

A photograph of a utility worker in a high-visibility yellow-green safety vest and a yellow hard hat. The worker is standing in front of a chain-link fence and is looking down at a device in their hands. To the right, a large, vertical, corrugated metal pipe is visible. The background shows a building with a corrugated metal roof and some trees under an overcast sky. The entire image has a blue gradient overlay.

**4.0
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 fixtures, planting of large tree species, etc., are not allowed in public easements and rights-of-way. Where an encroachment occurs, the Contractor 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 variance 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'. The total will then be 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/DNRP-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/DNRP-WTD when connections are made to their system.

4.3.B Comprehensive Sanitary Sewer Plan

The City has developed a comprehensive sanitary 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 or under 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

Ensure adjacent properties can be provided sewer service. Extend sewer main to extreme of property and design for the ultimate development of the tributary areas. The extension shall be of the size and profile grade necessary to be extended to other properties upstream in the future.

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 epoxy-lined 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, enclosures, and community car wash areas shall be graded to only allow a maximum of 200 square feet to be discharged to the sanitary sewer system, not the storm drain. Areas exceeding 200 square feet shall be covered.

4.4.H Casings

Where a sewer line passes under or through a retaining wall or is attached to a bridge structure, or other location determined by the engineer, 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

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 without approval by the Engineer and Public Works Operations. If approved, the diameter of the manhole shall be a minimum of 60" to compensate for the inclusion of the drop inside the manhole, see Standard Plan 4-12. Outside drop connections to existing manholes shall be installed per Standard Plan 4-6. The existing channel shelf shall be broken out to allow for the new pipe penetration. Plumbing the pipe above the existing shelf is unacceptable.

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 ensure 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 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. See WSDOT Standard Plan B-30.70.

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 Kent City Code 7.04.

4.6.A Sewer Permit

Prior to construction, replacement, repair, connections or additions to a side sewer, the Developer, Owner 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 through 4.5, 4.7 and 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 epoxy-lined 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 shall be minimum SDR 35. Side sewers installed in filled or unstable ground shall be constructed of PVC C900 or Class 50 epoxy-lined 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 and where required in accordance with Section 4.6.B. 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 variance 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.
16. The inside diameter for private force main/discharge pipelines from private grinder pump systems shall be one and one quarter inches (1-1/4"), or greater as necessary to conform to the design of the specific grinder pump system used. The inside diameter for pressure side sewers shall be one and one quarter inches (1-1/4"), or greater as necessary to conform to the design of the specific grinder pump system used. The pipeline size shall be that necessary to provide a fluid velocity between two and eight feet per second (2 – 8 fps) at the grinder pump's discharge rate. The minimum width of the trench shall be the inside pipe diameter, plus six inches (6") on each side of the pipeline.

4.6.C Connections

Each legally defined property shall be serviced by a separate side sewer stub connected to the City sewer main unless otherwise approved by the City Engineer. This can be done through a deviation request. A joint maintenance agreement recorded with King County shall be required. 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 Pump Systems, Pressure Side Sewers, and Private Force Main/Discharge Pipelines from 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 variance by the Engineer. The pumping system shall be designed in accordance with Section C1-10.1 of DOE's "Criteria for Sewage Works Design" and these standards. 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, EONE as manufactured by the Environment One Corporation, KPCG Series Grinder Pump as manufactured by Keen 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 variance by the Engineer. Variance approval is required for each permit prior to approval. Solid handling waste pumps are not allowed. See Standard Plan 4-10.

4.6.D.1 Definitions:

Gravity Building Sewer: A privately owned and maintained pipeline system located within private property that is designed to carry sewage or wastewater leading from a building drain/plumbing outlet of a structure to the gravity side sewer, or emptying into a private grinder pump wet well, if applicable. The gravity building sewer shall begin at the terminus of the “building drain” as defined by the applicable plumbing code and shall terminate at the property line/right-of-way margin or City easement boundary, or at a private grinder pump wet well, if applicable. The “STANDARDS FOR INSTALLATION OF GRAVITY BUILDING SEWERS / SIDE SEWERS” provide requirements for gravity building sewers conveying the flow from the structure or group of structures and emptying into the wet well.

Private Grinder Pump System: A privately owned and maintained pumping system, including all mechanical and electrical components and appurtenances, which is designed to convey sewage or wastewater generated within a structure or group of structures to the public sanitary sewer system. A private grinder pump system is required where the property cannot be served by a gravity building/side sewer connection.

Private Force Main/ Discharge Pipeline: A privately owned and maintained pipeline system that is designed to carry sewage or wastewater under pressure from a private grinder pump system to a gravity side sewer or pressure side sewer. The private force main/discharge pipeline shall begin at the outlet/discharge of a private grinder pump and shall typically terminate at the property line/right-of-way margin or the City easement boundary, and include a service box enclosing a check valve and two (2) isolation valves. If discharging to a public gravity sewer system, a private force main/discharge pipeline shall connect to the upstream terminus of a gravity side sewer, and shall not connect directly into a gravity sewer main without express written permission of the City.

Pressure Side Sewer: A privately owned and maintained pipeline system located within a public right-of-way or City easement that is designed to carry sewage or wastewater under pressure leading from the terminus of a private force main/discharge pipeline from a private grinder pump system or other approved facilities, to the public pressure sanitary sewer system main.

Gravity Side Sewer: A privately owned and maintained pipeline system located within a public right-of-way or City easement that is designed to carry sewage or wastewater leading from a gravity building sewer terminus,

a private force main/discharge pipeline from a private grinder pump, or other approved facilities to the public gravity sanitary sewer system main. The "STANDARDS FOR INSTALLATION OF GRAVITY BUILDING SEWERS / SIDE SEWERS" provide requirements for gravity side sewers conveying the flow from the gravity building sewer terminus to the public gravity sanitary sewer system main.

4.6.D.2 Design and Installation:

It is recommended that a design professional prepare plans and specifications for a private grinder pump system, including, but not limited to, the gravity building sewer emptying into the wet well and the private force main/discharge pipeline discharging from the wet well, between the building plumbing/ mechanical improvements on the property served and a point on the City's public gravity or pressure sewer system designated by the City. Many issues should be considered in the design and construction of private grinder pump systems including sewer flow management in case of a commercial power outage, commercial power for grinder pumps, surface improvement considerations, etc.).

If discharging to a public pressure sewer system, the grinder pump system shall be installed in conformance with that which was specified by the designer of the community's public pressure sewer system, and the manufacturer and model number of the required grinder pump system shall be noted on the permit. The property owner may request the installation of a different grinder pump system; to do so, he/she shall submit for the City approval, at his/her expense, a report prepared and sealed by a professional engineer licensed in the State of Washington analyzing the impact of the proposed differing grinder pump system on the community's public pressure sewer system, and certifying that the community's public pressure sewer system will continue to operate efficiently and effectively to the City's satisfaction by use of the differing grinder pump system that has been deemed compatible.

The private grinder pump system, including all mechanical and electrical components and appurtenances, shall be installed in accordance with the manufacturer's recommendations. No visible leakage will be permitted in the grinder pump wet well.

4.6.D.2.A Pipeline Size/Trench Width:

Private sewer force main material shall be high-density polyethylene rated for the correct working system pressure, and minimum SDR rating 11 for 1-1/4", 2", and 3" pipe. A 14-gauge insulated copper toning wire shall be wrapped around the pipe. The inside diameter for private force main/discharge pipelines from private grinder pump systems shall be one and one quarter inches (1-1/4"), or greater as necessary to conform to the design of the specific grinder pump

system used. The inside diameter for pressure side sewers shall be one and one quarter inches (1-1/4"), or greater as necessary to conform to the design of the specific grinder pump system used. The pipeline size shall be that necessary to provide a fluid velocity between two and eight feet per second (2 - 8 fps) at the grinder pump's discharge rate. The minimum width of the trench shall be the inside pipe diameter, plus six inches (6") on each side of the pipeline.

4.6.D.2.B Pipeline Alignment/Bends:

Pressure side sewers shall be laid at uniform slope and straight alignment from the pressure sewer main to their termini; changes in horizontal and/or vertical direction should be avoided and will only be allowed with prior written approval by the City. Private force main/discharge pipelines from private grinder pump systems shall be laid at uniform grade and alignment; changes in horizontal and/or vertical direction shall be made in "sweeps" of a radius no less than that recommended by the pipe manufacturer, or with proper pipe fittings. Single bend fittings shall not exceed 45°; a change in direction exceeding 45° may be made with multiple bends, provided a minimum of two feet (2') of pipe is placed between bends.

4.6.D.2.C Pipeline Cover:

The minimum cover over a pressure side sewer and/or private force main/discharge pipeline from a private grinder pump system, as measured from the final finished grade to the exterior top of the pipe, shall be two feet (2') in non-traffic or traffic areas, except the cover over the pipeline within twenty feet (20') of the grinder pump wet well shall be a minimum of one foot (1'). Any acceptable pipe material shown in 4.7.B may be used in non-traffic or traffic areas. Pipeline in public right-of-way shall have a minimum three feet (3') of cover over the pipeline.

4.6.D.2.D Service Box:

A service box enclosing a private isolation valve, a private check valve and isolation valve (oriented from upstream to downstream), and meeting the requirements of Standard Plan 4-10, shall be installed within private property on the downstream end of the private force main/discharge pipeline directly adjacent to the property line/right-of-way margin or the City easement boundary.

4.6.D.2.E Monitoring Manholes:

A monitoring/sampling manhole (APWA Type 1, 48-inch diameter) is required for all new or modified multi-family residential and non-residential sewer service connections. The monitoring/sampling manhole shall be installed in the gravity building sewer component of the system upstream of the grinder pump wet well.

4.6.D.2.F Pipe Zone Bedding:

Crushed surfacing top course (a.k.a. 5/8-inch minus crushed rock) shall be

placed and compacted four inches (4") below the bottom surface of pressure side sewer pipelines, and six inches (6") above the top surface of pressure side sewer pipelines. No other bedding material is acceptable.

4.6.D.2.G Tracer Wire / Tracer Tape:

It is required that tracer wire be installed for private force main/discharge pipelines from private grinder pump systems, pressure side sewers. Tracer wire shall be continuous THHN- insulated 12-gauge solid-core copper wire wrapped around the pipe, with the ends looped and exposed at both ends of the pipeline. The tracer tape shall be the detectable type, minimum two inches (2") in width, and marked with the word "SEWER" (Lineguard Type II Detectable or approved equal). The tracer tape shall be placed in a continuous fashion approximately six inches (6") to twelve inches (12") above the top of the pipeline, extending along the full length of the pipeline.

4.6.D.2.H Sewer Tap:

If a pressure side sewer stub or tee is not provided, the active pressure sewer main shall be saddled and tapped and a pressure side sewer stub installed. 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 and WISHA trench safety requirements shall apply for shoring.

