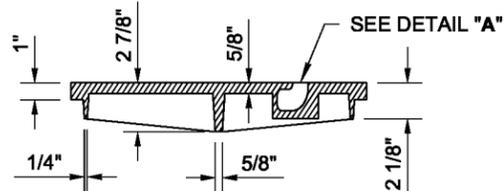
**SKID GROOVE PATTERN
DETAIL**



COVER PLAN



COVER PLAN

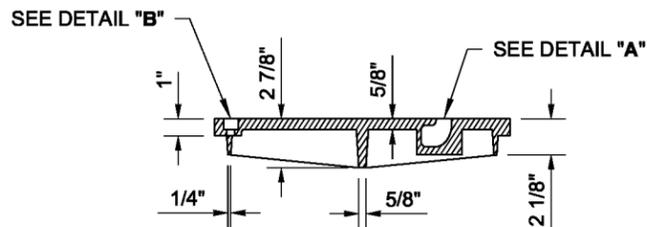


COVER SECTION B

(SEE NOTE 7)

STANDARD

TYPE 1

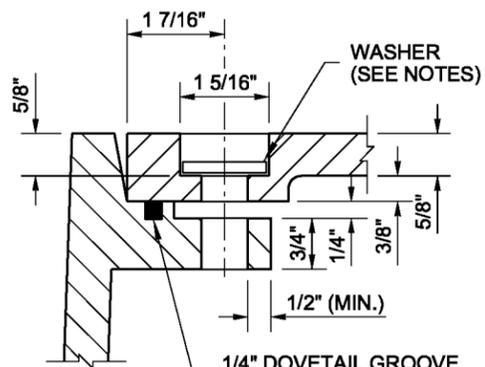


COVER SECTION B

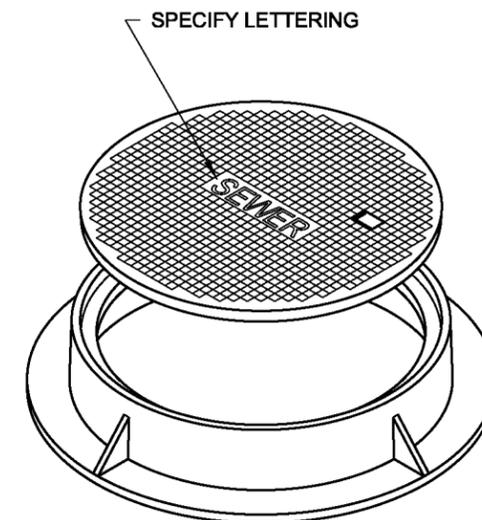
(SEE NOTE 7)

BOLT-DOWN / WATERTIGHT

TYPE 2



**BOLT-DOWN / WATERTIGHT
DETAIL "B"**



ISOMETRIC VIEW

NOTES

1. The gasket and groove may be in the seat (frame) or in the underside of the cover. The gasket may be "T" shaped in section. The groove may be cast or machined.
2. Bolt-down capability is required on all frames, grates, and covers, unless specified otherwise in the Contract. Provide 3 holes in the frame that are vertically aligned with the grate or cover slots. The frame shall accept the 5/8" - 1 NC x 2" Allen head cap screw by being tapped, or other approved mechanism. Location of bolt down holes varies by manufacturer.
3. For bolt-down manhole ring and covers that are not designated "Watertight," the neoprene gasket, groove, and washer are not required.
4. Washer shall be neoprene (Detail "B").
5. In lieu of blind pick notch for manhole covers, a single 1" pick hole is acceptable. Hole location and number of holes may vary by manufacturer.
6. Alternative reinforcing designs are acceptable in lieu of the rib design.
7. For clarity, the vertical scale of the Cover Section has been exaggerated, it is 1.5 times the horizontal scale (1H:1.5V).



NOTE: THIS PLAN IS NOT A LEGAL ENGINEERING DOCUMENT UNLESS IT IS THE ORIGINAL, SIGNED BY THE ENGINEER AND APPROVED FOR BY THE ENGINEER IN CHARGE OF THE PROJECT, FILED AT THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION. A COPY MAY BE OBTAINED UPON REQUEST.

**CIRCULAR FRAME (RING)
AND COVER**

STANDARD PLAN B-30.70-03

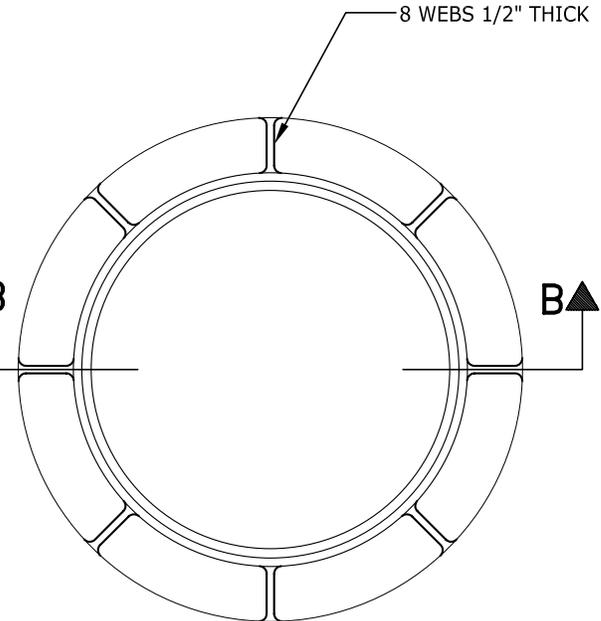
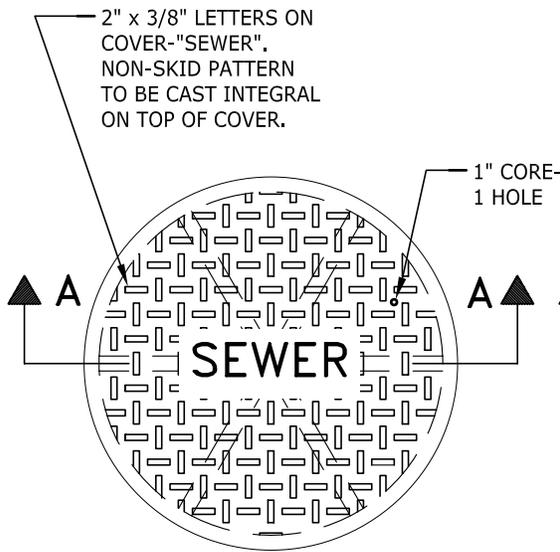
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

