



CITY OF BLACK DIAMOND
June 11, 2009 Workstudy Agenda
25510 Lawson St., Black Diamond, Washington

Workstudies are meetings for Council to review upcoming and pertinent business of the City. Public testimony is only accepted at the discretion of the Council

7:00 P.M. – CALL TO ORDER, ROLL CALL

- 1.) Construction Standards – Mr. Boettcher
- 2.) Adjournment

CITY OF BLACK DIAMOND

**ENGINEERING DESIGN AND
CONSTRUCTION STANDARDS**

2008



PREPARED BY



PACWEST ENGINEERING LLC

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CITY OF BLACK DIAMOND

ENGINEERING DESIGN AND CONSTRUCTION STANDARDS

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Adopted by Council Resolution No. XXX, Date XXX

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CHAPTER 1

GENERAL

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CHAPTER 1 – GENERAL

1.1 INTRODUCTION

These standards shall apply to all improvements within the public right-of-way and/or public easements, and for all improvements intended for ownership, operations or maintenance by the City.

These standards are intended as guidelines for engineers and developers in preparing their plans and for the City in reviewing plans.

Alternate design standards may be accepted when it can be shown, to the satisfaction of the City Engineer, that such alternate standards will provide a design equal to or superior to that specified. In evaluating the alternate design, the City Engineer shall consider appearance, durability, ease of maintenance, public safety and other appropriate factors.

1.2 DEFINITIONS

ACCESS – The safe, adequate, and usable ingress/egress (entrance/exit) to a property or use.

ALLEY – A public or private way at the rear or side of property permanently reserved as a means of vehicular or pedestrian access to a property. Functionally, an alley is the minimum or lowest classification of a street.

AASHTO – American Association of State Highway and Transportation Officials.

AVERAGE DAILY TRAFFIC (ADT) – The average number of vehicles passing a specified point during a 24-hour period. Annual average daily traffic (AADT) denotes that daily traffic that is averaged over one calendar year.

BOND/SURETY – Any document, instrument, or individual bound with and for the acceptable performance, execution, and completion of the work and for the satisfaction of all obligations incurred.

CITY – The City of Black Diamond, Washington

CITY ENGINEER – The City Engineer for the City of Black Diamond with authority and duties as designated or his/her authorized designee. If the current serving Public Works Director is a licensed professional engineer, he shall serve as the City Engineer

CLEARING – The removal and disposal of all unwanted material from the surface, such as trees, brush, downed timber, or other natural materials.

CONTRACTOR – A contractor licensed and bonded in the State of Washington.

CONTROLLED DENSITY FILL – A mixture of Portland cement, fly ash, aggregates, water, and admixtures proportioned to provide a nonsegregating, self-consolidating, free-flowing, and excavatable material that will result in a hardened, dense, nonsettling fill.

CUL-DE-SAC – A residential street characterized by a single ingress and egress.

DEDICATION – The deliberate appropriating of land by an owner(s) for any general and public uses, reserving to themselves no other rights than such as are compatible with the full exercise and enjoyment of the public uses to which the property is to be devoted.

DEVELOPER - The party having an agreement with the City to cause the installation of certain improvements which shall become a part of the City's utility and/or roadway system upon completion and acceptance.

DEVELOPMENT – The division of a parcel of land into two or more parcels; the construction, reconstruction, conversion, structural alteration, relocation, or enlargement of any structure; any mining, excavation, landfill, clearing, or land disturbance; and any use or extension of the use of land.

DEVIATION – A modification of these Standards approved by the City Engineer.

DRIVEWAY – A private way for vehicular access to one or more properties, lots, or developments.

EASEMENT – A right to make lawful and beneficial use of the land of another.

ENGINEER – A professional engineer licensed in the State of Washington.

EXCAVATION – The mechanical removal of earth material

FILL – A deposit of earth material placed and compacted by artificial means.

FIRE LANE –Any street or driving surface, whether public or private, that is used to meet the access requirement of the currently adopted edition of the Uniform Fire Code.

GRADE – Rate or percent of change in slope, either ascending or descending from or along the street, measured along the centerline of the street or access point.

GRADING – Any excavating or filling of earth materials or any combination thereof.

HALF STREET – A street constructed along an edge of development utilizing at least half the regular width of the right-of-way and permitted as an interim facility pending construction of the other half of the street by the adjacent owner. A minimum pavement width of 20' is required.

IMPERVIOUS SURFACE – Pavement, concrete, gravel, roofs, revetments, or any other man-made surface that substantially impedes the infiltration of precipitation.

IMPROVEMENTS – Any act that improves the value of public real and personal property, or that is necessary as a condition of development including, but not limited to, streets and roads complying with the development standards and specifications adopted by the City, public utility and pedestrian facilities, streetlights, landscape features, sewer and water lines, bridge structures, storm drainage facilities, and traffic control devices.

LATERAL SEWERS- 4" to 6" gravity sewer lines installed from the right-of-way/property line to a mainline sewer.

MAINLINE SEWERS- Gravity sewer lines 8" and larger installed between a manhole to manhole run within the public right-of-way or sewer easement.

MAINTENANCE BOND – A bond furnished by the Developer and written by a corporate body qualified to write surety in the State of Washington, guaranteeing that the Developer will repair any defects found in the work within the time period as further identified herein.

MUTCD – The *Manual on Uniform Traffic Control Devices* published by the US Department of Transportation.

PAVEMENT – The combination of sub-base, base course, and surfacing materials placed on a subgrade to support the traffic load and distribute it to the subgrade.

PEDESTRIAN – Person traveling on foot or in a wheelchair or similar device.

PEDESTRIAN FACILITIES – Infrastructure and equipment to accommodate or encourage walking, including sidewalks, curb ramps, traffic control devices, trails, walkways, crosswalks, paved shoulders, and other design features intended to provide for pedestrian travel.

PERFORMANCE BOND – A bond furnished by the Developer and written by a corporate body qualified to write surety in the State of Washington, guaranteeing that the work will be completed in accordance with the plans and specifications up to the face value of the bond.

PLANS – The plans, profiles, cross sections, elevations, details, and supplementary specifications signed by a licensed professional engineer and approved by the City that shows the location, character, dimensions, and details of the work to be performed.

PLANTING STRIP – The portion of right-of-way between the curb line and the sidewalk, used for the planting of trees, shrubs, or groundcover.

PROJECT – General term encompassing all phases of the work to be performed and is synonymous to the term “improvement” or “work.”

PUBLIC STREET – Publicly owned and maintained right-of way.

RECORD DRAWINGS – An approved final revision of a design drawing or plan updated to show the true condition or configuration of what has been built. The drawing or plan is designated “Record Drawing” on the drawing and the primary function is to document what was designed and what was actually built, including dimensions, elevations, location, and calculations.

RESTORATION – All work necessary to replace, repair, or otherwise restore the right-of-way and all features contained within the right-of-way to the same or equivalent condition as before.

ROAD – Used interchangeably with street.

SIDE SEWER - 4” to 6” gravity sewer lines installed from the building to a lateral sewer.

STREET – An open public way for the passage of vehicles. Limits include the outside edge of sidewalks or curbs and gutters, planter strips, paths, walkways, or side ditches, including the appertaining shoulder and all slopes, ditches, channels, waterways, and other features necessary for proper drainage and structural stability within the right-of-way. The term “street” is used interchangeably with “road.”

STREET, PRINCIPAL ARTERIAL – An arterial street provides an efficient, direct route for long-distance travel within the region and different parts of the City. Traffic on principal arterials is given preference at intersections, and some access control may be considered in order to maintain capacity to carry high volumes of traffic.

STREET, MINOR ARTERIAL – A minor arterial street provides an efficient route to connect major parts of the community. It also serves as a means of linking more defined parts of the community served by collectors. Traffic on minor arterials is given preference at intersections with streets of lower classification and access control may be limited.

STREET, COLLECTOR – A street that provides connections between the arterial and concentrations of residential, industrial and commercial land uses. The amount of

through traffic is less than an arterial, and there is more service to abutting land uses. Traffic flow is given preference to lesser streets.

STREET, NEIGHBORHOOD COLLECTOR – A street that distributes and collects traffic within a neighborhood and provides a connection to an arterial or collector. Traffic flow is given preference to lesser streets.

STREET, LOCAL ACCESS – A street that provides access to abutting land uses and serves to carry local traffic to a collector. The standard may vary with type of land served such as industrial, commercial or residential.

STREET, CUL-DE-SAC – A street with a single common ingress and egress and with a circular turnaround at the end. In certain circumstances an ell or tee turnaround may be approved.

STREET, PRIVATE – A street that has not been accepted for maintenance and public ownership by the City of Black Diamond. This does not include private driveways or access easements.

STREET TREES – Street trees will mean any tree located within any portion of the public right-of-way.

STREETSIDE IMPROVEMENTS – All of the street pavement, curb, gutter, sidewalk, storm drainage, water and sewer utilities, power and communications cable undergrounding, street trees, and street lighting as specified by these Standards, located within any public right-of-way abutting the property boundary of the development.

SURVEYOR – A professional land surveyor, licensed in the State of Washington.

TRAFFIC CONTROL – Those activities necessary to safeguard the general public, as well as all workers, during the construction and maintenance of street and other facilities within the right-of-way.

WSDOT – Washington State Department of Transportation.

1.3 DEVIATIONS

These Standards represent appropriate practice under most conditions, based on past experience in the City of Black Diamond and other jurisdictions. They are intended to provide facilities that are safe and appropriate for use in the City of Black Diamond. Situations will arise where alternatives to these Standards may better accommodate existing conditions, overcome adverse topography, or allow for more cost-effective solutions without adversely affecting safety, operations, maintenance, or aesthetics.

Requests for deviations from these Standards will be considered by the City Engineer. Such requests must be submitted to include supporting information demonstrating compliance with the following criteria:

1. The deviation will achieve the intended result with a comparable or superior design and quality of improvement; and
2. The deviation will not adversely affect safety or operations; and
3. The deviation will not adversely affect maintenance and its associated cost; and
4. The deviation will not adversely affect the aesthetic appearance; and
5. The deviation will not impact future expansion, development, or redevelopment.

It is recognized that the need for and timing of a deviation request may not be predictable. Requests should be submitted as soon as the need becomes known. No request will be considered until an application for a permit or other approval has been submitted. Known deviation requests that affect lot yield or scope of development must be decided prior to any public hearing or official decision on the application. This is important for public notice and participation in the decision process.

Deviations that affect engineering design, to the extent they are known, are recommended to be submitted for decision prior to submittal of construction plans. This will prevent wasted effort in the preparation of plans with nonstandard features that cannot be approved.

The City Engineer is the final authority on all deviation requests. The City Engineer reserves the right to direct or deny a deviation from these Standards at any time in the interest of public health, safety, and welfare.

1.4 PERMITS

No person, firm or corporation shall commence work on the construction, alteration or repair of any facility located either in the public right-of-way or a public easement without any necessary permit(s) first having been obtained from the City.

Any party requesting such permit shall file written application therefore with the City at least ten (10) working days before construction is proposed to start. Such application shall be made on a standard City form provided for that purpose.

The City may, in writing, suspend or revoke an issued permit whenever the permit is issued in error or on the basis of incorrect information supplied.

Much of the work covered under these standards will require multiple permit authority reviews and approvals. Any questions regarding current information about permits, approvals, forms, and required submittal information can be obtained by contacting the City of Black Diamond Public Works Department.

1.5 BONDING

Developers and contractors performing work within the public right-of-way or publicly owned easement(s) shall be prepared to satisfy the following bonding requirements:

1. A performance bond shall be furnished which shall be conditioned upon faithful completion of that portion of the work performed pursuant to the permit which will require completion by the City should the permittee or his contractor default. At a minimum all performance bonds shall be for 150% of the expected construction cost of all of the uncompleted work. The City Engineer will review cost estimates submitted by the applicant and may approve the cost estimate, revise the estimate, or approve the performance bond at a higher level to insure that adequate surety is provided. sole discretion.
2. A maintenance bond shall be furnished by the developer/owner which guarantees all work by the Contractor for a two-year period from the time of inspection and final approval of the construction by the City. At a minimum all maintenance bonds shall be for 15% of the actual construction cost of the public infrastructure. The City Engineer will review cost and associated risks of the infrastructure being accepted and will determine what level of surety is appropriate to guarantee performance of the public infrastructure.

1.6 HOLD HARMLESS CLAUSE

The Developer shall indemnify and hold harmless the City and the City Engineer, and their agents and employees, from and against all claims damages, losses, and expenses, including attorney's fees, arising out of or resulting from the performance of the work, and shall, after reasonable notice, defend and pay the expense of defending any suit and will pay any judgment, provided that any such claim, damage, loss, or expense is:

1. Attributable to bodily injury, sickness, disease, or death, or to injury or destruction of tangible property (other than the work itself), including the loss of use resulting there from, and
2. Caused in whole or in part by any negligent act or omission or by any other action giving rise to strict liability of the Developer, any subcontractor, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder.

In any and all claims against the City or City Engineer, or any of their agents or employees, by any employee of the Developer, any subcontractor, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, the indemnification obligation under this article shall not be limited in any way by any limitation on the amount or type of damages, compensation, or under workman's compensation acts, disability benefit acts, or other employee's benefit acts.

The obligations of the Developer under this article shall not include the sole negligence of the City or the City Engineer.

1.7 GENERAL AND AUTOMOBILE LIABILITY INSURANCE

The Developer shall not commence work until he has furnished evidence (in duplicate copy) of insurance required hereunder, and such insurance has been approved by the City Attorney; nor shall the Developer allow any contractor or subcontractor to commence work on his contract or subcontract until the same insurance requirements have been complied with by such contractor or subcontractor. Approval of the insurance by the City Attorney shall not relieve or decrease the liability of the Developer thereby.

Companies writing the insurance under this article shall be licensed to do business in the State of Washington or be permitted to do business under the Surplus Line Law of the State of Washington.

The Developer shall maintain, during the life of the permit/project, Comprehensive General and Automobile Liability Insurance, as detailed herein. The insurance shall include, as Additional Named Insured, the City. All insurance policies shall be endorsed to provide that the policy shall not be canceled or reduced in coverage until after ten (10) days prior written notice, as evidenced by return receipt of registered letter has been given to the City. There shall be included in the liability insurance, contractual coverage sufficiently broad to insure the provisions of "Hold Harmless Clause".

The insurance coverage shall protect the Developer from claims for damages for bodily injury, including death resulting there from, as well as claims for property damage, which may arise from operations under this contract, whether such operations be by himself or by any subcontractor or by anyone directly employed by either of them, it being understood that it is the Developer's obligation to enforce the requirements of this article as respects any contractor or subcontractor.

Nothing contained in these insurance requirements is to be construed as limiting the extent of the Developer's responsibility for payment of damages resulting from his operations under this permit/project.

In the event the Developer is required to make corrections on the premises after the work has been inspected and accepted, he shall obtain, at his own expense, and prior to commencement of any corrective work, full insurance coverage, as specified herein.

The Developer shall furnish, upon request by the City, certified copies of the insurance policy or policies within two weeks of the City's request.

1.7.01 GENERAL LIABILITY INSURANCE

General liability insurance shall provide coverage for both bodily injury and property damage.

1. Comprehensive General Bodily Injury Insurance shall provide coverage on an occurrence basis of not less than One Million dollars (\$1,000,000.00) for bodily injury, sickness or disease, including death resulting therefrom, sustained by each person; and for limits of not less than One Million Dollars (\$1,000,000.00) for each occurrence.
2. Comprehensive General Property Damage Liability Insurance on an occurrence as is for limits of not less than One Million Dollars (\$1,000,000.00) for damage to or destruction of property, including loss of use thereof, arising from each occurrence, and in an amount of not less than One Million Dollars (\$1,000,000.00) in aggregate.

Coverage shall include:

- a. Premises & Operations
- b. Developer's Protective Liability
- c. Products Liability, including Completed Operations Coverage
- d. Contractual Liability
- e. Broad Form Property Damage

Specific coverage shall be provided for:

1. Injury to or destruction of any property arising out of blasting or explosion
2. Injury to or destruction of any property arising out of the collapse of/or structural injury to any building or structure due to:
 - a. Excavation, including borrowing, filling or backfilling in connection therewith, or tunneling, pile driving, coffer-dam work or caisson work.
 - b. Moving, shoring, underpinning, raising or demolition of any building or structure or removal or rebuilding of any structural support thereof.
3. Injury or destruction of wires, conduits, pipes, mains, sewers or other similar property or any apparatus in connection therewith, below the surface of the ground, if such injury or destruction is caused by and occurs during the use of mechanical equipment for the purpose of excavating or drilling, or injury to or destruction of property at any time resulting there from.

1.7.02 AUTOMOBILE LIABILITY INSURANCE

Comprehensive automobile insurance shall provide coverage for both bodily injury and property damage.

1. Comprehensive Automobile Bodily Injury Liability Insurance shall provide coverage on an occurrence basis of not less than One Million dollars (\$1,000,000.00) for bodily injury, sickness or disease, including death resulting

therefrom, sustained by each person; and for limits of not less than One Million Dollars (\$1,000,000.00) for each occurrence.

2. Comprehensive Automobile Property Damage Liability Insurance on an occurrence basis for limits of not less than One Million Dollars (\$1,000,000.00) for damage to or destruction of property, including loss of use thereof, arising from each occurrence.

Coverage shall include:

- a. All owned automobiles
- b. Non-owned automobiles
- c. Hired automobiles

1.8 COMPENSATION & EMPLOYER'S LIABILITY INSURANCE

The Developer shall maintain Workmen's Compensation Insurance as required by state and federal statute for all of his employees to be engaged in work on the Project and, in case any such work is sublet, the Developer shall require the contractor or subcontractor similarly to provide Workmen's Compensation Insurance for all of the latter's employees to be engaged in such work. The Developer's Labor & Industries account number shall be provided to the City.

In the event any class of employees engaged in work at the site of the Project is not covered under the Workmen's Compensation Insurance, as required by state and federal statute, the Developer shall maintain and shall cause each contractor or subcontractor to maintain Employer's Liability Insurance with a private insurance company for limits of at least One Hundred Thousand Dollars (\$100,000.00), each person, and Three Hundred Thousand Dollars (\$300,000.00), each accident, and furnish satisfactory evidence of same.

1.9 NON-INTERFERENCE

The permittee shall be responsible for minimum interference with, but not limited to:

1. Traffic Routing
2. Fire Department Accessibility
3. Adjoining Property
4. Utility Facilities
5. Natural Surface Drainage

Special provisions may be included in any applicable City Permit(s) in order to minimize impacts and interference of construction.

1.10 UTILITY LOCATIONS

Utilities shall be furnished and installed within the right-of-way beneath new roads, or in existing roadways and rights-of-way so as to provide minimal interference with existing utilities and shall be located as generally shown in Standard Details. Where existing utilities are in place, new utilities shall conform to these Standards as nearly as practical and yet be compatible with the existing installations. Exceptions may be approved by the City when necessary to meet special or localized requirements.

Utilities shall be sized and designed to serve adjacent and tributary areas. Typically, utilities shall be required to be extended to "far" property lines. Easements shall be procured and provided by the developer to facilitate same.

1.10.01 WATER

Water lines shall be located within the planter strip between the sidewalk and the curb or outside the sidewalk on the North or East side of the street.

1.10.02 SANITARY SEWER

Sanitary sewer lines shall be located generally along the center line of the street with the manholes at the centerline.

1.10.03 STORM DRAINAGE

Storm drainage lines shall be located as follows:

1. Underneath gutterline of roadway
2. Minimum 5' separation from sanitary sewer
3. Minimum 6' separation from water

1.10.04 OTHER UTILITIES

Other utilities (gas, power, telephone, and cable TV) shall be located as follows:

1. Underground Installation: Underground installation of utilities is required by the City of Black Diamond. Utilities shall be located on either side of the road, at plan location and depth compatible with other utilities.

1.11 UTILITY COORDINATION

Excavations in city streets disrupt and interfere with the public use of city streets and damage the pavement. The purpose of this section is to reduce this disruption, interference, and damage by promoting better coordination among utilities making excavations in city streets and between these utilities and the City. Better coordination will assist in minimizing the number of excavations being made wherever feasible and

will ensure that excavations in city streets are, to the maximum extent possible, performed before, rather than after, the resurfacing of the streets.

Each utility shall look for opportunities to combine projects and share trenches. The utilities shall provide a reasonable assurance that other utilities have been contacted and given an opportunity to participate in the project.

Utilities/developers must show how they plan to serve properties adjacent to their proposed frontage improvements. This is to ensure all properties can be served in the future without cutting into the new street. Services are typically provided through main or service connection stubouts past the edge of the pavement.

1.12 CALL BEFORE YOU DIG

All developers/contractors are responsible for timely notification of all utilities in advance of any construction in right-of-way or utility easements. The utilities one-call Underground Location Center phone number is 1-800-424-5555 or 811.

1.13 DRAFTING STANDARDS

1. Drawings shall be clean, legible and suitable for reproduction. Minimum text size shall be 1/8".
2. Design drawings shall conform to the Plan Checklist.
3. Sheet sizes shall be 24" x 36" for engineering drawings and 18" x 24" for survey drawings.
4. No engineering plans shall be accepted with architect's scale.
5. All existing features (pipes, curbs, etc.) are to be produced with a fine (.5mm) pen or half-tones. Proposed features shall be distinguished by a larger or bolder line weight.
6. Minimum scale for plans shall be 1" = 20 feet.

of City staff that this set of plans appears to meet City requirements, engineering principles, and are substantially complete. **PLEASE ALSO NOTE:** If errors, discrepancies or lack of compliance of these plans with City code requirements are discovered after permitting, the applicant may be required to make changes during the construction process to bring the project into compliance, at applicant's sole expense.

INVENTORY

- ☐ The second page of the plan set shall inventory of all of the public infrastructure by each appurtenance or feature and divided up by category of Water, Street, Storm Water and Sanitary Sewer infrastructure.

PLAN VIEW STANDARD ITEMS

- ☐ Construction centerline stations
- ☐ Right-of-way and widths
- ☐ Edge of pavement and width
- ☐ Proposed survey monuments - locations and details
- ☐ Existing utilities
- ☐ Adjacent property lines and parcel numbers
- ☐ Street names
- ☐ Easements—existing, proposed, type, and width

PROFILE VIEW STANDARD ITEMS

- ☐ Profile grade
- ☐ Existing ground profile
- ☐ Scale (horizontal and vertical)
- ☐ Vertical elevation increments 25' stations on vertical curves and 50' on all tangents
- ☐ Existing utilities

1.14.02 TESC / GRADING

- ☐ Location of soil pits and infiltration tests
- ☐ Construction Entrance Detail
- ☐ Silt Fences and Traps
- ☐ Mulching and Vegetation Plan
- ☐ Clearing and Grubbing Limits
- ☐ Existing and Finish Grade
- ☐ Location and Details of all BMP's recommended
- ☐ Location and Details of Temporary Sediment ponds
- ☐ Construction notes for TESC / Grading

1.14.03 STREET**PLAN VIEW**

- ☐ PI, PC, PT stationing of horizontal curves
- ☐ Curve information delta, radius, tangent, and length
- ☐ Horizontal angle points (BCR, ECR) and curb return elevations
- ☐ Identify all field design situations
- ☐ Typical roadway sections and pavement types
- ☐ Sidewalks
- ☐ Curb and gutter
- ☐ Driveway entrances (station, width, type, material)
- ☐ Curb access ramps
- ☐ Intersection details
- ☐ Flow direction arrows at curb returns showing grade
- ☐ Pavement markings/stripping noted by station and offset
- ☐ Street signs
- ☐ Street trees with stations
- ☐ Construction Notes for Street

PROFILE VIEW

- ☐ Vertical information PVC, PVI, PVT, AP
- ☐ Show grades with (+ and -) slope
- ☐ Super elevated roadway segments
- ☐ New and existing centerline profile or edge of pavement profile

1.14.04 STORM DRAINAGE**PLAN VIEW**

- ☐ Station and offset at each manhole/catch basin
- ☐ Manholes/catch basins numbered
- ☐ Manhole/catch basin type designation
- ☐ Manholes/catch basin rim elevation
- ☐ Flow direction (with arrow on pipe)
- ☐ Type of pipe
- ☐ Size of pipe
- ☐ Length of pipe
- ☐ Stormwater detention facility (pond dimensions with elevations)
- ☐ Stormwater treatment facility (dimensions with elevations)
- ☐ Control structure with orifice size and elevation
- ☐ Emergency overflow location and elevation
- ☐ Design high water elevation
- ☐ Construction Notes for Storm Drainage

PROFILE VIEW

- ☐ Station and offset at each manhole/catch basin
- ☐ Invert elevations on manholes/catch basins showing direction of flow

- ☐ Manhole/catch basin type designation
- ☐ Rim elevation
- ☐ Type of pipe
- ☐ Size of pipe
- ☐ Length of pipe (shown in L.F.) center structure to center structure
- ☐ Grades shown
- ☐ Existing utility crossings
- ☐ Stormwater detention facility
- ☐ Stormwater treatment facility
- ☐ Control structure

1.14.05 SANITARY SEWER**PLAN VIEW**

- ☐ Station and offset shown at each proposed manhole
- ☐ Manholes numbered
- ☐ Manhole type designation
- ☐ Flow direction (with arrow on pipe)
- ☐ Distance from water lines (if applicable)
- ☐ Type of pipe
- ☐ Size of pipe
- ☐ Length of pipe from center of manhole to center of manhole
- ☐ Invert elevations
- ☐ Depth at property line
- ☐ Station for sewer laterals at property line
- ☐ S.T.E.P. System and appurtenances with station and offset
- ☐ Force main and appurtenances with station and offset
- ☐ Lift Station and appurtenances with station and offset
- ☐ Construction Notes for Sanitary Sewer

PROFILE VIEW

- ☐ Station and offset shown at each manhole
- ☐ Manholes numbered
- ☐ Invert elevation showing direction in and out
- ☐ Rim elevation
- ☐ Grades shown
- ☐ Type of pipe
- ☐ Size of pipe
- ☐ Length of pipe from center of manhole to center of manhole (in L.F.)
- ☐ Existing utility crossings
- ☐ S.T.E.P. system valves, pigg ports, pressure-sustaining devices, aeration vaults, air relief valves
- ☐ Force main and appurtenances with stations and offsets
- ☐ Lift station and appurtenances with station and offset

1.14.06 WATER**PLAN VIEW**

- ☐ Type of pipe
- ☐ Size of pipe
- ☐ Length of water main in L.F. between fixtures
- ☐ Tees, crosses, elbows, adapters, and valves; meter station and offset
- ☐ Fire hydrants
- ☐ Blow-off (at dead end of line)
- ☐ Vacuum and air release valves (when required)
- ☐ Type and brand of fixtures
- ☐ Fire Department Connection
- ☐ Thrust blocking required at all fittings
- ☐ Service to each lot
- ☐ Existing utility crossings
- ☐ Distance from sanitary or storm sewer (if applicable)
- ☐ RPBA and all back flow devices
- ☐ Meters
- ☐ Construction Notes for Water

PROFILE VIEW

- ☐ Existing utility crossings
- ☐ Show fixtures with stations and elevation (tees, crosses, hydrants, etc)
- ☐ Show valves with stations and elevations
- ☐ Size and material of water main
- ☐ Length of water main in L.F.
- ☐ Cover over pipe
- ☐ Grades

1.14.07 TRAFFIC SIGNALS

- ☐ Traffic signal poles
- ☐ Station and Offset to Signal Base, cabinets, loops, etc.
- ☐ Wiring schedule
 - Signal heads and mounting assembly
 - Detection loops
 - Control cabinet, size and layout
 - Power source
 - Conduit
 - Wire Size and Type
- ☐ Controller type, configuration, and wiring schematic
- ☐ Pedestrian pushbuttons
- ☐ Emergency vehicle preemption
- ☐ Interconnect
- ☐ Phase sequence diagram

- ☐ Junction boxes
- ☐ Conduit runs
- ☐ Construction Notes for Traffic Signals

1.14.08 ILLUMINATION

- ☐ Pole type, including Manufacturer and Model Number
- ☐ Mounting height, arm length, anchor bolt size and pattern
- ☐ Conduit runs
- ☐ Power source (wire size, type, conduit)
- ☐ Luminaire type, lamp wattage
- ☐ Station and Offset to Fixtures
- ☐ J-boxes (station and offset)
- ☐ One-line diagram for streetlight circuit(s)
- ☐ Construction Notes for Illumination

1.15 PRECONSTRUCTION MEETING

A preconstruction meeting shall be held prior to any work that occurs within the public right-of-way unless otherwise waived by the City. Prior to scheduling a preconstruction meeting, the following needs to occur:

1. All required plans shall have been submitted, reviewed, and approved by the City Engineer
2. All appropriate fees shall be paid
3. All required permits must be approved
4. Check list

1.16 INSPECTION

All work performed within the public right of way or easements or as described in these standards, whether by or for a private developer, by City forces, or by a City contractor, shall be done to established requirements outlined by the City Engineer and in accordance with these standards, WSDOT Standard Specifications, and any approved plans. Any revision to construction plans must be approved by the City Engineer before being implemented.

It is the responsibility of the developer, contractor, or their agents to notify the City in advance of the commencement of any authorized work. A preconstruction meeting and/or field review shall be required before the commencement of work. All applicable fees shall be paid prior to the preconstruction meeting. Any necessary easements or dedications are required before plan approval.

Before any plans are approved, the Developer must provide proof to the City that the Developer possesses all required easements, licenses, deeds, or other legal authority necessary to enter upon the lands where the proposed development will occur. In

addition, the Developer shall provide an easement acceptable to the City that will allow the City to access the property for purposes of future inspection and maintenance. No work shall commence unless all necessary City permits have been obtained

It is the responsibility of the developer, contractor, or their agents to have an approved set of plans and any necessary permits on the job site whenever work is being accomplished.

The City Engineer shall have authority to enforce these standards as well as other referenced or pertinent specifications. The City Engineer shall appoint project engineers and inspectors as necessary to inspect the work, and they shall exercise such authority as the City Engineer may delegate.