Taps for pressure side sewer stubs onto active pressure sewer mains shall be made by use of Electrofusion High Volume Tapping Tees, HDPE material with a PPI rating of PE3408, base to fit IPS pressure sewer main, and one and on quarter inches (1-1/4") or two inches (2") butt fusion outlet, as manufactured by G.F. Central Plastics LLC of Shawnee, Oklahoma, or an approved equal; said fittings shall be installed in strict compliance with the manufacturer's requirements and recommendations. The connection effected by this method shall have perfectly round holes, with no sharp or jagged edges. The tap shall be oriented at the top of the cross-section of the pressure sewer main. The connection made shall be water-tight. No "size-on-size" Electrofusion High Volume Tapping Tees will be allowed; "size-on-size" connections shall be produced by cutting-in and thermally-welding an HDPE tee fitting into the pressure sewer main.

4.6.D.2.I Restrictions:

No roof downspouts, building footing drains/ sump pump discharge pipes, groundwater/ spring drains, drains from uncovered outdoor impervious surfaces, etc., shall be connected to the private grinder pump system. Storm water, surface water, ground water, artesian well water, roof runoff, subsurface drainage, swimming pool drainage, condensate, deionized water, non-contact cooling water, and unpolluted wastewater shall be prohibited from entering the private grinder pump system.

4.6.D.2.J Joint Use Side Sewer and Grinder Pump Systems:

No private force main/discharge pipeline from a private grinder pump system may be connected to another private force main/discharge pipeline from another private grinder pump system for an adjacent property, or to a pressure side sewer serving an adjacent property, without prior written approval by the City and execution of a Joint Use Agreement and private easement(s). If joint use is allowed, no more than two (2) single family residences may jointly use a single private force main/discharge pipeline or pressure side sewer pipeline. The pipeline downstream of the point of connection of separate private force mains/discharge pipelines from separate private grinder pump systems, shall be a minimum one and one half inches (1 ½") in size. Separate private service boxes shall be installed on each private force main/discharge pipeline as required elsewhere in these standards.

No single grinder pump system shall provide service to premises and structures with plumbing systems that are under separate ownership. At the option of the owner, a single grinder pump system may serve more than one structure with plumbing systems that are situated on a single undivided property under a single ownership. It is recommended that separate grinder pump systems be provided for separate structures with plumbing systems, if there is an opportunity for property subdivision and subsequent separate ownerships.

4.6.D.2.K Leakage Testing:

Refer to Section 4.8.C for air testing force main systems.

All pressure side sewers and private force main/discharge pipelines from the private grinder pump systems shall be hydrostatically pressure tested at one and one-half (1 ½ times the working design pressure of the system, or 100 psi, whichever is greater, under the City observation.

4.6.D.2.L Backup Storage/System:

There are three (3) acceptable methods to manage sewer flows in the event of a commercial power outage that render the pump station inoperable. The owner may select from these methods and shall designate its selection in the Request for Variance.

1. Use of Existing On-Site Sewage System/Septic Tank
 - a. Both existing septic tank and drainfield must remain a functional system
 - b. The septic tank be pumped out and made safe in accordance with KCDPH Code

- c. The contents of the drainfield do not backflow into the septic tank
 - d. If the on-site system is in a high groundwater table area, the tank should not be completely drained and emptied, but only pumped sufficiently to remove the sludge on the tank's floor to avoid floating the tank
 - e. A locator is placed over the access/inspection cover for the septic tank, and its location noted/recorded, along with the drainfield location
 - f. If the on-site sewage system is no longer functional, or if the owner desired to recover the land surface for other purposes, the on-site sewage system must be properly abandoned in accordance with the KCDPH regulations. In this case, one of the other acceptable methods listed herein is used.
2. Holding Capacity in the System
- a. Sufficient storage must be provided to temporarily store a volume representing approximately 48 hours of sewer flow (200 gallons for a typical single-family residence).
 - b. The use of existing septic tank alone, without functioning drainfield and intended to provide holding capacity for emergency flow management purposes, will not be allowed.
 - c. The temporary storage can be provided within the grinder pump's wet well chamber, or within a separate storage/holding tank or vault. The "normal working volume" of the grinder pump's wet well chamber is measured between the "PUMP ON" level and the "PUMP OFF" level. The qualifying temporary storage shall be that available in excess of the "normal working volume" between the "PUMP OFF" level and the top of the wet well chamber.
3. Standby Engine-Driven Emergency Generator
- a. The standby engine-driven emergency generator can be equipped with a manual transfer switch that will isolate the grinder pump and its motor starter from the electrical system and the remainder of the structure served.
 - b. The transfer from commercial to emergency power can also be performed by simply using a "pig tail" plug on the grinder pump's electrical control panel, so that when commercial power is lost, the grinder pump can be plugged into the emergency generator to provide the power needed to operate the grinder pump.

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. 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 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 and WISHA 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) for industrial dischargers shall be approved by KC/DNRP-IWP. The type and size of grease interceptor(s) for food service establishments shall be determined by the Uniform Plumbing Code and approved by the Engineer. Each business requiring a grease interceptor shall have its own grease interceptor, unless otherwise directed by KC/DNRP-

IWP or the Engineer as applicable. Annual maintenance reports shall be maintained and provided to the city or to KC/DNRP-IWP upon request.

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 Sanitary Sewer Pipe

Unless otherwise approved, all sewer pipes shall be solid wall PVC SDR 35, conforming to ASTM D3034 or D3035 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. Class 50 epoxy-lined ductile iron pipe is required as a minimum on all force mains.

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 WSDOT Standard Plan B-30.70.

Frames and covers located within pedestrian access routes that are adjusted and/or installed shall have slip resistant surface per Section 6.5.B.

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 9-03.9(3) Crushed Surfacing Top Course 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

General trench backfill above the pipe zone bedding shall be either Crushed Surfacing Top Course (CSTC) or Controlled Density Fill (CDF) that meets the minimum requirements of Section 2-09.3(1)E Backfilling of the WSDOT Standard Specifications under all arterial classifications of roadways and those local streets adjacent to commercial or industrial land uses. Gravel borrow may 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. Compaction test reports from a certified testing company are required on all utility trenches within roadway sections. Acceptable compaction reports meeting the minimum compaction requirements are required to be delivered to the City Construction Inspector prior to completion of the project.

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 flushing and vacuum cleaned 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 ensure 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.

In the rare case, when the system being flushed and cleaned cannot be isolated entirely, the existing main shall be protected by means approved by the Engineer to prevent construction debris from entering the existing downstream system. 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 ensure 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) 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 within 24 hours of the scheduled time or, the TV inspection crew shows up at the site and the system is not ready for testing, 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 identified 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 finished 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 within 24 hours of the scheduled time or the vacuum testing crew shows up at the site and the system is not ready for testing, 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.

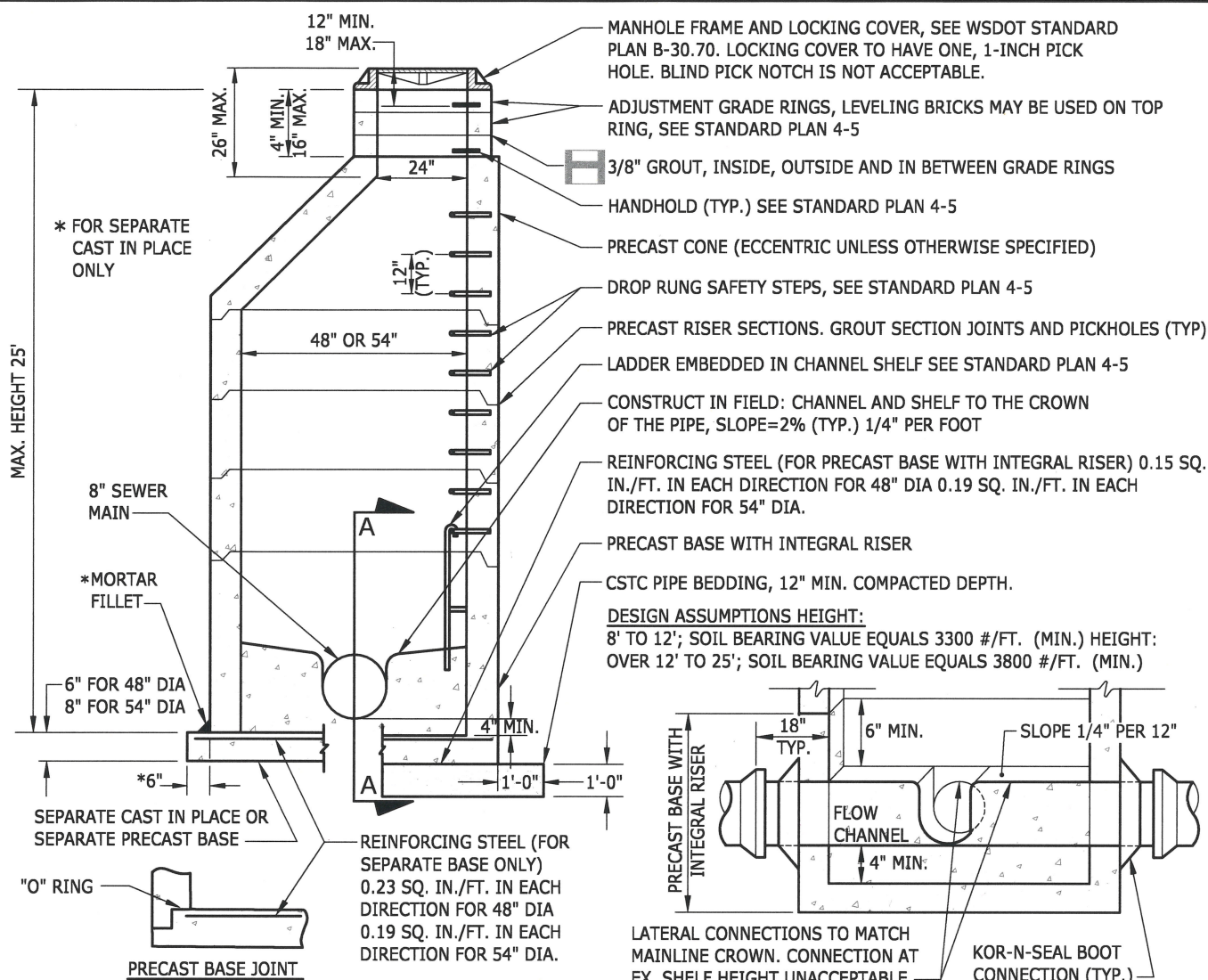
5. No sewage from a new pump station shall be discharged to an existing City pump station.
6. The Developer shall provide a financial guarantee per Section 1.12 to cover the estimated costs of operation and maintenance of the new pump station during the two years of service.

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4.10 SANITARY SEWER SYSTEM STANDARD PLANS

- 4-1 Sanitary Sewer Manhole Type 1 48" & 54"
- 4-2 Special Shallow Manhole
- 4-3 Not Used
- 4-4 Not Used
- 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
- 4-12 Inside Drop Sanitary Sewer Manhole
- 4-13 Adjustment of New and Existing Utility Structures to Finish Grade
- 4-14 Deflected Water Main Installation for Gravity Sewer Only

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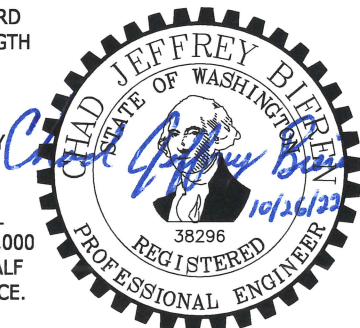


DESIGN ASSUMPTIONS HEIGHT:
 8' TO 12'; SOIL BEARING VALUE EQUALS 3300 #/FT. (MIN.) HEIGHT:
 OVER 12' TO 25'; SOIL BEARING VALUE EQUALS 3800 #/FT. (MIN.)