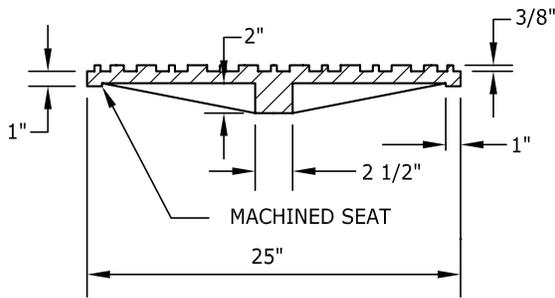
Pasco Bakotich III 04/26/12

STATE DESIGN ENGINEER DATE

Washington State Department of Transportation



LOCKING DEVICES FOR COVER MAY BE USED PROVIDING DETAILS HERE ARE NOT CHANGED



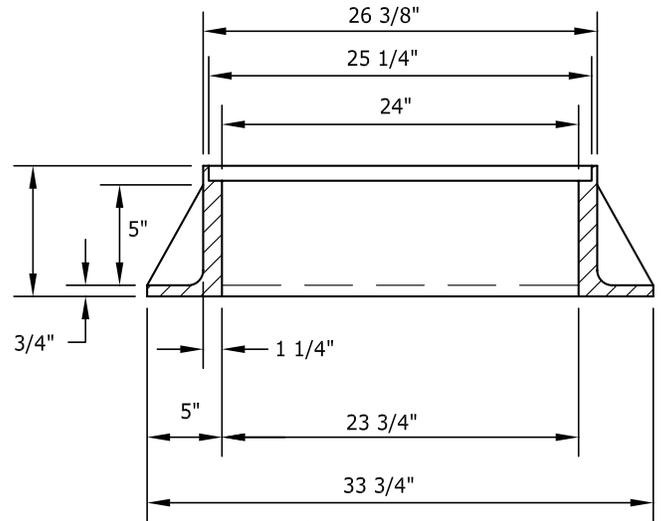
SECTION A-A

CAST IRON NON-LOCKING COVER

HEAVY RINGS=9"
LIGHT RINGS=6"

HEAVY RINGS - (9" DEPTH) USE WHERE PORTLAND CEMENT CONC. PAVMT. IS BEING PLACED TO THICKNESS GREATER THAN 6"

LIGHT RINGS - (6" DEPTH) USE WHERE PAVMT. THICKNESS IS 6" OR LESS



SECTION B-B

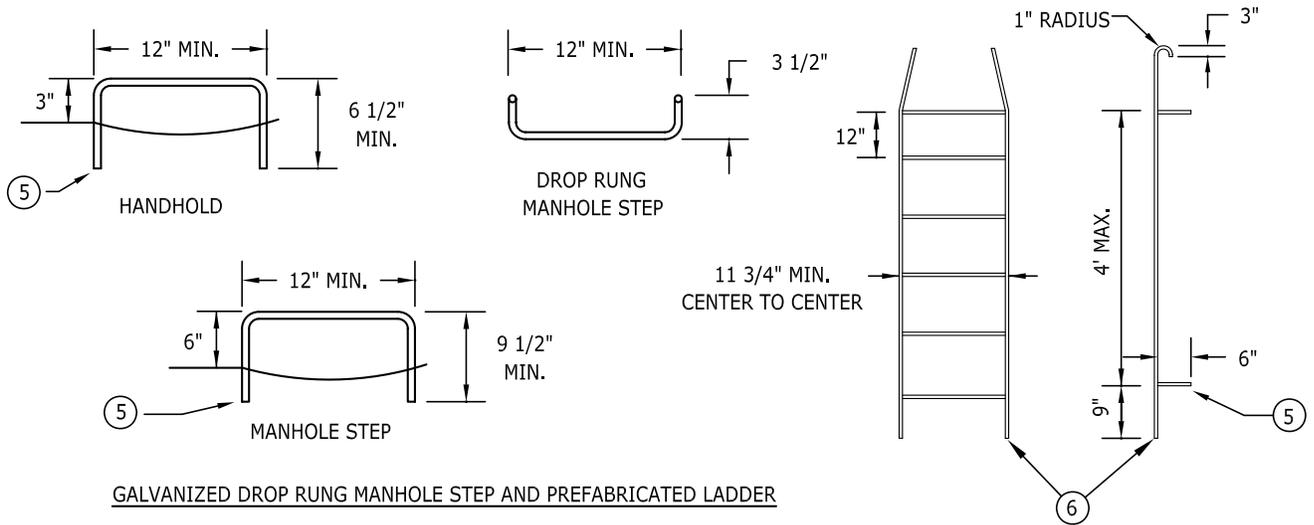
NOTES:

1. CAST IRON TO CONFORM TO SPEC. ASTM - 159-55, ALLOY #111 RATING H-20.
2. SEAT OF COVER & FRAME MACHINED.
3. NON-ROCKING FIT FOR MANHOLE COVERS.
4. BREAK ALL SHARP CORNERS WHERE POSSIBLE.
5. CASTING TO BE SHOT BLASTED AND FREE FROM SURFACE SAND AND SCALE.
6. CASTING TO BE SMOOTH, TRUE TO PATTERN, FREE FROM BLOWHOLES, POROSITY, HARD SPOTS, SHRINK HOLES, WARP, OR ANY OTHER DEFECTS WHICH COULD IMPAIR SERVICEABILITY.
7. CASTINGS SHALL BE COATED AS DIRECTED BY THE ENGINEER.

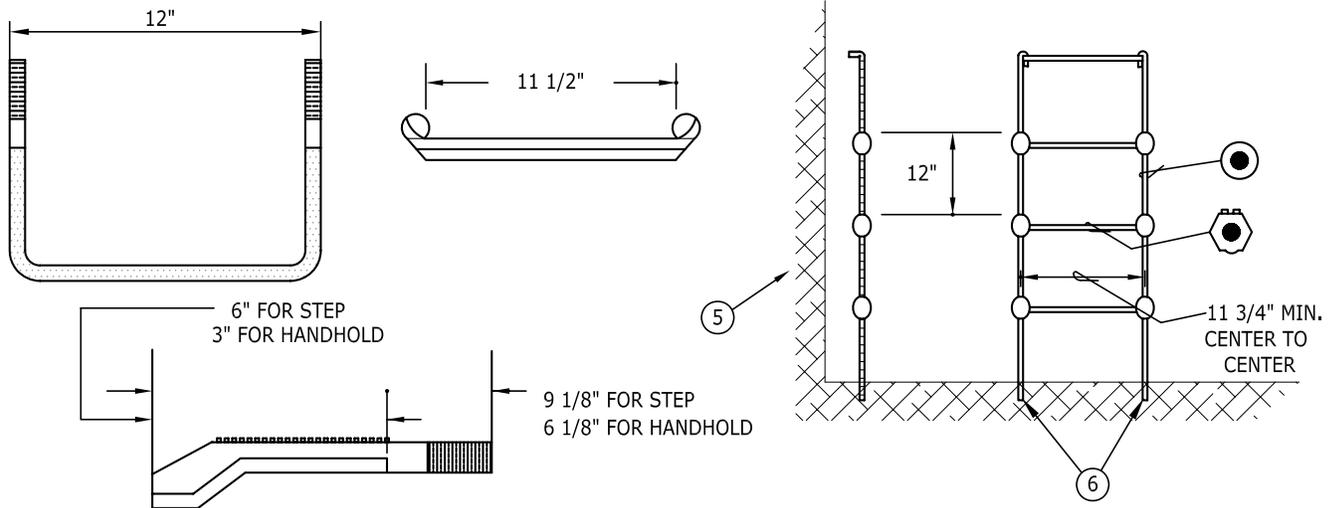


NOTE: THIS PLAN IS NOT A LEGAL ENGINEERING DOCUMENT BUT AN ELECTRONIC DUPLICATE. THE ORIGINAL, SIGNED BY THE ENGINEER AND APPROVED FOR PUBLICATION IS KEPT ON FILE AT THE CITY OF KENT. A COPY MAY BE OBTAINED UPON REQUEST.