All specific inspections, test measurements, or actions required of all work and materials are set forth in these standards. Tests shall be performed at the developer's or contractor's expense. Failure to comply with the provisions of these standards may result in stop work orders, removal of work accomplished, or other penalties.

A project is considered final when a letter of acceptance is issued by the City Engineer to the party responsible for the project.

In the course of construction unexpected site conditions will come up, errors/discrepancies/omissions with the approved plan set, alternative ideas to what was approved. The owner, engineer, contractor may request a plan change. The Owner, Engineer, and Contractor must all sign the plan change request prior to submittal to the City. The City will expedite these reviews within one to two days as it is understood that construction may be held up. The City Engineer will make these decisions based on the City's interests.

1.17 TRAFFIC CONTROL

The developer/contractor is required to submit a traffic control plan to the City Engineer for approval prior to commencing construction. The developer/contractor shall be responsible for interim traffic control during construction on or along traveled roadways. Traffic control shall follow the guidelines of the WSDOT Standard Specifications. All barricades, signs and flagging shall conform to the requirements of the MUTCD.

Signs must be legible and visible and should be removed at the end of each work day if no applicable after construction hours.

When road closures and detours cannot be avoided, the contractor/developer shall notify the City Engineer. The City requires a detour plan to be prepared, submitted and approved prior to closing any portion of a City roadway.

1.18 FINISHING AND CLEANUP

After all other work on this project is completed and before final acceptance, the entire roadway, including the roadbed, planting, sidewalk areas, shoulders, driveways, alley and side street approaches, slopes, ditches, utility trenches, and construction areas shall be neatly finished to the lines, grades and cross sections of a new roadway consistent with the original section, and as hereinafter specified.

For construction projects where all or portions of the construction is in undeveloped areas, the entire area which has been disturbed by the construction shall be shaped so that upon completion the area will present a uniform appearance, blending into the contour of the adjacent properties.

Slopes, sidewalk areas, planting areas and roadway shall be smoothed and finished to the required cross section and grade by means of a grading machine insofar as it is possible to do so without damaging existing improvements, trees and shrubs. Machine dressing shall be supplemented by hand work to meet requirements outlined herein, to the satisfaction of the City Inspector.

Upon completion of the cleaning and dressing, the project shall appear uniform in all respects. All graded areas shall be true to line and grade. Where the existing surface is below sidewalk and curb, the area shall be filled and dressed out to the walk.

Wherever fill material is required in the planting area, the finished grade shall be elevated to allow for final settlement, but nevertheless, the raised surface shall present a uniform appearance.

All rocks in excess of one (1) inch diameter shall be removed from the entire construction area and shall be disposed of the same as required for other waste material. In no instance shall the rock be thrown onto private property.

Overhang on slopes shall be removed and slopes dressed neatly so as to present a uniform, natural, well-sloped surface.

All excavated material at the outer lateral limits of the project shall be removed entirely.

Trash of all kinds resulting from clearing and grubbing or grading operations shall be removed and not placed in areas adjacent to the project.

Where machine operations have broken down brush and trees beyond the lateral limits of the project, the Developer and/or Contractor shall remove and dispose of same and restore said disturbed areas at his own expense.

Drainage facilities such as inlets, catch basins, culverts, and open ditches shall be cleaned of all debris which is the result of the Developer and/or Contractor's operations.

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

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

1.19 RECORD DRAWINGS

Record drawings shall be submitted to the City Engineer reflecting "as-built" conditions for all improvements within the City right-of-way. Record drawings shall be submitted to the City within thirty (30) calendar days after completion of the work. Record drawings shall be submitted on permanent, stable, reproducible mylar with a signature and data which verifies the "as-built" condition of the project.

1.20 DEVIATIONS

An application for a deviation from the standards established herein shall be charged a \$300 application fee. A separate fee shall be charged for each deviation requested.

In the course of construction unexpected site conditions will come up, errors/discrepancies/omissions with the approved plan set, alternative ideas to what was approved. The owner, engineer, contractor may request a plan change. The Owner, Engineer, and Contractor must all sign the plan change request prior to submittal to the City. The City will expedite these reviews within one to two days as it is understood that construction may be held up. The City Engineer will make these decisions based on the City's interests.

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CHAPTER 2

TESC, CLEARING AND GRADING

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CHAPTER 2 –TESC, CLEARING AND GRADING

2.1 GENERAL

2.1.01 GENERAL

The design of temporary erosion and sediment control (TESC) clearing and grading plans shall conform to the requirements of the Washington State Department of Ecology and those requirements specified herein, whichever is more stringent. Compliance with these standards does not alleviate the design engineer from using sound professional engineering practices. The design criteria contained herein are the minimum acceptable under standard conditions. Special conditions may require more stringent requirements.

The purpose of these requirements is to provide the design criteria necessary to preserve the City of Black Diamond's water courses; minimize surface and ground water quality degradation; control sedimentation in creeks, streams, rivers, ponds, lakes, and other water bodies; protect adjacent and downstream property owners from increased runoff rates which could cause erosion and flooding; and ensure the safety and stability of the City of Black Diamond's roads and rights-of-way.

The City adopts by reference the Construction Storm Water Pollution Prevention Volume II of Department of Ecology's Stormwater Management Manual for Western Washington dated 2005.

These temporary erosion and sediment control standards supplement and clarify the City's implementation of the Department of Ecology's Construction Storm Water Pollution Prevention Manual

2.1.02 EROSION SEDIMENTATION CONTROL GENERAL PLAN NOTES

The following is a listing of General Notes that should be incorporated on erosion control plans. All the notes on the list may not pertain to every project. The Engineer should include only those notes that are relevant to the project and may omit non-relevant notes. If additional notes are needed for specific aspects, they should be added after the General Notes.

Erosion Control General Notes:

1. Approval of this erosion/sedimentation control (ESC) plan does not constitute an approval of permanent road or drainage design (e.g. size and location of roads, pipes, restrictors, channels, retention facilities, utilities, etc.).

2. The implementation of these ESC plans and the construction, maintenance, replacement, and upgrading of these ESC facilities is the responsibility of the applicant/contractor until all construction is completed and approved and vegetation/landscaping is established.
3. The boundaries of the clearing limits shown on this plan shall be clearly marked in the field prior to construction. During the construction period, no disturbance beyond the marked clearing limits shall be permitted. The marking shall be maintained by the applicant/contractor for the duration of the construction.
4. The ESC facilities shown on this plan must be constructed in conjunction with all clearing and grading activities, and in such a manner as to ensure that sediment and sediment laden water do not enter the drainage system, roadways or violate applicable water & utility standards.
5. The ESC facilities shown on this plan are the minimum requirements for anticipated site conditions. During the construction period, these ESC facilities shall be upgraded as needed for unexpected storm events and to ensure that sediment and sediment-laden water do not leave the site.
6. The ESC facilities shall be inspected daily by the applicant/contractor and maintained as necessary to ensure their continued functioning.
7. The ESC facilities on inactive sites shall be inspected and maintained a minimum of once a month or within the 48 hours following a major storm event.
8. At no time shall more than 1' of sediment be allowed to accumulate within a the sump of a trapped catch basin. All catch basins and conveyance lines shall be cleaned prior to paving. The cleaning operation shall not flush sediment laden water into the downstream system.
9. Stabilized construction entrances shall be installed at the beginning of construction and maintained for the duration of the project. Additional measures may be required to ensure that all paved areas are kept clean for the duration of the project.

2.2 TESC DESIGN CRITERIA

2.2.01 TEMPORARY EROSION AND SEDIMENT CONTROL (TESC)

The detrimental effects of erosion and sedimentation shall be minimized by conforming to the current DOE manual, these standards, and the following general principles:

1. Soil shall be exposed for the shortest possible time.
2. Reducing the velocity and controlling the flow of runoff
3. Detaining runoff on the site to trap sediment
4. Releasing runoff safely to downstream areas

In applying these principles, the Developer and/or Contractor shall provide for erosion control by conducting work in workable units; minimizing the disturbance to cover crop materials; providing mulch and/or temporary cover crops, sedimentation basins, and/or diversions in critical areas during construction; controlling and conveying runoff; and establishing permanent vegetation and installing erosion control structures as soon as possible.

- A. Trench mulching: Where there is danger of backfill material being washed away due to steepness of the slope along the direction of the trench, back fill material shall be compacted and held in place by covering the disturbed area with straw and held with a covering of jute matting or wire mesh anchored in place.
- B. Cover-Crop Seeding: A cover crop shall be sown in all areas excavated or disturbed during construction that were not paved, landscaped and/or seeded prior to construction. Areas landscaped and/or seeded prior to construction shall be restored to their original or superior condition.

Cover-crop seeding shall follow backfilling operations.

The Developer and/or Contractor shall be responsible for protecting all areas from erosion until the cover crop affords such protection. The cover crop shall be re-seeded if required and additional measures taken to provide protection from erosion until the cover crop is capable of providing protection.

During winter months, the Contractor may postpone seeding, if conditions are such that the seed will not germinate and grow. The Developer and/or Contractor will not, however, be relieved of the responsibility of protecting all areas until the cover crop has been sown and affords protection from erosion.

2.2.02 TESC DESIGN REQUIREMENTS

TESC design requirements shall meet design criteria requirements of erosion control, storm retention, detention, and storm conveyance systems herein, including the following:

1. TESC silt control and detention facilities shall be sized for runoff volumes associated with graded sites.
2. TESC Detention/Retention facilities for temporary control of surface water shall include additional measures, such as sedimentation ponds and gravel filter berms, to protect downstream system or the infiltration area from silt. Continual maintenance, including removal of silt, shall be performed as needed to keep the facility fully functioning until permanent facilities are in place.
3. TESC retention facilities shall be sized for runoff volumes associated with graded sites. A backup/reserve infiltration area shall be provided as necessary.
4. The TESC plan shall be designed to avoid creating adverse effects on public right-of-ways or adjacent properties.
5. A quarry spall construction entrance shall be required and maintained throughout the hauling operation for erosion control and to prevent sediment tracking onto public streets. Additional measures may be required depending upon site conditions including the construction of a wash pad area and/or paving portions of the site where construction has been completed.
6. Siltation control measures (i.e., silt fences, setbacks, ditches w/ check dams, etc.) shall be provided to protect any on-site sensitive area designated for preservation, public right-of-way and/or adjacent properties.
7. Measures, including but not limited to catch basin protection, shall be taken to prevent silt-laden water from entering the City's public storm system and/or adjacent or downstream rivers, streams, and on- and off-site sensitive areas.
8. All exposed slopes shall be stabilized with an approved erosion control treatment.
9. No fill or cut slopes shall be steeper than two horizontal to one vertical (2:1) unless in accordance with an accepted geotechnical report sealed by a Washington State licensed engineer.
10. A minimum horizontal setback of 5' shall be provided between the bottom of any fill placement and the top of the bank of any defined drainage channel.
11. When filling a site, particular care should be taken to prevent impeding the existing upstream surface drainage flow.

12. Denuded areas and soil stockpiles must be stabilized.

All TESC measures regardless of design and implementation must meet the latest Nephelometric Turbidity Units (NTU) test requirements of the Washington State Department of Ecology and as specified in the DOE Construction Stormwater General Permit. If the applicable limits are not met, the project will be halted until such time as it is brought into compliance.

2.2.03 TEMPORARY DETENTION SYSTEMS

1. Temporary storm drainage detention facilities used during the grading and erosion control process shall be designed with a safety factor as per the current Department of Ecology Stormwater Management Manual for Western Washington.
2. Temporary Detention Facilities shall discharge at the 2-year 24-hour predevelopment discharge rate.
3. The temporary storm drainage facility shall be designed using an approved hydrograph method.
4. Silt control measures shall be used, including but not limited to sedimentation ponds, gravel filter berms, silt fences, and hay bales.
5. Temporary control structures in association with TESC plans shall be shown on the plans and conform to the Standard Details and the Department of Ecology's Stormwater Management Manual for Western Washington. They shall be installed on-site and maintained during the construction period prior to connecting to the City storm system.

2.2.04 TEMPORARY RETENTION SYSTEMS

Temporary Retention Systems requirements are as follows:

1. Temporary storm water retention facilities used during the grading and erosion control process shall be designed with a safety factor as per the Department of Ecology Stormwater Management Manual for Western Washington.
2. Flow of sediment-laden water shall be diverted to a sediment trap for removal and collection of sediment prior to infiltration.
3. The temporary infiltration area shall not be used as part of the permanent infiltration area.

4. The temporary storm drainage facility shall be designed using an approved hydrograph method.

2.2.05 SPECIAL PERMISSION FOR WINTER WORK

Any project with exposed soil, or that will be worked from October 1st to March 31st, shall prepare a Winterization Plan for review by the City Engineer. Where erosion risks are significant the city may not allow construction after October 1st or before March 31st. The plan shall at the minimum contain the following information:

1. Purpose
2. Property location
3. Property description
4. Contacts – including name, title, organization, and phone number of person or persons responsible for maintaining the project site
5. Temporary Erosion and Sediment Control (TESC) plan
6. Inspection and monitoring schedule
7. Maintenance and repair responsibility
8. A stockpile of TESC materials and their location
9. Inspection Report Form
10. Site Specific BMP's (Best Management Practices)
11. The amount of work area susceptible to erosion
12. The maximum amount of active work area.

2.3 LAND CLEARING

2.3.01 PURPOSE

The following establishes the requirements for land clearing. These requirements do not supersede nor are they intended to be inconsistent with any landscaping requirement.

1. Clearing shall not unreasonably or contribute to erosion, landslides, flooding, siltation, or other pollution as determined by the City Engineer.
2. Clearing shall contain reasonable provisions for the preservation of natural features, vegetation, sensitive areas, and drainage courses.
3. Clearing shall be conducted so as to expose the smallest area of soil for the least amount of time.
4. If the clearing is to include the removal of ground cover, a TESC plan may be required.

5. A licensed and bonded contractor shall perform the clearing of any tree that is within striking distance of a structure, overhead power/utility lines, public right-of-way, roads or that has the potential to cause damage to other trees.
6. A land clearing plan shall contain the following:
 - a. The vegetation to be removed.
 - b. The location and type of all existing trees 6" diameter and larger for evergreens and 4" diameter or larger for deciduous. The plan shall indicate if a tree is to either be retained or removed.
7. No work shall occur with 5 feet of the drip line of any and all trees to be saved. A construction fence shall be installed around all trees to be saved.

2.4 GRADING

2.4.01 EXCAVATIONS

1. Cut slopes shall generally be constructed no steeper than two horizontal to one vertical (2:1). The City Engineer may approve steeper slopes after a geotechnical analysis is performed justifying a steeper slope.
2. Cut slopes shall be stabilized by terracing, cat tracking, jute mat, grass sod, hydroseeding, or by other planting or surfacing materials acceptable to the City Engineer.
3. The City Engineer may require geotechnical analysis for the following:
 - a. Slopes with sub-surface or surface water flows
 - b. In areas of questionable soils conditions
 - c. Where the length of the slope requires terracing
 - d. In other situations where slope stability could be in question

2.4.02 FILLS

1. Fill slopes shall generally be constructed no steeper than two horizontal to one vertical (2:1). The City Engineer may approve steeper slopes after a geotechnical analysis is performed justifying a steeper slope.
2. Fill slopes shall be stabilized by terracing, cat tracking, jute mat, grass sod, hydroseeding, or by other planting or surfacing materials acceptable to the City.

3. The City Engineer may require geotechnical analysis for the following:
 - a. Slopes with sub-surface or surface water flows
 - b. In areas of questionable soils conditions
 - c. Where the length of the slope requires terracing
 - d. In other situations where slope stability could be in question

2.4.02.1 PREPARATION FOR FILL

Prior to any fill being placed, all vegetation, topsoil and other unsuitable material shall be removed unless dictated otherwise by the geotechnical engineer. Where fill is being placed on existing slopes of greater than five horizontal to one vertical (5:1), a geotechnical analysis shall be performed.

2.4.02.2 COMPACTION

Fill material shall be placed in lifts and compacted in accordance with the latest WSDOT Standard Specifications.

2.4.03 SLOPE EASEMENT

Slope easements adjacent to the right-of-way for maintenance of cut or fill slopes and drainage facilities may be required. Easement shall be from the catch point plus a minimum of 5'.

2.5 RETAINING WALLS

Retaining walls can vary with design and must be approved by the City Engineer. Retaining walls in locations where the possibility exists for pedestrians to walk near the top edge of the wall shall require protective fencing. Retaining walls with a vertical difference of 3' or greater along pedestrian corridors and areas where maintenance personnel will be required to access will require a handrail for safety of pedestrian traffic.

2.5.01 ROCK WALLS

Rock walls may be used for containment of cut slopes or fill embankment up to a maximum height of 8'. Rock walls over 4' height or in areas of questionable soil stability will require an engineered design. The engineered design shall include a soils investigation and report by a geotechnical engineer and structural calculations to support the rock wall design.

2.5.01.1 SIZE

Size categories include:

Two-Man Rocks (200-700 pounds) 18"-28" average diameter

Three-Man Rocks (700-2000 pounds) 28"-36" average diameter

Four-Man Rocks (2000-4000 pounds) 36"-48" average diameter
Five-Man Rocks (4000-6000 pounds) 48"-54" average diameter
Six-Man Rocks (6000-8000 pounds) 54"-60" average diameter

2.5.01.2 MATERIAL

The rock material shall be as rectangular as possible. No stone shall be used that does not extend through the wall. The quarried rock shall be hard, sound, durable, and free from weathered portions, seams, cracks, and other defects.

2.5.01.3 UNDERDRAINS

Underdrains are required for all retaining walls over 4' high. A minimum 6" diameter rigid PVC perforated drainpipe shall be placed in a shallow excavated trench located along the inside edge of the keyway. The pipe shall be bedded on and surrounded by gravel backfill to a minimum height of 18" above the bottom of the pipe. A filter fabric shall surround the gravel backfill and shall have a minimum of 1' overlap along the top surface of the gravel. The perforated pipe shall be connected to a storm drain system or to an acceptable outfall. Cleanouts of the same size and pipe quality shall be installed at 100 foot intervals and every change of direction

2.5.02 BLOCK RETAINING WALLS

Block retaining walls, (i.e., Keystone, Allan Block, Ecology Block) may be used for containment of cut slopes or fill embankment. Block retaining walls over 4' high or in areas of questionable soil stability will require an engineered design. The engineered design shall include a soils investigation and report by a geotechnical engineer and structural calculations to support the block wall design.

2.5.02.1 MATERIAL

Blocks used for retaining walls shall be in good condition and structurally sound; cracked and/or broken blocks should be returned to the manufacturer.

2.5.02.2 UNDERDRAINS

(See **Section 2.5.01.3**)

2.5.03 REINFORCED CONCRETE WALLS

Reinforced concrete walls or cast-in-place concrete walls may be used for containment of cut slopes or fill embankment. Concrete retaining walls over 4' high or in areas of questionable soil stability will require an engineered design. The engineered design shall include a soils investigation and report by a geotechnical engineer and structural calculations to support the concrete wall design.

2.5.03.1 MATERIAL

A minimum 3,000-psi structural reinforced concrete shall be used in the design of concrete retaining walls.

2.5.03.2 UNDERDRAINS

(See **Section 2.5.01.3**)

2.5.04 MECHANICALLY STABILIZED EARTH WALLS (MSE WALLS)

MSE walls may be used in conjunction with other retaining walls or as a stand-alone application when constructing fill slopes. MSE walls will require an engineered design. The engineered design shall include a soils investigation and report by a geotechnical engineer and structural calculations to support the MSE wall design.

2.5.04.1 MATERIAL

MSE walls shall employ well-draining structural soil compacted to the geotechnical engineer's specifications.

2.5.04.2 UNDERDRAINS

(See **Section 2.5.01.3**)

2.6 CONSTRUCTION SEQUENCE

A construction sequence is intended to ensure that the timing and installation of adequate storm drainage and erosion control measures are in place prior to activities that may cause erosion to occur. The following elements should be included in a construction sequence:

1. Attendance a pre-construction meeting.
2. Establishment of clearing and grading limits.
3. Construction of temporary construction entrance.
4. Construction of perimeter ditches, filter fabric fences, and other erosion control devices as shown.
5. Construction of storm drainage control facilities including emergency overflow as applicable.
6. Construction of ditches and swales as necessary to direct all surface water to the storm drainage control facilities as clearing and grading progress. Prevention of

uncontrolled surface water being allowed to leave the site at any time during the grading operations.

7. Establishment of at what point grading activities can begin, which is usually only after all drainage and erosion control measures are in place.
8. For sites with a final development plan, the following shall also be addressed when applicable:
 - a. Installation of on-site permanent storm drainage, sanitary sewer, and water facilities.
 - b. Site paving.
 - c. Indicate at what point building construction may begin.
 - d. A detailed plan of how to transition from the temporary to permanent storm facilities.
 - e. The possibilities of any phased construction.
 - f. Any off-site public or private improvements including the general timing and duration.
 - g. The removal of all TESC measures at project completion upon City approval.
9. The TESC plan sheet shall also include a construction sequence element which clearly identifies the timing and methodology required to:
 - a. Contain areas of active earthwork to prevent uncontrolled discharge of storm drainage.
 - b. Minimize erosion and the extent and time soils are exposed on-site.
 - c. Address seasonal variations in weather conditions (the period of greatest concern is October 1 through April 1). A separate winterization may be required.
 - d. Prevent tracking of sediment onto City streets.
 - e. Protect permanent on-site and off-site storm drainage systems.

CHAPTER 3

TRANSPORTATION

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TRANSPORTATION SECTION
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CHAPTER 4

STORM DRAINAGE

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CHAPTER 4 – STORM DRAINAGE

4.1 GENERAL

4.1.01 GENERAL

The purpose of these requirements is to provide the design criteria necessary to help preserve the City of Black Diamond's water courses; to minimize surface and ground water quality degradation; to control the sedimentation in creeks, streams, rivers, ponds, lakes, and other water bodies; to protect adjacent and downstream property owners from increased runoff rates which could cause erosion and flooding; to ensure the safety of the City of Black Diamond's streets and right-of-way; and to decrease drainage-related damage to both public and private property.

Compliance with these standards does not alleviate the design engineer from using sound professional engineering practices. The design criteria contained herein are the equal to or exceed State standards. Special conditions may require more stringent requirements.

4.1.02 STORM DRAINAGE GENERAL PLAN NOTES

The following is a listing of General Notes that should be incorporated on storm drainage plans. All the notes on the list may not pertain to every project. The Engineer should include only those notes that are relevant to the project and may omit non-relevant notes. If additional notes are needed for specific aspects, they should be added after the General Notes.

Storm Drainage General Notes:

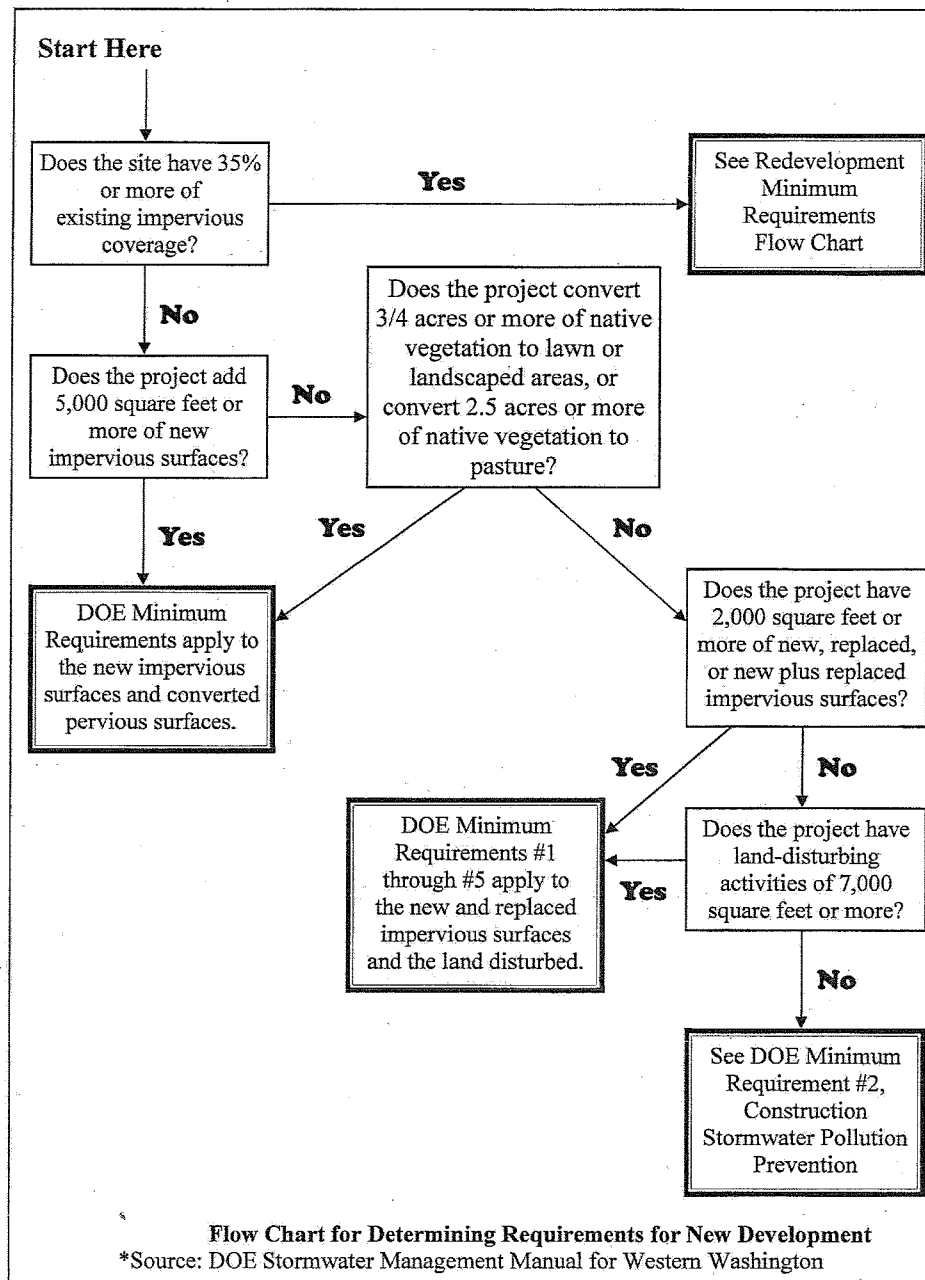
1. All work shall conform to City of Black Diamond Standards, the Stormwater Management Manual for Western Washington by the Department of Ecology, and the WSDOT Standard Specifications.
2. Temporary erosion / water pollution measures shall be required in accordance with the Stormwater Management Manual for Western Washington by the Department of Ecology and as follows:
 - a. Soil erosion and water pollution/flood control plans shall be submitted to the City, approved by the City, and implemented by the contractor prior to disturbing any soil on the site. Submittal and approval of these plans shall preclude any construction activity on the site.

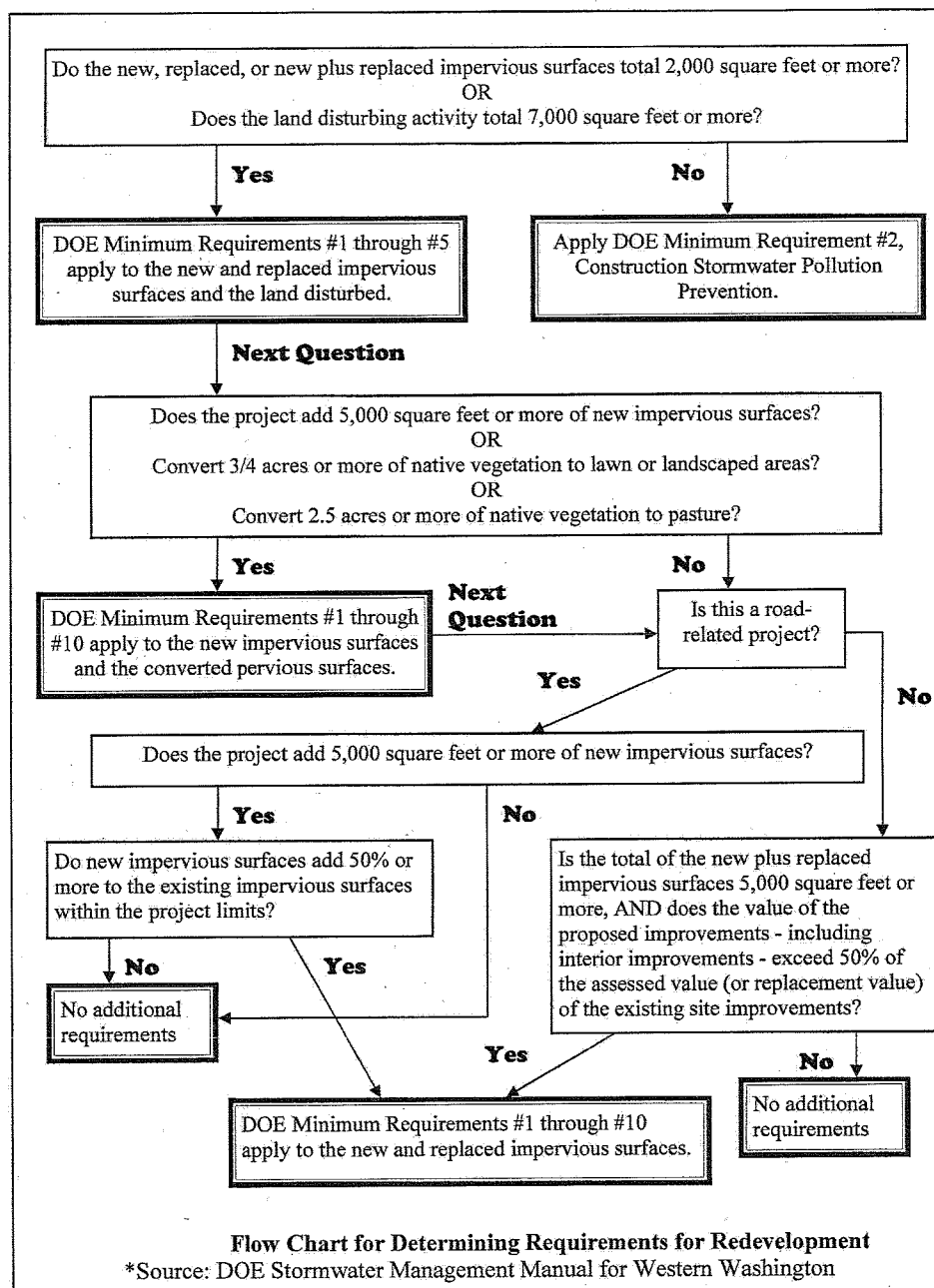
- b. All permanent storage and retention/detention areas used as part of the temporary erosion control and water pollution / flood activities and conveyance system shall be cleaned of all silts, sand, and other materials following completion of construction and the permanent facilities shall then be completed including permanent infiltration areas. If an infiltration pond is to be used on a temporary basis for a sediment control pond, a protective layer of fine soil as determined by an engineer shall be installed in order to protect the infiltrative capacity of the ultimate underlying soil
3. Compliance with all other permits and other requirements by the City of Black Diamond and/or other governing authorities shall be required.
4. A preconstruction meeting shall be held with the City prior to the start of construction.
5. All storm mains and retention/detention areas shall be staked for grade and alignment by an engineering or surveying firm capable of performing such work, and currently licensed in the State of Washington to do so.
6. Storm drain pipe shall meet the following requirements:
 - a. Polyvinyl Chloride: PVC pipe shall conform to ASTM D 3034, SDR 35 or ASTM F 789 with joints and rubber gaskets conforming to ASTM D3212 and ASTM F4777.
 - b. Plain Concrete: Plain concrete pipe per WSDOT Standard Specifications.
 - c. Reinforced Concrete: Reinforced concrete pipe per WSDOT Standard Specifications.
 - d. Ductile Iron: Ductile iron pipe shall conform to AWWA C151 Class 50 and have a cement mortar lining conforming to AWWA C104. All pipes shall be joined using non-restrained joints which shall be rubber gaskets, push on type or mechanical joint, conforming to AWWA.
 - e. Polyethylene: PE smooth wall pipe per Advanced Drainage Systems (ADS) N-12 (bell and spigot), or City approved equal, constructed per WSDOT Standard Specifications.
7. Special structures, oil/water separators and outlet controls shall be installed per plans and manufacturers recommendations.
8. All disturbed areas shall receive permanent erosion control in the form of vegetation establishment such as grass seeding or hydroseeding. A means shall be established to protect the permanent storm drain system prior to establishment of the permanent erosion control measures. This method shall be included in the soil erosion and water pollution/flood control plans.
9. Provide traffic control plan(s) as required in accordance with MUTCD.