SECTION A-A
 LATERAL CONNECTIONS TO MATCH MAINLINE CROWN. CONNECTION AT EX. SHELF HEIGHT UNACCEPTABLE
 KOR-N-SEAL BOOT CONNECTION (TYP.)

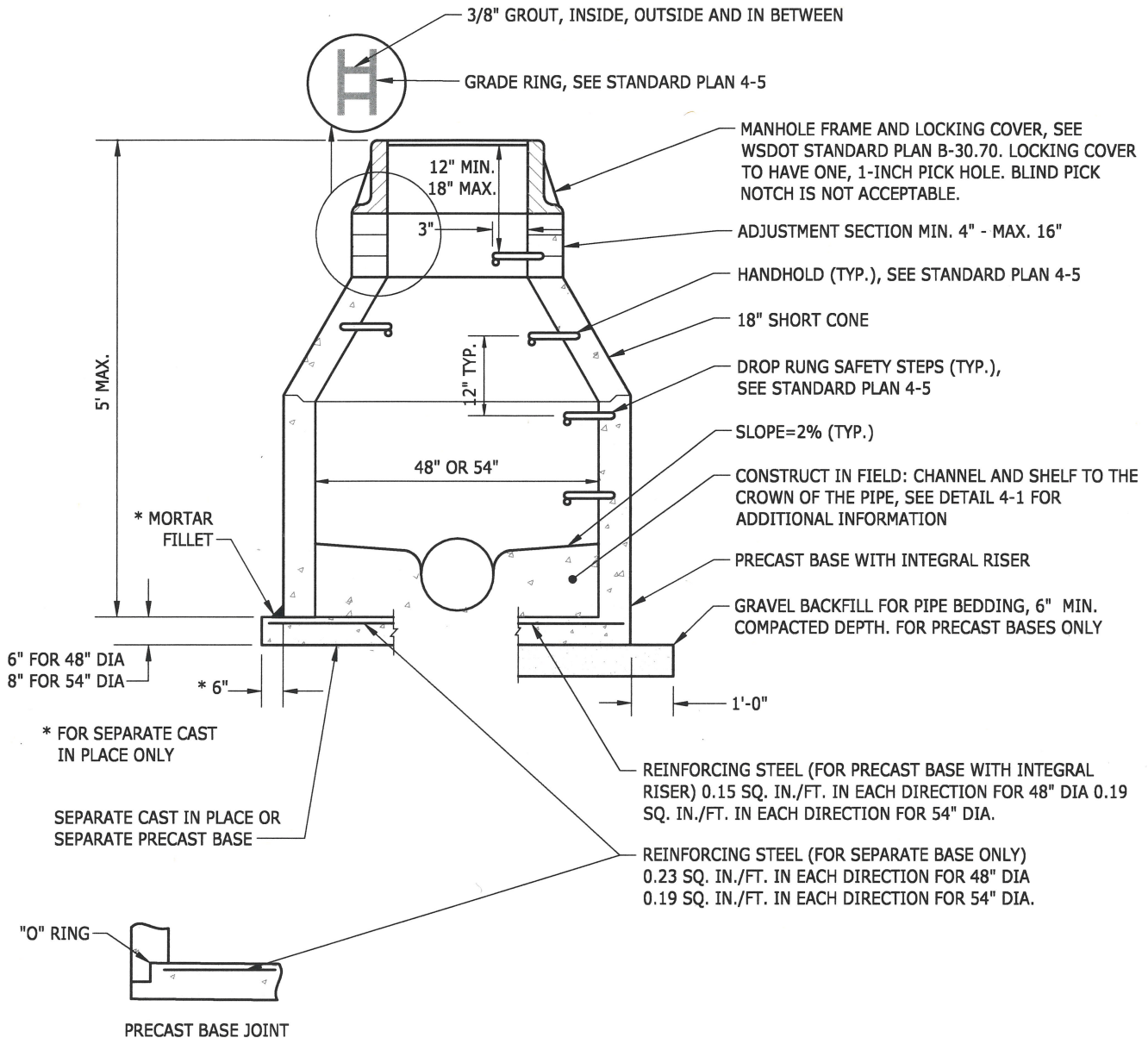
NOTES:

1. MANHOLE REQUIRED WHEN CONNECTION TO MAIN IS 8" DIA. OR GREATER.
2. MANHOLES TO BE CONSTRUCTED IN ACCORDANCE W/ AASHTO M-199 AND (ASTM C 478) UNLESS OTHERWISE SHOWN ON PLANS OR NOTED IN THE WSDOT STD. SPECS.
3. PRECAST BASES SHALL BE FURNISHED WITH CUTOUTS OR KNOCKOUTS. KNOCKOUTS SHALL HAVE A WALL THICKNESS OF 2" MINIMUM.
4. 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".
5. 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.
6. ALL BASE REINFORCING STEEL SHALL HAVE A MIN. YIELD STRENGTH OF 60,000 PSI AND BE PLACED IN THE UPPER HALF OF THE BASE WITH 1" MIN. CLEARANCE.
7. ALL SANITARY SEWER MANHOLES SHALL BE VACUUM TESTED. IN LOCATIONS WITH HIGH WATER TABLE, EXTERIOR COATING AND JOINT SEALANT TAPE WILL BE REQUIRED TO PREVENT HYDRO STATIC WATER INFILTRATION OF MANHOLE.
8. MORTAR 3/8" LINING OUTSIDE, INSIDE, AND IN BETWEEN THE ADJUSTMENT SECTION TO FORM A SMOOTH WATERTIGHT FINISH.
9. GROUT ALL MANHOLE SECTION JOINTS AND PICKHOLES OUTSIDE AND INSIDE TO A SMOOTH FINISH.
10. 400 FT MAXIMUM SPACING OF MANHOLES (TYP).



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		CITY OF KENT ENGINEERING DEPARTMENT	
		SANITARY SEWER MANHOLE TYPE 1 48IN & 54IN	
DESIGNED	COK	SCALE	NONE
DRAWN	COK	DATE	04/2022
CHECKED	COK	ENGINEER	
APPROVED	<i>Chad Bierle</i>		
			4-1



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. IN AREAS OR LOCATIONS WHERE HIGH GROUND WATER TABLE EXIST, THE EXTERIOR OF THE MANHOLE SHALL BE COATED AND JOINT SEALANT TAPE USED TO PREVENT HYDROSTATIC WATER INFILTRATION.




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		CITY OF KENT ENGINEERING DEPARTMENT	
		SPECIAL SHALLOW MANHOLE	
DESIGNED	COK	SCALE	NONE
DRAWN	COK	DATE	04/2022
CHECKED	COK	ENGINEER	
APPROVED	<i>Chad Bierer</i>		
			4-2


NOT
USED

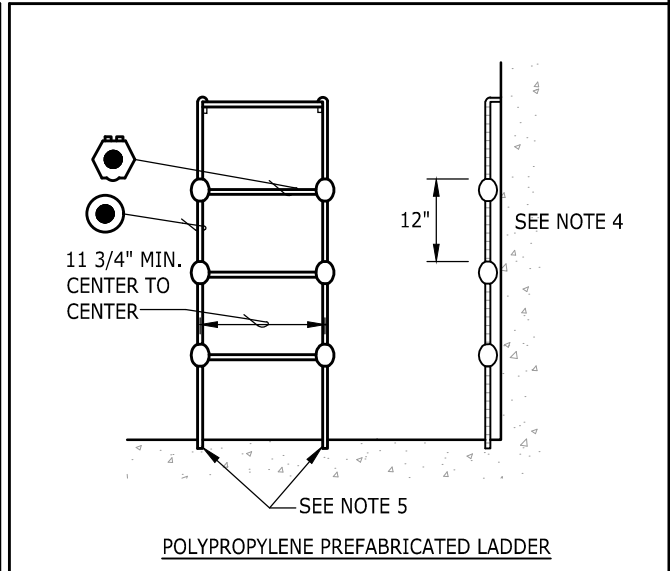
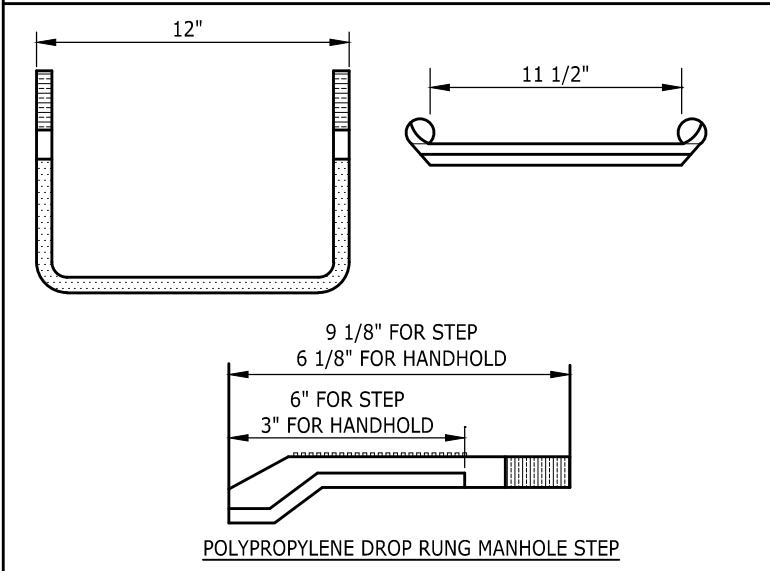
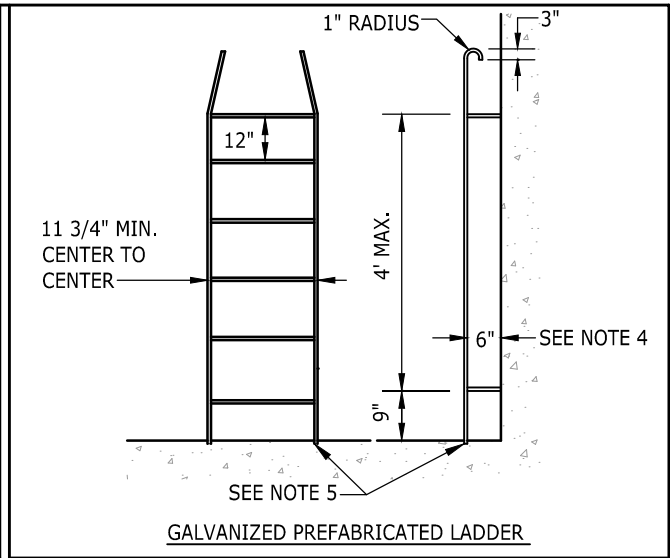
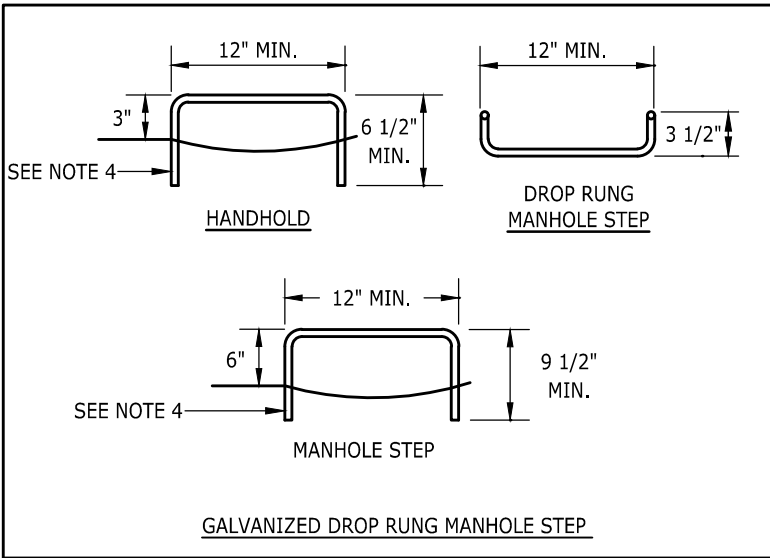
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	CITY OF KENT ENGINEERING DEPARTMENT	
	XXXX XXXX	
DESIGNED _____ COK	SCALE _____ NONE	STANDARD PLAN
DRAWN _____ COK	DATE _____ 12/2019	4-3
CHECKED _____ COK	ENGINEER _____	
APPROVED _____		