		CITY OF KENT ENGINEERING DEPARTMENT	
		PRIVATE MANHOLE COVER	
DESIGNED <u>DMW</u>	SCALE <u>NONE</u>	STANDARD PLAN	
DRAWN <u>BB</u>	DATE _____		
CHECKED _____	ENGINEER _____	4-4	
APPROVED _____			



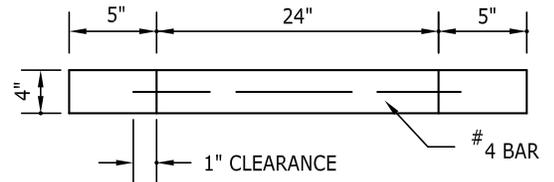
GALVANIZED DROP RUNG MANHOLE STEP AND PREFABRICATED LADDER



POLYPROPYLENE DROP RUNG MANHOLE STEP AND PREFABRICATED LADDER

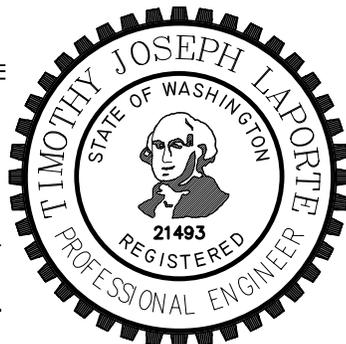
NOTES:

1. MANHOLE STEPS CONFORMING TO SECTION R, ASTM C-478. AASHTO M-199 REQUIREMENTS AND REQUIREMENTS OF ASTM D-4101 FOR POLYPROPYLENE AND ASTM A-615 FOR 1/2" GRADE 60 DEFORMED REINFORCING BAR FOR POLYPROPYLENE STEPS, AND ALL WISHA AND OSHA SPECIFICATIONS, ARE ACCEPTABLE PROVIDED THEY ARE PRE-APPROVED BY THE DIRECTOR OF PUBLIC WORKS.
2. DROP RUNG STEPS ARE TO BE #8 GALVANIZED DEFORMED REBAR.
3. PREFABRICATED LADDERS ARE TO BE #7 GALVANIZED SMOOTH STEEL.
4. MANHOLE PREFABRICATED LADDER STEPS SHALL BE PARALLEL OR APPROXIMATELY RADIAL AT THE OPTION OF THE MANUFACTURER, EXCEPT THAT ALL STEPS IN ANY MANHOLE SHALL BE THE SAME.
5. PENETRATION OF OUTER WALL BY A STEP LADDER OR LADDER LEG IS PROHIBITED. USE FLANGED END FOR BOLTING TO WALL IN STORM DRAINAGE APPLICATIONS.
6. EMBED FOOT OF LADDER IN CONCRETE IN POURED AND/OR CHanneled FLOOR.
7. MANHOLE STEPS OR LADDERS ARE NOT REQUIRED WHEN THE COVER TO BOTTOM OF MANHOLE IS LESS THAN 4'.