10. Call underground locate line 1-800-424-5555 a minimum of 48 hours prior to any excavations.
11. Storm drain pipelines shall be installed to the far property line(s) to serve adjacent tributary areas as may be warranted. They shall be appropriately sized to accommodate flows as further identified herein. Pipes shall be designed to facilitate a minimum 2.5 feet/second flow unless otherwise approved by the City Engineer.
12. All storm water pipes shall be pressure tested between catch basins and TV inspected.
13. Natural surface water shall bypass all retention and detention storm systems.

4.1.03 THRESHOLD REQUIREMENTS

The requirements outlined in these standards shall apply to projects meeting the threshold requirements as outlined in the following two flowcharts as taken from the DOE Stormwater Management Manual for Western Washington.





4.1.04 DESIGN STANDARDS

All storm drainage improvements shall be designed and constructed in conformance with the "Stormwater Management Manual for Western Washington", as published by the Department of Ecology and as modified by these Black Diamond Standards.

Additionally, the following general requirements shall be met in developing a storm drainage system:

1. Storm drainage entering the subject property shall be received at the naturally occurring locations, and storm drainage exiting the subject property shall be discharged as near as possible to the natural locations or to adjacent public facilities with adequate energy dissipation within the subject property to mitigate downstream impacts. Natural surface water shall bypass all retention and detention systems.
2. The design storm peak discharge from the subject property shall not be increased by the proposed development. Retention or detention systems shall be utilized to accomplish this requirement.
3. Storm drainage quantity and quality control measures are required for new improvements.
4. The entire storm system shall be analyzed for the 100 year storm plus 10% and a flow path must be established that will not damage property or the environment to a point of safe storm water outfall. An emergency cross drainage agreement may need to be secured or established.
5. In general, the lowest on-site storage elevation shall be higher than the hydraulic grade line of the receiving off-site storm drainage system. The hydraulic elevation of the receiving system shall be based on the 100 year design storm or as determined by the City, if a specific elevation is known.
6. The finished floor elevation of buildings shall be indicated on the plans and shall conform to the more restrictive of:
 - a. A minimum of 1' above the maximum high water elevation indicated in the detention or retention system design and a minimum of 6" above the overflow design elevation, or
 - b. In compliance with the City's established flood regulation requirements.
7. No individual lot or development shall be allowed to drain uncontrolled storm drainage from more than 600 square feet of impervious surface area across driveways into the public right-of-way.
8. In areas with soils that have high infiltration rates or are located within an aquifer protection area, liners or impermeable barriers may be required to be incorporated with storm drainage system designs.
9. All projects shall execute with the City a standard Stormwater Easement and Maintenance Agreement for the site's private storm drainage facilities. The easement shall be approved by the City and executed by the owner prior to the issuance of occupancy permits for the development.
10. All non-single family roof drains shall be directed into the site storm drainage detention or retention system or other discharge point as applicable. Water

collected from foundation drains shall not be discharged into storm water detention or retention systems. Piped conveyance systems shall be a minimum of 6" diameter and contain cleanouts as necessary. All piped conveyance lines shall be connected to the storm drainage detention or retention system at catch basins or other maintenance access points. Piped conveyance lines from roof drains shall have a minimum of 1% slope. Runoff shall be discharged by one of the following methods:

- a. Discharged into an on-site infiltration system.
 - b. Discharged into a private collection pipe that would be connected to a public drainage system at a catch basin. For new plat developments a series of private collection systems, each serving as many lots as feasible, shall connect to the public system. Such systems shall be located within private drainage easements.
 - c. Alternative low impact development designs will also be considered.
11. Single-family home sites shall provide a means for collection and discharge of water from roof, foundation drains, and driveway. The storm drainage pipe shall be 4" minimum diameter with a minimum 1% slope. Runoff shall be discharged by one of the following methods:
- a. Discharged into an on-site infiltration system.
 - b. If soils do not allow an on-site infiltration system, then discharge into a private collection pipe that would be connected to a public drainage system at a catch basin.

4.1.05 PUBLIC STORM FACILITY EASEMENTS

A stormwater easement is required for the placement, operation, and maintenance of storm facilities on private property.

Public stormwater easements shall meet the following minimum requirements:

1. Public stormwater easements shall extend a minimum of 7.5' to each side of the centerline of the storm pipe and 7.5' beyond the outside extremity of a storm facility or twice the depth of the storm pipe, whichever is greater.
2. Public stormwater easements shall be reviewed by the City and then recorded at King County prior to acceptance of the public storm system.
3. Building setback requirements:
 - a. 5' minimum from covered parking

- b. 10' minimum from structures and retaining walls, or equal to depth of pipe, whichever is greater
- c. 20' minimum width easement shall be provided between buildings, on multi-family and commercial sites
- d. When passing between any two buildings (residential or commercial, etc.) which are 25' apart or less, the easement width shall extend the full width between the buildings, and the depth of the storm line shall not exceed 10'.

4.1.06 PROHIBITED AND ALLOWED DISCHARGES TO THE STORM SYSTEM

Certain types of discharges are prohibited and allowed. In order to prevent discharge of pollutants such as those listed below, each property, business, and residence is required to implement best management practices, or BMP's. BMP's may include structural (i.e. water quality treatment facilities, roofs to cover materials) or non-structural (regular sweeping, moving activities inside) measures.

4.1.06.1 PROHIBITED DISCHARGES

No person shall discharge, either directly or indirectly, any organic or inorganic matter into the storm and/or surface water system that may cause or tend to cause water pollution, including but not limited to the following:

- a. Trash or debris
- b. Construction materials
- c. Petroleum products including but not limited to oil, gasoline, grease, fuel oil, or heating oil
- d. Antifreeze and other automotive products
- e. Metals in either particulate or dissolved form
- f. Radioactive material
- g. Batteries
- h. Acids, alkalis, or bases
- i. Paints, stains, resins, lacquers, or varnishes
- j. Degreasers and/or solvents
- k. Drain cleaners
- l. Pesticides, herbicides, or fertilizers
- m. Steam cleaning wastes
- n. Soaps, detergents, or ammonia
- o. Swimming pool backwash
- p. Chlorine, bromine, and other disinfectants
- q. Heated water
- r. Domestic animal wastes
- s. Sewage
- t. Recreational vehicle waste

- u. Animal carcasses
- v. Food wastes
- w. Bark and other fibrous materials
- x. Collected lawn clippings, leaves, or branches
- y. Silt, sediment, or gravel
- z. Dyes (without prior permission of the City)
- aa. Chemicals not normally found in uncontaminated water
- bb. Any hazardous material or waste not listed above

4.1.06.2 ALLOWABLE DISCHARGES

The following type of discharges shall not be considered prohibited discharges unless the City Engineer determines that the type of discharge, whether singly or in combination with others, is causing significant contamination of surface, ground, or storm waters.

- a. Potable water
- b. Potable water line flushing
- c. Uncontaminated water from crawl space pumps of footing drains
- d. Lawn watering
- e. Dechlorinated swimming pool water
- f. Materials placed as part of an approved habitat restoration or bank stabilization project
- g. Natural uncontaminated surface water or ground water
- h. Flows from riparian habitats and wetlands
- i. Discharges from boats (engine exhaust; cooling waters; effluent from sinks, showers, and laundry facilities; and treated discharge from Type I and Type II marine sanitation devices)
- j. Common practices for water well disinfection
- k. Other types of discharges as determined by the City Engineer

4.2 HYDROLOGIC ANALYSIS

4.2.01 HYDROLOGIC ANALYSIS METHODS

The City of Black Diamond requires the use of EPA's HSPF (Hydrologic Simulation Program-Fortran) program or an approved equivalent model when sizing flow control and water quality BMP's, Reference the Department of Ecology, Stormwater Management Manual for Western Washington.

The City of Black Diamond requires the use of SBUH (Santa Barbara Urban Hydrograph) or similar model to determine peak discharge rates for sizing conveyance systems.

The engineer shall perform a backwater analysis of proposed conveyance system. The engineer at a minimum analyze the discharge from the proposed storm system a ¼ mile downstream or to a safe outfall location.

4.3 FLOW CONTROL

4.3.01 DETENTION SYSTEMS

On-site detention systems shall be provided to ensure that stormwater flow rates following development do not exceed the pre-development conditions. The design of storm drainage and detention system shall depend on the type and local site conditions. Detention systems shall be designed with a safety factor in accordance with the Department of Ecology's Stormwater Management Manual for Western Washington.

DETENTION SYSTEM	APPROVED FOR USE WITHIN:	
	PUBLIC	PRIVATE
Detention Ponds	X	X
Detention Tanks		X
Detention Vaults	X	X
Parking Lot Ponds		X

4.3.02 DETENTION PONDS

The following criteria shall be incorporated when designing detention ponds:

1. Detention ponds shall be designed using rounded shapes and variations in slopes to provide a more natural and aesthetically pleasing facility.
2. The total maximum depth of the detention pond from the bottom to the emergency overflow water surface elevation shall be 10'. City Engineer approval shall be obtained if special circumstances require a depth in excess of 10'.
3. A minimum freeboard of 1' shall be provided between the emergency overflow elevation and the top of the pond.
4. For maintenance and aesthetic purposes, pond designs shall minimize structural elements such as retaining walls. For ponds where retaining walls are required, they should be limited to a maximum of three sides.

5. An access/maintenance road shall be provided to the pond. The road shall be a minimum of 15' wide and a maximum slope of 15%. Access shall be provided to the outlet control structure and any additional significant drainage system components.
6. Storm detention systems shall be designed such that storm drainage from public systems does not discharge into areas of private ownership or private maintenance responsibilities.
7. The edge of the detention facility shall be located a minimum of 10' or twice the depth (whichever is greater) from any structure, property line, and/or infiltration gallery. The detention facility shall be set back a minimum of 50' from the top of any slope greater than 15%. Detention facilities built on or near steep slopes will require a geotechnical analysis and report addressing the potential impacts on the slope.
8. Seed mixes for detention ponds shall be as follows:
 - a. Mix #1 (Dry Conditions)
 - 30% Colonial Bentgrass
 - 30% Kentucky Bluegrass
 - 20% Tall Fescue
 - 15% Perennial Rye Grass
 - 5% White or Red Clover
 - Application Rate = 120 lbs/acre
 - b. Mix #2 (High Groundwater Conditions)
 - 30% Creeping Red Fescue
 - 30% Redtop Bentgrass
 - 30% Meadow or Pacific Foxtail
 - 5% Timothy
 - 5% Birdsfoot Trefoil
 - Application Rate = 60 lbs/acre

4.3.03 DETENTION TANKS / VAULTS

Detention vaults/tanks, upon approval of the City Engineer, may be allowed within the following design limits:

1. The minimum interior depth of vaults shall be 7'. The maximum interior depth of vaults shall be 15'.
2. The maximum depth of a vault from finished ground surface to bottom of vault shall be 20'.
3. The detention vault bottom should slope at least 5% from each side towards the center, forming a broad "V" to facilitate sediment removal. More than one "V" may be used to minimize vault depth.

4. Pumped outfalls are not allowed.
5. A buoyancy analysis is required demonstrating that the vault will not be impacted by ground water.
6. Minimum three thousand (3,000) psi structural reinforced concrete shall be used for detention vaults. All construction joints must be provided with water stops.
7. All vaults shall meet structural stability requirements for the overburden support and H-20 traffic loading. If the vault is to be placed in a parking lot, then a higher loading may be required. Cast-in-place wall sections shall be designed as retaining walls. A structural engineer licensed in the State of Washington shall stamp all structural designs. Vaults shall be placed on stable, well-consolidated native or compacted foundation material with suitable bedding material. Vaults shall not be allowed in fill slopes unless analyzed in a geotechnical report for stability and construction purposes.
8. The following criteria shall be used when designing detention vault inlets and outlets:
 - a. The number of inlets to the detention vault shall be limited to a maximum of three (3).
 - b. The vault and the outlet pipe shall be designed to convey the post-developed 100-year design flow.
 - c. The inlet to the detention vault shall be designed such that the flow velocity is reduced to 3 feet per second (fps) to eliminate re-suspension of settled sediments.
 - d. Outlet control structures shall be designed based on the requirements in Section 1.14.3.06 of these Standards.
9. Access shall be provided over the inlet pipe and outlet structure. The following guidelines for access shall be used
 - a. All underground detention facilities shall have a minimum of one (1) access cover with ladder per 50' of length or width and at least one (1) access cover with ladder to the bottom of the vault or tanks per cell.
 - b. Lockable grates instead of solid manhole covers are required to increase air contact with water surface. Grates will allow air contact with the water and minimize the possibility of stagnant conditions, which can result in oxygen depletion especially in warm weather. Vaults shall be designed with a 5'x10' grated access hatch over the

inlet and outlet pipes. Access hatches installed in drive aisles and other paved areas subject to vehicular traffic shall be H-20 rated.

- c. Ladders and hand-holds shall be provided at all access points.
- d. Vaults must comply with the OSHA confined space requirements, which includes clearly marking entrances to confined space areas.

4.3.04 PARKING LOT PONDS

1. The use of commercial parking lots for detention of stormwater shall be reviewed by the City Engineer and approved or denied based on the design, location and general parameters of the project.
2. The overflow elevation shall be a minimum of 1' below the finished floor elevation of adjacent buildings and adjacent properties, landscaping, parking stalls, walking paths, and sidewalks and in compliance with City regulated flood elevation requirements.
3. At no time shall parking lot emergency overflow elevation exceed a depth of 6".
4. Curbs cannot be used for retaining storage.

4.3.05 RETENTION SYSTEMS

4.3.05.1 RETENTION SYSTEM DESIGN

The following criteria shall be incorporated when designing retention systems:

1. The City prefers retention (infiltration) for storm drainage quantity control when soil conditions are satisfactory for such application and water quality treatment can be provided. The retention system shall be designed per the Washington State Department of Ecology Stormwater Management Manual for Western Washington.
2. To support a retention system design, the City requires an infiltration rate analysis and adequate soil log information for the location of the proposed retention facility to a minimum depth of 3' below the proposed effective bottom of the facility.
3. Overflow systems for retention systems shall be designed in such a way as to discharge excess water during a major storm event to a public facility by sheet flow. Sheet flowing across adjacent properties will not be allowed.

4. The bottom of the retention facility shall be 3' minimum above the seasonal high ground-water elevation.
5. The system shall be located in natural soils and not in embankments.
6. The maximum allowable void ratio for pipe trench rock shall be 25%, which includes a 5% siltation allowance.
7. Catch basins shall be provided on each end of the infiltration system if the trench design method is utilized. Access to these catch basins is required for maintenance and operation.
8. Perforated pipes used in conjunction with infiltration systems shall be installed with the perforated holes facing downward towards the bottom of the trench.
9. Infiltration systems shall be located outside of parking and driving areas, unless otherwise approved by the City Engineer.
10. In aquifer recharge protection areas, additional water quality measures may be required.
11. Infiltration trenches and galleries shall be designed such that no point in the facility is located more than 100' from an access structure.
12. Retention systems shall be designed with a safety factor in accordance with the Department of Ecology's Stormwater Management Manual for Western Washington.

4.3.05.2 RETENTION SYSTEM INFILTRATION RATE REQUIREMENTS

The infiltration rate for a Storm Drainage Retention System shall be based upon the requirements outlined in the Washington State Department of Ecology's Stormwater Management Manual for Western Washington.

4.3.06 DISCHARGE CONTROL

4.3.06.1 DISCHARGE CONTROL DESIGN

The following criteria shall be incorporated when designing discharge control facilities:

1. When determining the pre-developed flows, the site shall be analyzed at its historic pre-developed condition.

2. The hydraulic head of the discharge control structure shall be designed so that the orifice at the bottom of the control structure shall be a minimum of 1" diameter.
3. The calculated orifice diameter size shall be rounded off to the nearest 1/8" or 0.01' increment.

4.3.06.2 DISCHARGE CONTROL STRUCTURES

Discharge control structures shall meet the following requirements:

1. Notched Weir Control Structures

- a. Notched weir structure details shall be shown on the plans to scale and follow the requirements shown on the Standard Details.
- b. A baffle shall be provided on the notched weir to provide oil/water separation.

2. Orifice Control Structures

- a. Orifice structure details shall be shown on the plans to scale and follow the requirements shown on the Standard Details.
- b. The overflow/orifice assembly shall not impede access or maintenance and operation.

4.4 WATER QUALITY

Storm drainage quality treatment measures are required to remove sediment and pollutants from storm runoff prior to discharging into the downstream facilities. Storm drainage quality treatment may be achieved by a variety of different methods. These include, but are not limited to, wetponds, wetvaults, bioswales, oil/water separators, and various emerging technologies.

TREATMENT METHOD	APPROVED FOR USE WITHIN:	
	PUBLIC	PRIVATE
Bio-Infiltration Swale	X	X
Infiltration	X	X
Sand Filters		X
Biofiltration Swales	X	X
Filter Strips	X	X
Basic Wetpond	X	X
Wetvault	X	X
Stormwater Treatment Wetland	X	X
Combined Detention and Wetpool Facilities	X	X
Bioretention / rain garden	X	X
"StormFilter" with ZPG Media*	X	X

* When all other options above can be shown to be un-workable this method may be employed by special permission of the City Engineer.

Storm drainage quality treatment general requirements are as follows:

1. All systems shall, at a minimum, provide water quality treatment for a volume of stormwater discharged during the 6-month 24-hour post-development storm event. For ease of calculation, this may be assumed to be 72% of the 2-year 24-hour post development storm event.
2. Storm drainage discharge requires quality control pre-treatment via an approved method prior to discharge into downstream systems or groundwater.
3. Water quality systems shall be designed for simplicity and ease of maintenance.
4. Treatment systems shall be designed such that storm drainage from public streets does not discharge into areas of private ownership or private maintenance responsibility.

4.4.01 WETPONDS

A wetpond may be used when space is unavailable for aboveground treatment. The primary design factor that determines the removal efficiency of a wetpond is the volume of the wetpool. Larger volumes in the wetpool create a higher potential for pollutant removal. Performance is also improved by avoiding dead zones like corners where little circulation occurs, using large length-to-width ratios, dissipating energy at the inlet, and ensuring that flow rates are uniform to the extent possible and not increased between cells. Other design considerations include those for safety, maintenance, and detention sizing.

The following criteria shall be incorporated when designing wetponds:

1. The wetpool volume for the wetpond shall be equal to or greater than the total developed volume of runoff from the 6-month 24-hour storm event.
2. The surface area the wetpond at the water quality design water surface must be at least equal to 1% of the impervious area of the drainage basin.
3. The wetpool portion of the pond shall be a minimum of 3' depth with an additional 1' of sediment storage provided in the first cell.
4. Wetponds should be designed as flow-through systems with the distance between the inlet and outlet maximized. A flow length-to-width ratio greater than 3:1 is required.
5. An access road shall be provided to the wetpond. The access road shall be a minimum of 15' wide. Access shall be provided to the outlet control structure and any additional significant drainage system components.

6. Wetponds shall be designed to eliminate the infiltration of untreated stormwater.

4.4.02 WETVAULTS

As with wetponds, the primary design consideration that determines the removal efficiency of a wetvault is the volume of the wetpool. Larger volumes in the wetpool create a higher potential for pollutant removal. Other impacts to the design factors include those for safety, maintenance, and detention sizing.

The following criteria shall be incorporated when designing wetvaults:

1. The wetpool volume for the wetvault shall be equal to or greater than the total volume of runoff from the 6-month 24-hour storm event.
2. The surface area of the wetvault at the water quality design water surface must be at least equal to 1% of the impervious area of the drainage basin.
3. The inlet and outlet should be designed to obtain the maximum flowpath.
4. The sediment storage in the first cell shall be an average of 1' minimum.
5. The wetpool portion of the vault shall be a minimum of 3' depth measured from the bottom of the sidewall.
6. For wetvaults in which the surface area of the second cell is greater than 1,250 square feet, 4% of the surface area over the second cell should be grated for ventilation.
7. Vaults should be designed as flow-through systems with the distance between the inlet and outlet maximized as much as possible. A flow length-to-width ratio greater than 3:1 is required.
8. The vault shall be separated into two (2) cells by a wall. The wall shall extend from the vault floor to the water quality design surface elevation.
9. The two (2) cells of a detention vault should not be divided into additional subcells by internal walls. If internal structural support is needed, it is preferred that column construction be used to support the vault lid rather than walls.

4.4.03 BIOSWALES

Sites under five acres may use bioswales, or larger sites when they are used to supplement other approved forms of storm drainage quality treatment.

Bioswale design shall use the following criteria:

1. Bioswales shall be at least 100' in length. Swale lengths shall be adjusted to achieve a minimum hydraulic residence time of nine (9) minutes for design storm flows. Roof runoff may bypass the bioswale. The bioswale may not be used for detention/retention storage. In areas where the stormwater can infiltrate, liners or impermeable material will be required.
2. Bioswales shall be sized to treat the volume of the 2-year 24-hour post-development design storm. Flows greater than the 2-year 24-hour post-development storm must bypass the swale unless it can be shown that velocities will be less than one foot per second (1 fps) or less. Sites of less than 10,000 square feet of impervious area are not required to by-pass flows.
3. Bioswales shall be designed to be a minimum of 1' above the seasonal high ground water elevation.
4. Bioswales should be designed at a slope of 2%-4%. A deviation for slopes less than 2% will be required and must be planted with wetland vegetation. Sudden gradient drops may be provided to maintain a maximum of 4% slope so long as to not impede maintenance or introduce erosion potential.
5. Bioswales shall be designed using a Manning's runoff coefficient "n" = 0.20.
6. Side slopes shall be no steeper than three horizontal to one vertical (3H:1V) in the treatment area. Side slopes above the treatment area shall be no steeper than two horizontal to one vertical (2H:1V). Vertical walls may be used on a maximum of three (3) sides, provided proper access is provided for maintenance and safety issues.
7. The design flow depth shall be 3" or less.
8. Determine the required base width using Manning's Equation. A minimum of 2' width is required for a 100' bioswale. Maximum velocity during design flow shall not be greater than one foot per second (1 fps) for design storm flows.
9. A minimum of 10' shall be provided between the outside edge of the bioswale and any property line or obstruction that would impede maintenance. Landscaping for storm drainage quality treatment facilities require irrigation to prevent plants and sod from dying during times of limited precipitation. When irrigation is not available to water bioswales during construction, seeding or hydroseeding may be done only between March 1 and May 1 and between September 1 and October 15, unless other watering provisions are established.

10. Permanent level spreaders or other devices shall be used every 50' to redistribute the flows to avoid channeling in the bio-swale. Construction materials are limited to concrete.

4.4.04 OIL/WATER SEPARATORS

Oil separation facilities are to be used in pre-treating storm drainage flows from fuel islands and wash pads where heavy concentrations of oil may occur, and floor drains prior to discharging into the sanitary sewer system. Each installation must be designed for the specific oil component and flow rate receiving treatment.

The following criteria shall be used in the design of oil separation facilities:

1. Wash pads intended for washing the exterior surfaces of vehicles shall drain to a Type 2 Catch Basin with a down turned 90-degree elbow prior to discharge to the sanitary sewer.
2. A forebay to collect floatable and the larger settleable solids.
3. An afterbay in which absorbent pillows or similar materials are placed. Used absorbent pillows shall be properly disposed of.
4. An inspection T inside the first chamber at the inflow pipe and a sample T at the outflow pipe.
5. Access to the separator shall be maintained free for inspection at all times.
6. A maximum of two hundred square foot (200 SF) area open to rainfall may discharge to the separator.
7. If a pump mechanism is required to convey the discharge from the site to the sanitary sewer system, the pump must be designed for discharge to a controlled gravity outlet flow into the City system.
8. The separator shall have a valve on the discharge pipe that can be closed during cleaning and in the event of a spill.
9. All piping entering and leaving the separator must be 6" minimum diameter.
10. Access points in the top of the vault must be provided to allow a minimum 12" diameter access for observation and maintenance to all chambers of the separator.
11. Access doors as applicable, should be galvanized spring-assisted diamond plate with a penta-head bolt-locking latch and recessed lift handle.

12. Doors must open a full one hundred and eighty degrees (180°).

4.4.05 MEDIA FILTER DRAINS

Media filter drains shall be incorporated into the design of the storm drainage system where applicable. Media filter drains shall be designed as outlined in Chapter 5 of the WSDOT Highway Runoff Manual (June 2008).

4.4.06 EMERGING TECHNOLOGIES

The City may allow the use of emerging technologies (i.e Vertechnics Systems, Stormcepters and Stormwater Management Storm Filter Systems) for storm drainage quality treatment with prior approval by the City Engineer. Consideration will be given to systems with a proven track record that have received WSDOT and/or Department of Ecology approval.

At a minimum, emerging technology systems must provide the following:

1. Provide storm drainage quality treatment for the maximum flow from the 2-year 24-hour post-development storm event.
2. Remove a minimum of 80% of the total suspended solids (TSS) from the site stormwater.
3. Designed, where applicable, to remove a minimum of 50% of all heavy metals, phosphorus, and/or oils from the site stormwater.
4. Allow for reasonable and practical maintenance and operation.

4.5 CONVEYANCE SYSTEM

4.5.01 PIPE

Storm drain pipe within a public right-of-way or easement shall be sized to carry the 100 year storm event maximum anticipated runoff from the possible contributing tributary area. The minimum main size shall be 12" diameter. Lateral line size shall be 8" minimum diameter. Runoff shall be computed and, if the flow require it, a larger pipe shall be used. Nothing shall preclude the City from requiring the installation of a larger sized main if the City determines a larger size is needed to serve adjacent areas or for future service.

Storm drain gradients shall be such as to assure minimum flow velocity of 2.5 feet per second when flowing full.

All pipe for storm mains shall comply with one of the following types based on localized conditions:

Polyvinyl Chloride: PVC pipe shall conform to ASTM D 3034, SDR 35 or ASTM F 789 with joints and rubber gaskets conforming to ASTM D3212 and ASTM F4777.

Plain Concrete: Plain concrete pipe per WSDOT Standard Specifications.

Reinforced Concrete: Reinforced concrete pipe per WSDOT Standard Specifications.

Ductile Iron: Ductile iron pipe shall conform to AWWA C151 Class 50 and have a cement mortar lining conforming to AWWA C104. All pipes shall be joined using non-restrained joints which shall be rubber gaskets, push on type or mechanical joint, conforming to AWWA C111.

Polyethylene: PE smooth wall pipe per Advanced Drainage Systems (ADS) N-12 (bell and spigot), or City approved equal, constructed per WSDOT Standard Specifications.

All storm pipe shall be pressure tested and TV inspected at the developers expense prior to acceptance by the City.

4.5.02 CATCH BASINS & MANHOLES

Maximum catch basin spacing shall be 200' on road grades up to 3%, 300' when the road grade is 3% or greater, and 500' maximum on main storm drains between access structures, whether catch basins or manholes.

Catch basins shall be placed whenever the length of surface drainage exceeds 300' on road grade, extending either direction from crest or sag on vertical curves. Vaned grates shall be employed on street grades exceeding 6% slope.

All new catch basins added to the City of Black Diamond drainage system or to private drainage systems must be stapled with "DUMP NO WASTE – DRAINS TO LAKE". Also, any existing catch basins located in the frontage of a property being developed must be stenciled.