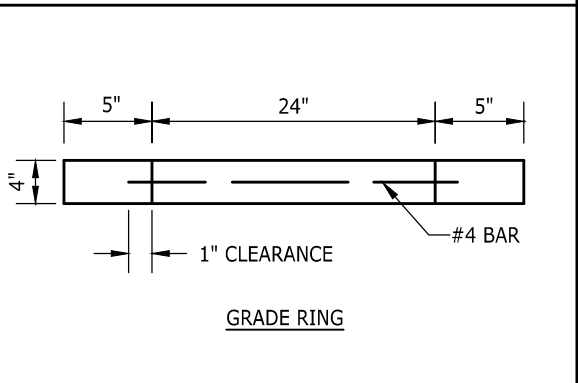
NOT
USED

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	CITY OF KENT ENGINEERING DEPARTMENT	
	XXXX XXXX	
DESIGNED _____ COK	SCALE _____ NONE	STANDARD PLAN
DRAWN _____ COK	DATE _____ 12/2019	4-4
CHECKED _____ COK	ENGINEER _____	
APPROVED _____		



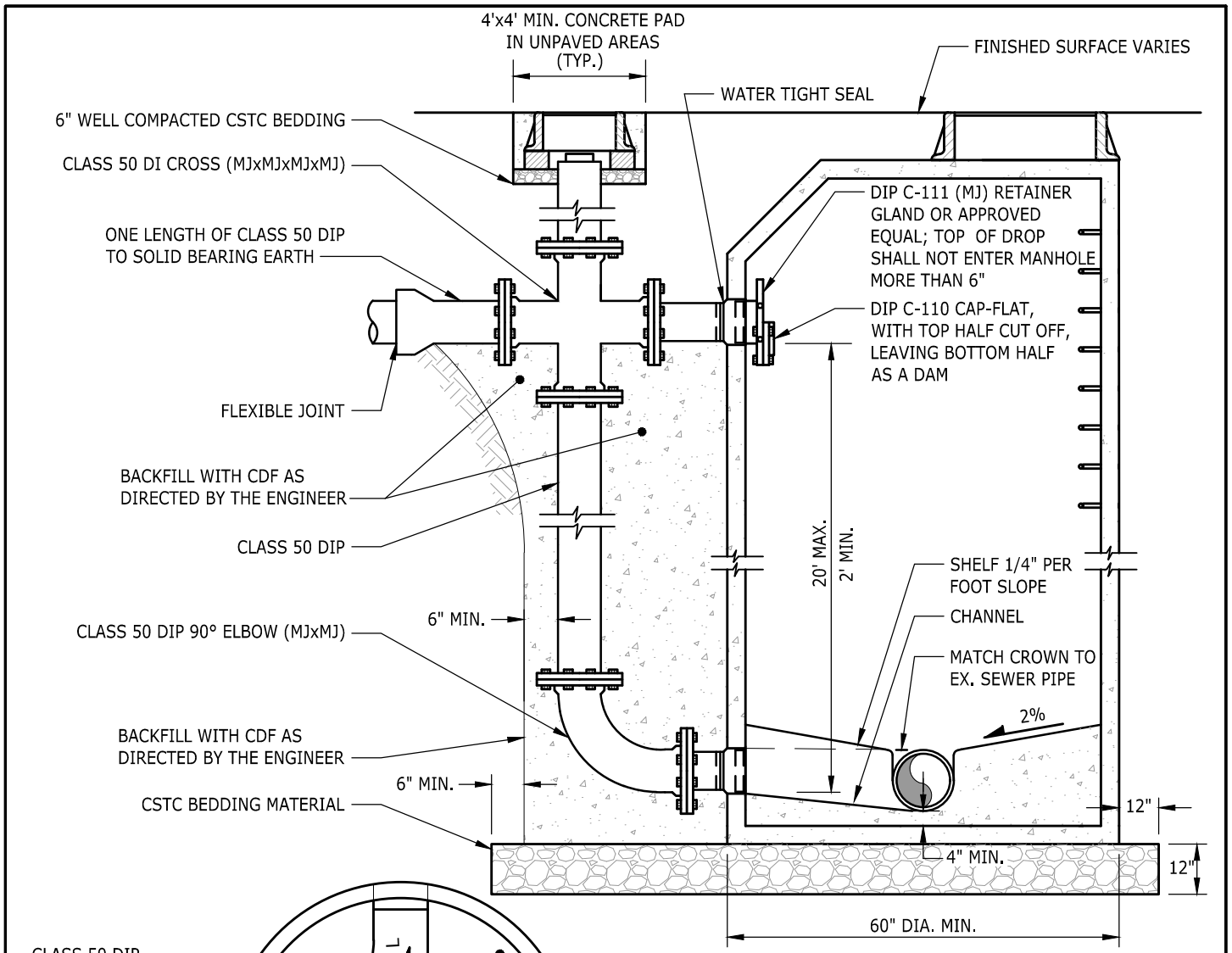
- NOTES:**
1. MANHOLE STEPS CONFORMING TO SECTION R, ASTM C-478. AASHTO M-199 REQUIREMENTS AND REQUIREMENTS OF ASTM D-4101 FOR POLYPROPYLENE AND ASTM A-615 FOR 1/2" GRADE 60 DEFORMED REINFORCING BAR FOR POLYPROPYLENE STEPS, AND ALL WISHA AND OSHA SPECIFICATIONS, ARE ACCEPTABLE PROVIDED THEY ARE PRE-APPROVED BY THE ENGINEER.
 2. PREFABRICATED LADDERS ARE TO BE #7 GALVANIZED SMOOTH STEEL.
 3. 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.
 4. PENETRATION OF OUTER WALL BY A STEP LADDER OR LADDER LEG IS PROHIBITED. USE FLANGED END FOR BOLTING TO WALL.
 5. EMBED FOOT OF GALVANIZED PREFABRICATED LADDER IN CONCRETE IN POURED OR CHanneLED FLOOR.
 6. MANHOLE STEPS OR LADDERS ARE NOT REQUIRED WHEN THE COVER TO BOTTOM OF MANHOLE IS LESS THAN 4'.



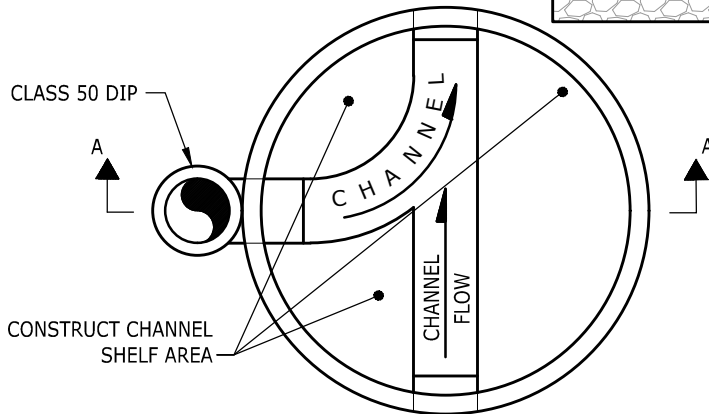
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		CITY OF KENT ENGINEERING DEPARTMENT	
		MANHOLE GRADE RING, SAFETY STEPS & LADDER	
DESIGNED: COK	SCALE: NONE	STANDARD PLAN	
DRAWN: COK	DATE: 12/2019	4-5	
CHECKED: COK	ENGINEER		
APPROVED:			



ELEVATION SECTION A-A



CHANNEL PLAN VIEW

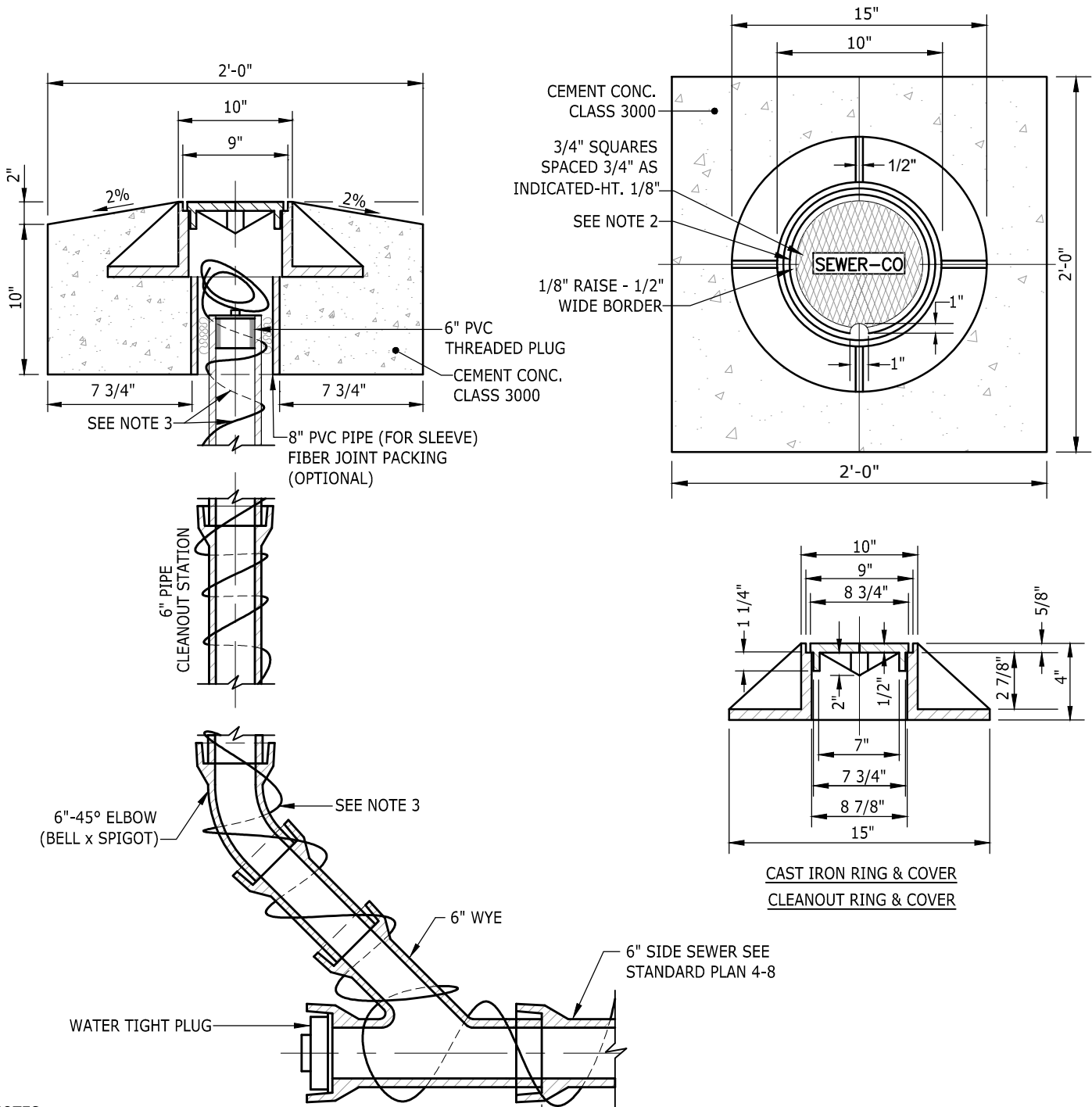
NOTES:

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

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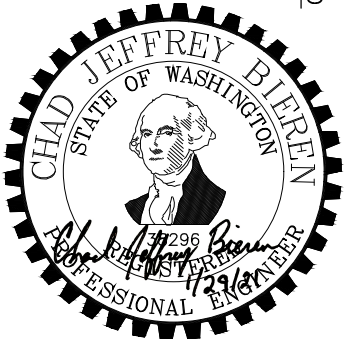


		CITY OF KENT ENGINEERING DEPARTMENT	
		DUCTILE IRON DROP CONNECTION	
DESIGNED <u>COK</u>	SCALE <u>NONE</u>	STANDARD PLAN	
DRAWN <u>COK</u>	DATE <u>12/2019</u>	4-6	
CHECKED <u>COK</u>	ENGINEER		
APPROVED _____			



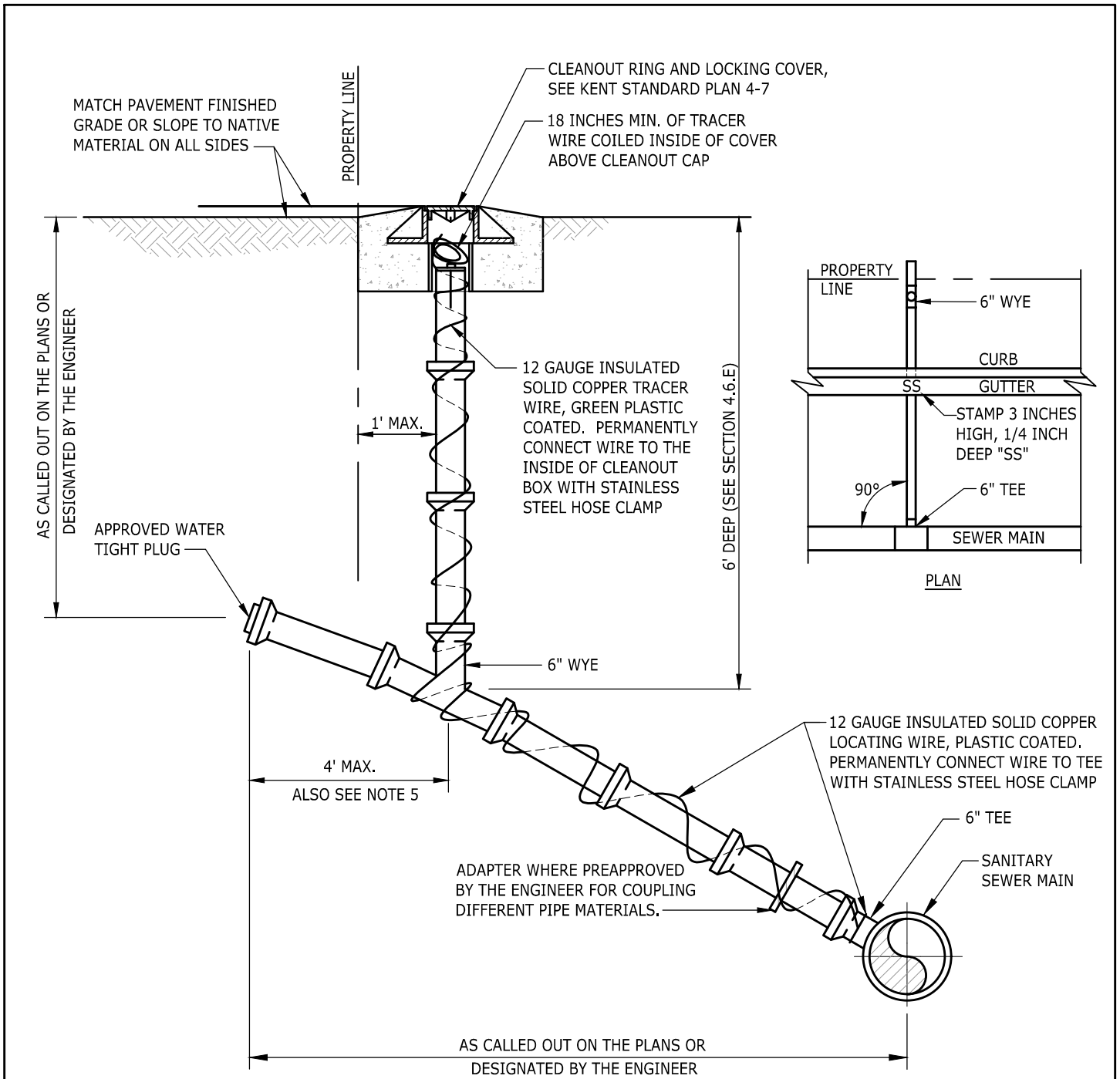
NOTES:

1. CAST IRON TO CONFORM TO A.S.T.M. A48-56 CLASS 30.
2. COVER SHALL BE OLYMPIC FOUNDRY M1007 OR EQUIVALENT MARKED "SEWER-CO" OR "CO".
3. TRACER WIRE = 12 GAUGE INSULATED SOLID COPPER WIRE, GREEN PLASTIC COATED. BARE END OF WIRE PERMANENTLY CONNECTED TO TEE AT MAIN WITH A SS HOSE CLAMP. WRAP SIDE SEWER AND INSTALL WIRE WITHIN CLEANOUT COVER, COIL ENOUGH LENGTH TO BRING ABOVE GRADE 18 INCHES FOR LOCATE PURPOSES.



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		CITY OF KENT ENGINEERING DEPARTMENT	
		6" CLEANOUT	
DESIGNED	COK	SCALE	NONE
DRAWN	COK	DATE	12/2019
CHECKED	COK	ENGINEER	
APPROVED		4-7	




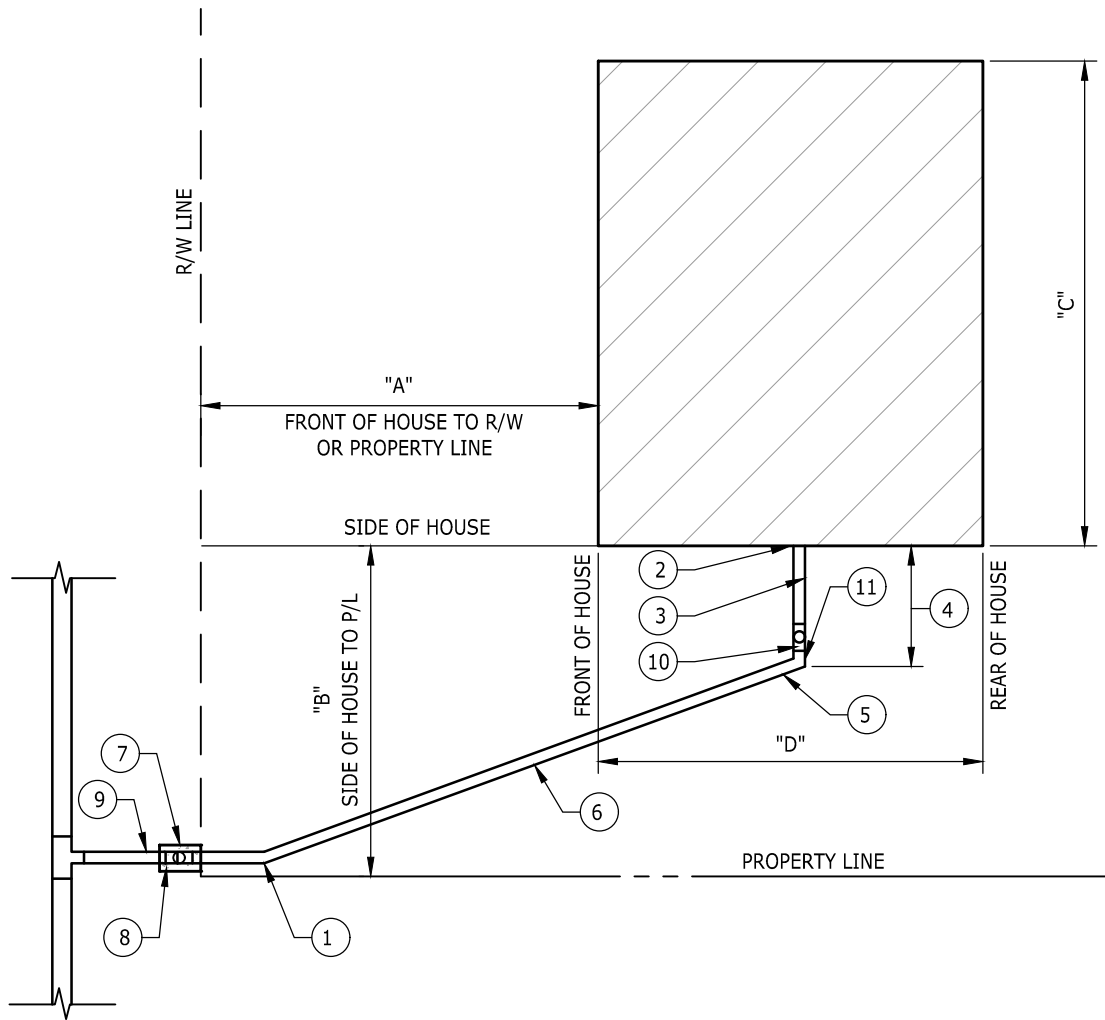
NOTES:

1. JOINT DEFLECTION SHALL NOT BE GREATER THAN RECOMMENDED BY THE PIPE MANUFACTURER 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.
5. STUBS SHALL EXTEND 2' BEYOND ANY DRY UTILITY EASEMENTS.