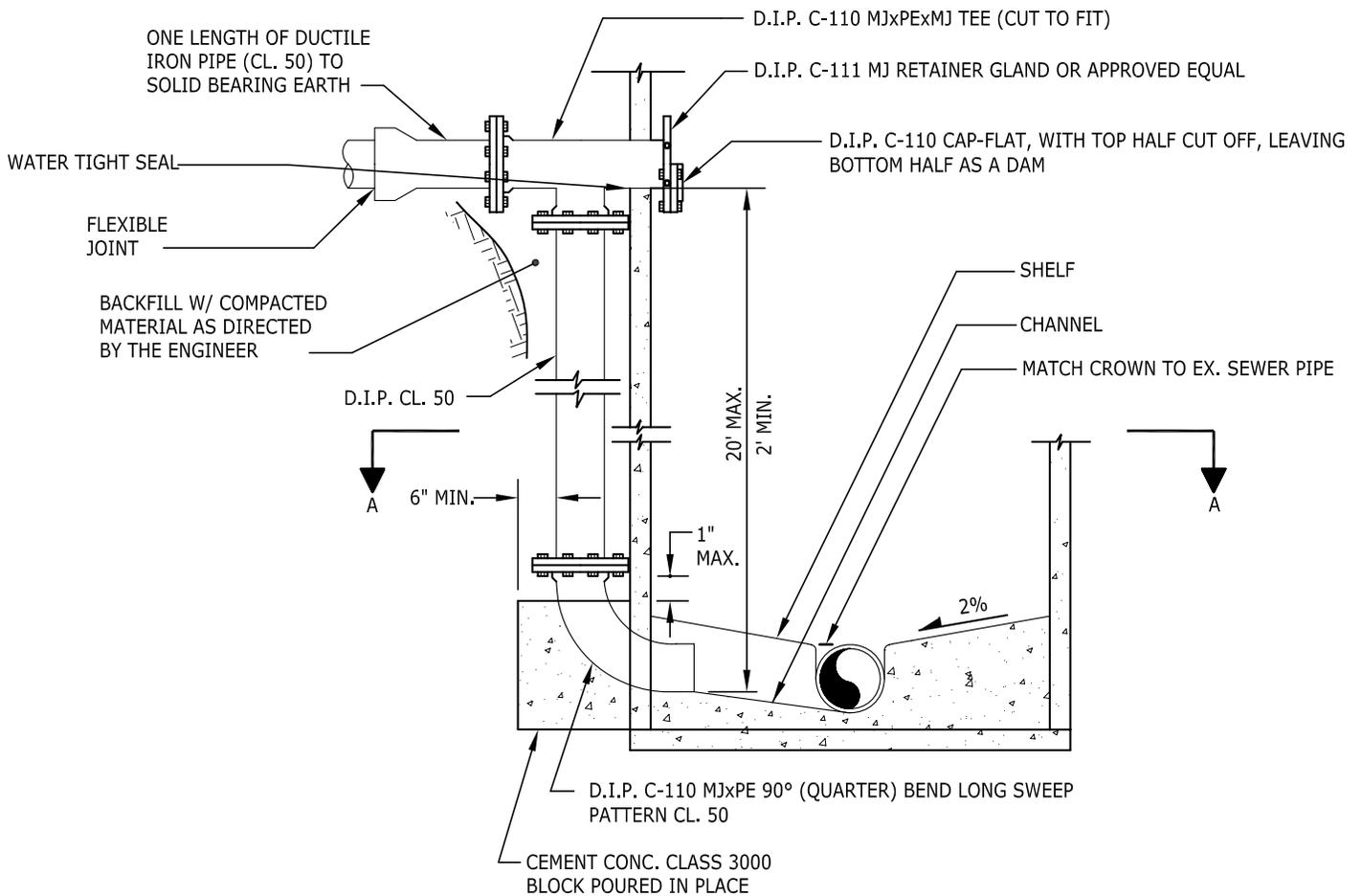


GRADE RING

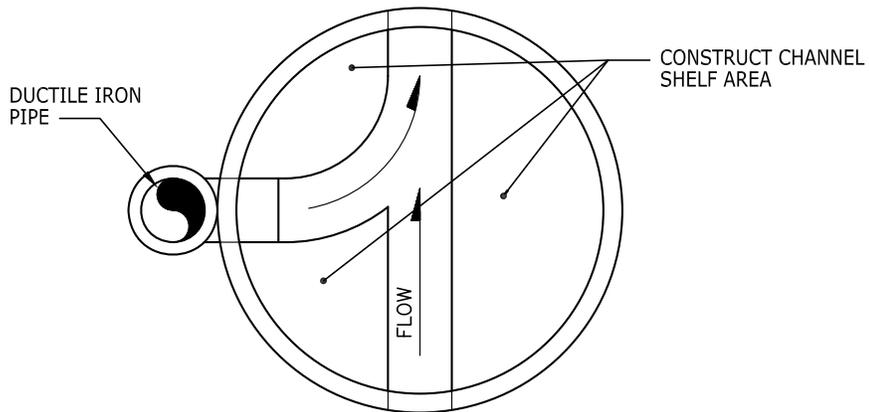
NOTE: THIS PLAN IS NOT A LEGAL ENGINEERING DOCUMENT BUT AN ELECTRONIC DUPLICATE. THE ORIGINAL, SIGNED BY THE ENGINEER AND APPROVED FOR PUBLICATION IS KEPT ON FILE AT THE CITY OF KENT. A COPY MAY BE OBTAINED UPON REQUEST.



		CITY OF KENT ENGINEERING DEPARTMENT	
		MANHOLE GRADE RING, SAFETY STEPS & LADDER	
DESIGNED	DMW	SCALE	NONE
DRAWN	BB	DATE	
CHECKED		DATE	
APPROVED		ENGINEER	
			4-5



ELEVATION



CHANNEL SECTION "A-A"

NOTES:

1. OUTSIDE DROPS MUST BE CONSTRUCTED W/ DUCTILE IRON AS SHOWN; CONC. ENCASED PVC IS NOT ACCEPTABLE.
2. USE RESTRAINED FITTINGS AT ALL DROP CONNECTION POINTS.
3. SNUG RETAINER GLAND AS CLOSE TO MANHOLE FACE AS PRACTICABLE.
4. IF DROP HEIGHT IS LESS THAN 2', A DROP CONNECTION IS NOT ALLOWED.

NOTE: THIS PLAN IS NOT A LEGAL ENGINEERING DOCUMENT BUT AN ELECTRONIC DUPLICATE. THE ORIGINAL, SIGNED BY THE ENGINEER AND APPROVED FOR PUBLICATION IS KEPT ON FILE AT THE CITY OF KENT. A COPY MAY BE OBTAINED UPON REQUEST.



**CITY OF KENT
ENGINEERING DEPARTMENT**

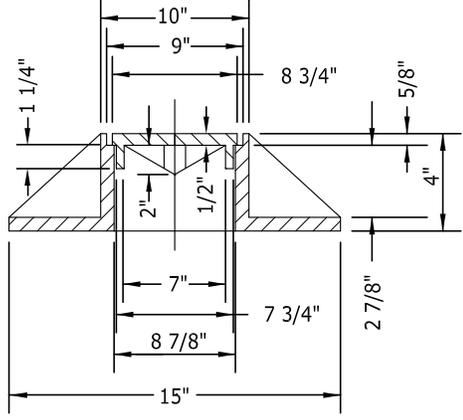
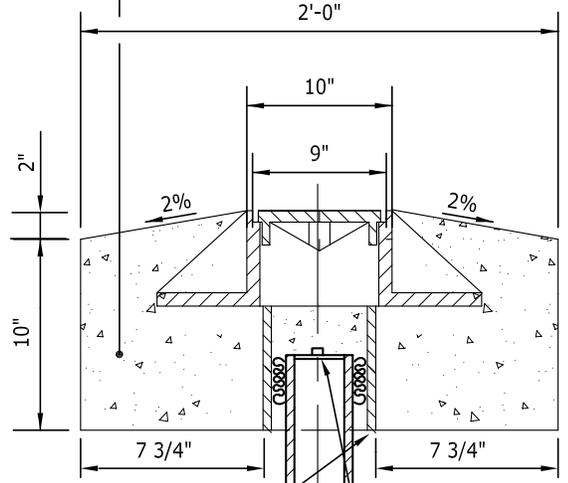
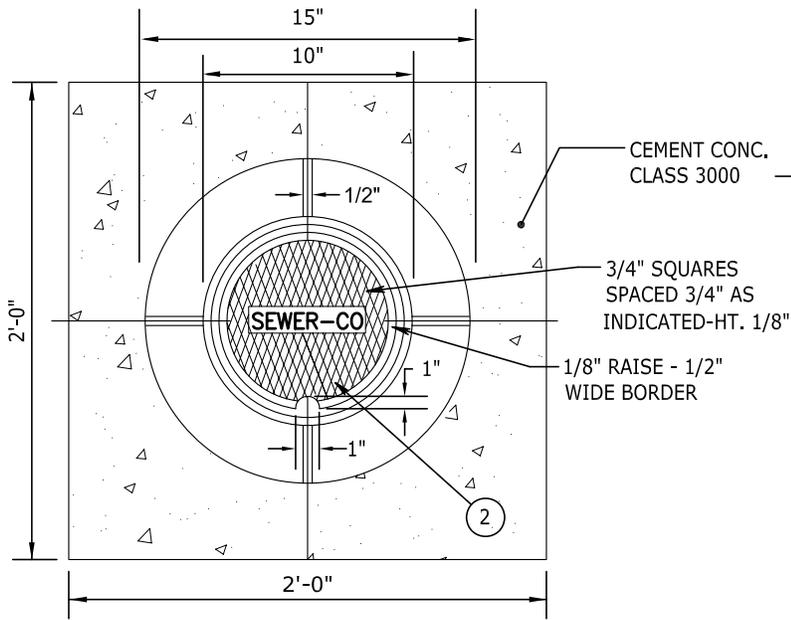
**DUCTILE IRON DROP
CONNECTION**