The stencil must be placed on the street side of the catch basin grate, not on the curb. A white traffic zone latex paint shall be utilized. The area to be painted shall be cleaned with a wire brush so that the surface is free of dirt. Application of the stencil shall be in accordance with DOE requirements.

4.5.03 MAINTENANCE ACCESS ROADS

All maintenance access roads shall be constructed within a provided easement and shall be designed for heavy equipment. Roads shall be constructed with material meeting the Washington State Standard Construction Specifications for quarry rock.

4.6 STORM METHODS OF CONSTRUCTION**4.6.01 GENERAL CONSTRUCTION REQUIREMENTS**

The improvements shall be constructed as shown on the plans and in accordance with these Standards, Standard Details, and Standard Specifications. Manufacturer's equipment shall be installed in compliance with specifications of the manufacturer, except where a higher quality of workmanship is required by the plans and specifications. All materials and work shall be in strict accordance with any applicable regulations of the State, County and local authorities. The Contractor shall arrange for such inspection by these agencies as may be required and shall submit evidence of their approval, if requested by the Engineer.

The plans may show the approximate locations of various existing utilities known to the engineer, such as gas lines, water mains, sanitary sewers, power lines, telephone lines, television cables, and other obstructions based on information obtained from various sources. This information is not guaranteed to be accurate, and the Contractor is directed to check for interferences and obstructions by inquiry from the different utilities and by underground exploration ahead of his regular excavation.

The Contractor shall request field locates and notify the owners of underground facilities about the scheduled commencement of excavation through a one-call number: **(1-800-424-5555).**

Notice shall be made to owners of underground utilities not less than two (2) business days or more than ten (10) business days prior to scheduled date of commencement of excavation.

The Contractor shall excavate around and under service pipes with special care and shall support and maintain them in service. Where it is necessary to cut, move or reconnect any service lines, arrangements shall be made with the respective utility.

4.6.02 STAKING

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

All construction staking shall be inspected by the City prior to construction. Cut sheets shall be delivered to the City prior to the commencement of construction.

A preconstruction meeting shall be held with the City prior to commencing staking.

The minimum staking of the storm drainage system shall be as follows:

1. Stake centerline alignment every 25' with cuts and/or fills to the invert of the pipe or flow line of a ditch or swale
2. Stake location of all catch basins/manholes and other fixtures for grade and alignment
3. Stake location, size and depth of retention/detention facilities
4. Stake finished grade of catch basin/manhole rim elevation and invert elevations of all pipes in catch basins, manholes, and those that daylight

4.6.03 PIPE BEDDING

Pipe bedding for storm drain construction shall be in accordance with Section 3.3.08 of these Standards.

4.6.04 TRENCH BACKFILL

Trench backfill for storm drain construction shall be in accordance with Section 3.3.09 of these Standards.

4.6.05 PIPE LAYING

Pipe laying shall be in accordance with the manufacturer's recommendations.

Survey line and grade shall be established in a manner consistent with accepted practices.

Existing flows shall be diverted away from the pipe segment being worked on by method approved by the Engineer.

The pipe shall be lowered into the trench by means of ropes, tripod, crane or any other suitable means. The pipe shall not be dropped or handled roughly. The pipe shall be checked for cracks and defects prior to use and any defective pipe rejected.

Tees and other fittings shall be installed as shown on the Standard Details and at such locations as are shown on the plans or as otherwise directed by the Engineer. These items shall not be covered until the Engineer has recorded their exact location.

4.6.06 TESTING OF STORM DRAIN LINES

Method of testing storm drain lines shall be as follows unless otherwise specified herein or approved by the City prior to the start of construction. Testing is required of, and shall apply to both storm drain main and lateral installations.

4.6.06.1 DEFLECTION TEST FOR FLEXIBLE PIPE

Storm drain lines constructed of flexible pipe shall be deflection tested not less than 30 days after the trench backfill and compaction has been completed.

The test shall be conducted by pulling a solid pointed mandrel with a circular cross section with diameter equal to 95% of the inside pipe diameter through the completed pipeline. Minimum length of circular portion shall be equal to the diameter of the pipe. Pull shall be manual without mechanical assistance and the mandrel shall negotiate deflected section freely.

Testing shall be conducted on a manhole/catch basin to manhole/catch basin basis and shall be done after the line has been completely flushed out with water.

Contractor shall locate and repair any sections failing to pass the test and retest the section.

4.6.06.2 TELEVISION INSPECTION

The Developer shall provide the City with a videotape inspection of all storm drain lines prior to paving and/or final project acceptance.

If defects are found or suspected during the two year warranty period, the City shall also require that the Developer provide videotape inspection of any or all storm drain lines before expiration of the warranty.

The Contractor shall provide a television inspection of the installed storm drain system post construction acceptance between December 1st and February 28th before the end of the construction warranty period.

The Contractor shall correct all deficiencies and provide another television inspection to document the corrections.

4.6.06.3 AIR TESTING

The Contractor shall use a low-pressure air test. The following procedures shall be used on conducting the low-pressure air test. The Contractor shall furnish all facilities and personnel for conducting the test under the observation of the Engineer. The equipment and personnel shall be subject to the approval of the Engineer.

The Contractor shall make an air test prior to backfilling for his own purposes. However, the acceptance air test shall be made after backfilling has been completed and compacted.

All wyes, tees, or end of lateral sewer stubs shall be plugged with flexible joint caps, or acceptable alternate, securely fastened to withstand the internal test pressures. Such plugs or caps shall be readily removable and their removal shall provide a socket suitable for making a flexible jointed lateral connection or extension. No double plugs shall be allowed.

Immediately following the pipe cleaning, the pipe installation shall be tested with low-pressure air. Air shall be slowly supplied to the plugged pipe installation until the internal air pressure reaches 4.0 pounds per square inch greater than the average back pressure of any groundwater that may submerge the pipe. At least two minutes shall be allowed for temperature stabilization before proceeding further.

The requirements of this specification shall be considered satisfied if the time required in seconds for the pressure to decrease from 3.5 to 2.5 pounds per square inch greater than the average back pressure of any groundwater is equal to or greater than the required time as calculated below:

$$K = 0.0444d^2L$$

$$C = 0.0003918dL$$

If $C_T \leq 1$	then time = K_T
If $1 < C_T < 1.75$	then time = K_T / C_T
If $C_T \geq 1.75$	then time = $K_T / 1.75$

Where:

d = Pipe diameter (inches)

L = Pipe length (feet)

K = Value for each length of pipe of a specific diameter

C = Value for each length of pipe of a specific diameter

K_T = Sum of all K values

C_T = Sum of all C values

The use of air pressure for testing storm lines creates hazards that must be recognized. The Contractor shall be certain that all plugs are securely blocked to prevent blowouts. An air supply regulator shall be installed on the air supply line to the sewer that shall permit a maximum of 10 psi in the line to be tested. All pressure shall be relieved from the storm section being tested prior to removal of test plugs. No individuals shall be present in structures while the storm line tests are being conducted.

4.6.07 CLEARANCES / OTHER UTILITIES

Horizontal separation from other utilities shall be maintained in accordance with standard utility locations as shown in the Standard details. If the minimum vertical distance between utility pipes is less than 6" and such installation is approved by the City, a pad shall be placed between the pipes. The pad shall be O.D. x O.D. x 2.5" thick minimum or as required to protect the pipes. Above O.D. is equal to the outside diameter of the larger pipe. The pad shall be a polyethylene foam plank (Dow Plastics Ethafoam[™] 220), or approved equal. Additional measures may be necessary to ensure system integrity and shall be required as evaluated by the City on a case by case basis.

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CHAPTER 5

SANITARY SEWER

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CHAPTER 5 – SANITARY SEWER

5.1 SEWER PLANNING / DESIGN STANDARDS

5.1.01 GENERAL

These Standards set forth minimums for the planning, design, and construction of sanitary sewer collection facilities.

Chapter 13 of the Black Diamond City Code and the Black Diamond Wastewater Comprehensive Plan are the basis for these Standards.

These standards do not include design of special facilities, such as Pump Stations or Sewage Lift Stations. These special facilities require unique design requirements and will be subject to the standards set forth in the Washington State Department of Ecology (DOE) Criteria for Sewage Works Design Manual (Orange Book) and individual review by the City.

Although these standards are intended to apply to physical development within the City, the standards will not apply for all situations.

Compliance with these standards does not relieve the designer of the responsibility to apply conservative and sound professional judgment. These are minimum standards and are intended to assist, but not substitute for competent work by design professionals.

The City Engineer shall at his sole discretion due to special conditions and/or environmental constraints, require more stringent requirements than would normally be required under these standards.

5.1.02 PLANNING CRITERIA

5.1.02.1 SERVE TO EXTREME OF PROPERTY

Ensure adjacent properties can be provided sewer service (extend to extreme of property and design for the ultimate development of the tributary areas).

Sewer service shall be provided by a gravity system (unless approved by the City).

Approval of an alternative pressure system will be determined by the Public Works Director.

The City will not take ownership of the pumps, wet wells, alarms or improvements on private property.

5.1.02.2 DEMAND PROJECTIONS

Demand projections shall be per existing measured flows, Washington State Department of Ecology's Criteria for Sewage Works Design Manual (Orange Book), or as stated in the City of Black Diamond Comprehensive Sewer Plan.

5.1.02.3 SYSTEM PARAMETERS

- A. Sewer lines shall be designed on the basis of per capita flows for the design period in conjunction with a peaking factor.
- B. Designing for average daily flows may be based on per capital flows as included in Washington State Department of Ecology's Criteria for Sewage Works Design Manual (Orange Book). These flow values are assumed to cover normal infiltration, but an additional allowance should be made where conditions are unfavorable. Alternative methods for design flow calculations include use of water consumption records, actual measured flows, or other methods.
- C. Generally, sewer lines shall be designed to carry at least the peak hourly flow when operating at capacity. Peak hourly flow should be the design average daily flow in conjunction with a peaking factor. The peaking factor shall not be less than 2.5.
- D. Design flow calculations shall be provided to the City.
- E. No storm drainage connections (downspouts, foundation drains, sump pumps, etc.) shall be made to the sanitary sewer system.

5.1.03 SANITARY SEWER GENERAL PLAN NOTES

The following is a listing of General Notes that shall be incorporated on the sanitary sewer plans. All the notes on the list may not pertain to every project. The Engineer should include only those notes that are relevant to the project and shall omit non-

relevant notes. If additional notes are needed for specific aspects, they should be added after the General Notes.

Sanitary Sewer General Notes:

1. All work shall conform to City of Black Diamond Sanitary Sewer Standards and the Developer Extension Agreement.
2. All new manholes shall have a minimum inside diameter of 48" and shall conform to the Standard Details.
3. Sanitary sewer pipe shall be PVC conforming to ASTM-D3034 SDR 35 or Ductile Iron pipe (class 52), provided the ductile iron pipe is lined with epoxy, polyurethane, or SewperCoat, where required by the City Engineer. Bedding and backfill shall be as shown in the Standard Details.
4. Where shown as C900-PVC, the sewer pipe shall be pressure class 150 (DR 18) conforming to AWWA C900.
5. All lateral sewers shall be 6" diameter pipe at a minimum 2% slope.
6. Lateral sewer stations are referenced from nearest downstream manhole.
7. At a minimum, temporary lot corners must be set and side sewer locations verified in the field prior to construction.
8. All lateral sewer stubs shall be capped with a watertight plug. Plug location shall be marked with a 2" x 4" pressure treated wood stake, minimum 12' long, with one end buried at depth of the plug invert and extending at least 3' vertically out of the ground. The portion of stake above ground shall be painted white and marked with the word "SEWER" and the depth from pipe invert to ground surface. Connect pipe to stake with a 14-gauge wire at or above finished ground level.
9. The locations of all existing utilities shown hereon have been established by field survey or obtained from available records and should therefore be considered approximate only and not necessarily complete. It is the sole responsibility of the contractor to independently verify the accuracy of all utility locations shown, and to further discover and avoid any other utilities not shown hereon which may be affected by the implementation of this plan.
10. All testing and connections to existing mains shall be done in the presence of a representative of the City of Black Diamond. Side sewer pipelines shall be inspected by the City and the test witnessed by the City prior to backfilling the trench. If any work is backfilled or covered without approval or consent of the City, it must be uncovered for inspection.

11. All trenches shall be compacted and pavement installed prior to final testing and TV & video inspection of sewer lines for acceptance.
12. Lateral sewers shall be tested for acceptance at the same time the main sewer is tested.
13. Tops of manholes within public rights-of-way shall not be adjusted to final grade until just after paving.
14. All manholes in unpaved areas shall include a concrete seal around adjusting rings and shall be equipped with locking covers per the Standard Details. In paved areas the material around the manhole shall match the surrounding paving material
15. Manhole elevation shall be above the 100 year flood plain.
16. Contractor shall adjust all manhole rims to flush with final finished grades, unless otherwise shown.
17. All sewer main extensions must be "staked" by survey for "line and grade" and cut sheets provided to the Engineer, prior to starting construction.
18. All sewer mains in plats or developments must be located within public right-of-way or tracts.
19. Contractor shall install, at all connections to existing down stream manholes, plugs to prevent foreign materials from entering existing sanitary sewer system. Plugs shall remain in place throughout the duration of construction and shall be removed along with collected debris at the time of final inspection and in the presence of a representative of the City of Black Diamond.
20. Surface restoration of existing asphalt pavement shall be as required by these Standards or the Developers Extension Agreement.
21. Contractor shall maintain a minimum of 10' horizontal separation between all water and sewer lines. Any conflicts shall be reported to the City and the Engineer prior to construction.

22. It shall be the contractor's responsibility to ensure that no conflicts exist between sanitary sewer lines and proposed or existing utilities prior to construction.
23. Minimum cover over sewer mainline pipe shall be 4', unless otherwise approved by the City Engineer.
24. The Contractor shall use a vacuum street sweeper to remove dust and debris from pavement areas as directed by the Engineer. Care shall be taken to control fugitive dust. Flushing of streets shall not be permitted.
25. Before commencement of trenching, the Contractor shall provide erosion control measures in accordance with these standards and the Department of Ecology requirements.
26. Side sewer demolition shall be performed prior to removal of building foundation. The side sewer for each building shall be excavated and removed from the house connection to the edge of the public right-of-way, or main as directed by the City. The Contractor shall cap the end of the lateral sewer to remain in place as applicable. Side sewer demolition shall be performed in the presence of an authorized representative of the City of Black Diamond.
27. Avoid crossing water or sewer mains at highly acute angles. The measured acute angle between utilities should be 45 to 90 degrees.
28. At points where existing thrust blocking is found, minimum clearance between the concrete blocking and other buried utilities or structures shall be 5'.
29. Where new utility line crosses below an existing AC main, the AC pipe shall be replaced with DI pipe to 3' past each side of the trench as shown on the City Standard Details. Alternatively, where directed by the Engineer, the trench shall be backfilled with controlled density fill (CDF, aka flowable fill) from bottom of trench to bottom of the AC main.
30. Call 1-800-424-5555 48 hours before construction for utility locations.

5.1.04 GENERAL DESIGN STANDARDS

- A. All lengths and dimensions shall be horizontal distances, no slope distances on plans.
- B. If working in existing streets, indicate type of pavement restoration required, or refer to these Standards or the Developers Extension Agreement.
- C. Dimension existing and new main locations from right-of-way centerline and/or property line, or label stations and offsets.
- D. Check with City to determine how surrounding development will affect design (e.g. serve to extreme of property if adjacent property has potential for future development).
- E. On plans show existing manholes or give reference distances to existing manholes near project including manhole number and invert/rim elevations.
- F. Check with City of Black Diamond for necessary permitting requirements.
- G. Manholes connected to lines being abandoned shall be re-channeled with 3,000 PSI cement concrete.
- H. All sewer system design shall be performed by a civil engineer licensed in the State of Washington.

5.1.05 MAIN LINES**5.1.05.1 MINIMUM PIPE SIZE**

Minimum main line pipe size shall be 8".

5.1.05.2 PIPE SLOPE

- A. All sewers shall be designed and constructed to give mean velocities of not less than 2.0 feet per second.
- B. Maximum main line slope shall not induce velocities greater than 10 feet per second under daily peak flows.
- C. The following table lists the minimum slopes that should be provided; however, slopes greater than those listed are desirable under low-flow conditions.

PIPE SIZE (IN.)	MINIMUM SLOPE* (FT PER 100 FT)
8	0.40
10	0.28
12	0.22
14	0.17
15	0.15
16	0.14
18	0.12
21	0.10
24	0.08
27	0.07
30	0.06
36	0.05
*Note: Minimum velocity of 2 ft/s shall be maintained at all times.	

- D. Pipe anchor blocks shall be placed at 20' on center where pipe slope exceeds 20%.
- E. Timber baffle/hill holders shall be required on unpaved slopes that exceed 20%; minimum spacing shall be 20' on center.

5.1.05.3 GROUNDWATER PROTECTION

The project design engineer must submit a geotechnical report prepared by an approved soils professional indicating the type of soil and wet-season groundwater conditions expected to be present in and around the sanitary sewer mainline trench.

If, based on the approved geotechnical report, it can be reasonably expected that the sewer main will encounter saturated groundwater conditions, the project design shall take measures to mitigate the potential for infiltration into the sewer trench. These measures shall include but are not limited to using butt-fused High-Density Polyethylene (HDPE) pipe and manholes as approved by the City Engineer.

5.1.05.4 PLAN VIEW

- A. List pipe length, size and material along side of pipe, e.g. 150 L.F.- 8" PVC.
- B. Pipe length is to be based on horizontal distance between centers of manholes.

- C. Indicate direction of flow with arrows on end of pipe entering manhole.

5.1.05.5 PROFILE VIEW

- A. List pipe length, size, material and slope to 4 decimal places (ft per ft), e.g. 150 L.F. - 8" PVC 0.0125 FT/FT. Pipe material shall be listed on the pipe profile.
- B. Slope is based on I.E. OUT of upstream manhole, I.E. INTO downstream manhole and horizontal distance between centers of manholes.

5.1.06 MANHOLES

- A. Maximum distance between manholes shall be 400'.
- B. All manhole covers shall be set flush with ground surface, except where otherwise designated by the City. Manholes in unpaved areas, in easements, shall have bolt-locking, watertight covers and Portland concrete cement collars. All manholes in paved areas and sidewalks shall have standard, non-bolt locking covers.
- C. Manholes shall not be placed in areas subject to surface inundation such as pavement depressions and gutters. All manholes, including cover, shall be designed for a watertight system. Buoyancy of the watertight manhole, including access system, shall be accounted for in the design. For manholes located in paved roadways, parking lots, or other areas that become subject to stormwater surface flow due to re-grading, the manhole shall be retrofitted with a watertight locking lid and frame system to prevent inflow. Any connection to an existing manhole shall require same to be brought up to current City standards.
- D. All manholes shall be completely watertight from the top of the casting down. Manholes adjacent to and within a zone of influence from an infiltration facility or other groundwater source shall be High-Density Polyethylene (HDPE). Buoyancy of HDPE manholes shall be accounted for in the design.
- Manhole materials and construction shall be in accordance with WSDOT Standard Specifications except as modified in the City Standard Details.
 - Precast concrete manhole sections shall be joined with either rubber or flexible plastic gaskets and outside joints sealed with non-shrink grout.
 - All lifting holes shall be completely filled with non-shrink grout.
 - Typical pipe penetrations through precast concrete sections shall be either factory knockouts or core drilled (not line drilled or rough broken) cutouts.

- Pipe shall enter the manhole through a rubber gasketed entry coupling (Kor-N-Seal boot) specifically designed for a flexible, watertight connection cast into the manhole section.
 - Where a new manhole is built around an existing sewer main, the manhole shall be designed by a Washington State Licensed P.E. and be of sufficient diameter to provide a watertight connection between the manhole and the wall of the existing pipe.
- E. Concrete Perimeter seals shall be provided around all manhole adjustment sections in easement areas:
- Paved areas- asphalt concrete per Standard Detail.
- Unpaved areas- cement concrete per Standard Detail.
- F. Existing and Terminal Manholes:
- When connecting to an existing manhole, all requirements of these Engineering Standards must be met. The design shall call out all necessary revisions to the existing manhole, or if the existing manhole cannot be renovated to meet the standards, the manhole shall be removed and replaced with a conforming structure.
- When there is a potential for future main line extension from terminal manhole, any lateral sewers that are connected directly to the terminal manhole shall be placed in locations that avoid conflict with potential future mainline extensions from the manhole.
- Existing concrete manholes tapped for a force main connection shall have the interior of the manhole lined with a protective coating as approved by the City Engineer.
- G. Where lateral sewers connect to manhole, the crown of lateral sewer shall be equal to or above main sewer crown.
- H. Drop in invert elevation across manhole shall be from 0.1' to 0.2'. Maximum allowable drop in invert elevation across the manhole shall be 1.0'.
- I. Minimum Manhole Sizing
- 48" manhole
 1. 2 connecting pipes, 8" diam. to 12" diam.
 2. 3 connecting pipes, 8" diam. to 10" diam.
 - 54" manhole

1. 2 connecting pipes, 15" diam. to 21" diam.
2. 3 connecting pipes, 10" diam. to 15" diam.
3. 4 connecting pipes, 8" diam. to 12" diam.

72" manhole

1. 2 connecting pipes, 21" diam. to 24" diam.
2. 3 connecting pipes, 15" diam.
3. 4 connecting pipes, 15" diam.

For other pipe configurations, the size of the manhole will be investigated on a case by case basis.

The minimum angle between the incoming and the outgoing pipe shall be 90-degrees; pipe shall be radial with the center of manhole.

The above configurations shall provide adequate shelves and room for maintenance and performing video inspections.

- J. Channels shall be centered in manhole.
- K. Ladder rungs shall be placed on side of manhole with largest shelf.
- L. Manhole depths:

MANHOLE SIZE	PIPE SIZE	DEPTH OF MANHOLE	COMMENTS
48"	6" (Existing)	4.0' Min – 12' Max.	"Standard Shallow Manhole" per Standard Detail
	8"	4.0' Min. - 12' Max	
	10" – 12"	4.0' Min – 12' Max	
54"	8"	4.0' Min – 15' Max	"Standard Shallow Manhole" per Standard Detail
	10"-12"	4.0' Min – 15' Max	
	15"-21"	4.5' Min – 15' Max	
72"	15"	8.0' Min – 25' Max	Flat-top manhole, 2 access lids (one over each major pipe entrance/exit
	18"-24"	8.5' Min – 25' Max	
	27"	9.0' Min – 25' Max	

- 72" manholes over 11.5' in depth shall include 48" reducing section (WSDOT Type 2 Manhole).
- Increased manhole size may be required based on number and size of entering pipes.
- Manholes deeper than 20' will require special design to deal with confined space issues, structural issues and safety.

- M. Glass fiber supported plastic or PVC-hard lined manhole channels shall be installed at contractor's option, or as required by the City.
- N. Where there are corrosion risks HDPE manholes will be required.

5.1.07 PIPE CLASS PROTECTION - COVER

- A. PolyVinyl Chloride (PVC) pipe class designation:
All sewer pipe shall be SDR 35 PVC conforming to ASTM D3034, unless otherwise determined or approved by the City.

Depth of cover over SDR 35 PVC pipe shall be 4' minimum and 15' maximum. Pipe depths outside this range will require use of pressure class PVC conforming to AWWA C900 (dimension ratio 18 or less) or approved equivalent.

- B. PVC pipe shall be encased in a steel or ductile iron casing when crossing under improvements where the ability to remove and replace pipe without disturbance to the improvement is needed. Casings are required when:

- Crossing under rockeries over 5' high.
- Crossing under retaining wall footings over 5' wide.
- Crossing under reinforced earth retaining walls (both wall and reinforcing material).

Casings shall extend a minimum of 5' past each edge of the improvement, or a distance equal to the depth of pipe, whichever is greater. The carrier pipe shall be supported by casing spacers where casing length exceeds 10'.

Minimum clearance between bottom of rockery and top of pipe or casing shall be 2'. The trench shall be backfilled with crushed rock when clearance is less than 3'.

- C. Ductile iron pipe, class 52, shall be used only where required by the City.
- D. Building setback requirements:

5' minimum from covered parking.

10' minimum from structures and retaining walls, or equal to depth of pipe, whichever is greater to edge of easement.

-20' minimum width easement shall be provided between buildings, on multi-family and commercial sites. An all-weather access roadway shall be provide for vactor-truck access.

When passing between any two buildings (residential or commercial, etc.) which are 25' apart or less, the easement width shall extend the full width between the buildings, and the depth of the sewer line shall not exceed 10'.

5.1.08 CLEARANCES – OTHER UTILITIES

- A. All clearances listed below are from edge-to-edge of each pipe.
- B. Water services and lateral sewers shall have at least 10' horizontal clearance.
- C. Check for crossing or parallel utilities. Maintain minimum vertical and horizontal clearances. Avoid crossing at highly acute angles (the angle measure between utilities should be between 45 and 90 degrees).

- D. Horizontal clearances from sanitary sewer:

Cable TV	5'
Gas	5'
Power	10'
Storm	5'
Telephone, Fiber Optic	10'
Water	10'

- E. Vertical clearances from sanitary sewer:

Cable TV	1'
Gas	1'
Power	1'
Storm	1'
Telephone, Fiber Optic	1'
Water	1.5'

- F. Where sewer crosses above or below watermain, one full length of sewer pipe shall be used with the pipes centered for maximum joint separation. Washington Department of Ecology criteria will also apply.
- G. Send letter and preliminary plan to existing utilities to inform them of new construction. Request as-built information and incorporate into plans. At minimum the following utilities should be contacted:

Cable television
Natural gas
Power
Storm drainage

Telephone, Fiber Optic
Water

5.1.09 CONNECTIONS TO EXISTING SYSTEM

- A. New sewer mains (8" and larger) shall connect to existing sewer main at existing manholes, or with new manhole on existing sewer per Standard Detail.
- B. When connecting to existing manhole, core-drill opening for pipe and re-channel manhole base. Use Kor-n-Seal connector. Update existing manhole to current standards as necessary.
- C. Where new main is larger in diameter than existing downstream main, check that capacity of existing main is not exceeded by flow from new main.
- D. When connecting to an existing manhole, check that requirements of this section regarding manholes are satisfied, and/or replace manhole as directed by the City.
- E. If connecting to existing manhole which has access less than 24" in diameter and/or concentric cone (manholes over 5' deep), manhole shall be upgraded to include new 24" ring and cover and/or eccentric cone.
- F. If connection to existing manhole places a channel directly under access opening, move ladder and rotate cone section to place access over concrete shelf.

- G. Connections to end of existing pipe:

If end of pipe is known to have a bell, and new pipe is same material as existing, plans can specify connection by inserting spigot of new pipe into existing bell end, with "donut" gasket.

If existing line is plain end, or must be cut, plans shall specify use of a coupling to connect new and existing lines.

- H. Approved couplings for use on sewer mains include:

Ductile iron mechanical couplings (equal to ROMAC) on ductile iron, concrete, vitrified clay, or pipes with differing materials or diameters.

On PVC or PE mains, PVC or PE couplings with compatible dimension ratio and gaskets to connect new and existing pipes shall be used.

Where a section of existing PVC pipe is replaced by "dropping-in" a new section of PVC pipe, the connections to existing pipe shall be made with PVC closure couplings (repair couplings).

5.1.10 FATS, OILS, GREASE SEPARATION

5.1.10.1 Oil/Water Separator

Whenever a use generates mineral/petroleum oils exceeding 100 milligrams per liter to be discharged to the sanitary sewer, pre-treatment is required. An oil/water separation device shall be installed by the property owner as specified in the Standard Details. Selection and sizing of an oil/water separator shall be subject to approval of the City. Water discharged from any oil/water separator to the sanitary sewer system shall not contain in excess of 100 milligrams per liter of petroleum oil, non-biodegradable cutting oil or mineral products, and shall be in compliance with the City of Black Diamond and King County Wastewater Treatment Division regulations for discharge to the sanitary sewer.

- A. Sizing of a separator facility shall be based upon maximum available flow to the separator and provision of a 45 minute retention time in the separator at that flow, with a minimum capacity of at least 100 gallons.
- B. The oil/water separator shall be covered with removable sections. Access and inspection covers, weighing not more than 30 lbs. and with suitable hand holds, are to be provided directly above inspection "tee" and oil/grit collection compartments.
- C. Only wastewater from floor drains and covered parking areas shall drain to the separator. The location and design shall minimize or eliminate the possibility of storm water reaching the separator. Areas over 200 square feet open to rainfall or other stormwater runoff shall not drain to the separator. Sewage from restrooms and shower facilities shall not drain to the separator. No stormwater runoff shall be connected to the sanitary sewer. See Standard Detail.
- D. Allowable materials for construction are as follows:
 - Tank - concrete
 - Baffles - concrete, steel plate
- E. The separator shall be located within 20' of drive and be accessible by maintenance vehicles.

- F. A sampling tee shall be located on the outlet with a minimum 18" drop below the invert. Access to the separator shall be maintained free for inspection and compliance determination sampling at all times.
- G. The effluent discharged from any oil/water separator to the sanitary sewer shall not exceed 100 parts per million total oil.
- H. When pre-treatment is no longer required, the inlet and outlet pipes shall be permanently plugged, the separation chambers pumped out, and the vault removed, or filled with compacted crushed rock or controlled density fill.

5.1.10.2 GREASE INTERCEPTOR

All food preparation establishments that cook meat are required to install a grease interception device. Additionally, the City may require use of a grease interceptor for other uses, regardless of size and type, that generate animal/vegetable fats, oils or grease (F.O.G.) waste, or cause a visible sheen or accumulations in the effluent. A grease interception device as specified by City of Black Diamond Standard Details, and/or other biological, chemical, or other pretreatment approved by the City, shall be installed by the owner. Effluent discharged from any grease interceptor shall not contain a visible sheen or accumulations of F.O.G., and shall be in compliance with the City of Black Diamond and the King County Wastewater Treatment Division regulations for discharge to the sanitary sewer.