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		CITY OF KENT ENGINEERING DEPARTMENT	
		SIDE SEWER STUB CONNECTION	
DESIGNED	COK	SCALE	NONE
DRAWN	COK	DATE	12/2019
CHECKED	COK	ENGINEER	
APPROVED			
			STANDARD PLAN 4-8



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 AND 4-8)
- ⑨. 6" DIA. SIDE SEWER STUB TO PROPERTY LINE (SEE STANDARD PLAN 4-8)
- ⑩. BEND, WYE AND CLEANOUT
- ⑪. CLEANOUT BELOW GRADE. 1' MAX.

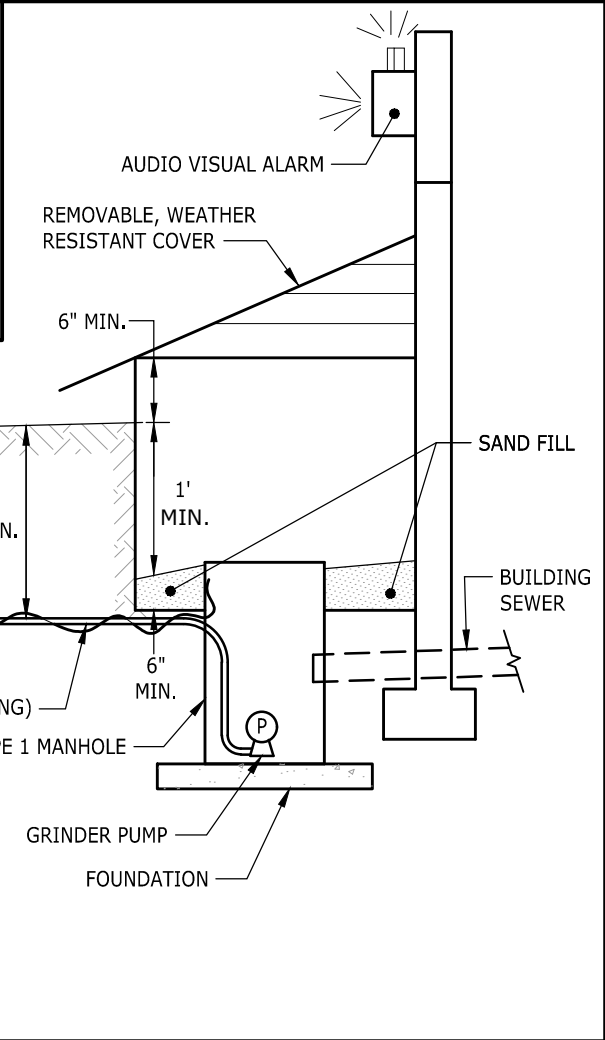
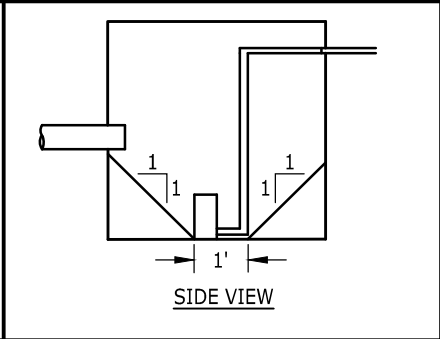
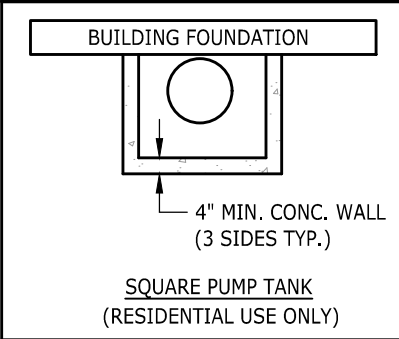
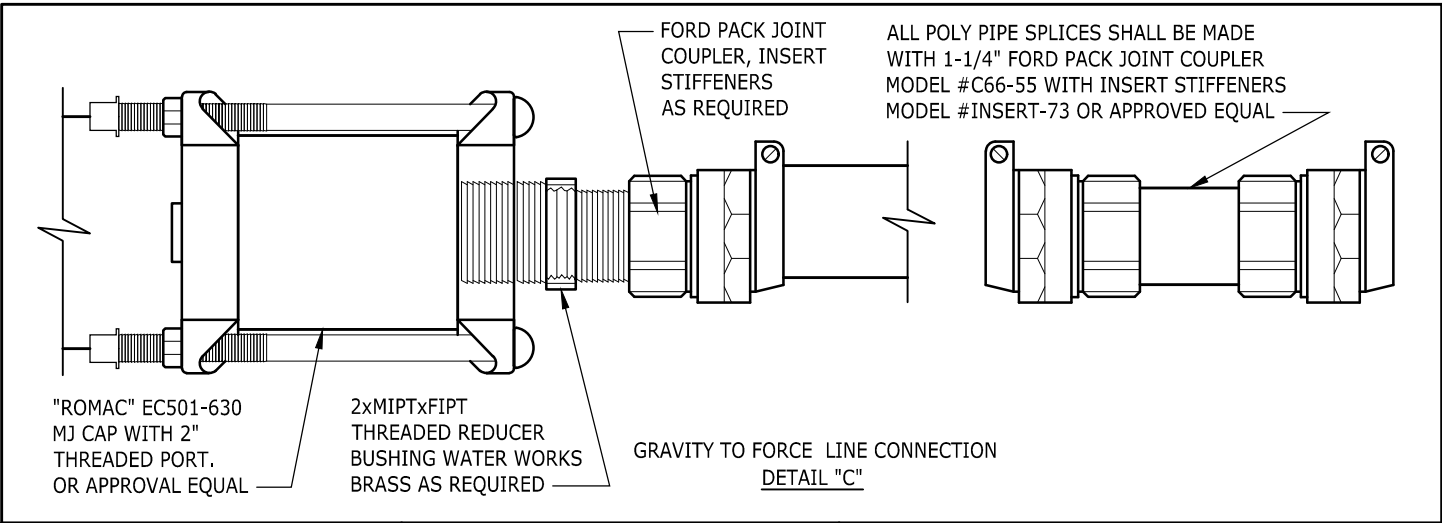
SIDE SEWER PIPE

- 1. 4" (MIN. SIZE) SEWER PIPE REQUIRED 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 <u>COK</u>	SCALE <u>NONE</u>	STANDARD PLAN
DRAWN <u>COK</u>	DATE <u>12/2019</u>	4-9
CHECKED <u>COK</u>	ENGINEER	
APPROVED _____		



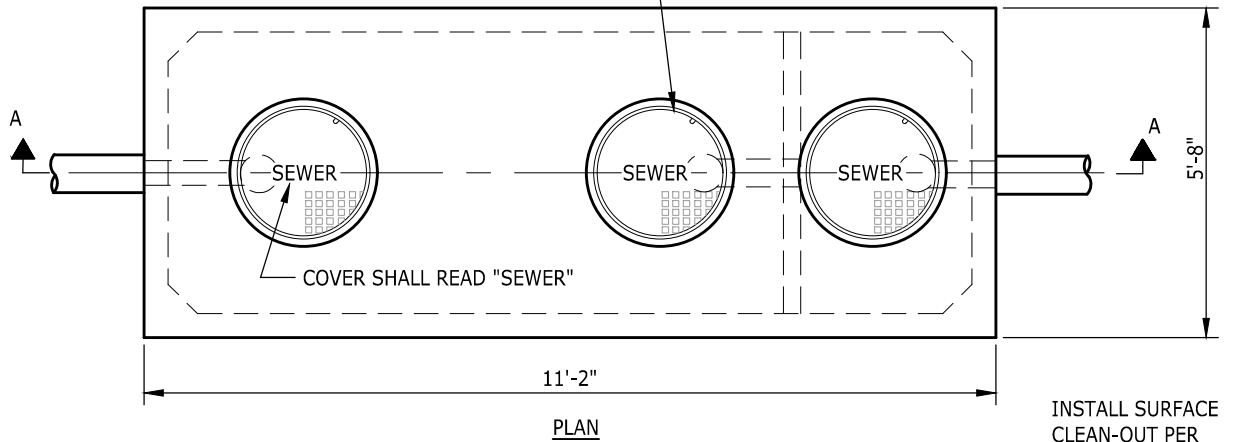
- NOTES:**
1. ALL ELECTRICAL SHALL MEET WASHINGTON STATE ELECTRIC CODES.
 2. GRINDER PUMP AND TANK SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
 3. TYPE 1 MANHOLES SHALL BE FOR COMMERCIAL USE ONLY. SEE STANDARD PLANS 4-1 AND 4-2. THE BASE OF THE MANHOLE SHALL BE SLOPED AS SHOWN IN THE "SIDE VIEW" ABOVE.
 4. CLEAN OUT SHALL BE INSTALLED PER STANDARD PLANS 4-7 AND 4-8.
 5. FOUNDATION AND WALLS SHALL BE DESIGNED FOR SITE CONDITIONS.
 6. SEE SECTION 4.8.C OF THE CITY OF KENT DEVELOPMENT STANDARDS FOR PRESSURE TEST REQUIREMENTS.
 7. STRUCTURE MAY NOT BE ALLOWED WITHIN BSBL. RECOMMEND NOT USED IN 100 YR FLOOD PLAIN.



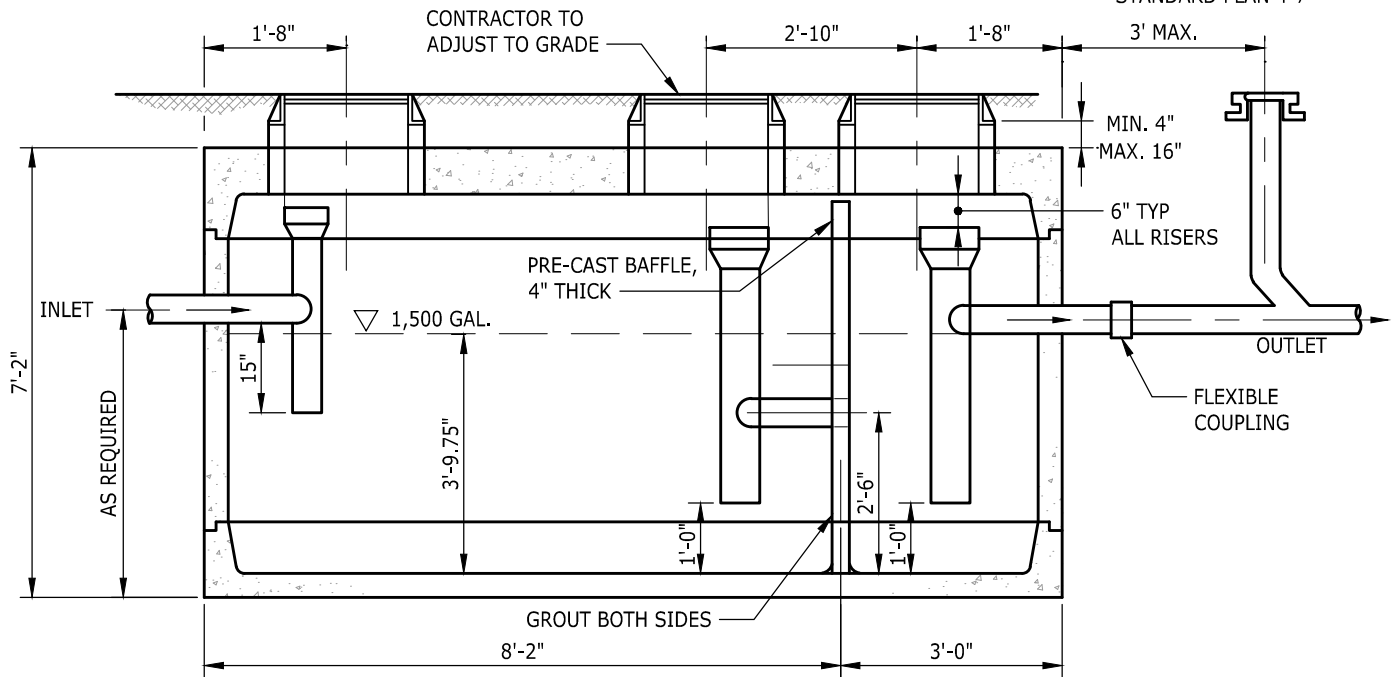
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		CITY OF KENT ENGINEERING DEPARTMENT	
		LOW PRESSURE GRINDER PUMP	
DESIGNED	COK	SCALE	NONE
DRAWN	COK	DATE	9/2020
CHECKED	COK	ENGINEER	
APPROVED		4-10	
			STANDARD PLAN