DESIGNED DMW
DRAWN BB
CHECKED _____
APPROVED _____

SCALE NONE
DATE _____
ENGINEER _____

STANDARD PLAN

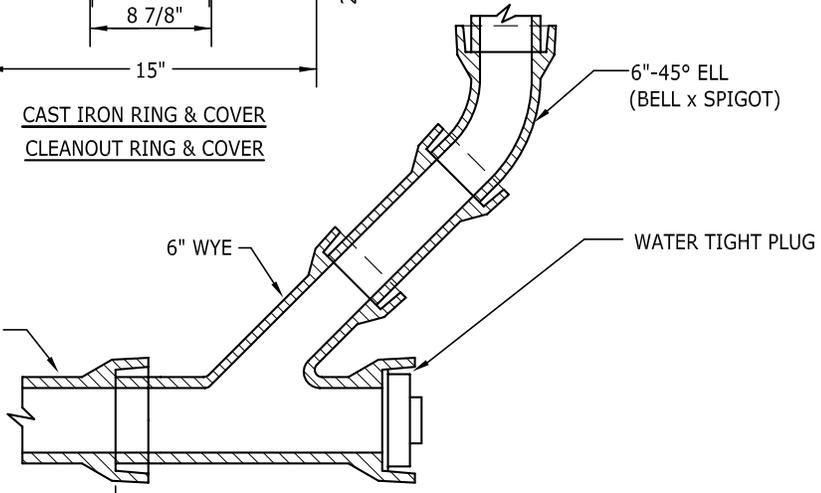
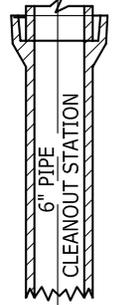
4-6



CAST IRON RING & COVER
CLEANOUT RING & COVER

8" PVC PIPE (FOR SLEEVE)
FIBER JOINT PACKING (OPTIONAL)

6" PVC THREADED PLUG



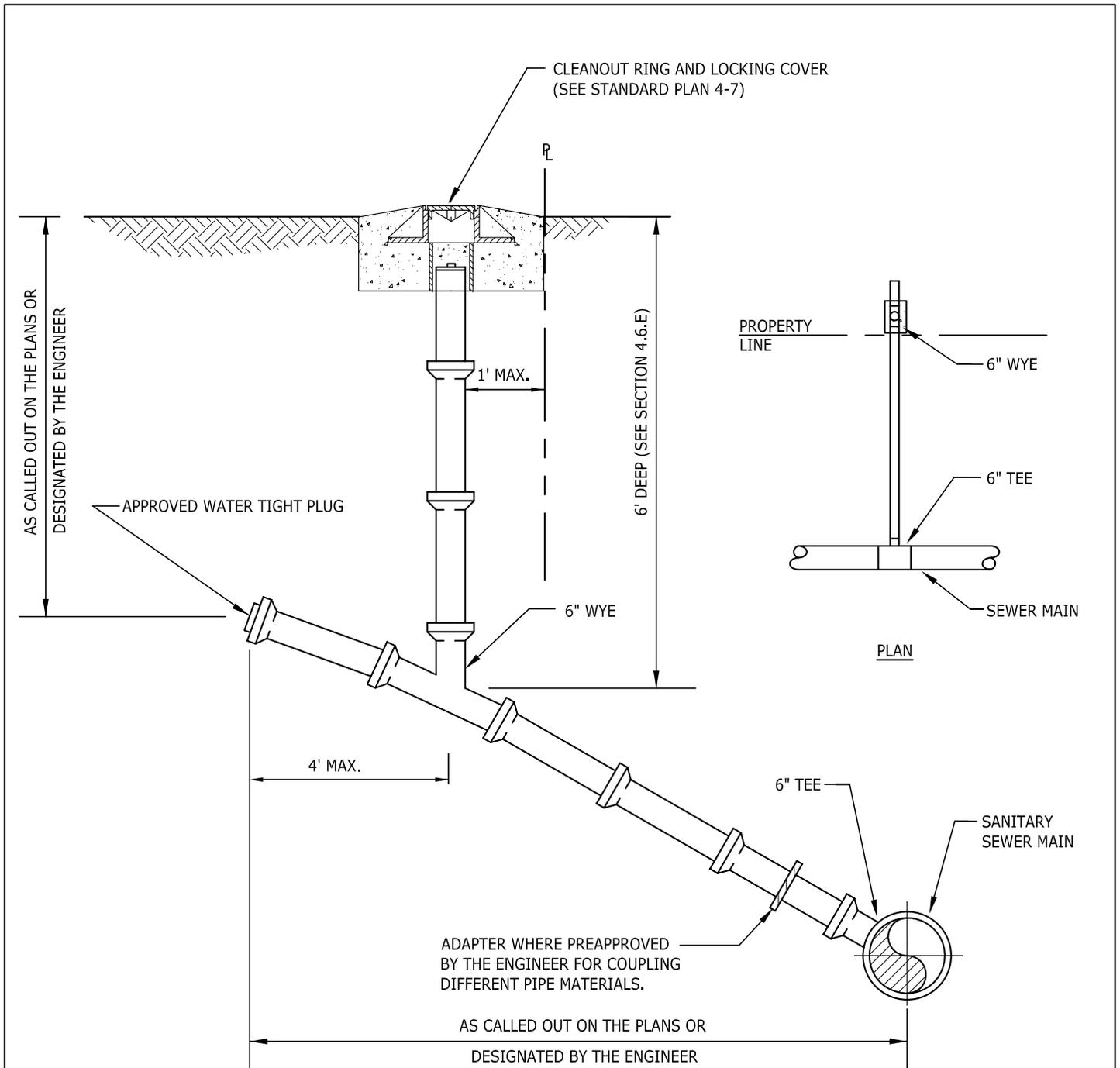
NOTE: THIS PLAN IS NOT A LEGAL ENGINEERING DOCUMENT BUT AN ELECTRONIC DUPLICATE. THE ORIGINAL, SIGNED BY THE ENGINEER AND APPROVED FOR PUBLICATION IS KEPT ON FILE AT THE CITY OF KENT. A COPY MAY BE OBTAINED UPON REQUEST.

NOTES:

- CAST IRON TO CONFORM TO A.S.T.M. A48-56 CLASS 30.
- COVER SHALL BE OLYMPIC FOUNDRY M 1007 OR EQUIVALENT MARKED "SEWER-CO" OR "CO".