- A. Size and design of the grease interceptor shall conform to the International Plumbing Code, standards, and shall be subject to approval by the City. Minimum capacity shall be 1,000 gallons except as noted in these regulations or the City's Standard Details.
- B. Fixtures in the kitchen area which discharge wastewater containing grease are to be connected to the grease interceptor. Such fixtures include dishwashers, pot sinks, range woks, janitor's sink, floor sinks, rotoclones. Toilets, urinals, and wash basins shall not flow through the interceptor.
- C. The interceptor shall be located outside the building within 20' of drive and be accessible by maintenance vehicles.
- D. The interceptor shall be filled with clean water prior to start-up of system.
- E. Allowable materials for construction are as follows:

- Tank - concrete

- Baffles - concrete, plastic

- F. Access to the interceptor shall be maintained free for inspection and compliance determination sampling at all times.
- G. When pre-treatment is no longer required, the inlet and outlet pipes shall be permanently plugged, the separation chambers pumped out, and the vault removed, or filled with compacted crushed rock or controlled density fill.

5.1.11 EASEMENTS

- A. Show easements on all plans and identify width.
- B. Show easements on all private property. If easement is defined as a constant width on each side of sewer main, then show a segment of the easement and label as typical (typ).
- C. All easements shall be a minimum of 15' in width, or twice the depth of pipe, whichever is greater. Locate sewer main 10' from edge of easement facing interior of lot, to ensure setback from building.
- D. All easements that contain sewer manholes must have an all-weather access roadway to the manhole locations. The all-weather access must be constructed to support a vactor-truck.
- E. See Section 5.1.07 Building Setback Requirements.

5.1.12 LATERAL AND SIDE SEWERS

- A. Lateral sewer shall extend from main line to 10' past edge of right-of-way. 6" pipe shall be used inside the public right-of-way (unless expected flows require larger size line).
- B. 4" minimum pipe shall be used inside private property, for residential side sewers for a single connection contained within the lot.

Commercial side sewers shall be a minimum 6" pipe.

For multi-family developments, a separate side sewer must serve each separate building. For those buildings serving over two units, side sewers must connect to a manhole and shall be sized to serve 50% flow capacity at a 2% slope (8" minimum diameter).

- C. Lateral sewer shall have minimum 5' of cover at property line, or as needed to serve the property. Greater depths shall be required where elevation of lowest floor to be served is lower than surface elevation at property line. Ensure that stub can serve all property by gravity flow.
- D. Lateral sewers shall connect to main sewers with a tee rather than a wye, unless otherwise approved by the City. Lateral sewers shall run perpendicular to the sewer main, in the right-of-way. On plan, indicate station of lateral sewer tee from nearest downstream manhole. Also indicate length of lateral sewer from main to plug at end of line. Call out invert at plugged-end of stub.
- E. Minimum lateral sewer slope shall be 2%. Maximum slope shall be 100%.
- F. All side sewer clean-outs on commercial and multi-family projects shall include at-grade access with covers per the Standard Detail.
- G. Side sewer cleanouts shall be installed at all locations where the side sewer pipe has a change in alignment of 90-degrees or greater.
- H. Maximum distance between side sewer clean-outs shall be 100'.

5.2 SEWER MATERIALS

5.2.01 GENERAL

All materials shall be new and undamaged. The same manufacturer of each item shall be used throughout the work.

Where reference is made to other specifications, it shall be the latest revision at the time of construction, or as noted on the plans or herein.

All materials not specifically referenced shall comply with applicable sections of ASTM, AWWA or the WSDOT Standard Specifications.

Approved manufacturers and model numbers of various materials are listed in Approved Materials List. When specific manufacturers or models are listed, no substitutions will be allowed without prior approval by the City.

5.2.02 GRAVITY SEWER PIPE & FITTINGS

Depth of cover over SDR 35 PVC pipe shall be 4' minimum and 15' maximum. Pipe depths outside this range will require use of pressure class PVC conforming to AWWA

C900 (dimension ratio 18 or less) or approved equivalent. Ductile iron pipe is allowable only with approval by the City.

4" to 15" Diameter P.V.C. Pipe:

All P.V.C pipe and fittings shall be integral wall bell and spigot, rubber gasket joint, unplasticized PolyVinyl chloride (P.V.C.) pipe. All P.V.C. pipe shall have a minimum "pipe stiffness" of 46 psi at 5% deflection at 73° F when tested in accordance with ASTM Designation D2412, external loading properties of plastic pipe; and a minimum impact strength based on ASTM D3034 at 73° F using a 20 pound Tup A.

All P.V.C. sewer pipe and fittings manufacture and installation shall meet or exceed the ASTM recommended specifications D3034, SDR 35, unless otherwise specified, and all installation shall be in strict compliance with the manufacturer's directions. All pipe shall be clearly marked with the date of manufacture. All pipe shall be provided with a reference mark for proper spigot insertion. Joint gaskets shall be fabricated from a compound of which the basic polymer shall be a synthetic rubber consisting of styrene, butadiene, polyisoprene or any combination thereof and shall meet the requirements of ASTM D-3212.

18" to 27" Diameter P.V.C. Pipe:

All P.V.C. pipe and fittings shall be integral wall bell and spigot, rubber gasket joint, unplasticized PolyVinyl chloride (P.V.C.) pipe. All P.V.C. pipe shall have a minimum "pipe stiffness" of 46 psi at 5% deflection at 73° F when tested in accordance with ASTM Designation D2412, external loading properties of plastic pipe; and a minimum impact strength based on ASTM F679 at 73° F using a 30-pound or 20-pound Tup B.

All P.V.C. sewer pipe and fittings manufacture and installation shall meet or exceed the ASTM recommended specifications F679 for thickness class T-1, unless otherwise specified, and all installations shall be in strict compliance with the manufacturer's directions. All pipe shall be clearly marked with the date of manufacture. There shall be no reduction in pipe wall thickness at the bell as a result of bell formation. All pipe shall be provided with a reference mark for proper spigot insertion. Joint gaskets shall be fabricated from a compound of which the basic polymer shall be a synthetic rubber consisting of styrene, butadiene, polyisoprene or any combination thereof and shall meet the requirements of ASTM D-3212.

AWWA C900 P.V.C. Pipe:

Where indicated on the plans, gravity sewer pipe shall be manufactured in accordance with AWWA Standard C900, with the following additional requirements or exceptions.

4" through 12" nominal diameter P.V.C. pipe shall be furnished in cast iron pipe equivalent outside diameters.

C900 P.V.C. pipe shall be pressure class 150 (DR 18) unless otherwise called for in the plan. Pipe joints shall be manufactured using an integral bell with an elastomeric gasket push-on type joint. Elastomeric gaskets shall conform to ASTM F477. All fittings shall be PVC, compatible with C900 PVC pipe class called for in the plan, unless otherwise approved. PVC fittings shall conform to AWWA C900 with respect to joint dimensions and physical properties.

5.2.03 PRESSURE SEWER PIPE

P.V.C. pressure pipe shall conform to AWWA C900 pressure class 100 (DR 25) unless otherwise called for in the plan. Joints shall be made up as recommended by the pipe manufacturer for pressure pipe. For pipe diameters under 2" HDPE shall be used.

PVC fittings compatible with AWWA C900 pipe, or ductile iron fittings, when allowed, shall conform to these specifications.

5.2.04 FITTINGS

All fittings shall be of the same material as the pipe unless otherwise specified. For lateral sewers, a tee shall be installed in pipelines 8" or larger.

For lateral sewer connections to existing sewer lines, a flexible metallic side sewer saddle shall be used for hole-cuts. If any other type of fitting is required, the type and make shall be specified on the plans.

5.2.05 PLUGS

All open ends shall be sealed with a plug or material and gasket material approved by the City. The plug shall be able to withstand all test pressures without leakage.

5.2.06 BOLTS IN PIPING

Bolts shall be malleable iron, Cor-ten, or stainless steel.

Bolts and nuts for flanged pipe and fittings shall conform in size and length with ANSI/AWWA C115/A21.15. T-bolts shall be malleable iron Cor-ten in accordance with ANSI/AWWA C111/A21.11. Stainless steel bolts shall meet the requirements of ASTM A-307, Grade A. Shackle rods, nuts and washers shall be hot-dipped galvanized in accordance with AASHTO M 232 and coated thoroughly with asphaltic material.

Stainless steel nuts, bolts and washers shall be type 304.

5.2.07 FLANGE GASKETS

Gasket Material shall be neoprene, Buna N. chlorinated butyl, or cloth inserted rubber.

5.2.08 GATE VALVES

The minimum requirements for all gate valves, 2" to 12", shall, in design, material and workmanship, conform to the Standards of AWWA C509.

Buried gate valves shall be iron body, bronze mounted, resilient seat, non-rising stem, suitable for installation with the type and class of pipe being installed, ends to be as specified. Operating stems equipped with standard 2" operation nut, and O-ring stem seals. Valves not buried shall be as specified.

5.2.09 VALVE BOX

Valve Box shall be cast iron, two-piece, 8" or 18" slip type top section with flange located within 3" of top with 24" bottom section (and extension, if required), equal to RICH-Seattle Type. Valve box lid shall be cast iron, 3 " deep, with recessed lifting handle, and the word "SEWER" or "SS" cast into it.

Valve box paving risers shall be cast iron suitable for H-20 traffic loading. The riser shall have four lugs or a flange around the perimeter, and be sized to fit into a RICH-Seattle Type valve box top.

Valve box adjusting sleeves (for use in unimproved areas) shall be cast iron, 12" long.

All castings shall be coated with asphaltic varnish.

5.2.10 VALVE OPERATING NUT EXTENSION

Use where valves are installed more than 3' below finished grade. Extensions are to be a minimum of 1' with only one extension per valve.

5.2.11 MANHOLES

Manholes shall be precast concrete sections with a confined O-ring rubber gasket joints per ASTM C-478 and ASTM C-443 with either a precast base or a cast-in-place base made from a 3,000 psi structural concrete or HDPE.

Polypropylene safety steps shall be constructed from polypropylene, conforming to ASTM D-4101, injection molded around a 1/2" diameter grade 60 steel reinforcing bar conforming to ASTM A-615. The polypropylene step shall be either cast-in-place or

driven into pre-formed holes in the manhole wall. The step shall be capable of resisting pullout forces exceeding 1,500 pounds.

Steps and ladders dimensions shall conform to the Standard Detail. Steps shall project uniformly from the inside wall of the manhole. Steps shall be installed to form a continuous vertical ladder with rungs equally spaced at 12" centers. Steps in precast base shall be cast in place safety steps, or prefabricated galvanized hanging ladder per Standard Detail fabricated with #8 (1") reinforcing bar and #7 smooth steel bar conforming with ASTM A-615, Grade 40, galvanizing conforming with ASTM A-123.

Concrete adjustment rings shall conform to the ASTM C-32, Grade MA and the Standard Specifications.

Mortar used shall be composed of one part cement to two parts of plaster sand.

Outside drop structures shall be constructed with AWWA C900 pipe and fittings, DR 18.

As an alternate to steel reinforcement, 48" diameter x 3' high eccentric or concentric cone sections shall be reinforced with synthetic fiber. The synthetic fiber shall meet the requirement of ASTM C 1116 Type III. The synthetic fiber shall be added at a rate of 0.75 pounds per cubic yard of concrete and shall be thoroughly mixed with the concrete before placement in the forms. The synthetic fibers shall be a minimum of 0.75" and a maximum of 2" in length. A minimum of two (2) hoops of W2 wire shall be placed in the 48" end of each cone. No steel is required in the remainder of the cone.

5.2.12 MANHOLE RING & COVER

Ductile iron and cast iron rings and covers shall conform to the standard details and Section 9-05.15 of the standard specifications, as modified herein.

Casting shall be domestically produced and shall conform to the requirements of ASTM A-536, Grade 80-55-06 for ductile iron and ASTM A-30, Class 25 for cast iron, and shall be free of porosity, shrinkage cavities, cold shuts, or cracks, or any surface defects which would impair serviceability. Repair of defects by welding or by the use of smooth-on or similar material will not be permitted.

Manhole rings and covers shall be machine-finished and gasketed or ground-on seating surfaces so as to assure non-rocking fit in any position and interchangeability. At the request of the City, there shall be made available at the foundry standard rings and standard covers for use by inspectors in testing fit and seating.

When bolt-locking covers are required, the locking bolts shall be 5/8" - 11 NC stainless steel type 304 socket (Allen) head bolts, 2" long. In addition, the cover will be installed with a watertight gasket per the City Standard Details.

At the request of the Engineer, there shall be made available at the foundry a testing device suitable for proving the capacity of the assembly to resist an uplift pressure on the lid equal to 20' of head.

5.2.13 CONCRETE BEDDING & BLOCKING

Bedding, blocking, or encasement concrete shall be mixed from materials acceptable to the Engineer and shall have a 30-day compressive strength of not less than 2,500 psi. The mix shall contain five (5) sacks of cement per cubic yard and shall be of such consistency that the slump is between 1" and 5". All concrete shall be mechanically mixed.

5.2.14 OIL/WATER SEPARATOR

Oil/Water separator vaults shall be of precast concrete construction.

Cement concrete shall have a minimum 28-day compressive strength of 4500 pounds per square inch.

Deformed bars for steel reinforcement shall be in accordance with ASTM A615, grade 60. Welded-wire fabric reinforcement shall be in accordance with ASTM A185, grade 65. All interior piping shall be PVC sized to match side sewer line size. Baffles and weir shall be ½" thick steel plates galvanized in accordance with ASTM A123. Vault cover shall include one (1) 24" square diamond plate access door and two (2) 12" square diamond plate inspection covers centered over outlet tee and inlet. Cover shall be designed for AASHTO H-20 load. See the Standard Details for vault sizes and miscellaneous details.

5.2.15 GREASE INTERCEPTOR

Grease Interceptor Vaults shall be of precast concrete construction. Cement concrete shall have a minimum 28-day compressive strength of 4500 pounds per square inch.

Deformed bars for steel reinforcement shall be in accordance with ASTM A615, grade 60. Welded-wire fabric reinforcement shall be in accordance with ASTM A185, grade 65. All interior piping shall be PVC sized to match side sewer line size.

Interior baffle shall be precast reinforced concrete, 4" thick. Concrete baffle shall be secured in place by slotted vault walls or with stainless steel angles as shown in the Standard Detail.

Vault cover shall include 24" diameter bolt-locking manhole covers and frames located over inspection tees. Manhole covers shall not allow passage of air or gases. Vault

cover shall be designed for AASHTO H-20 load with 30% impact factor. See the Standard Details for vault sizes and miscellaneous details.

5.2.16 COMMERCIAL CLEAN-OUT WITH TEST SAMPLING TEE

Commercial clean-out and sampling tee shall consist of PVC pipe and fittings configured as shown in the Standard Detail. Clean-out access shall consist of a cast-iron material imbedded in class "C" concrete as shown in the Standard Detail. Sampling tee enclosure shall be a concrete meter box as specified in the Standard Detail.

5.2.17 BACKWATER VALVE

When it is determined there is a significant risk of backflow the City may require a Backwater check valve be installed on 4" to 8" diameter side sewers and which shall be rubber flapper swing type check valve. Flapper shall be constructed from steel reinforced rubber with 45-durometer standard rubber hardness. Valve seat shall be at 45-degree angle to direction of flow. Flow area through valve shall equal full pipe area. Valve body shall be cast iron with flanged ends and bolted over to allow removal of flapper without removing valve from line.

Backwater valve shall be housed in 48" diameter precast concrete valve chamber with concentric 48" by 24" concentric reducing cone, or concrete meter boxes, depending on depth. 24" frame and cover shall be marked "sewer".

5.2.18 STEEL CASING

Steel casing shall be black steel pipe conforming to ASTM A53.

Casing wall thickness shall be 0.250" for casings 24" or less in diameter and 0.375" for casings over 24" in diameter.

Carrier pipe for sewage shall be PVC, SDR 35.

5.2.19 CASING SPACER

Casing spacers shall be installed in casings over 10' long. Where casing spacers are not used, the carrier pipe shall be more than 10' in length (no pipe joints inside casing).

Casing spacer shell shall be manufactured in two pieces from heavy gauge T-304 stainless steel or 14 gauge hot rolled pickled steel joined with ribbed flanges. The shell shall be lined with a PVC liner 0.090" thick with 85-90 durometer.

Carbon steel casing spacer shell and risers shall be coated with a heat fused PolyVinyl chloride coating, or hot-dip galvanized.

PolyVinyl Chloride Coating Specifications:

Durometer - Shore A2 (10 Sec.) (ASTM D1706-61T)	-	80
Maximum operating temperature (constant)	-	150° (65°C)
Electrical properties (ASTM D149-61) (short time .010")	-	1380 V/Mil
Resistance:		
Salt spray (ASTM B117)	-	Excellent
Acids	-	Good
Alkalies	-	Good

All nuts and bolts shall be 18-8 stainless steel.

Runners shall be supported by risers made from heavy gauge T-304 stainless steel or 12 gauge hot rolled pickled steel.

Runners shall be ultra high molecular weight polymer with high resistance to abrasion and sliding wear.

TYPICAL DATA			
PROPERTY	ASTM METHOD	UNITS	VALUE
Specific Gravity	D-792	gm/cc	.934
Tensile Strength (Break)	D-638	PSI	3500
Elongation (Break)	D-638	%	380
Izod Impact	D-256	Ft.Lbs./in. of notch	No break
Hardness	D-2240	Shore D	67
Coefficient of Friction	D-1894	-	0.11 - 0.13
Heat Distortion Temp. 66 PSI	D-648	C	88
Coefficient of Thermal	D-696	F-1	5.5 x 10-5
ABRASION CHARACTERISTICS:			
Taber Abrasion	D-1044	Mg/loss	N
Sand Slurry *			7

* Sand slurry condition - 7 hours in one part sand/ one part water slurry at 1725 RPM.

Carbon steel - 100, Hifax - 15. The lower the value, the more resistant to abrasion.

Casing spacers shall be "center positioning" type. Height of risers and runners combined shall be sufficient to keep the carrier pipe bell, couplings, or fittings at least 0.75" from the casing pipe wall at all times and provide at least 1" clearance between runners and top of casing wall, to prevent jamming during installation.

5.2.20 NEOPRENE FOAM PAD

Where approved by the City, a neoprene foam pad shall be used for cushion between adjacent pipes which are not meeting minimum vertical clearance requirements. The approved material is the Dow Plastics Ethafoam™ 220, or an approved equal meeting the same ASTM requirements.

5.3 SEWER METHODS OF CONSTRUCTION

5.3.01 GENERAL CONSTRUCTION REQUIREMENTS

The improvements shall be constructed as shown on the plans and in accordance with these Standards, Standard Details, and Standard Specifications. Manufacturer's equipment shall be installed in compliance with specifications of the manufacturer, except where a higher quality of workmanship is required by the plans and specifications. All materials and work shall be in strict accordance with any applicable regulations of the State, County and local authorities. The Contractor shall arrange for such inspection by these agencies as may be required and shall submit evidence of their approval, if requested by the Engineer.

5.3.01.1 ALIGNMENT & STAKING

All work done under a Project shall be to the lines shown on the plans, or to approved revisions.

5.3.01.2 PRE CONSTRUCTION PHOTOS

Before commencing any construction work as described in the plans and specifications, the Contractor shall provide photographs of pre-existing conditions of the area that will be disturbed during construction operations.

Photographs will be obtained as follows:

1. Every 25' interval in easements.
2. Every 50' interval in paved areas.
3. And any other location as directed by the Engineer.

The photographs shall be developed in 5" x 7" color prints, contained in albums, catalogued, and cross-referenced.

5.3.01.3 INSPECTIONS & TESTS

- A. The City shall, at all times, have access to the work for the purpose of inspecting and testing, and the Contractor shall provide proper facilities for such access and such inspection and testing.
- B. If at any time a Contractor fails to correct deficiencies identified by the City in a reasonable time frame, the City shall suspend the construction permit until deficiencies are corrected and tested to the satisfaction of the City and liquidated damages shall be assessed against the contractor.
- C. At the preconstruction meeting with the contractor and owner representative, the contractor is responsible for providing the City with a sequence of construction for sewer mains, manholes, laterals, and side sewers that will allow portions of new construction to be hydrostatically tested or pressure tested per City requirements. The contractor will advise the City immediately if any changes in this sequencing arise during construction.
- D. The first section of pipe not less than 300' in length installed and no more than 2 manhole to manhole runs (complete with lateral sewer connections) shall be installed in order to qualify the crew and/or the material. A successful installation of this first section shall be a prerequisite to further pipe installation and required pressure test and written receipt of acceptance. If any work is backfilled or covered without approval or consent of the City, it must, if required by the City, be uncovered for inspection.
- E. Before a performance test is to be observed by the City the Contractor shall make whatever preliminary tests are necessary to assure that the material and/or equipment are in accordance with the plans and specifications.
- F. Written notice of deficiencies, adequately describing the same, shall be given to the Contractor upon completion of each inspection and the Contractor shall correct such deficiencies within seven days of the notice and before final

inspection will be made by the Engineer, unless otherwise approved.

5.3.02 TEMPORARY EROSION AND SEDIMENT CONTROL

The detrimental effects of erosion and sedimentation shall be minimized by conforming to the current DOE manual, these standards, and the following general principles:

1. Soil shall be exposed for the shortest possible time.
2. Reducing the velocity and controlling the flow of runoff
3. Detaining runoff on the site to trap sediment
4. Releasing runoff safely to downstream areas

In applying these principles, the Developer and/or Contractor shall provide for erosion control by conducting work in workable units; minimizing the disturbance to cover crop materials; providing mulch and/or temporary cover crops, sedimentation basins, and/or diversions in critical areas during construction; controlling and conveying runoff; and establishing permanent vegetation and installing erosion control structures as soon as possible.

5.3.03 GRADE ESTABLISHMENT

Sewer grades shall be established by means of laser beam or grade boards or other means approved by the Engineer. The grades shall be checked at periodic intervals as directed by the Engineer.

A plumb bob shall be used to check the line of the pipe. Both grade and line shall be checked for each length of pipe laid, except at tunnels or through jacked casings where adequate methods shall be used to carry forward the line and grade.

If the contractor chooses to use a laser beam the equipment and methods shall meet the approval of the engineer. Laser beam alignment and grade shall as a minimum be verified at a point 50' from the laser by use of a grade board.

The Contractor shall replace all monuments, right-of-way markers, property stakes, etc., that are removed or disturbed, to the satisfaction of the Engineer.

5.3.04 MANHOLE EXCAVATION

Excavation for precast manholes shall be sufficient to provide a minimum of 12" between the manhole and the side of the excavation. The excavation shall be kept free from water until jointing has been completed. Surface water shall be diverted so as not to enter the excavation. The contractor shall maintain sufficient dewatering equipment on the job to insure that these provisions are carried out.

5.3.05 PIPE LAYING

Pipe laying shall be in accordance with the following.

Each pipe shall be laid with bells up grade with the invert of the pipe to the alignment and grade shown on the plans. Care shall be exercised to ensure close concentric joints and a smooth invert. Open ends of pipe and fittings shall be temporarily plugged and covered when laying is not in progress.

Existing sewage flow shall be diverted away from the segment being worked on by method approved by the Engineer.

Adjustment to the line and grade shall be done by scraping away or filling in and tamping material under the body of the pipe. Adjustment to the line and grade by wedging and blocking shall not be permitted.

The pipe shall be lowered into the trench by means of ropes, tripod, crane or any other suitable means. The pipe shall not be dropped or handled roughly. The pipe shall be checked for cracks and defects prior to use and any defective pipe rejected.

Tees, wyes, and standing services shall be installed as shown on the Standard Details and at such locations as are shown on the plans or as otherwise directed by the Engineer. These items shall not be covered until the Engineer has recorded their exact location.

Pipe laying shall start from the lowest point unless otherwise approved by the Engineer.

Slip lining shall be performed as per recommended procedure by manufacturer, as per details and as approved by the Engineer.

5.3.06 ALIGNMENT TOLERANCE

The maximum tolerance from true line and grade shall be as follows:

Maximum deviation from established line and grade shall not be greater than 1/32" per inch of pipe diameter and not to exceed 1/2".

No adverse grade in any pipe length will be permitted.

The difference in deviation from true line and grade between any two successive joints shall not exceed 1/3 of the amounts specified above.

5.3.07 PIPE ZONE BEDDING AND BACKFILL

Pipe shall be placed on a prepared subgrade of imported material at least 6" deep below the barrel of the pipe and filled around the pipe as shown in the Standard Details. The imported material shall be 5/8" minus crushed rock in conformance with Section 9-03.4(2) of the 2008 WSDOT Standard Specifications, pea gravel may be used for bedding where ground water is not a problem. After preparation of the subgrade, bell holes shall be excavated so the pipe, when laid, will have a uniform bearing under the full length of the pipe. The Contractor shall be responsible for adequate support and bedding for the pipe. The trench shall be hand backfilled and compacted from the spring line of the pipe to 6" above the top of the pipe as shown in the Standard Detail. The material shall be placed and compacted to no less than 95 percent of the maximum theoretical density as measured by ASTM D-1557 prior to placement of the next layer.

Where the undisturbed trench below the bedding is unstable, the unstable materials shall be removed and backfilled with 5/8" minus crushed rock as necessary to produce a stable foundation upon which to place the bedding. The Contractor shall be responsible for providing a stable foundation for placing of the bedding.

Boulders, rocks, and other obstructions shall be entirely removed or cut out the full width of the trench and to a depth 6" below the pipe bottom and backfilled as provided above.

Whenever the trench is excavated below the depth required for proper bedding, it shall be backfilled with 5/8" minus crushed rock and compacted.

5.3.08 TRENCH BACKFILL

Compaction of backfill from the bottom of the trench to 6" above the top of the pipe shall be as specified in Section 5.3.06.

Backfilling and surface restoration shall closely follow installation of pipe so that not more than 100' are left exposed during construction hours without approval of the City. Backfill shall not be deposited in the trench in any manner which will damage or disturb the pipe or the initial backfill. Compaction of the backfill may be accomplished by mechanical tamper, by vibrating, rolling, jetting, or a combination of these methods, as approved by the City. The Contractor shall provide the services of a testing laboratory acceptable to the Engineer to perform in place density tests to show that the specified density has been obtained. The approval of the compaction method and the achievement of the specified density shall, in no way, relieve the Contractor of responsibility for all repairs caused by settlement of the backfill prior to acceptance and during the two-year period after acceptance of the project.

All trenching shall be backfilled with bank run gravel for trench backfill materials conforming to the WSDOT Standard Specifications Section 9-03.19, unless otherwise approved by the City. The City shall be the sole judge of approving materials to be

utilized for backfill. All backfill material shall be free from cinders, ashes, refuse, vegetable or organic material, boulders, rocks or stones, frozen soil, or other unsuitable material.

Backfill shall be compacted to 95% of the maximum density in traveled areas and road prisms, driveways, roadways, shoulders, parking lots or other traveled areas and 90% in all other areas. Backfill compaction shall be performed in 8" to 12" lifts. Compaction test results shall be supplied to the City for review and approval prior to paving.

5.3.09 PAVEMENT RESTORATION

Trench cuts in roadways greatly degrade the condition of the pavement, as well as reduce the design life. The most significant damage can be seen in newer pavements. It is the goal of pavement restoration to have a pavement in better or as good as pre-trench cut condition. This can be achieved through prevention of trench cuts through utility coordination, and high-quality pavement restoration.

5.3.09.1 LANE WIDTH RESTORATION REQUIREMENTS

For longitudinal utility trench cuts in pavements, a minimum 2" overlay or full-depth pavement reconstruction is required for the following widths:

4. One-lane overlay or reconstruction: when trench cut or patch is within one travel lane.
5. Two-lane overlay or reconstruction: when trench cut or patch is within two travel lanes.
6. Additional overlay or reconstruction: when the remaining pavement area to the edge of existing pavement on either side is less than one travel lane or pavement is less than five years old. No longitudinal joints will be allowed in the wheel path.

5.3.09.2 PAVEMENT RESTORATION REQUIREMENTS

The "Pavement Restoration Requirements" table describes pavement restoration requirements for various size projects and various existing pavement conditions.

PAVEMENT RESTORATION REQUIREMENTS

PROJECT TYPE	EXISTING PAVEMENT CONDITION		
	NEW PAVEMENTS <5 YEARS OLD	PAVEMENTS >5 YEARS OLD	PAVEMENTS IDENTIFIED BY THE CITY TO BE RECONSTRUCTED WITHIN 2 YEARS
LARGE PROJECTS			
Consists of a project requiring a longitudinal trench cut through the paved roadway surface 50' or greater, or four or more transverse trench cuts per 300' of roadway	Complete reconstruction, grind/inlay, or overlay of entire paved surface (all lanes). Pavement section based on pavement design.	Grind/inlay, reconstruction, or overlay. Width per lane requirements in Section 3.3.04.1. Pavement section based on pavement design.	Depending on intended reconstruction strategy, could utilize lesser pavement restoration. Minimum restoration is patch.
SMALL PROJECTS			
Consists of a project requiring a longitudinal trench cut through the paved roadway surface less than 50' or less than four transverse trench cuts per 300' of roadway.	Pavement patch pursuant to standard plans. Trench restoration penalty assessed per square yard of trench.	Pavement patch pursuant to standard plans.	Depending on intended reconstruction strategy, could utilize lesser pavement restoration. Minimum restoration is patch.
EMERGENCY PROJECTS			
Consists of a project that could not be foreseen requiring immediate attention for the preservation of life or property.	Complete reconstruction, grind/inlay, overlay, or patch (dependent on project size – see above). Width pursuant to lane requirements in Section 3.3.04.1. Pavement section based on pavement design.	Complete reconstruction, grind/inlay, overlay, or patch (dependent on project size – see above). Width pursuant to lane requirements in Section 3.3.04.1. Pavement section based on pavement design.	Depending on intended reconstruction strategy, could utilize lesser pavement restoration. Minimum restoration is patch.