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



INSTALL SURFACE
CLEAN-OUT PER
STANDARD PLAN 4-7




SECTION A-A

NOTES:

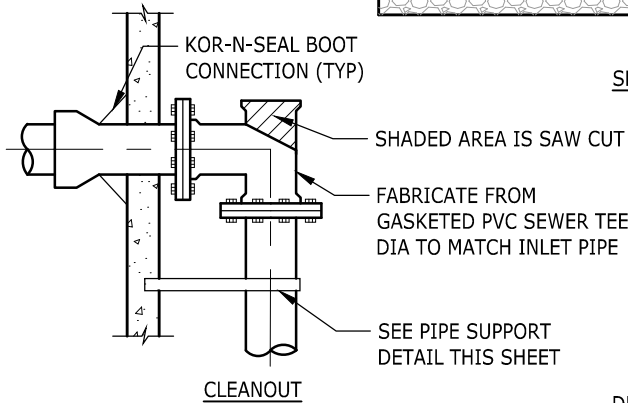
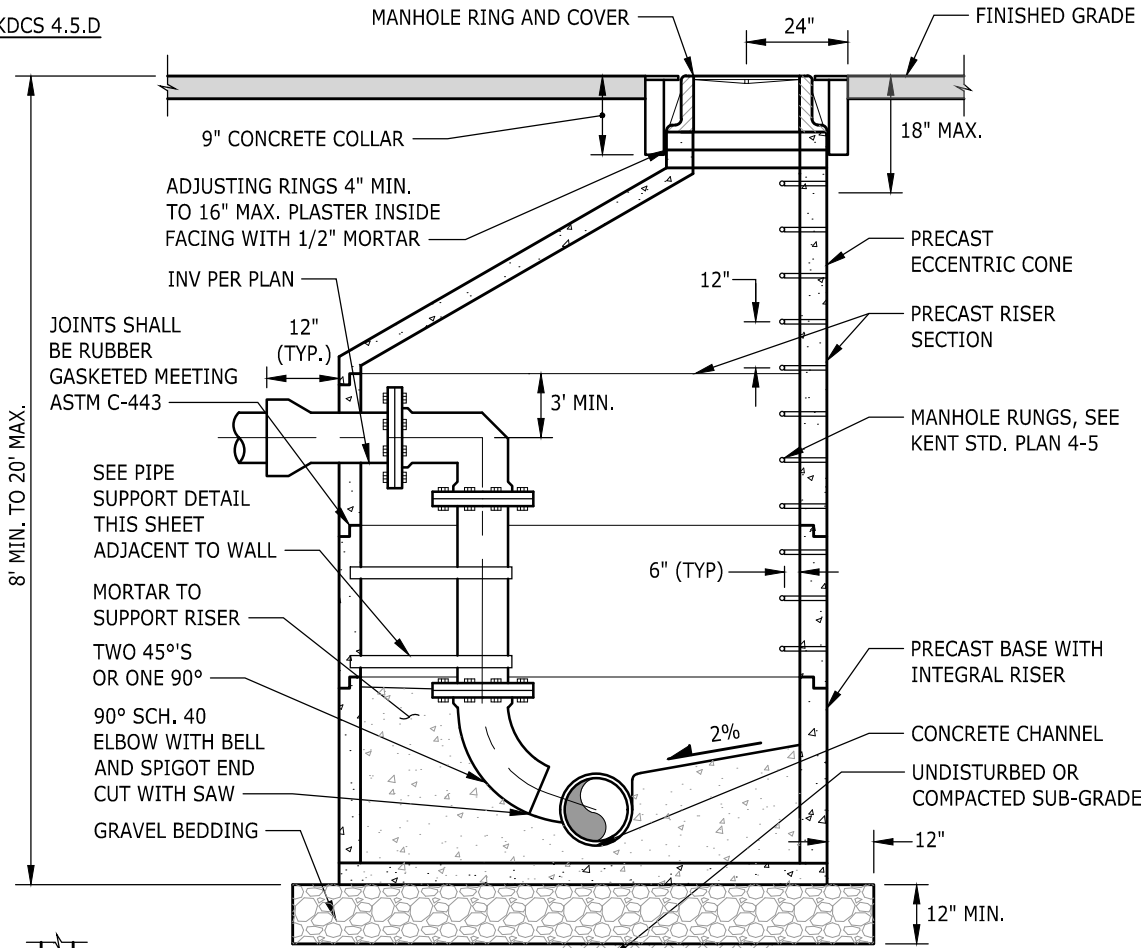
1. LOCATE STRUCTURE ADJACENT TO DRIVE AND FOR ACCESS BY MAINTENANCE VEHICLE.
2. FILL WITH CLEAN WATER PRIOR TO START UP OF SYSTEM.
3. INTERCEPTOR TO BE MAINTAINED BY OWNER AND ANNUAL MAINTENANCE REPORT WILL BE REQUIRED.
4. UTILITY VAULT CO., INC. MODEL NO. 5106 GA OR EQUAL.
5. CONNECTIONS TO CONCRETE WALLS WITH PVC PIPE REQUIRES KOR-N-SEAL CONNECTOR OR A.C. X PVC BAND 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



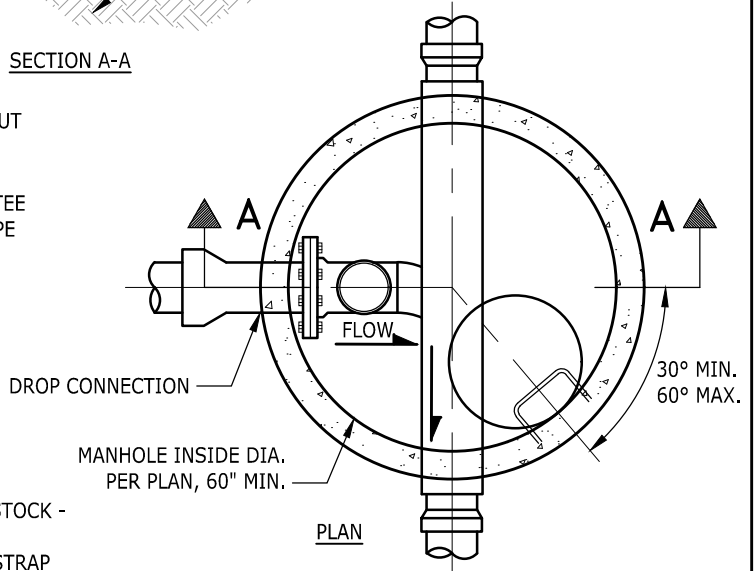
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		CITY OF KENT ENGINEERING DEPARTMENT	
		1,500 GALLON GREASE INTERCEPTOR	
DESIGNED	COK	SCALE	NONE
DRAWN	COK	DATE	12/2019
CHECKED	COK	ENGINEER	
APPROVED		4-11	

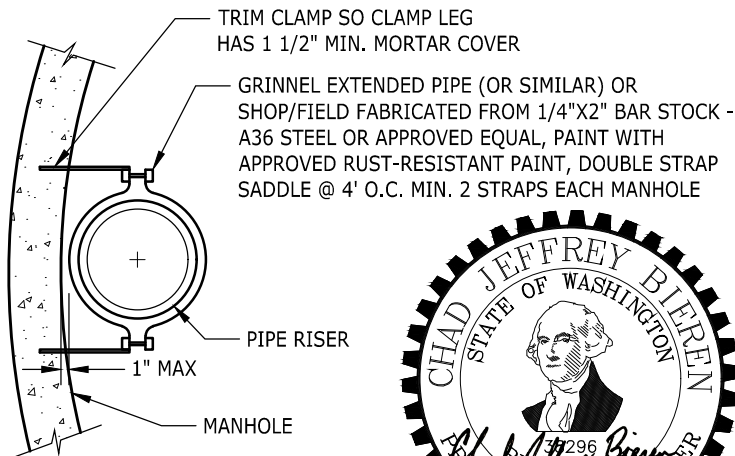
NOTE: SEE KDCS 4.5.D



SECTION A-A



PLAN



PIPE SUPPORT DETAIL

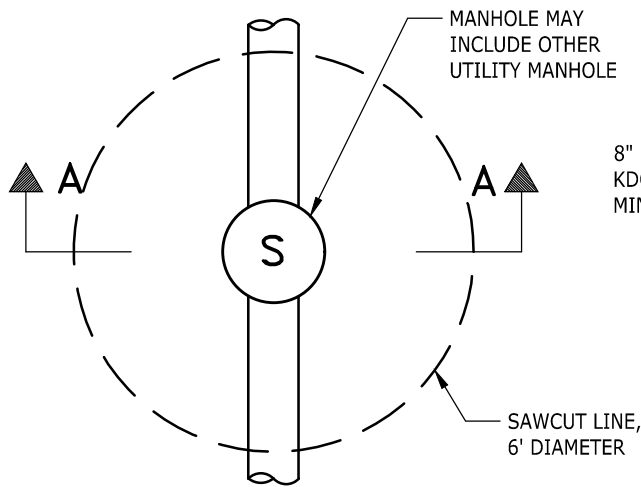
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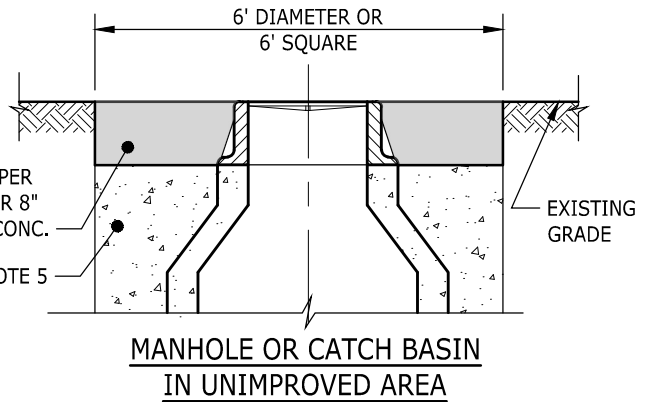
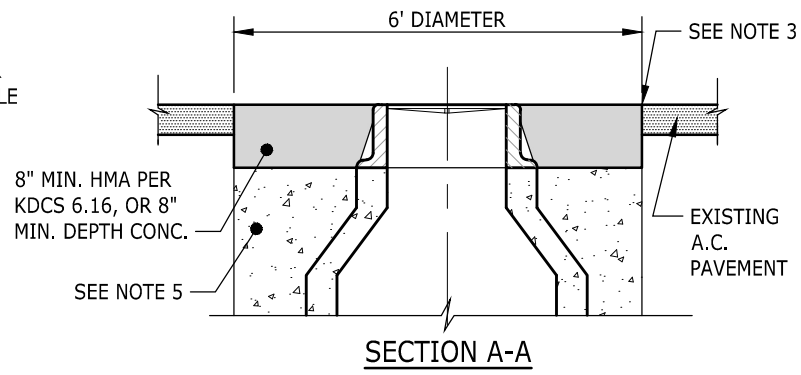
CITY OF KENT
ENGINEERING DEPARTMENT