		CITY OF KENT ENGINEERING DEPARTMENT	
		6" CLEANOUT	
DESIGNED <u>DMW</u>	SCALE <u>NONE</u>	STANDARD PLAN	
DRAWN <u>BB</u>	DATE _____		
CHECKED _____	ENGINEER _____	4-7	
APPROVED _____			



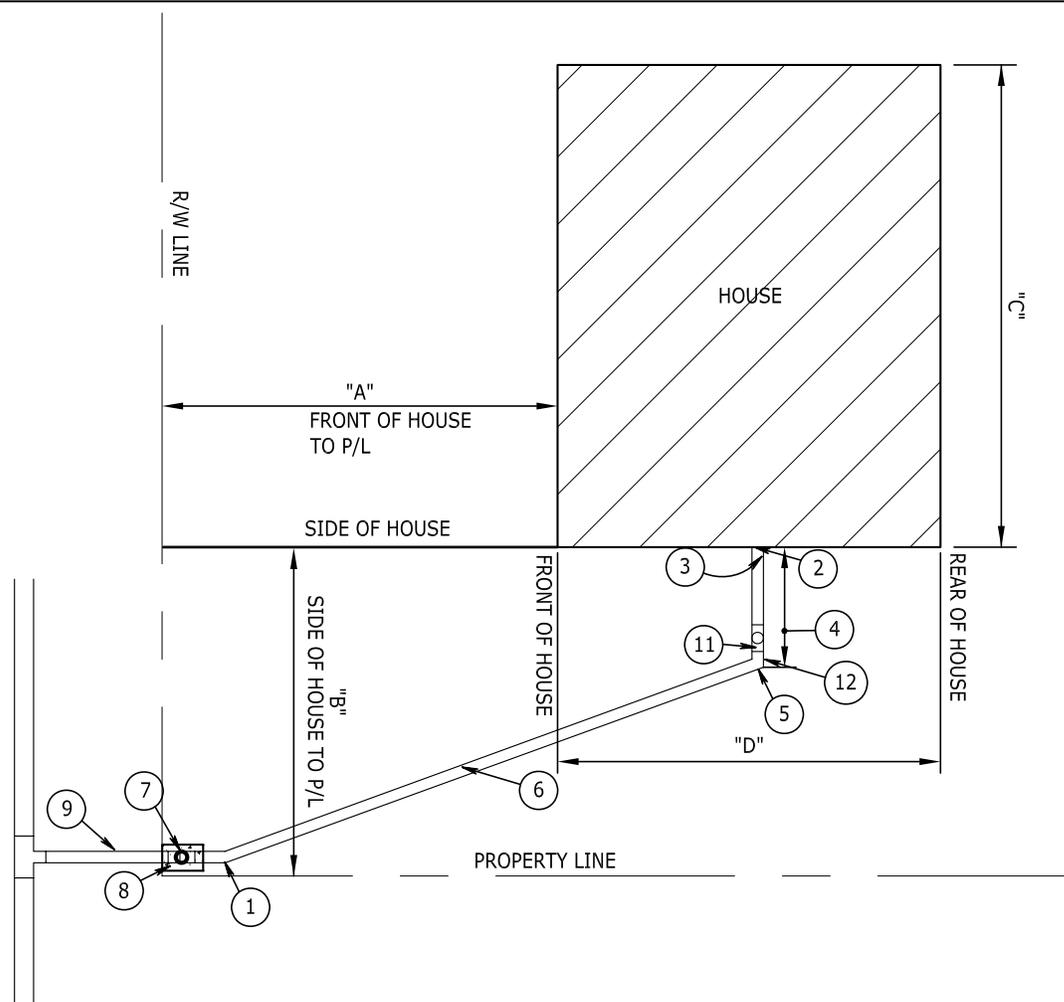
NOTES:

1. JOINT DEFLECTION SHALL NOT BE GREATER THAN RECOMMENDED BY THE PIPE MFR. AND APPROVED BY THE ENGINEER.
2. MINIMUM SLOPE SHALL BE 1%. MAX. PERMISSIBLE SLOPE SHALL BE 2 HORIZ. TO 1 VERT. UNLESS SPECIFIED OTHERWISE.
3. PIPE SHALL BE PVC, CAST IRON, OR DUCTILE IRON CLASS 50, MIN. SIZE 6". SIZE AND MATERIAL SHALL BE AS SPECIFIED ON THE PLANS OR APPROVED BY THE ENGINEER.
4. 5' MINIMUM SEPARATION BETWEEN SEWER MAIN TAPS.

NOTE: THIS PLAN IS NOT A LEGAL ENGINEERING DOCUMENT BUT AN ELECTRONIC DUPLICATE. THE ORIGINAL, SIGNED BY THE ENGINEER AND APPROVED FOR PUBLICATION IS KEPT ON FILE AT THE CITY OF KENT. A COPY MAY BE OBTAINED UPON REQUEST.



		CITY OF KENT ENGINEERING DEPARTMENT	
		SIDE SEWER STUB CONNECTION	
DESIGNED <u>DMW</u>	SCALE <u>NONE</u>	STANDARD PLAN 4-8	
DRAWN <u>BB</u>	DATE _____		
CHECKED _____	ENGINEER _____		
APPROVED _____			



NOTES:

- 1. 45°-90° BEND
- 2. CONNECTION TO BUILDING SEWER
- 3. RUBBER COUPLING REQUIRED TO PIPE AT HOUSE
- 4. 3' MIN., 5' MAX. DISTANCE FROM HOUSE
- 5. 24" MIN. COVER
- 6. 4" DIA. SIDE SEWER TO HOUSE
- 7. 6" X 4" REDUCER
- 8. CLEANOUT (SEE STANDARD PLANS 4-7 & 4-8)
- 9. 6" DIA. SIDE SEWER STUB TO PROPERTY LINE (SEE STANDARD PLAN 4-8)
- 10. 100' MAX. DISTANCE BETWEEN CLEAN-OUT AND 400' MAX. DISTANCE BETWEEN MANHOLES.
- 11. BEND, WYE AND CLEANOUT
- 12. CLEANOUT BELOW GRADE. 1' MAX.

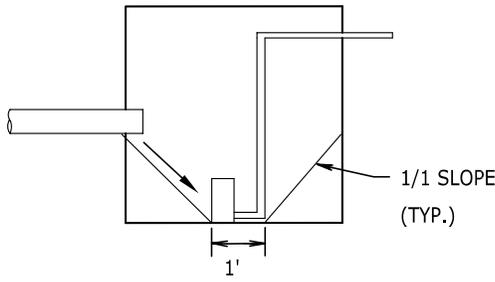
SIDE SEWER PIPE

- 1. 4" (MIN. SIZE) SEWER PIPE REQ'D. ON PROPERTY.
- 2. 2% MIN. GRADE (1/4" FALL PER FT) FOR 4" PIPE
100% MAX. GRADE (12" PER FT).
- 3. JOINTS MUST BE MADE WITH RUBBER TYPE GASKET APPROVED BY THE ENGINEER.
- 4. CONSTRUCTION ON PRIVATE PROPERTY MAY BE DONE BY OWNER BUT REQUIRES A PERMIT.

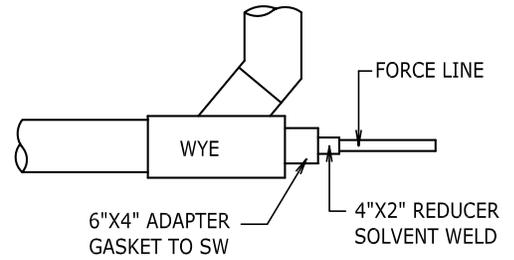
NOTE: THIS PLAN IS NOT A LEGAL ENGINEERING DOCUMENT BUT AN ELECTRONIC DUPLICATE. THE ORIGINAL, SIGNED BY THE ENGINEER AND APPROVED FOR PUBLICATION IS KEPT ON FILE AT THE CITY OF KENT. A COPY MAY BE OBTAINED UPON REQUEST.