5.3.09.3 TRENCH CUTS IN NEW PAVEMENTS

Trench cuts are not permitted in pavements that have been constructed or rehabilitated within five years. Rehabilitation includes all asphalt overlays. If there is no other option but to cut into a new pavement, the pavement must be restored pursuant to the "Pavement Restoration Requirements" table.

5.3.09.4 FEE-IN-LIEU

If it is determined by the City Engineer that full paved surface restoration impacts are excessive (i.e. traffic congestion, business impacts, etc.), restoration may be reduced to trench restoration only and a fee-in-lieu equal to the cost of full paved surface restoration assessed.

5.3.09.5 CONSTRUCTION REQUIREMENTS

1. All trench and pavement cuts will be made uniformly by wheel or saw cutting. If edge of trench line degrades, ravel, or is non-uniform, additional saw cutting will be required prior to final patch or paving.
2. Tack coat will be applied to the existing pavement and edge of cut and will be emulsified asphalt grade CSS-1 as specified in the latest version of the WSDOT Standard Specifications. Longitudinal joints between successive layers of asphalt concrete shall be displaced laterally a minimum of 12" unless otherwise approved by the City Engineer.
3. Connection to existing asphalt at centerline, lane edges, and overlay ends shall be made by grinding. Feathering of asphalt is not acceptable without written approval from the City Engineer. Grind can be a few inches off centerline to avoid existing striping.
4. Surface smoothness shall be pursuant to the latest version of the WSDOT Standard Specifications. The paving will be corrected by removal and repaving.
5. All joints on trenching or overlays shall be sealed using crack sealant as specified in the latest version of the WSDOT Standard Specifications.
6. When trenching within the roadway shoulder(s), the shoulder should be restored to its original or better condition.
7. If existing concrete panels are affected, the full panel shall be removed and replaced. Cutting of existing concrete panels will not be allowed.
8. The final patch shall be completed as soon as possible and will be completed within three days after first opening the trench. This time frame may be adjusted if delays are due to inclement paving weather or other adverse conditions that may exist. However, delaying of final patch or overlay work is allowable only subject to the City Engineer's approval.

5.3.10 JOINTS

Joint material shall be used in accordance with the recommendations of the manufacturer. Pipe handling after the gasket has been affixed shall be carefully controlled to avoid bumping the gasket and, thus knocking it out of position or contaminating it with dirt or other foreign material. Any gasket so disturbed shall be

removed cleaned, re-lubricated and replaced. Deflection of joints shall be limited to 80% of the published maximum deflection for the gasketed joint.

Care shall be taken to properly align the pipe before joints are forced home. During insertion of the tongue or spigot, the pipe shall be partially supported by hand, sling, or crane as required to minimize lateral pressure on the gasket and to maintain concentricity until the gasket is properly positioned. Pipe deflection and straightening shall be held to a very minimum once the joint is home to prevent creep of the joint.

Sufficient pressure shall be applied in making the joint to assure that the joint is home as defined in the standard installation instructions provided by the pipe manufacturer. Sufficient restraint shall be applied to the line to assure the joints once home are held so, by tamping fill material under and alongside the pipe or otherwise. At the end of the day's work, the last pipe shall be blocked in such a manner as may be required to prevent creep during down time.

5.3.11 PRESSURE SEWER MAINS AND VALVES

5.3.11.1 PRESSURE MAIN INSTALLATION

Pressure pipe as specified on the plans shall be installed as recommended by the pipe manufacturer. Pressure sewer mains shall be laid so that no high point exists except at the discharge manhole or an air release assembly.

5.3.11.2 VALVE INSTALLATION

Before installation, valves shall be cleaned of all foreign material. Such blocking as the Engineer shall deem necessary shall be provided. The valve and valve box shall be set plumb with the valve box centered on the valve. Valves shall be opened and shut under pressure to check operation without leakage. Where valve operating nut is more than 3' below finished grade, a stem extension conforming to the Water Standard Detail must be installed

The top of the valve box base section shall be located a minimum of 6" and maximum of 9" below finished grade. A polyethylene sheet, 8-mils thick, shall be placed between the top and base valve box sections to prevent metal to metal contact where the sections overlap.

Valve box top sections shall be adjusted flush with the finished pavement and, in those areas to be excavated for future roadway grades, enough adjustment shall be provided in the valve box to allow the top of the box to be adjusted to the required grade.

5.3.11.3 VALVE BOX MARKER INSTALLATION

Concrete marker posts shall be painted with two coats Rust-Oleum No. 2766 Hi-Gloss white paint. The marker shall be set on a line

through the valve at right angles to the centerline of the road. The marker shall generally be set on the property line unless the Engineer decides another location is safer or more conspicuous. Distance to the valves shall be nearly stenciled on the post with 2" numerals. Valve markers shall be installed only in unimproved or unpaved areas.

5.3.12 LATERAL SEWERS

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

All applicable specifications given herein for sewer construction shall be held to apply to side sewer laterals.

Side sewers shall be for single connection only and be a minimum six inch (6") diameter pipe. Side sewers shall be connected to the tee, provided in the sewer main where such is available, utilizing approved fittings or adapters. The side sewer shall rise at a maximum of 45° and a minimum of 2%, from the sewer main.

Where there are no basements, the minimum side sewer depth shall be six (6) feet below existing curb line and five (5) feet below ground at property line, except where existing improvements, proposed improvements or topography may dictate additional depth. The elevations of the side sewer connections shall be of sufficient depth to serve all existing and potential future basements.

The contractor shall provide for each 6 inch side sewer service a twelve (12) foot long 2 inch x 4 inch wooden post which extends from the invert of the end of the 6 inch pipe to above the existing ground. The exposed area of this post shall be painted white and shall have selected thereon in two inch letters (black paint) "S/S" and shall also indicate the depth of the sewer service stub from finished grade.

Where no tee or wye is provided or available, connection shall be made by machine-made tap and saddle, only with specific written authorization of the City. The City shall review the exact location and material, list in its evaluation.

The maximum bend permissible at any one fitting shall not exceed forty-five degrees (45°). The maximum bend of any combination of two adjacent fittings shall not exceed 45° (one-eighth bend) unless straight pipe of not less than three (3) feet in length is installed between such adjacent fittings, or unless one of the fittings is a wye branch with a cleanout provided on the straight leg.

All materials and methods of construction for side sewers shall be equal to those used for sewer mainline construction, unless otherwise listed herein.

It shall be the responsibility of the licensed side sewer contractor to cut the road surface, dig a trench, lay the pipe, make the connection to the wye or tee, backfill the

trench and restore the roadway surfacing and vegetation within the limits of any thoroughfare or right-of-way, public or private. Such work shall be performed as quickly and with as little hindrance to traffic as possible, and in strict accordance with the requirements of the City, the county, or jurisdiction said thoroughfares or right-of-way is located and in accordance with the right-of-way permit or developers extension agreement.

All connections to existing mains shall be made at an existing tee fitting or by core drilling a hole in the existing sewer main and installing an approved gasketed factory sewer saddle or cutting in a gasketed factory tee. Line drilling or rough breakouts shall not be used.

5.3.13 PIPE CUT-INS

Connections to existing sewer main lines shall be carefully made and all broken pieces removed. If the pipe becomes cracked during the cut-in, the damaged section shall be replaced with a wye branch or tee at the expense of the owner.

Connections to ductile or cast iron will be accomplished by tee cut-ins using metallic mechanical couplings adaptable to the size and type of pipe on gravity mains. In low pressure lake front mains where flows or large main sizes prohibit tee cut-ins, hole cuts shall be approved by the City on a case by case basis and, when approved, shall be accomplished by specialty contractors. The procedure for hole cut requires issuance of a side sewer permit and 24 hours notice to the City.

The excavation shall be safe and include shoring in accordance with O.S.H.A. and W.I.S.H.A., W.A.C. 296-155-650 through 296-155-66505 including access ladder and shoring on the face of the excavation.

For a tapped connection to the mainline, the hole shall be as small as possible to accommodate the outside diameter of the side sewer pipe with adequate space for minor angle alignment adjustments of the side sewer. The connection shall be made with a factory saddle specifically designed for side sewer connections and fabricated of corrosion resistant materials and mechanically attached to the pipe to withstand the anticipated loads. The saddle shall provide a rubber gasketed joint between the sewer main and the saddle.

5.3.14 CONNECTING PIPE MATERIAL

If the type of wye or tee provided in the sewer system does not match the proposed side sewer pipe joint detail, a short transition piece shall be jointed to the wye branch or tee by means of a gasket of the type used in the sewer system where possible. If this gasket type is not available, careful caulking with an approved caulking material made especially for that purpose shall be used. The balance of the side sewer shall then be

constructed with compression-type flexible gaskets up to the point of connection with the house plumbing

5.3.15 MANHOLES

Manholes shall be constructed as shown in the Standard Details for standard manholes and drop manholes. Manholes shall be of precast reinforced concrete. Manhole ring and covers shall be adjusted to the elevation required by the Engineer prior to final acceptance of the work.

The manhole base slab shall be placed on firm soil. If the foundation material is inadequate, the Contractor shall use foundation gravel or bedding concrete under the normal base to support the manhole.

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

Where work is located in public right-of-way, not less than 14" or more than 26" shall be provided between the top of the cone or slab and the top of the manhole frame.

The outside and inside of manhole adjusting bricks and the joints of any non-gasketed precast concrete sections shall be thoroughly wetted and completely filled with mortar, plastered and troweled smooth with 3/4" of mortar in order to attain a watertight surface.

Mortar shall be placed between each level of adjusting bricks, riser rings, top of cone section, and bottom of iron ring.

All lift holes, if any, on precast items shall be completely filled with expanding mortar, smoothed both inside and out, to insure water-tightness. All steel loops, if any, on precast section must be removed, flush with the manhole wall. The stubs shall be covered with mortar and smoothed. Rough, uneven surfaces will not be permitted.

Channels shall be made to conform accurately to the sewer grade and shall be brought together smoothly with well-rounded junction, satisfactory to the Engineer. The channels shall be field poured after the inlet and outlet pipes have been laid and firmly grouted into place at the proper elevation. Allowances shall be made for a minimum of 0.1' drop in elevation across the manhole in the direction of flow. The maximum allowable drop in invert elevation across the manhole in the direction of flow shall be 1.0'. Channel sides shall be carried up vertically from the invert to three-quarters of the diameter of the various pipes. The concrete shelf shall be warped evenly and sloped 1" per foot to drain. Rough, uneven surfaces will not be permitted. Channels shall be constructed to allow the installation and use of a mechanical plug of the appropriate size. Prefabricated manhole bases with glass fiber supported plastic or PVC hard lined channels will be allowed at the Contractor's option.

All manholes in paved areas shall be located such that they are not subject to surface inundation such as pavement depressions and gutters. If locating manholes in such areas cannot be avoided, entire manhole including cover is to be designed with water tight system.

All manholes located in unpaved areas shall include a concrete collar around the manhole adjusting bricks per Standard Detail; see MANHOLE ADJUSTMENT SECTION DETAIL (UNPAVED AREAS). Manholes in unpaved areas shall be placed above adjacent grade to prevent collection of surface water and the manhole shall also have a bolt-locking watertight lid.

All rigid pipe entering or leaving the manhole shall be provided with Kor-n-Seal connectors as approved by the City and shall be placed on firmly compacted bedding. Special care shall be taken to see that the openings through which pipes enter the structure are completely water-tight.

All manholes require visual inspection by the City and vacuum testing per ASTM C497 and C1244. Prior to backfilling, all pick holes and external joints shall be grouted with a non-shrink grout and an epoxy coating or heat shrink wrap be provided around the outside of the manhole, JetSet grout is not allowed. The City inspector will provide written acceptance of this work before backfilling can occur.

5.3.16 CONNECTION TO EXISTING MANHOLE

Connection to existing manhole shall be accomplished in such a manner that all existing services are maintained, that no refuse, broken brick, concrete or other extraneous matter enter into the existing sewer. The outfall shall be plugged or screened throughout the contractors operation at the Engineer's option.

A circular opening shall be carefully core drilled in the manhole barrel on the proper alignment so that the new sewer will be in line with the center of the manhole, and at the height which will allow the new sewer to be placed at the proper grade. The opening shall be of such size as to provide clearance of not less than 1" or more than 3" between the outside of the pipe and the manhole wall. Pipe connections, channel forming, grouting of pipe and backfilling shall be as specified previously for standard manholes.

No additional pipe shall be connected until final set of the grout has occurred. When additional pipe is connected, care shall be taken to avoid shocks or other undue strains to the grouted pipe.

Any opening resulting from removal of existing pipe shall be filled with mortar to provide a watertight seal, unless new pipe is to be reconnected to that opening.

When any new sewer is connected to an existing manhole with an inside drop structure, the minimum angle between drop piping and existing access steps shall be 90° (1/4 of

manhole circumference), or 45° for 6" pipe. Where minimum clearance cannot be met, the cone section shall be rotated and steps relocated to provide maximum possible clearance from drop tee and pipe. Cut existing steps flush with manhole wall and cover stubs with mortar to provide a smooth finish.

When any new sewer is connected to an existing manhole, the manhole shall be reconstructed to conform to current standards.

Upward adjustments of old, existing manholes must be done with all new parts including cone section so there is only one mismatched seam. The mismatched seam shall be reinforced with a concrete collar poured around the seam, 6" to 12" above and below the seam line, around the outside of the manhole, minimum 6" thick. The collar shall also be sealed with the Wrapid Seal™ (or equivalent) manhole encapsulation system.

Where the new manhole barrel section key is not compatible with the existing barrel section key, the new section key shall be broken off as shown in sanitary sewer standard detail "Manhole Section Adjustment".

5.3.17 CLEANING & FLUSHING

Prior to pipe testing, all pipes shall be cleaned in the following manner:

The Contractor shall furnish an inflatable rubber ball of a size that will inflate to fit snugly into the pipe to be tested. The ball shall, at the option of the Contractor, be used without a tag line; or a rope or cord shall be fastened to the ball to enable the Contractor to know and control its position at all times. The ball shall be placed in the last cleanout or manhole on the pipe to be cleaned and water shall be introduced behind it. The ball shall pass through the pipe with only the force of the water impelling it. All debris flushed out ahead of the ball shall be removed at the first manhole where its presence is noted. In the event cemented or wedged debris or damaged pipe stops the ball, the Contractor shall remove the obstruction.

5.3.18 TESTING OF GRAVITY SEWER LINES

Method of testing gravity sewers shall be as follows unless otherwise specified herein or approved by the City prior to the start of construction. Testing is required of, and shall apply to, both sanitary sewer main and lateral sewer installations.

5.3.18.1 AIR TESTING

The Contractor shall use a low-pressure air test. The following procedures shall be used on conducting the low-pressure air test. The Contractor shall furnish all facilities and personnel for conducting the test under the observation of the Engineer. The equipment and personnel shall be subject to the approval of the Engineer.

The Contractor shall make an air test prior to backfilling for his own purposes. However, the acceptance air test shall be made after backfilling has been completed and compacted.

All wyes, tees, or end of lateral sewer stubs shall be plugged with flexible joint caps, or acceptable alternate, securely fastened to withstand the internal test pressures. Such plugs or caps shall be readily removable and their removal shall provide a socket suitable for making a flexible jointed lateral connection or extension. No double plugs shall be allowed.

Immediately following the pipe cleaning, the pipe installation shall be tested with low-pressure air. Air shall be slowly supplied to the plugged pipe installation until the internal air pressure reaches 4.0 pounds per square inch greater than the average back pressure of any groundwater that may submerge the pipe. At least two minutes shall be allowed for temperature stabilization before proceeding further.

The requirements of this specification shall be considered satisfied if the time required in seconds for the pressure to decrease from 3.5 to 2.5 pounds per square inch greater than the average back pressure of any groundwater is equal to or greater than the required time as calculated below:

$$K = 0.0444d^2L$$

$$C = 0.0003918dL$$

$$\text{If } C_T \leq 1$$

$$\text{then time} = K_T$$

$$\text{If } 1 < C_T < 1.75$$

$$\text{then time} = K_T / C_T$$

$$\text{If } C_T \geq 1.75$$

$$\text{then time} = K_T / 1.75$$

Where:

d = Pipe diameter (inches)

L = Pipe length (feet)

K = Value for each length of pipe of a specific diameter

C = Value for each length of pipe of a specific diameter

K_T = Sum of all K values

C_T = Sum of all C values

The use of air pressure for testing sewer lines creates hazards that must be recognized. The Contractor shall be certain that all plugs are securely blocked to prevent blowouts. An air supply regulator shall be installed on the air supply line to the sewer that shall permit a maximum of 10 psi in the line to be tested. All pressure shall be relieved from the sewer section being tested prior to removal of test

plugs. No individuals shall be present in manholes while the sewer line tests are being conducted.

5.3.18.2 DEFLECTION TEST FOR FLEXIBLE PIPE

Sanitary sewers constructed of flexible pipe shall be deflection tested not less than 30 days after the trench backfill and compaction has been completed.

The test shall be conducted by pulling a solid pointed mandrel with a circular cross section with diameter equal to 95% of the inside pipe diameter through the completed pipeline. Minimum length of circular portion shall be equal to the diameter of the pipe. Pull shall be manual without mechanical assistance and the mandrel shall negotiate deflected section freely.

Testing shall be conducted on a manhole to manhole basis and shall be done after the line has been completely flushed out with water.

Contractor shall locate and repair any sections failing to pass the test and retest the section.

5.3.18.3 TELEVISION INSPECTION

The Developer shall provide the City with a videotape inspection of all sanitary sewers prior to paving and final project acceptance.

If defects are found or suspected during the two year warranty period, the City shall also require that the Developer provide videotape inspection of any or all sanitary sewers before expiration of the warranty.

The Contractor shall provide a television inspection of the installed sewer post construction acceptance between December 1st and February 28th before the end of the construction warranty period.

The Contractor shall correct all deficiencies and provide another television inspection to document the corrections.

5.3.19 TESTING OF SEWER MANHOLES

All new sanitary sewer manholes and existing sanitary sewer manholes penetrated by new lines shall be visually inspected and vacuum tested for leakage. A vacuum test of all manholes is required prior to acceptance.

Vacuum testing shall be done in accordance with ASTM C 1244-93. All pipes entering the manhole shall be temporarily plugged, and plugs shall be braced. The test head

shall be placed in or on top of the manhole ring. A vacuum of 10" of mercury shall be drawn on the manhole, the valve on the vacuum line of the test head closed, and the vacuum pump shut off. The time shall be measured for the vacuum to drop to 9" of mercury. The manhole shall pass if the time for the vacuum reading to drop from 10" of mercury to 9" of mercury meets or exceeds the values indicated in the following table:

MINIMUM TEST TIMES FOR VARIOUS MANHOLE DIAMETERS									
	Diameter (inches)								
	30 or less	33	35	42	48	54	60	66	72
Depth* (feet)	Time (seconds)								
8 or less	11	12	14	17	20	23	26	29	33
10	14	15	18	21	25	29	33	36	41
12	17	18	21	25	30	35	39	43	49
14	20	21	25	30	35	41	46	51	57
16	22	24	29	34	40	46	52	58	67
18	25	27	32	38	45	52	59	65	73
20	28	30	35	42	50	53	65	72	81
22	31	33	39	46	55	64	72	79	89
24	33	36	42	51	59	64	78	87	97
26	35	39	46	55	64	75	85	94	105
28	39	42	49	59	69	81	91	101	113
30	42	45	53	63	74	87	98	108	121

*Depth is measured from the top of the manhole to the lowest invert.
 ** Test times for depths between those in this table may be calculated by interpolation.

5.3.20 TESTING OF PRESSURE SEWER MAIN

Prior to acceptance of the project, the pressure line shall be subjected to a hydrostatic pressure test of 100 psi at the high point of the line. Any leaks or imperfections developing or occurring under the test pressure shall be remedied by the Contractor before final acceptance of the project. Leakage shall be measured by approved means. Test pressure shall be maintained while the entire installation is inspected. The Contractor shall provide all necessary equipment and shall perform all work connected with the tests. Insofar as is practical, test shall be made with pipe joints and fittings exposed for inspection.

5.3.21 OIL/WATER SEPARATOR

Oil/water separators shall be constructed as shown in the Standard Details. Excavation for precast vault shall be sufficient to provide a minimum of 12" between the vault and the side of the excavation. Vault shall be placed at proper depth to set vault cover flush with finish grade. If additional depth of cover is required over inlet or outlet piping vault riser sections shall be installed to raise vault cover a maximum of 24".

The oil/water separator shall be placed on firm soil. If the foundation material is inadequate, the Contractor shall use foundation gravel or bedding concrete under the normal base to support the separator.

Vault shall be placed and set plumb so as to provide vertical sides. The completed separator shall be rigid and watertight.

Joints of precast concrete sections shall be thoroughly wetted and completely filled with mortar, plastered and troweled smooth with 3/4" of mortar in order to attain a watertight surface.

All lift holes, if any, on precast items shall be completely filled with expanding mortar and smoothed both inside and out, to insure water-tightness. All steel loops, if any, on precast section must be removed, flush with the vault wall. The stubs shall be covered with mortar and smoothed. Rough, uneven surfaces will not be permitted. Precast vault shall be provided with 8" diameter knockouts at all pipe openings or have openings core-drilled prior to installation.

All rigid pipe entering or leaving the structure shall be provided with flexible joints within 12" of the manhole structure and shall be placed on firmly compacted bedding. Special care shall be taken to see that the openings through which pipes enter the structure are completely and firmly filled with mortar from the outside to ensure water-tightness. All P.V.C. pipe connections to vault shall be made with gasketed coupling as approved by the City.

5.3.22 GREASE INTERCEPTOR

Grease interceptors shall be constructed as shown in the Standard Details. Excavation for precast vault shall be sufficient to provide a minimum of 12" between the vault and the side of the excavation.

24" diameter manhole frame and cover shall be adjusted to the elevation required by the Engineer prior to final acceptance of the work. Adjusting rings shall be manufactured from precast reinforced concrete. Total height of rings shall be from 8" minimum to 20" maximum.

The grease interceptor shall be placed on firm soil. If the foundation material is inadequate, the Contractor shall use foundation gravel or bedding concrete under the normal base to support the interceptor.

Vault shall be placed and set plumb so as to provide vertical sides. The completed interceptor shall be rigid and watertight.

The outside and inside of manhole adjusting rings, joints of precast concrete sections and the perimeter of precast baffle shall be thoroughly wetted and completely filled with

mortar, plastered and troweled smooth with 3/4" of mortar in order to attain a watertight surface.

All lift holes, if any, on precast items shall be completely filled with expanding mortar, smoothed both inside and out, to insure water-tightness. All steel loops, if any, on precast section must be removed, flush with the vault wall. The stubs shall be covered with mortar and smoothed. Rough, uneven surfaces will not be permitted.

Precast vault and baffle shall be provided with 8" diameter knockouts at all pipe openings or have openings core-drilled prior to installation.

All rigid pipe entering or leaving the structure shall be provided with flexible joints within 12" of the manhole structure and shall be placed on firmly compacted bedding. Special care shall be taken to see that the openings through which pipes enter the structure are completely and firmly filled with mortar from the outside to ensure water-tightness. All P.V.C. pipe connections to vault and baffle shall be made with double gasketed rigid bodied couplings as approved by the City.

5.3.23 COMMERCIAL CLEANOUT WITH TEST SAMPLING TEE

Test sampling tees, when required, shall be placed outside the building no more than 24" downstream of a clean-out extended to grade, enclosed in a cast concrete meter box as shown in the Standard Detail. The enclosure shall be supported on minimum 2" thick gravel base. The capped orifice shall be a maximum of 4" from finished grade. The sampling tee shall be installed so that it opens in a direction at right angles to and vertically above the flow of the pipe. The sampling tee shall be accessible at all times for compliance determination sampling.

5.3.24 UNDERGROUND UTILITIES

The plans show the approximate locations of various existing utilities known to the engineer, such as gas lines, water mains, storm drainage, power lines, telephone lines, television cables, and other obstructions based on information obtained from various sources. This information is not guaranteed to be accurate, and the Contractor is directed to check for interferences and obstructions by inquiry from the different utilities and by underground exploration ahead of his regular excavation.

The Contractor shall request field locates and notify the owners of underground facilities about the scheduled commencement of excavation through the one-call number (1-800-424-5555).

If the City is not included in the one-number locator service, notice shall be provided individually to those owners of underground facilities known to or suspected of having underground facilities within the area of proposed excavation.

Notice shall be made to owners of underground utilities not less than two (2) business days or more than ten (10) business days prior to scheduled date of commencement of excavation.

The Contractor shall excavate around and under service pipes with special care and shall support and maintain them in service. Where it is necessary to cut, move or reconnect any service lines, arrangements shall be made with the respective utility.

5.3.25 CONSTRUCTION ON EASEMENTS

All work on easements shall be performed strictly in accordance with easement provisions. Easements shall be restored equal to or better than original condition. The Contractor shall do no work on easement areas until specifically authorized by Engineer.

5.3.26 ADJUST EXISTING STRUCTURE TO GRADE

5.3.26.1 MANHOLE AND CLEAN-OUT ADJUSTMENT

Existing manholes and clean-outs affected by a pavement overlay shall be adjusted to grade within three working days of overlay.

Adjustment of existing manholes shall be in accordance with Section 7-05.3(1) of the Standard Specifications. Clean-outs adjusted to grade shall conform to the Standard Detail.

5.3.26.2 VALVE BOX ADJUSTMENT - PAVEMENT OVERLAYS AND SIDEWALKS

- A. Raising the existing valve box cover less than 2" shall be accomplished by adjusting the existing top section of the valve box.
- B. Raising the existing valve box cover 2" or more, shall be accomplished by either adjusting the existing top section or be inserting a valve box paving riser into the existing valve box top. The paving riser shall be epoxied to the valve box.
- C. If the valve box base section needs to be extended, the contractor shall install a 4" diameter cast iron soil pipe, with bell-end of the soil pipe inserted over the top of the existing valve box base section. The spigot-end of the soil pipe shall be located a minimum of 6" and maximum of 9" below finished grade. The valve box top section shall be slipped over the soil pipe and adjusted to final grade. A polyethylene sheet, 8-mils thick, shall be placed between the

valve box and soil pipe to prevent metal to metal contact where the sections overlap.

Final box adjustment shall leave the top of the valve box no higher than final grade, and no lower than 0.5" below final grade.

In asphalt concrete pavement overlay areas, excavation of the valve box to be raised shall be accomplished by sawcutting or neat-line jackhammering the pavement a minimum of 12" around the perimeter of the valve box.

Final adjustment of valve boxes shall be made within 20 calendar days following the final overlay.

5.3.26.3 VALVE BOX ADJUSTMENT - UNIMPROVED AREAS

Adjustment of valve box covers located outside paved areas or sidewalks can be accomplished using a 12" valve box adjusting sleeve inserted into the existing valve box top section.

5.3.27 ABANDONING FACILITIES

5.3.27.1 ABANDONING PIPE IN PLACE

The Contractor shall remove the pipe or completely fill the pipeline to be abandoned with sand, concrete, or controlled density fill.

5.3.27.2 ABANDONING STRUCTURES

Abandonment of structures shall be completed only after piped systems have been properly abandoned. A structure or structures within the public right-of-way, a public easement or which are parts of the publicly-owned and maintained system must be:

- Removed completely according to Section 2-02 of the current Standard Specifications; or
- Abandoned according to Section 7-05.3(2) of the current Standard Specifications, except that controlled density fill shall be used in lieu of sand if desired.

5.3.27.3 ABANDONING LATERAL SEWERS

Abandoned lateral sewers shall be cut and capped at the main with a watertight plug for future use or plugged with a minimum length of 3 pipe diameters with a non-shrink grout or other impermeable material. The pipe shall be prepared to provide a watertight bond between the plug material and the existing pipe.

Abandoned lateral sewers shall be inspected for leakage per these specifications, including video inspection at the sewer main connection, prior to final acceptance.

5.3.28 HIGHWAY AND RAILROAD CROSSINGS

Interstate, state, or county highway and railroad crossings require the placing of steel, cast iron or concrete pipe casing by jacking or tunneling and laying the carrier pipe within the casing.

5.3.29 BORING AND JACKING STEEL CASING

The Contractor shall verify the vertical and horizontal location of existing utilities. If required to avoid conflicts and maintain minimum clearances, adjustment shall be made to the grade of the casing.

The pipe shall be bored and jacked where indicated. The Contractor shall removed or penetrate all obstructions encountered. If groundwater is found to be a problem during boring operations, the Contractor shall do all that is necessary to control the flow sufficiently to protect the excavation, pipe and equipment so that the work is not impaired. Any pipe damaged during the boring and jacking operation shall be repaired by the Contractor in a manner approved by the Engineer.

Special care shall be taken during the installation of the bored and jacked pipe to ensure that no settlement or caving be caused to the above surface. Any such caving caused by the placement of the pipe shall be the Contractor's responsibility and he shall repair any area so affected as directed by the Engineer.

During the jacking operations, particular care shall be exercised to prevent caving ahead of the pipe which will cause voids outside of the pipe. If voids exist, the Contractor shall drill through the wall of the pipe and fill the voids with a pumped cement grout. All voids shall be filled to the satisfaction of the Engineer.

The carrier pipe shall be installed in the casing as shown on the drawings. Where length of the casing exceeds 10', the Contractor shall support carrier pipe with casing spacers as shown in the Standard Detail. The casing pipe shall not be backfilled with sand and grout. The casing ends shall be sealed with manufactured rubber end seal device.

Boring pits shall be backfilled with select native material and compacted to 95% maximum dry density as determined by ASTM D-1557. The contractor shall provide sufficient select backfill material to make up for the rejected material.

All disturbed ground shall be restored to its original condition or better.

5.3.30 WORKING WITH ASBESTOS CEMENT PIPE

When working with asbestos cement pipe, the Contractor is required to maintain workers' exposure to asbestos material at or below the exposure limit as prescribed in WAC 296-62-07705 State/Federal Guidelines and Certification.