INSIDE DROP SANITARY SEWER MANHOLE

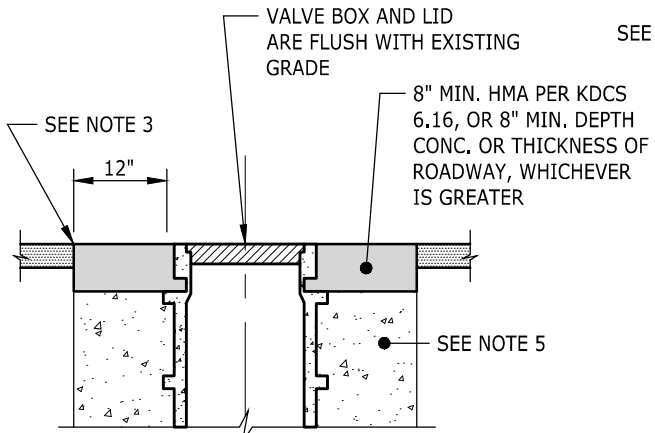
DESIGNED	COK	SCALE	NONE	STANDARD PLAN
DRAWN	COK	DATE	9/2020	4-12
CHECKED	COK	ENGINEER		
APPROVED				



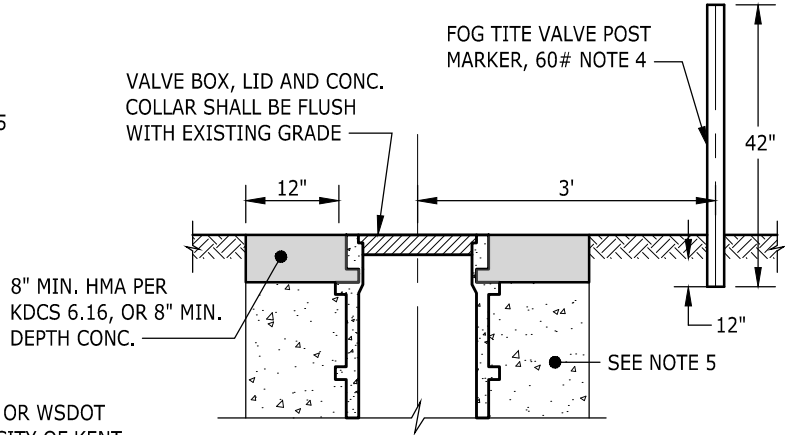
TYPICAL PLAN VIEW OF MANHOLE (OR CB) IN ASPHALT AREA



MANHOLE OR CATCH BASIN IN UNIMPROVED AREA



VALVE BOX IN ASPHALT AREA

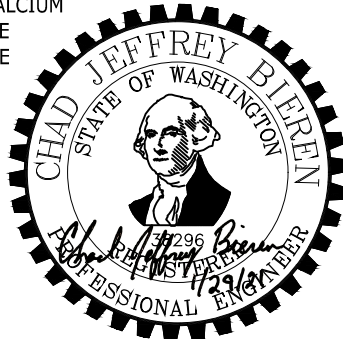



VALVE BOX IN UNIMPROVED AREA

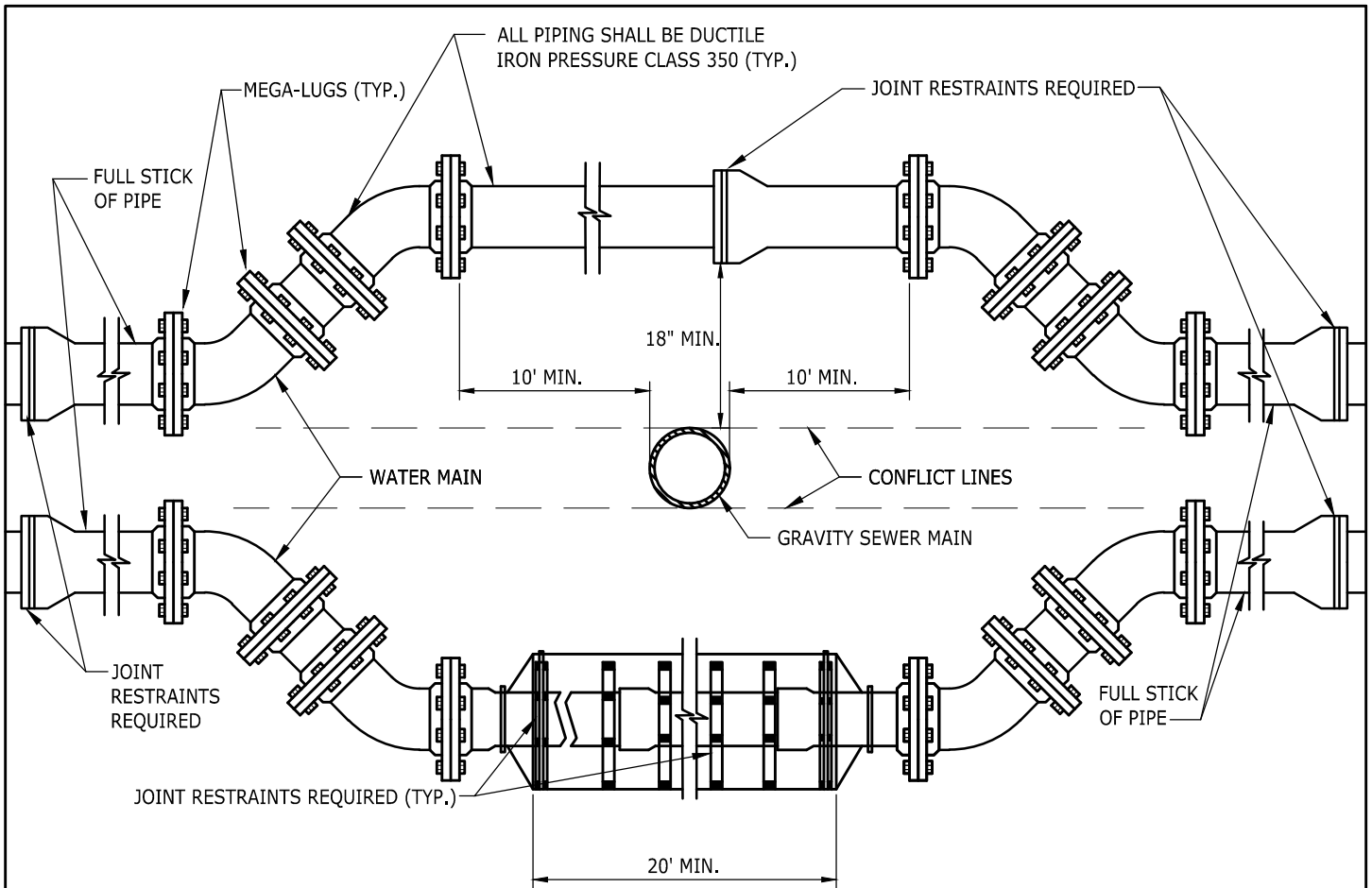
NOTES:

1. ADJUSTMENT OF UTILITY STRUCTURES SHALL BE PER KENT OR WSDOT SPECIAL PROVISION SECTION 7-05.3(1), AS DIRECTED BY CITY OF KENT.
2. ALL ADJUSTMENTS SHALL BE COMPLETED AFTER FINISHED PAVING.
3. SURFACE SEAL AT MATCHLINE SHALL BE AR-4000.
4. VALVE IN UNIMPROVED AREAS SHALL HAVE A MARKER.
5. FILL ANY VOIDS OR DISTURBED AREAS BELOW CASTING WITH QUICK SETTING CEMENT CONCRETE. NO CALCIUM ACCELERANT PERMITTED. CONCRETE SHALL EXTEND A MIN. OF 2" ABOVE CASTING FLANGE.

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			CITY OF KENT	
			ENGINEERING DEPARTMENT	
ADJUSTMENT OF NEW AND EXISTING UTILITY STRUCTURES TO FINISH GRADE				
DESIGNED <u>COK</u>	SCALE <u>NONE</u>	STANDARD PLAN		
DRAWN <u>COK</u>	DATE <u>12/2019</u>	4-13		
CHECKED <u>COK</u>	ENGINEER			
APPROVED _____				



NOTES:

1. THE ENTIRE RUN SHALL BE DUCTILE IRON AND RESTRAINED.
2. FOR CASING REQUIREMENTS SEE DETAIL 3-25.
3. A FULL LENGTH OF PIPE SHALL BE INSTALLED AT BOTH BEGINNING AND END OF THE DEFLECTED RUNS. SEE ABOVE DETAIL.
4. THE FIRST BELL END JOINT AFTER THE DEFLECTED RUNS SHALL BE RESTRAINED.
5. WHEN THE WATER MAIN IS REQUIRED TO BE INSTALLED OVER THE SEWER MAIN (DEFLECTED) AND DOES NOT MEET THE 18" SEPARATION A CASING SHALL BE INSTALLED USING THIS EXAMPLE SHOWN ABOVE.
6. THE MINIMUM DEPTH OF THE WATER MAIN SHALL BE 3.5' BUT WHEN DEFLECTING THE WATER MAIN OVER THE SEWER MAIN USING A CASING, THE SEPARATION BETWEEN THE BOTTOM OF THE CASING AND TOP OF THE SEWER MAIN MAY BE 6". FILL SEPARATION WITH FOUNDATION MATERIAL CLASS A OR B PER WSDOT STD. SPEC. 9-03.17, OR AS REQUIRED BY THE ENGINEER.
7. WHEN DEFLECTING THE WATER MAIN OVER THE SEWER MAIN WITHOUT A CASING THE MINIMUM DEPTH OF THE DEFLECTED WATER MAIN MAY BE 3'. THE MINIMUM SEPARATION BETWEEN THE BOTTOM OF THE WATER MAIN AND TOP OF THE SEWER MAIN SHALL BE 18".
8. AT NO TIME SHALL A PRESSURE SEWER MAIN BE INSTALLED OVER THE WATER MAIN OR SERVICE.



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		CITY OF KENT ENGINEERING DEPARTMENT	
		DEFLECTED WATER MAIN INSTALLATION FOR GRAVITY SEWER ONLY	
DESIGNED	COK	SCALE	NONE
DRAWN	COK	DATE	9/2020
CHECKED	COK	ENGINEER	
APPROVED		4-14	