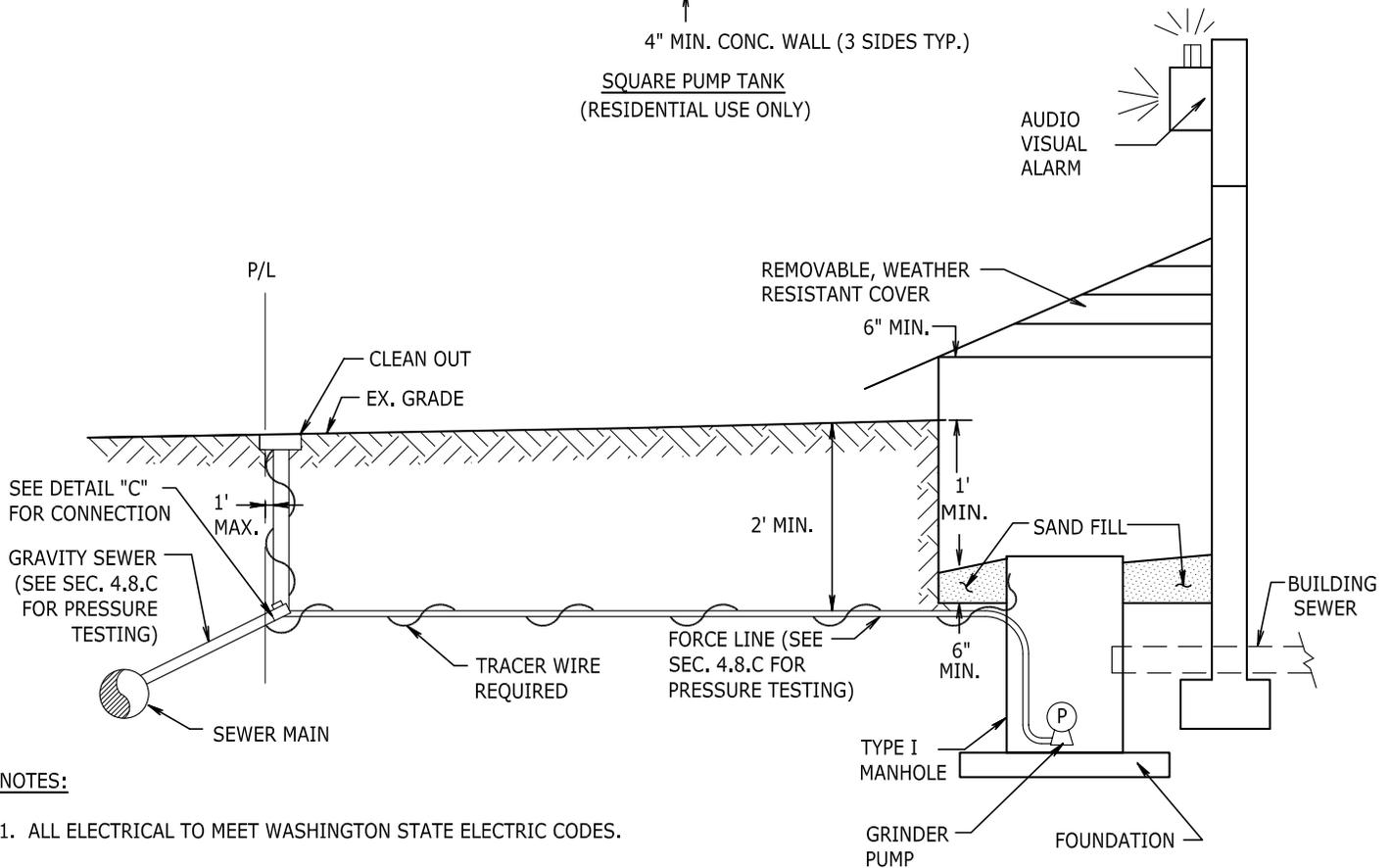
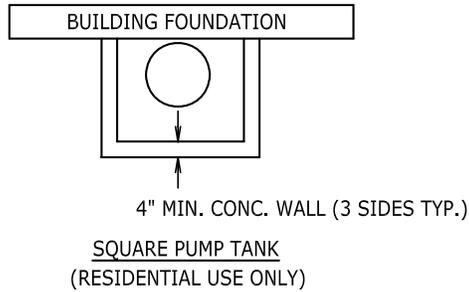
		CITY OF KENT ENGINEERING DEPARTMENT	
		RESIDENTIAL SIDE SEWER CONNECTION	
DESIGNED: DMW	SCALE: NONE	STANDARD PLAN	
DRAWN: BB	DATE: _____		
CHECKED: _____	ENGINEER: _____	4-9	
APPROVED: _____			



SIDE VIEW



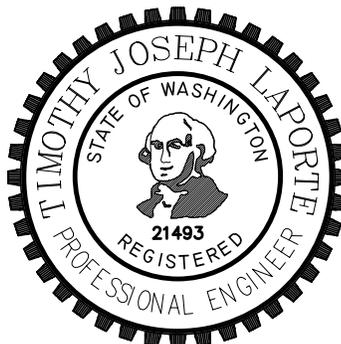
GRAVITY TO FORCE LINE CONNECTION
DETAIL "C"



NOTES:

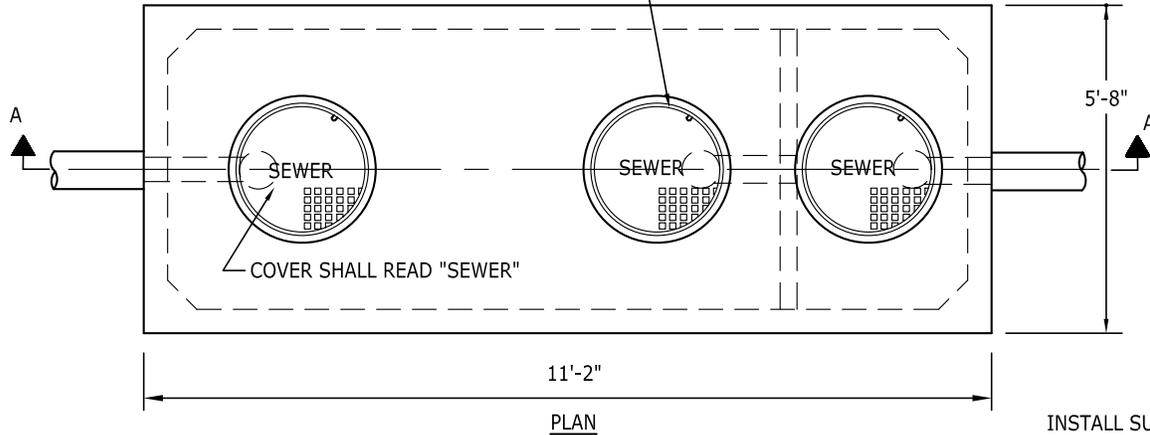
1. ALL ELECTRICAL TO MEET WASHINGTON STATE ELECTRIC CODES.
2. GRINDER PUMP AND TANK TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURES RECOMMENDATIONS.
4. TYPE 1 MANHOLES ARE TO BE FOR COMMERCIAL USE ONLY. SEE STANDARD PLAN 4-1 AND 4-2. THE BASE OF THE MANHOLE SHALL BE SLOPED AS SHOWN IN THE "SIDE VIEW" ABOVE.
5. CLEAN OUT TO BE INSTALLED PER STANDARD PLAN 4-7 AND 4-8.
6. FOUNDATION AND WALLS TO BE DESIGNED FOR SITE CONDITIONS.