5.3.31 ASBESTOS CEMENT WATERMAIN CROSSINGS

Where new utility line crosses below an existing AC main, excavation shall be accomplished with water jetting, vacuum excavation, or by hand. City inspector shall be present during excavation. Trench shall be backfilled with controlled density fill (CDF, aka flowable fill) from bottom of trench to bottom of AC main. If the AC main appears to be damaged, or at risk of failure, the City will require section replacement according to the Standard Detail for "Typical AC Watermain Crossing Replacement Detail".

5.3.32 CLEARANCES / OTHER UTILITIES

If the minimum vertical distance between utility pipes is less than 6" and such installation is approved by the City, a pad shall be placed between the pipes. The pad shall be O.D. x O.D. x 2.5" thick minimum or as required to protect the pipes. Above O.D. is equal to the outside diameter of the larger pipe. The pad shall be a polyethylene foam plank (Dow Plastics Ethafoam™ 220), or approved equal. Additional measures may be necessary to ensure system integrity and shall be required as evaluated by the City on a case by case basis.

5.4 SIDE SEWER REGULATIONS**5.4.01 GENERAL**

The following requirements govern side sewer construction in the City's service area. These standards apply to sewerage facilities from the point of connection to the public sewer system (end of a lateral sewer stub, mainline tee, or a hole-cut into a sewer main) to the building.

5.4.02 CONNECTION REQUIRED

Whenever connection to the City sewer system is required, the property owner shall remove any connection to a cesspool, septic tank, or other on-site wastewater disposal facilities and direct connection should be made to the City system. Former facilities must be abandoned per King County Health Department regulations.

5.4.03 SIDE SEWER CONTRACTORS LICENSE**5.4.03.1 APPLICATION REQUIREMENTS**

To obtain a side sewer contractor's license from the City, an applicant must:

Possess a current Washington State Contractor's License.

Possess a current City of Black Diamond business and occupation license.

Certify that he or she has read and understands the contents of this regulation.

Pay all license fees required by the City

5.4.03.2 RESPONSIBILITY OF SIDE SEWER CONTRACTOR

The licensed side sewer contractor shall be responsible for complying with all requirements of the City related to side sewer construction, for any and all actions or omissions of his employees, and for any damage done to existing utilities encountered during any excavation.

5.4.03.3 LICENSE REVOCATION

A side sewer contractor's license issued by the City may be suspended or revoked by the City Administrator for cause.

5.4.03.4 WORK ON PRIVATE PROPERTY

The owner or their designee is the only person authorized to install and repair side sewers on his own property other than a licensed side sewer contractor.

5.4.03.5 WORK ON PRIVATE PROPERTY

Only a licensed side sewer contractor shall be issued a permit for side sewer work in a public right-of-way.

5.4.04 SIDE SEWER PERMIT**5.4.04.1 PERMIT APPLICATION REQUIREMENTS**

In making application for a side sewer permit, the owner or side sewer contractor shall furnish the City with a drawing showing:

A. The size and location of structures on the property.

- B. The full course of the proposed side sewer from the public sewer in the street to the structure.

Any street opening permits required to complete installation of a side sewer must be obtained prior to acceptance of the permit application.

The Applicant must show that any easements that shall be required for installation of the side sewer have been obtained and recorded with King County.

All permit fees required by the City must be paid with the permit application.

5.4.04.2 PERMIT RESTRICTIONS

- A. No permit will be issued for side sewer connection before the public or private sewer system is accepted by the City.

- B. No work shall be started on any private or side sewer without a permit.

- C. No licensed side sewer contractor shall do any side sewer work under any other person's permit.

- D. No side sewer work shall be done without approval and inspection by the City. Visual inspection of the side sewer is required by the City prior to backfilling.

- E. All side sewer permits expire twelve months after issuance.

5.4.04.3 WORK ON PRIVATE PROPERTY

The owner or their designee is the only person authorized to install and repair side sewers on his own property other than a licensed side sewer contractor.

5.4.04.4 PRIVATE SIDE SEWERS

Private side sewers are the extension of side sewer laterals located outside of the public rights-of-way or easements graded to the City of Black Diamond.

1. Side sewer pipe located on private property shall be 4" (larger if specifically approved by the City), ductile iron or PVC ASTM 3034, and shall be installed at 2% minimum grade (1/4 inch fall per foot). Construction on private property may be performed by owner, but requires a permit.

2. Pipe shall be bedded with pea gravel or clean free draining sand.
3. Six inch sewer pipe is required in the street right-of-way and shall have a 2% minimum grade. Construction in street rights-of-way shall be performed by a licensed side sewer contractor and requires a permit.
4. Side sewer shall be inspected by the City's Representative / Inspector prior to backfilling. Side sewer shall be plugged and tested in the presence of the City Inspector by filling with water to a stand pipe a minimum of 5' in length.
5. On private property, minimum cover shall be 18" over top of pipe from the point which is 30" out from house and continuing to the connection with the City's sewer system.
6. Parallel water and sewer lines shall be 10 feet apart horizontally wherever possible and have a vertical separation of 18" if a vertical crossing is necessary.
7. No more than 100 feet is allowed between cleanouts. Cleanouts are required for bends equal to or greater than 90°. Cleanout shall be a watertight plugged gasketed tee or wye lateral.
8. All pipe joints shall be rubber gasket type.
9. Provide "grease trap" of a size and type approved by the City at all such locations as may be deemed necessary by the City.

5.4.04.5 BENDS AND WYES

All changes of direction shall be made with bends, wye branches or a combination of wye branch and bends.

A visual inspection wye shall be installed on each side sewer near the building connection for future City inspections.

5.4.04.6 SIDE SEWER CLEAN-OUTS

The following specifications shall apply for all side sewer cleanouts.

- A. All changes of direction greater than 45-degrees will be made with a wye branch and bends as required. Where wye

branches are used, the straight through opening is to be used as the cleanout.

- B. A cleanout shall be required between 24" and 36" of all buildings unless permission to omit or change the location of such cleanout has been received from the City.
- C. Cleanouts, including those for commercial properties shall be installed at locations designated by the City but in no case shall distance between cleanouts exceed 100'.
- D. A cleanout shall be the same diameter as the pipe down grade to which it connects.
- E. On long runs of pipe, manholes shall be installed, or be required, in lieu of cleanouts.
- F. Suitable rings and covers of a type designated by the City shall be used for all cleanouts on commercial and multi-family property and such rings shall be cast in a concrete block per the Standard Details.
- G. All cleanout lids not in paved areas shall extend to the finish ground surface.
- H. A maximum of two single-family residential structures shall be connected to a single sewer lateral. A 6" cleanout extending to the finish ground surface will be required at the wye where the upper connection is made. Install cleanout per applicable City Standard Details.

5.4.04.7 SIDE SEWER ACCEPTANCE

It shall be the responsibility of the side sewer contractor to install all risers, cleanouts, casting, concrete blocks, etc., required before the installation will be approved by the City.

5.4.04.8 OLD SIDE SEWERS FOR NEW BUILDINGS

When an existing structure is removed and new structure is constructed, a new side sewer permit is required, and any existing side sewer that does not meet the current requirements of the City shall be replaced.

5.4.04.9 OTHER PERMITS REQUIRED

The issuance of a side sewer permit by the City shall not relieve the permit holder from the responsibility of obtaining such other permits or licenses as shall be required by the City of Black Diamond, the county or other jurisdiction the side sewer is installed in.

5.4.04.10 POSTING SIDE SEWER PERMIT

The contractor's side sewer permit shall be available at the job and must be readily accessible to the City inspector. No inspection will be made unless such permit is readily available at the job site.

5.4.05 HOLD HARMLESS

- A. Contractor shall protect, defend, indemnify and save harmless City, its officers, employees and agents from any and all costs, claims, judgments or awards of damages, arising out of or in any way resulting from the negligent acts or omissions of Contractor, its officers, employees and agents.
- B. City shall protect, defend, indemnify and save harmless Contractor, its officers, employees and agents from any and all costs, claims, judgments or awards of damages, arising out of or in any way resulting from the negligent acts or omissions of City, its officers, employees or agents.

5.4.06 GENERAL NOTIFICATION REQUIREMENTS

All side sewer cleaning contractors and/or plumbers, side sewer contractors, and owners shall notify the City of such operations prior to cleaning existing side sewers (as distinguished from plumbing and septic tank facilities).

5.4.07 GENERAL CONSTRUCTION REQUIREMENTS**5.4.07.1 GENERAL**

All materials and methods of construction for side sewers shall be equal to those used for sewer mainline construction, unless otherwise listed herein.

5.4.07.2 RESTORATION OF THOROUGHFARES AND RIGHT-OF-WAYS

It shall be the responsibility of the licensed side sewer contractor to cut the road surface, dig a trench, lay the pipe, make the connection to the wye or tee, backfill the trench and restore the roadway surfacing and vegetation within the limits of any thoroughfare or right-of-way, public or private. Such work shall be performed as quickly and with as little hindrance to traffic as

possible, and in strict accordance with the requirements of the City, the county, or jurisdiction said thoroughfares or right-of-way is located and in accordance with the right-of-way permit or developers extension agreement.

5.4.07.3 INSPECTIONS

After the side sewer permit is obtained, arrangements for inspection of a side sewer installation shall be made with the City, 24 hours in advance by the side sewer contractor. The City reserves the right to set the time for inspections.

An extra charge shall be made by the City for each visit to any person who requests any inspection after regular hours on a workday, or on a weekend or holiday. The side sewer contractor will be billed for hours beyond that included in the permit fee.

5.4.07.4 SITE SAFETY

The following requirements shall apply to safety practices to be followed by licensed side sewer contractors while performing permitted side sewer work in the City sewer service area:

Barricades - Before beginning excavation in a public area there shall be at the site sufficient barricades to properly protect the work. The barricades shall be illuminated during the nighttime hours with a minimum of four flares or flashing signals.

Trench Covering - All excavations or trenches within a public area or within 4' of a public area must be temporarily covered at night and during hours of work site inactivity.

Ditch Pumps - During pipe laying, a ditch pump shall be available at the site.

Shoring - The contractor shall have immediately available for use sufficient shoring to adequately protect workers where unstable ground conditions are encountered, in accordance with OSHA and WISHA requirements.

Flagger - A flagger must be posted whenever work is underway in a public thoroughfare.

5.4.07.5 SITE CLEAN-UP

The side sewer contractor shall remove all debris and excess excavation and shall repair all damage, public or private, in kind immediately after backfilling.

5.4.07.6 FAILURE TO RESTORE EXCAVATIONS

If any excavation is left open beyond a reasonable length of time, the City shall cause the excavation to be backfilled and the public way restored. Any cost incurred in such work shall be charged to the owner or side sewer contractor in charge of such work, and shall be payable immediately to the City upon written notification of the amount thereof given to the contractor or posted at the location of the work.

5.4.07.7 FAILURE TO COMPLETE SIDE SEWER WORK

If any work done under a side sewer permit is not in accordance with provisions of the requirements of the City and if the contractor or person doing the work fails and/or refuses to properly construct and complete such work, notice of such failure or refusal shall be given to the owner or occupant of the property. The City shall cause the work to be stopped. If the work, in the opinion of the City, constitutes a hazard to public safety, health or the public sewer, such work shall be completed by the City. The cost of such work and any materials and administrative services necessary therefore shall be charged to the owner and/or contractor and shall be payable by the owner and/or contractor immediately upon written notice given by the City of the amount thereof or by posting a notice thereof on the premises.

Such cost shall constitute a civil debt owing to the City jointly and severally by the persons who have been given notice as herein provided. The debt shall be collectable in the same manner as any other civil debt owing to the City, including attachment of the contractor's side sewer bond.

5.4.08 CONNECTION REQUIREMENTS

If a side sewer must be connected to a manhole, then it shall penetrate the manhole wall through a Kor-n-Seal watertight rubber gasketed factory manhole adapter specially designed for the side sewer material type. A mortared connection at a manhole will not be permitted unless the structure is constructed as a saddle manhole.

Connection between the side sewer/lateral and dissimilar building plumbing piping shall be accomplished using approved flexible water tight rigid bodied double gasketed couplings specifically designed for the pipe materials joined. Butt joints wrapped and/or encased in concrete or mortar joint will not be allowed. Connection of pressure discharges from building plumbing to gravity side sewers/laterals shall be accomplished using standard pressure fittings and shall be anchored to ensure against movement during pressurization cycles.

5.4.08.1 TEE CONNECTIONS

All tee connections must be clean and visible during inspection. The first length of pipe installed at the tee shall not be more than 2' long.

Factory tees shall be appropriate for the soil conditions encountered in the connection location and shall have rubber gasketed joints. Material selection shall take into account the soil corrosivity, compatibility of materials with the existing pipe, strength requirements, and bedding/backfill conditions. The tee shall be connected to the existing sewer main pipe by short sections of plain end pipe and an approved stainless steel repair clamp. The short sections of pipe shall match the sewer main pipe material and shall meet or exceed the strength of the existing system. Stainless steel repair clamps shall be gasketed, with a minimum length of two pipe diameters, and assembled with all stainless steel bolts and nuts.

5.4.08.2 CONNECTION TO PLUMBING

Connection to the house soil pipe shall be made by means of a flexible clamp type coupling or other approved method.

5.4.09 EXCAVATIONS

5.4.9.1 MEASUREMENTS FURNISHED BY THE CITY

Excavations shall be made at the measurements per the Standard Sewer Details for the location of the wye, tee, or side sewer stub.

5.4.9.2 MAIN SEWER CHECK

The licensed side sewer contractor must check the depth of the main sewer at manholes on each side of wye location before starting to excavate for side sewer.

5.4.9.3 PROSPECTING FOR STUB

If the wye, tee, stub, or riser is not located at the measurements as furnished, the contractor shall prospect 4' in all directions from the distance and depth given. If such prospecting fails to disclose the stub, the contractor shall immediately contact the City and report the circumstances. Upon receipt of such report, a City representative will promptly visit the site and render further assistance.

5.4.10 LAYING PIPE

5.4.10.1 GRADE

All sewers shall be laid true to grade with the bell up grade.

5.4.10.2 FOUNDATION CLEARANCE

Side sewers parallel to the foundation wall of any building shall be laid not less than 30" therefrom.

5.4.10.3 MINIMUM COVER FOR SIDE SEWER

In addition to minimum cover required by Section 5.1 "Sewer Planning/Design Standards":

- A. Minimum cover for side sewers crossing a ditch in the public way shall be 2'-6".
- B. On private property where less than minimum cover can be maintained, approvals shall be obtained from the City for installation of alternate pipe materials.

5.4.11 INSPECTION AND TESTING**5.4.11.1 COVERING WORK**

Visual inspection by a City authorized representative is required on each side sewer prior to backfill. The entire lateral and side sewer must be hydrostatically or air pressure tested according to these standards. No trench shall be filled nor any sewer or drain covered until the work has been inspected and approved by the City.

5.4.11.2 TEST STUBS AND BRANCHES

The side sewer contractor must test, by flushing or other means, the existing stub or branch from main to property line to see that it is in operative condition before connecting the side sewer. The contractor will accept responsibility that the existing stub or branch is open and in a usable condition when completed. If the existing stub or branch is not found open and usable, the City must be notified before proceeding with the connection.

5.4.12 SPECIAL REQUIREMENTS**5.4.12.1 GAP DRAINS**

Where back flush of sand filters of swim pools are required to be disposed of in the sanitary sewer, a gap drain will be required. Diatomaceous earth filter backwash is not allowed to be disposed of in the sanitary sewer.

5.4.12.2 GRAVITY FLOW

In any structure in which the plumbing is too low to permit gravity flow to the sewer system or private sewer, the sewage shall be lifted by artificial means and discharged into the sewer system or private sewer.

When only the lower floor of a structure is too low for gravity flow, the remaining floors must flow by gravity.

5.4.12.3 PUMPED SIDE SEWERS

All pump installations must meet all building and plumbing codes.

5.4.12.4 HYDRAULIC GRADIENT

In any structure where the plumbing drain is 2' or less above the hydraulic gradient of a body of water, or below the rim of the next upstream manhole, a backwater valve and a holding tank shall be required per the Uniform Plumbing Code.

5.4.12.5 BACKWATER VALVES

Wherever a situation exists involving an unusual danger of backup, a backwater valve is required. The effective operation of the backwater sewage valve shall be the responsibility of the owner of the side sewer. Before any installation of this nature is made, the owner will be required to comply with provisions of this regulation concerning the agreement to save the City harmless from damage or injury.

5.4.12.6 REPAIR AND MAINTENANCE

The property owner shall be responsible to repair and maintain the side sewer from the point of connection to the lateral sewer to the building. If excessive I/I is discovered in the side sewer, the property owner shall repair their side sewer within twelve months of notification by the City. Identified I/I sources shall be corrected and tested to the satisfaction of the City within twelve months, otherwise the City shall perform the repair work and bill the property owner for the cost of the repair through the monthly utility bill.

5.4.13 SIDE SEWER DEMOLITION

Side sewer demolition shall be performed prior to removal of building foundation. The side sewer for each building shall be excavated and removed from the house connection to the property line or the main as specified by the City. The Contractor shall cap the end of the side sewer or lateral to remain in place. Side sewer demolition shall be performed in the presence of an authorized City of Black Diamond representative.

5.4.14 SPECIFICATIONS NOT COVERED BY THESE STANDARDS

In the event a construction or installation specification relating to side sewers is not covered by this regulation, the City shall require compliance with other manuals or standards as it sees fit.

5.5 SEWER APPROVED MATERIALS LIST

The following manufacturers have been approved for use for sanitary sewer construction. Where specific manufacturers are listed no other manufacturer shall be used without prior approval by the City.

DUCTILE IRON PIPE

All manufacturers that meet the performance requirements specified under the material section of the standards.

DUCTILE IRON FITTINGS

All manufacturers that meet the performance requirements specified under the material section of the standards.

GALVANIZED IRON PIPE

All manufacturers that meet the performance requirements specified under the material section of the standards.

JOINT RESTRAINT SYSTEMS

EBAA Iron (MEGALUG Series 1100)
Griffin Pipe Products Company (Snap-Lok, Bolt-Lok)
Romac (Grip Ring)
Star National Products (Shackle Products)
US Pipe (TR FLEX)

REPAIR COUPLINGS

Romac, Dresser

CASING SPACERS

Pipeline Seal and Insulator Co.:
 8" band, carbon steel with fusion-bonded coating, Model C8G-2
 12" band, carbon steel with fusion-bonded coating, Model C12G-2
Cascade Waterworks Mfg. Co.:
 Stainless Steel or hot-dip galvanized carbon steel Casing Spacers (catalog number depends on size)

Advance Products & Systems, Inc.:
 8" band, stainless steel, Model SS18
 12" band, stainless steel, Model SS12

8" band, carbon steel with fusion-bonded coating, Model SI8
12" band, carbon steel with fusion-bonded coating, Model SI12

CASING END SEALS

Pipeline Seal and Insulator Co.:
Standard Pull-on (Model S)
Custom Pull-on (Model G)

Cascade Waterworks Mfg. Co.:
CCES End Seal

Advance Products & Systems, Inc.
Molded End Seal, Model AM

VALVES

All manufacturers that meet the performance requirements specified under the material section of the standards.

VALVE BOXES

Olympic Foundry Inc.: #VB045 Lid, Top and Base Section

RICH (VanRich Casting Corp.): Top section and lid #045 with RICH Standard Base

Inland Foundry Co., Inc.: Valve Box Paving Riser #2052-3, #2052-4, #2053-5
12" Adjusting Sleeve #044A

PVC PIPE (ASTM D3034) 4" - 15"

All manufacturers that meet the performance requirements specified under the material section of the standards.

PVC PIPE (ASTM F679) 18" - 27"

All manufacturers that meet the performance requirements specified under the material section of the standards.

PVC PIPE (AWWA C900) 4" - 12"

All manufacturers that meet the performance requirements specified under the material section of the standards.

ABS PIPE AND FITTINGS

All manufacturers that meet the performance requirements specified under the material section of the standards.

PRECAST MANHOLE SECTIONS

Pacific International Pipe and Engineering, Inc.
Associated Sand and Gravel Company

HIGH-DENSITY POLYETHYLENE (HDPE) MANHOLES

Rhino USA of Oregon, LLC
ISCO Industries

POLYPROPYLENE MANHOLE STEPS

Lane International Corporation, P-13938
M.A. Industries, Inc., PS-2-PF

MANHOLE FRAMES AND COVERS

Inland Foundry Co.
Olympic Foundry

CLEAN-OUT FRAMES AND COVERS

Inland Foundry Co.
Olympic Foundry

PVC BY CONCRETE MANHOLE ADAPTERS

A.C. x P.V.C. Brant Adapter
Kor-N-Seal Company, Kor-N-Seal Connector
GPK Products, Inc., GPK PVC Manhole Adapter

AWWA C900 FITTINGS AND MANHOLE ADAPTERS

Head Manufacturing (Idaho)
Vassallo (Florida)

OIL/WATER SEPARATORS

100 gallon - Utility Vault Co., Inc., No. 25-SA
450 gallon - Utility Vault Co., Inc., No. 660-SA
800 gallon - Utility Vault Co., Inc., No. 48-SA
1,000 gallon - Utility Vault Co., Inc., No. 48-SA

GREASE INTERCEPTORS

Utility Vault Co, Inc., See Standard Detail.

BACKWATER VALVES

APCO Rubber Flapper Swing Check, 100 Series

MECHANICAL SEWER PLUGS

SIDU Manufacturing Company, Inc.
Sewer Equipment Company of America
SRECO Flexible

PREFABRICATED PLASTIC MANHOLE CHANNELS

GU Manhole Liners Ltd.

NEOPRENE FOAM PAD (FOR CUSHION BETWEEN ADJACENT PIPES)

Dow Plastics Ethafoamtm 220

CHAPTER 6

WATER

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CHAPTER 6 - WATER

6.1 WATER PLANNING / DESIGN STANDARDS

6.1.01 OVERVIEW

These Engineering Standards set forth the minimum standards for the planning, design, and construction of water facilities.

The Black Diamond Municipal Code Public Service Chapter 13.04 is the basis for these Standards.

These standards do not include design of special facilities, such as Pump Stations or Reservoirs. These special facilities require unique design requirements and will be subject to individual review and approval by the City.

Although these standards are intended to apply to physical development within the City, the standards will not apply for all situations. Compliance with these standards does not relieve the designer of the responsibility to apply conservative and sound professional judgment. These are minimum standards and are intended to assist, but not substitute for competent work by design professionals. The City may at its sole discretion due to special conditions and/or environmental constraints, require more stringent requirements than would normally be required under these standards.

6.1.02 GENERAL REQUIREMENTS

See Chapter One.

6.1.03 GENERAL WATER DESIGN STANDARDS

- A. Prior to construction, the Contractor shall notify the City for a pre-construction meeting. The Contractor's representative who will be the day-to-day on-site person in charge shall be in attendance for the applicant or developer at the preconstruction meeting. A video tape of the project before construction shall be performed and submitted to the City prior to commencement of work.
- B. Work shall be performed only by contractors experienced in laying public water mains.
- C. Prior to any work being performed, the Contractor shall contact the City's Utilities Superintendent or City Engineer to set forth the proposed work schedule.

- D. Contractor shall deliver material submittal for all materials to be used to the City's Water Superintendent and/or City Engineer prior to delivery of materials to the site. City Water Department Representative shall be on site to inspect materials prior to installation. Contact the City's Utility Superintendent to schedule delivery time and date.
- E. Water mains shall be laid only in dedicated streets or in 15' (minimum width) easements which have been granted to the City. Off-site easements shall be dedicated to the City and recorded prior to any work within such easements. All easements shall be clearly shown and labeled on plans.
- F. All water main distribution pipeline construction shall have a minimum 36" cover from finished grade and 42" cover over transmission mains. Water mains shall be extended to the far property line(s) of the property being served. Off-site extensions may be required to hydraulically loop existing and new systems. Dead end lines are not permitted. Water mains on platted cul-de-sacs shall be extended to create a hydraulic loop. Oversizing of water mains may be required to be installed per City's current Water Comprehensive Plan. 8" ductile iron pipe is the minimum size required.
- G. Fire hydrants are generally required approximately every 500' in residential areas, and every 250' in commercial areas. However, fire hydrants shall be furnished and installed at all locations as specifically mandated by the fire marshal and/or per City Building Code.
- H. Fire hydrants on dead end streets and roads shall be located within approximately 300' from the frontage center of the farthest lot. Distances required herein shall be measured linearly along street or road.
- I. Pipes connecting hydrants to mains shall be at least 6" diameter and not longer than 50'.
- J. All materials shall be new and undamaged.
- K. The water main shall be cement lined, ductile iron pipe class 52. The minimum nominal size for water mains shall be 8", unless otherwise approved/required by City Engineer. EXCEPTION: 6" hydrant spools and pipelines located beneath rock or retaining walls shall be Cl. 53 and shall be contained inside steel sleeves.
- L. All fittings shall be cement-lined ductile iron.
- M. Pipe deflection at the joints shall be in accordance with pipe manufacturer's recommendations.
- N. All valve marker posts shall be painted yellow and marked with the distance to valve being referenced in unpaved areas.
- O. Residential water service pipe shall be 1" minimum high plastic "Poly" pipe (no joints beneath pavement areas or from main to setter), meeting or exceed ASTM D2239, SDR-7 as manufactured by Driscopipe (CL 200), or City approved equivalent.

- P. Meter services and meter boxes shall be set to final grade. Centerline of service inlets shall be located to match bottom elevation of meter box in such a manner that meter inlet and outlet will be the same elevation as bottom of meter box. Service inlet shall be centered at inlet end of box and faced toward outlet end of box parallel with long sides.
- Q. All water services shall end within road right-of-way or easements and are not allowed in driveways or sidewalks unless approved by the City.
- R. All meters shall be installed by the City, and the Developer/Owner shall pay the current meter installation charge and any other water system fees, costs or charges.
- S. One water sampling station may be required for developments in size of five lots or larger as required by the City. The water sampling station shall be installed at a location determined by the City. One additional sampling station may be required for each additional 50 lots or portion thereof. Location(s) shall be determined by the City of Black Diamond Water Department.
- T. All new buildings and residences shall include in their water service a suitable shut off check valve and pressure reducing valve. Shut off shall be accessibly located on the customer side of the meter setter.
- U. All new construction shall comply with the "Accepted procedure and practice in Cross Connection Control Manual" as published by the Pacific Northwest Section of the American Water Works Association", 1996, Sixth Edition, and current amendments thereto.
- V. Each fitting/valve shall have attachment type listed (e.g. FL, MJ, FL x MJ, etc.). Watermain shut-off shall be coordinated with the Water Department for preferred timing during flow control conditions. Cut in connections shall not be made on Fridays, holidays or weekends. All tapping sleeves and tapping valves shall be pressure tested prior to making connection to existing mains.
- W. Contractor shall notify City's Water Superintendent and obtain approval of schedule for water shut-off or turn-on, affecting the water system, a minimum of 48 hours in advance. Valves shall only be operated by City forces.
- X. Road restoration shall be per City, County or State design and construction standards, as may be applicable. Developer and Contractor shall become familiar with all State, County and City conditions of required permits, and shall adhere to all conditions and requirements.
- Y. Provide air vacuum release assemblies where required (typically at the high points of the water system).
- Z. List pipe length (from center-of-fitting to center-of-fitting), size, and material along side of each pipe, e.g. 150 L.F. - 8" D.I.. Pipe material can be listed in a general note in lieu of listing along each pipe.

- AA. Dimension existing and new main locations from right-of-way line and/or property line, or label stations and offsets.
- BB. Blocking
Provide thrust blocking or anchor blocking at all fittings and bends in accordance with the City standards. At vertical bends, pipe shall be restrained a minimum of 36' (2 joints) from each side of bend. Reduced-size concrete blocks shall be installed at bends. No change in pipe direction or diameter shall occur within 36' of the vertical bend. In addition, bends, tees, reducers, etc., beyond the 36' limit, shall be restrained with standard blocking. Where this criteria cannot be met, plans should call for vertical blocking without joint restraint, or a restraint method should be designed and detailed on the plan.
- Check if special blocking or joint restraint designs are necessary (e.g. poor soil, conflicting utility, etc.).
 - Show all blocking on any detail drawing that shows vertical bends.
 - See Approved Materials List for joint restraint methods, other than concrete blocking.
- CC. Drawings shall reference distance to nearest existing valve and/or hydrant from new point of connection to existing watermain.
- DD. Where hydrants are not available, provide temporary 2" blow off assemblies for testing and disinfection of new 8" watermains or 4" blow off assemblies for 12" or larger watermains. Place blow-off at high end of line, where possible.
- EE. Cap end of existing water lines to be abandoned as follows:
- Asbestos cement lines: use end cap coupling.
 - Cast or ductile iron lines: use MJ cap or plug.
- FF. All water vaults (water service, backflow device, pressure reducing station, etc.) shall include designs for floor drain piping draining to daylight. Discharge point of vault floor drains shall be shown on the plan. Where vault floor drain cannot drain to daylight, consult with the City during project design review to determine the best alternative to a daylight drain (to storm if necessary).

6.1.04 WATER GENERAL PLAN NOTES

The following is a listing of General Notes that should be incorporated on the first water plan sheet. All the notes on the list may not pertain to every project. The Engineer should include only those notes that are relevant to the project and may omit non-relevant notes. If additional notes are needed for specific aspects, they should be added after the General Notes.