NOTE: THIS PLAN IS NOT A LEGAL ENGINEERING DOCUMENT BUT AN ELECTRONIC DUPLICATE. THE ORIGINAL, SIGNED BY THE ENGINEER AND APPROVED FOR PUBLICATION IS KEPT ON FILE AT THE CITY OF KENT. A COPY MAY BE OBTAINED UPON REQUEST.



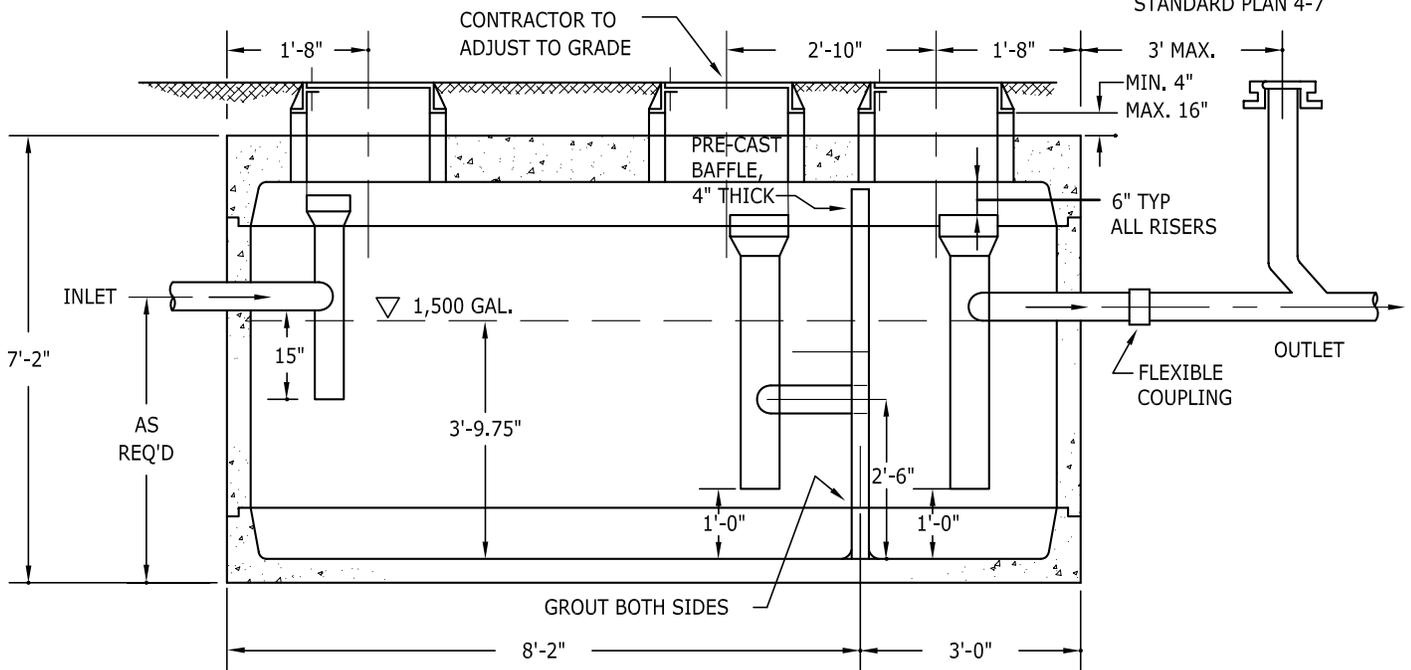
		CITY OF KENT ENGINEERING DEPARTMENT	
		LOW PRESSURE GRINDER PUMP	
DESIGNED	DMW	SCALE	NONE
DRAWN	BB	DATE	
CHECKED			
APPROVED		ENGINEER	
			STANDARD PLAN 4-10

24" DIA. LOCKING FRAME AND COVER AIR AND GAS TIGHT-3 PLACES-
(LOCATE AS SHOWN, ON CENTERLINE) SEE STANDARD PLAN 4-4



PLAN

INSTALL SURFACE
CLEAN-OUT PER
STANDARD PLAN 4-7

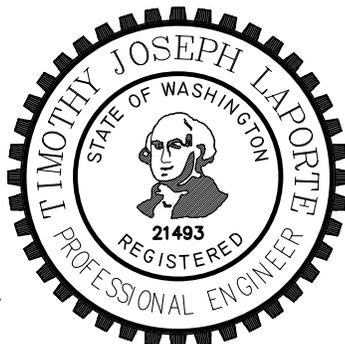


SECTION A-A

NOTES:

1. LOCATE STRUCTURE ADJACENT TO DRIVE AND FOR ACCESS BY MAINTENANCE VEHICLE.
2. FILL WITH CLEAN WATER PRIOR TO START UP OF SYSTEM.
3. INTERCEPTOR TO BE MAINTAINED BY OWNER AND ANNUAL MAINTENANCE REPORT WILL BE REQUIRED.
4. UTILITY VAULT CO., INC. MODEL NO. 5106 GA OR EQUAL.
5. CONNECTIONS TO CONCRETE WALLS WITH PVC PIPE REQUIRES KOR-N-SEAL CONNECTOR OR A.C. X PVC BRANT ADAPTER OR APPROVED EQUAL. SEAL ALL PIPE CONNECTIONS WITH NON-SHRINK GROUT.
6. 6" PVC SHALL BE USED THROUGHOUT. PIPE MATERIAL SHALL BE PER STANDARDS. TOP OF "TEES" TO BE KEPT OPEN.
7. GRAY WATER ONLY. BLACK WATER SHALL BE CARRIED BY SEPARATE SIDE SEWER.
8. ANY CHANGES REQUIRE PRIOR APPROVAL BY THE ENGINEER

NOTE: THIS PLAN IS NOT A LEGAL ENGINEERING DOCUMENT BUT AN ELECTRONIC DUPLICATE. THE ORIGINAL, SIGNED BY THE ENGINEER AND APPROVED FOR PUBLICATION IS KEPT ON FILE AT THE CITY OF KENT. A COPY MAY BE OBTAINED UPON REQUEST.



		CITY OF KENT ENGINEERING DEPARTMENT	
		1,500 GALLON GREASE INTERCEPTOR	
DESIGNED <u>DMW</u>	SCALE <u>NONE</u>	STANDARD PLAN 4-11	
DRAWN <u>BB</u>	DATE _____		
CHECKED _____	ENGINEER _____		
APPROVED _____			