Water General Notes:

1. All work shall conform to City of Black Diamond City Engineering Design and Construction Standards and the Developer Extension Agreement.
2. All pipes shall be cement lined, ductile iron class 52 unless otherwise shown. Minimum size water line is 8".
3. All pipe and fittings not to be disinfected in place shall be swabbed with 1% available chlorine solution prior to installation.
4. The new watermain shall be connected to the existing system only after new main is pressure tested, flushed, disinfected, and satisfactory bacteriological sample results are obtained.
5. After disinfecting the watermain, chlorinated water shall be disposed of in a manner that does no physical or environmental damage to property, streams, storm sewers or any waterways.
6. Watermain shut-off shall be coordinated with the City's Utilities Superintendent for preferred timing during flow control conditions. Watermain shut-offs shall not be scheduled to take place on Fridays, or on the day before a City holiday, unless otherwise approved by the City.
7. The locations of all existing utilities shown hereon have been established by field survey or obtained from available records and should therefore be considered approximate only and not necessarily complete. It is the sole responsibility of the contractor to independently verify the accuracy of all utility locations shown, and to further discover and avoid any other utilities not shown hereon which may be affected by the implementation of this plan.
8. Deflect the watermain above or below existing utilities as required to maintain 3' minimum cover and 12" minimum vertical clearance between utilities unless otherwise specified.
9. The watermain shall be installed only after the roadway subgrade is backfilled, graded and compacted in cut and fill areas.
10. Trench backfill of 5/8" minus gravel and surface restoration of existing asphalt pavement shall be as required by these standards (see Trench Restoration detail).
11. All fittings shall be blocked per Standard Detail unless otherwise specified.
12. All water meters shall be 5/8" x 3/4" unless otherwise specified.

13. When working with asbestos cement pipe, the Contractor is required to maintain workers' exposure to asbestos material as prescribed in WAC 296-62-07705. All asbestos cement pipe from cut ins or tie-ins shall be removed and disposed of in accordance with WAC's.
14. Call 1-800-424-5555 a minimum of 48 hours before construction for utility locations.
15. Uniform plumbing code requires the installation of privately owned and operated pressure reducing valves where the operating pressure exceeds 80 psi.
16. The Contractor shall use a vacuum street sweeper to remove dust and debris from pavement areas. Care shall be taken to control fugitive dust in conformance with State standards. Flushing of streets shall not be permitted.
17. Before commencement of trenching, the Contractor shall provide erosion control measures in accordance with these standards and the Department of Ecology requirements.
18. Abandonment of existing water services shall be accomplished as follows:
 - a. If no corporation is available, remove existing service saddle from water main and replace with new stainless steel repair band, Romac SS2, Romac Service Saddle 101S, or approved equal (will not be required when water main is to be abandoned prior to service demolition).
 - b. Remove and return existing meter, setter and meter box to the City of Black Diamond Water Department.
 - c. Cap or crimp (if copper) existing service line to be abandoned in place, each end.
19. Where new utility line crosses below an existing AC main, the trench shall be backfilled with controlled density fill (CDF, ala flowable fill) from bottom of trench to bottom of the AC main. If the AC main appears to be damaged or at risk of failure, the City will require section replacement according to the Standard Details for "Typical AC Watermain Crossing Replacement Detail".
20. Avoid crossing water or sewer mains at highly acute angles. The smallest angle measure between utilities should be 45 to 90-degrees.

21. Where watermain crosses above or below sanitary sewer, one full length of water pipe shall be centered for maximum joint separation. Encasement may be required at the discretion of the City Engineer.
22. At points where existing thrust blocking is found, minimum clearance between the concrete blocking and other buried utilities or structures shall be 5'.
23. All new buildings and residences shall include in their water service a suitable shut off check valve and pressure reducing valve. Shut off shall be accessibly located on the customer side of the meter setter. See customer service detail.
24. Contractor shall allow for postal delivery access to all residences during project construction. Contractor shall provide and maintain mail boxes and paper boxes during construction.
25. Contractor shall allow and provide for emergency vehicle access to all properties during construction.
26. Between the time that a fire hydrant is installed and the completed facility is placed in operation, the fire hydrant shall at all times be wrapped in burlap, or covered in some other suitable manner to clearly indicate that the fire hydrant is not in service.

6.1.05 PLANNING CRITERIA

6.1.05.1 MAIN EXTENSIONS AND UPSIZING WATER LINES TO PROPERTY

See City of Black Diamond Municipal Code Section 13.04.040 for specific requirements. Watermains shall be extended to the far property line(s) of the property being served. Off-site extensions may be required to hydraulically loop existing and new system. Dead end lines are not permitted, except by approval of the Public Works Director.

6.1.05.2 PIPE SIZING

Minimum water main size is 8" ductile, larger size pipe will be required if shown in the city's current Comprehensive Water Plan or as deemed necessary based on the project demands. Verification of capacity by the developer's engineer may be required at the request of the City.

6.1.05.3 SYSTEM PARAMETERS

- A. Water velocity in mains - velocities shall not exceed 10 feet per second during highest demand and fireflow.

B. Distribution System Pressures (Measured at Finished Floor Building Elevation):

Desirable	-	Minimum	50 psi
		Maximum	80 psi
Allowable	-	Minimum	43 psi
		Maximum	125 psi

Minimum 30 psi is allowed for existing systems.

Individual pressure reducing valves are required to be installed by Developer/Owner on all services.

B. Reservoir Replenishment - Facilities (i.e. transmission mains, pump stations) shall be sized to enable storage facilities to be refilled within 3 days after an emergency or major fire.

6.1.05.4 FIREFLOW REQUIREMENTS

Fireflow requirements shall be as determined by City of Black Diamond.

The City will determine available fireflow using its computer simulated model. The Developer/Owner shall be responsible for all costs associated with project-specific computer modeling.

Minimum system pressure during fireflow analysis is 20 psi throughout the system.

The following table includes minimum fire flow design requirements. Actual fireflow requirements will be as determined by the Fire Marshall.

FIRE FLOW REQUIREMENT (GPM)	CLASSIFICATION
1,000 gpm	Urban Reserve; Residential (Low Density)
2,500 gpm	Residential (Medium Density); Mixed Use; Neighborhood Commercial; Town Center; Community Commercial; Master Planned Development Overlay
3,000 gpm	Business Park & Light Industrial
3,500 gpm	Industrial; School

6.1.06 VALVING

600' maximum distance between valves on distribution mains.

Provide a valve at each end of an easement, except when the developer can demonstrate to the City's satisfaction that it would be impractical.

At watermain intersections, valves shall be placed on 3 out of 4 legs at each cross, and 2 out of 3 legs at each tee (unless tapping an existing watermain).

Additional valves may be required for area isolation.

Air/vacuum relief valves shall be installed at local high points in watermain.

Only one valve is required on the tee serving a fire hydrant.

6.1.07 FIRE HYDRANTS

The following information is provided as a guideline to be used during design. The final number of hydrants and their location shall be approved by the City of Black Diamond and the City's Fire Marshall.

A. Pipes connecting hydrants to mains shall be 6" in diameter and not longer than 50'.

B. Between the time that the fire hydrant is installed and the completed facility is placed in operation, the fire hydrant shall at all times be wrapped in burlap, or covered in some other suitable manner to clearly indicate that the fire hydrant is not in service.

C. Fire hydrant location:

Single-family residential: Spacing = 500' apart. Coverage = 250' from front property line.

Multi-family/commercial: As determined by the fire department,

D. 3' minimum clearance shall be provided around hydrant for operation.

E. When fire hydrants are located in parking lots, or other areas subject to vehicular traffic, hydrant guard posts shall be installed as follows:

Hydrant guard post shall be installed in areas where the hydrant is not protected by a cement concrete curb on all sides where vehicles may have access.

6.1.08 PIPE CLASS / PROTECTION / COVER

- A. Pipe shall be ductile iron, class 52. All ductile iron pipe shall conform to ANSI/AWWA C151/A21.51 standards. The pipe shall be cement lined to a minimum thickness of 1/16".
- B. Ductile iron pipe shall be encased in a steel or ductile iron casing when crossing under improvements where the ability to remove and replace pipe without disturbance to the improvement is needed. Casings are required when:
- Crossing under rockeries over 5' high.
 - Crossing under retaining wall footings over 5' wide.
 - Crossing under reinforced earth retaining walls (both wall and reinforcing material).

Casings shall extend a minimum of 5' past each edge of the improvement, or a distance equal to the depth of pipe whichever is greater. The carrier pipe shall be supported by casing spacers and filled with sand.

Minimum clearance between bottom of rockery and top of pipe or casing shall be 2'. The trench shall be backfilled with crushed rock when clearance is less than 3'.

- C. Watermain depth of cover:
- 3' minimum from final grade
 - 6' maximum from final grade
- D. Building setback requirements:
- 10' minimum from building (and retaining walls) to watermain.
 - 20' minimum easement shall be provided between buildings.

6.1.09 CLEARANCES / OTHER UTILITIES

- A. All clearances listed below are from edge-to-edge of each pipe and/or appurtenances.
- B. Water services and sewer stubs shall have at least 10' horizontal separation.
- C. Check for crossing or parallel utilities. Maintain minimum vertical and horizontal clearances. Avoid crossing at highly acute angles (smallest angle measure between utilities should be between 45 and 90-degrees).
- D. At points where thrust blocking is required, minimum clearance between the concrete blocking and other buried utilities or structures shall be 5'.
- E. Horizontal clearances from watermain:

Cable TV	5'
Gas	5'
Power	5'
Storm	5'
Sanitary	10'
Telephone, Fiber Optics	5'

F. Vertical clearances from watermain:

Cable TV	12"
Gas	12"
Power	12"
Storm	12"
Sanitary	18" below the water main
Telephone, Fiber Optics	12"

- G. Where watermain crosses above or below sanitary sewer, one full length of water pipe shall be used with the pipes centered for maximum joint separation. Washington Department of Ecology criteria will also apply.

- H. Design Engineer shall send letter and preliminary plan to existing utilities to inform them of new construction. Request as-built information and incorporate into plans. At minimum the following utilities should be contacted:

Cable Television
 Natural Gas
 Power
 Sanitary Sewer
 Storm Drainage
 Telephone, Fiber Optics

- I. Draft plans shall be sent to the above listed utilities to allow coordination of projects.

6.1.10 SLOPES

- A. Vertical bends shall be used when joint deflection would exceed one-half of pipe manufacturer's recommended maximum deflection.
- B. Pipe joints shall be restrained where slopes are 20% or greater. Joint restraint on slopes shall be megalug restrainer for mechanical joint fittings and tie rod/retainer clamp assemblies for DI push on joints or other methods from approved materials list. Anchor blocks shall be used in conjunction with joint restraint where slopes are 20% or greater.
- C. Timber baffle/hill holders shall be required on unpaved slopes that exceed 20%, minimum spacing shall be 20' on center.

6.1.11 CONNECTIONS TO EXISTING SYSTEM

- A. Cut-in connections are the preferred method of connections to the existing system. When tapping water mains use stainless steel or full-bodied cast iron Mueller-type tapping tee.
- B. Size-on-size tapping tees are not allowed.
- C. Connections to existing mains smaller than 8" diameter shall be made by cutting in a tee, unless otherwise approved by the City.

6.1.12 EASEMENTS

- A. Show easements with recording number on plans and identify width.
- B. Show easements on all private property. If easement is defined as a constant width on each side of watermain, then show a segment of the easement and label as typical (typ).
- C. All easements shall be a minimum of 15' width, unless otherwise approved or required by the City. 20' minimum easements shall be provided between buildings on the same property, or through a side yard.
- D. Also see Section 6.1.07.D. "Building Setback Requirements".

6.1.13 SERVICES

- A. The minimum water service size shall be 1" diameter minimum from main to meter. Minimum allowable water meter size shall be 5/8" x 3/4". Check that minimum pressure can be maintained when service is flowing at anticipated maximum levels. If friction losses will cause pressure at building to drop below minimum, increase service line size as necessary to raise pressure.
- B. Private water services shall be 3/4" minimum H.D. poly pipe with no joints. Washed sand may be utilized as an acceptable bedding material for services. Maximum bends shall be in accordance with manufacturer's specifications.
- B. Show location of water services on plan and indicate size. Sizes shall be determined by the Developer per the Uniform Plumbing Code.
- C. Irrigation for commercial, institutional or industrial uses shall be by separate water meter installed by the City at the applicant's cost. Location and size of irrigation service shall be approved by the City. See "Dual Meter Installation" standard detail.

- D. Static service pressures at ground floor elevation shall be determined at all lots/buildings to ensure compliance with system pressure standards. Minimum system pressure shall be 30 psi as measured at the meter location. System pressures in the range of 40-60 psi are desired.
- E. Plan shall identify lots/buildings where builder/owner shall install individual pressure reducing valves. Individual pressure reducing valves are required on customer side of service lines (after water meter box) when service pressures exceed 80 psi.
- F. 2" and larger service installations shall include an adequate bypass.

6.1.14 BACKFLOW PREVENTION

"Per City Code 13.04.070, irrigation systems, fire sprinkler systems, and other water uses which may or will cause the contamination of the potable water supply by backflow, shall be required to install approved backflow prevention assemblies, and/or otherwise meet the requirements of the WAC 246-290-490 "Cross Connection Control Regulation in Washington State", and the recommendations of the PNWS-AWWA Cross Connection Control Manual, latest edition. Requirements may include premise, facility, or fixture isolation, or a combination of such, depending upon the degree of hazard. All backflow prevention assemblies installed shall be on the Washington State DOH list of approved backflow prevention assemblies, most recent edition at the time of installation, and shall be installed per the Standard Details.

Fire sprinkler system connections to the City's water system shall be owned and maintained by the property owner, beginning immediately downstream of the gate valve where the system connects to the City's water main.

All commercial buildings shall be required to install Reduced Pressure Backflow Assemblies as approved by the Washington State Department of Health.

The backflow prevention assembly on fire sprinkler system connections shall be located as close to the serving water main as possible, either on the owner's property or an easement dedicated to the owner's property.

Interior backflow prevention, when permitted, must meet the Uniform Plumbing Code requirements as administered by the Building Division. Such backflow prevention must also meet the requirements of the Black Diamond Utilities Department.

Multi-family projects require a double check valve assembly. Multi-family projects that have eight or more units will require a bypass with equal backflow prevention to avoid loss of service during maintenance and repair.

6.2 WATER MATERIALS

6.2.01 GENERAL

All materials shall be new and undamaged. The same manufacturer of each item shall be used throughout the work.

Where reference is made to other specifications, it shall be the latest revision at the time of construction, except as noted on the plans or herein.

All materials not specifically referenced shall comply with applicable sections of ANSI, ASTM, AWWA or the WSDOT Standard Specifications.

Approved manufacturers and model numbers of various materials are listed in the Approved Water Materials List published by the City. When specific manufacturers or models are listed, no substitutions will be allowed without prior approval by the City.

6.2.02 WATER PIPE

Water pipe shall be ductile iron pipe, minimum thickness Class 52, cement-lined unless otherwise specified and shall conform to ANSI/AWWA C151/A21.51 or as shown on plans.

Any installation requiring polyethylene encasement for ductile iron pipe, the encasement shall be installed in accordance with ANSI/SWWA C105/A2.5.

Rubber gasket pipe joints to be push-on-joint (Tyton) or mechanical joint (M.J.) in accordance with ANSI/AWWA C111/A21.11, unless otherwise specified.

Flanged joints shall conform to ANSI B16.1, class 125 drilling pattern, rated for 250 psi working pressure.

Standard thickness cement lining shall be in accordance with ANSI/AWWA C104/A21.4.

The Contractor shall furnish certification from the manufacturer of the pipe and gasket being supplied that the inspection and all of the specified tests have been made and the results thereof comply with the requirements of the above referenced standards.

6.2.03 WATER SAMPLING STATION

One water sampling station may be required for developments in size of five lots or larger as required by the City. The water sampling station shall be installed at a location determined by the City. One additional sampling station may be required for each additional 50 lots or portion thereof. Model #88 Eclipse Sampling Station with aluminum enclosure shall be used.

6.2.04 FITTINGS

All water main fittings shall be ductile iron, short body, cement lined, and for pressure rating of 350 psi for mechanical joint fittings and 250 psi for flange joint fittings, unless otherwise noted. Metal thickness and manufacturing process shall conform to applicable portions of ANSI/AWWA C110/A21.10. Mechanical joint, ductile iron, compact fittings 24" and less shall be in accordance with ANSI/AWWA C153/A21.53. Flanged fittings, cast or ductile iron, shall conform to ANSI B16.1, class 125 drilling pattern.

Standard cement lining shall be in accordance with ANSI/AWWA C104/A21.4.

Rubber gaskets for push-on-joints (Tyton) or mechanical joint (M.J.) shall be in accordance with ANSI/AWWA C111/A21.11.

Gasket material for flanges shall be neoprene, Buna N, chlorinated butyl, or cloth-inserted rubber.

Type of connections shall be specified as push-on joint (Tyton), mechanical joint (M.J.), plain end (P.E.), flanged (FL), and threaded.

Approved manufacturers of brass fittings and valves up to 2" sizes include Ford, Mueller, and James Jones Company (except James Jones meter setters, which are not approved).

6.2.05 GALVANIZED IRON PIPE

Where galvanized iron pipe is specified, the pipe shall be standard weight, Schedule 40, steel pipe per Standard Specification for black and hot-dipped, zinc-coated (galvanized) welded and seamless steel pipe for ordinary uses (ASTM A-120). Fittings shall be screwed malleable iron galvanized per ANSI B16.3. Galvanized pipe shall be used only for dry pipe in pressure relief vacuum breaker assemblies.

6.2.06 COUPLINGS

Flexible coupling and transition coupling cast components shall be ductile iron. Center rings and end rings shall be ductile iron in accordance with ASTM 536-80, Grade 65-45-12.

Gasket material shall be virgin SBR in accordance with ASTM D2000 3 BA715.

Bolts shall be high strength, low alloy steel trackhead bolts with national course rolled thread and heavy hex nuts. Steel shall meet ANSI/AWWA C111/A21.11 composition specifications.

Approved couplings include Romac, Smith-Blair (Rockwell), Mueller MaxiFit, and Mueller MaxiStep.

6.2.07 ADAPTERS

All flange by mechanical joint (FL x MJ) adapters shall be ductile iron.

6.2.08 BOLTS IN PIPING

Bolts shall be malleable iron, Cor-ten, or stainless steel.

Bolts and nuts for flanged pipe and fittings shall conform in size and length with ANSI/AWWA C115/A21.15. T-bolts shall be malleable iron or Cor-ten in accordance with ANSI/AWWA 111/A21.11. Stainless steel bolts shall meet the requirements of ASTM A-193, Grade B8. Shackle rods, nuts and washers shall be hot-dipped galvanized in accordance with AASHTO M 232 and coated thoroughly with asphaltic material. Stainless steel nuts, bolts and washers shall be type 304.

6.2.09 FLANGE GASKETS

Gasket material shall be neoprene, Buna N, chlorinated butyl, or cloth inserted rubber.

6.2.10 GATE VALVE

The minimum requirement for all gate valves, 2" to 12" shall conform to ANSI/AWWA C509-87 Standards for resilient-seated, high strength, bronze stemmed gate valves. The valves shall be iron-bodied, iron disk completely encapsulated with polyurethane rubber and bronze, non-rising stem with "O" ring seals. The polyurethane sealing rubber shall be fusion bonded to the wedge to meet ASTM tests for rubber to metal bond ASTM D429. The valves shall open counter-clockwise and be furnished with 2" square operating nuts except valves in vaults shall be furnished with handwheels. All surfaces,

interior and exterior shall be fusion bonded epoxy coated, acceptable for potable water. Valves shall be rated 250 psi or higher.

The valves shall be set with stems vertical. The axis of the valve box shall be common with the axis projected off the valve stem. The tops of the adjustable valve boxes shall be set to the existing or established grade, whichever is applicable.

Valves 2" to 12" shall be Dresser, M&H, Waterous or Clow. Valves larger than 12" must be approved by the City Engineer.

6.2.11 VALVE BOX

Each valve shall be provided with an adjustable two-piece cast iron valve box of 5" minimum inside diameter. Valve boxes shall have a top section with a 18" minimum length. The valve boxes lid shall be cast iron, 3 ½" deep, with recessed lifting handle, and the letter "W" cast into it. Valve box riser ears shall be installed with the ears parallel to the direction of water flow.

The valve box shall be set in a telescoping fashion around the 5" pipe cut to the correct length to allow future adjustment up or down.

6.2.12 VALVE OPERATING NUT EXTENSION

Use where valves are installed more than 3' below finished grade. Extensions are to be a minimum of 1' with only one extension per valve.

6.2.13 BUTTERFLY VALVE

Butterfly valves shall conform to ANSI/AWWA C504, Class 250B. Valves in chambers shall have a manual hand wheel operation. Buried valves shall have a stem extension with AWWA 2" operating nut and suitable valve box. Butterfly valves will be required on 16" and larger pipe.

6.2.14 TAPPING SLEEVES AND TAPPING VALVES

The tapping sleeves shall be rated for a working pressure of 200 psi minimum and furnished complete with joint accessories. Tapping sleeves shall be constructed in two sections for ease of installation and shall be assembled around the main without interrupting service.

Mechanical joint style sleeves shall be ductile iron and is required for size-on-size connection to cast iron pipe. Mechanical joint sleeves shall be cast by Clow, Dresser, Mueller, Tyler, U.S. Pipe, or approved equal.

Fabricated steel style sleeves shall be fusion bonded coated, acceptable for potable water, and is acceptable for A.C. pipe taps only. Fabricated steel sleeves shall be manufactured by JCM, Romac or approved equal.

Tapping valves shall be provided with a standard mechanical joint outlet for use with ductile iron pipe and shall have oversized seat rings to permit entry of the tapping machine cutters. In all other respects, the tapping valves shall conform to the resilient seat gate valves herein specified with regards to operation and materials.

The installation of the tapping sleeves and valves shall be performed by a qualified contractor such as Spear Tap, HD Supply, or owner approved equal.

6.2.15 AIR AND VACUUM RELEASE VALVE

Combination Air Valves shall be of the single housing style that combines the operating features of both an Air/Vacuum and Air Release Valve.

The Air/Vacuum portion shall automatically exhaust large quantities of air during the filling of the pipeline and automatically allows air to re-enter the pipeline when the internal pressure of the pipeline approaches a negative value due to column separation, draining of the pipeline, power outage, pipeline break, etc.

The Air Release portion shall automatically release small pockets of air from the pipeline while the pipeline is in operation and under pressure.

The Combination Air Valve shall have minimum 1" NPT inlet and outlet connections and be able to withstand a working pressure of 300 PSI.

The valve body and cover shall be cast iron with stainless steel float.

Acceptable air and vacuum release valves include APCO No. 143-C, Val-Matic No. 201C, or Crispin UL10.

6.2.16 PRESSURE REDUCING STATION

The Station shall be sized by the Engineer using the City's hydraulic model. A pressure reducing valve shall maintain constant downstream pressure regardless of varying inlet pressure. Pressure reducing stations shall be GCS Systems Incorporated Pre-Assembled, Pre-Tested packaged systems or approved equal.

6.2.17 FIRE HYDRANT

All fire hydrants shall be approved by the National Board of Fire Underwriters and conform to AWWA Specification C502, break-away type, in which the valve will remain

closed if the barrel is broken. The hydrant barrel shall have a diameter of not less than 8-1/2", and the valve diameter shall be not less than 5-1/4". Each hydrant shall be equipped with two 2-1/2" hose ports (National Standard Thread), and one 4" pumper connection (National Standard Thread), with permanent 4" Storz hydrant adaptor and Storz blind cap. Each hydrant shall be equipped with a suitable positive acting drain valve and 1-1/4" pentagonal operating nut (counter-clockwise opening). The fire hydrants shall be M&H "Reliant" #929 or City approved equal. Equivalent fire hydrants shall utilize parts and tools as required for the M&H hydrants in order to facilitate operations and maintenance.

The holding spools between the gate valve and fire hydrant shall be made from 6" Class 52 ductile iron pipe, 0.34" wall thickness. The hydrant and gate valve shall be anchored in place using holding spools and mechanical joint restraint device. Holding spools with length in excess of 17' shall be supplied with an M. J. sleeve and mechanical joint restraint device.

The fire hydrants shall be painted with two (2) coats of Preservative Brand caterpillar or international yellow paint. After installation, they shall be wire brushed and field painted with two additional coats of the same yellow enamel paint. Distance to the hydrant valve shall be clearly stenciled in black numerals 2" in height on the fire hydrant below the pumper port.

6.2.18 FIRE HYDRANT GUARD POSTS

Hydrant guard posts shall be 6" diameter concrete filled ductile iron pipe class 52, 6' long. Pipe shall be painted with two (2) coats of Preservative Brand caterpillar or international yellow paint.

6.2.19 METER SETTER

Meter setters shall have double purpose couplings, unless otherwise specified, and angle meter valve with drilled wings for padlock, 12" high. Equal to Ford VBH92-12W-11-33-A with a PVC spacer to reinforce the setter and to keep it aligned.

2" meter setters shall have vertical inlet and outlet tees with 1" lateral bypass, flanged ball meter valve on inlet, flanged key meter valve on outlet, ball valve on bypass, and padlock wings on all valves.

Acceptable meter setters are Ford 90 Series – VBH 92-12W-11-33-A, VBH 86-12B-11-66, or VBH 87-12B-11-77.

1-1/2" Angle meter valves for irrigation shall be type Ford FV13-666W or Mueller 1-1/2" H-14286.

2" Angle meter valves for irrigation shall be type Ford FV13-777W or Mueller 2" H-14286.

6.2.20 CORPORATION STOP / SERVICE SADDLES

Corporation stops shall be brass in accordance with AWWA Standard C800 with AWWA tapered thread (CC) inlet by compression fitting for poly iron pipe-size outlet, complete with coupling nut for poly service.

Corporation stops for 1", 1 1/2" and 2" tap shall be the ball valve type.

Service saddles for a 1" tap shall be type Romac 101S for use on PVC and AC pipe. Service saddles for a 1" tap for use on ductile iron pipe for Romac 101. Service saddles for a 1-1/2" tap or 2" tap shall be type Romac 202S.

1" Corporation stops shall be Ford F10000, FB1000, or Mueller No. H-15008.

1-1/2" Corporation stops shall be Ford Ballcorp FB400 or Mueller No. H-15008.

2" Corporation stops shall be Ford Ballcorp FB400 or Mueller Oriseal No. H-9968.

6.2.21 METER BOX

For 5/8", 3/4", or 1" Water Meter, a high-density Polyethylene homogeneously molded as one unit meter box, Model MSBCF1324-18XL as manufactured by Mid-State Plastics, Inc. or approved equal (equal meeting the exact same measurements so lids are interchangeable) shall be required. For 1-1/2" or 2" service, Model MSBCF1730-18XL shall be utilized. Ductile iron lids as manufactured by Carson Industries shall be required, or approve equal. All lids shall have a 1-3/4" touch read hole, with a meter inspection lid.

6.2.22 PLASTIC SERVICE PIPE

Plastic service pipe shall be 1" Class 200 SDR-7. All connections with plastic pipe shall be made utilizing stainless steel inserts along with couplings or adapters. No joints will be allowed from the corporation stop to the meter setter.

Materials: Pipe shall be manufactured from ultrahigh molecular weight, high density polyethylene resin PE 3408. It shall meet the requirements of Type III, Class C, Category 5-P34-08 polyethylene as defined by ASTM specification D-1248 "Polyethylene Plastics Molding material", and pipe shall conform to product standard 11-70 or ASTM-D-2239.

Marking: Pipe shall be permanently imprinted with manufacturer's brand name, pipe size, product standard (pipe only), identification of the NSF approval, ASTM specification, recommended working pressure, and production code. Letters shall be at least 3/16 in. high and should appear on the pipe at intervals no less than every 24".

Dimensions: Pipe dimensions and tolerances shall correspond with the values listed in U.S. Department of Commerce PS-11-70 or ASTM-D-2239 for flexible plastic pipe with a standard dimension ratio (SDR) of 7 I.P.S.

Pressure: Pipe shall have working pressure of 200psi at 73.4°F.

Plastic service pipe shall be Drisco pipe 5100 ultra line or approved equal.

6.2.23 PIPE INSULATION

All pipe for above ground service shall have 2" thick foam insulation with an aluminum jacket. Aluminum jacketing shall be manufactured from Type 3003 or 5005 alloy; temper of H-14 gauge 0.016. Foam insulation shall conform to the following:

Foam insulation shall be closed cell polystyrene foam manufactured by extrusion process. Foam insulation shall be odorless, chemically inert, with no food value and shall be resistant to ground chemicals and microorganism. Foam insulation shall conform to the properties included in the following table.

PROPERTIES	ASTM TEST	AVERAGE
Thermal Conductivity "K" Factor BTU HR./SQ. FT./+F/IN. Mean Temp. 40+	C518-70 & C177-63	0.23
Moisture Resistance Water Absorption % By Volume	D2842-69	0.8
Water Vapor Transmission (Perm-Inch)	C355-64	0.9
Physical Density (lb./cu. ft.)	C303-56	1.8
Compressive Strength (PSI) Perpendicular to Board Face (5% Deflection or Yield)	D1621-64	40

6.2.24 CONCRETE BEDDING AND BLOCKING

Bedding, blocking, encasement, or slope anchor concrete shall be mixed from materials acceptable to the City Engineer and shall have a 30-day compressive strength of not less than 2,500 psi. The mix shall contain five (5) sacks of cement per cubic yard. All concrete shall be mechanically mixed. All bolts and nuts shall be poly-wrapped prior to pouring concrete.

6.2.25 JOINT RESTRAINT

Acceptable joint restraint systems are as follows:

- EBA Iron (MEGALUG Series 1100)
- Griffin Pipe Products Company (Snap-Lok, Bolt-Lok)
- Romac (Grip Ring)
- Star National Products (Shackle Products)
- US Pipe (TR FLEX)
- Uni-Flange Corporation (Series 1300 and 1390)

Where shackle restraint is used, all parts shall be hot-dipped galvanized.

6.2.26 INDIVIDUAL PRESSURE REDUCING VALVES

Individual pressure reducing valves shall be installed on individual services. Acceptable valves for residential use are Wilkins 600 with built-in bypass. Acceptable pressure reducing valves for commercial use are Wilkins 600 with built-in bypass. Acceptable pressure relief valves for commercial use are CLA-VAL 55F.

6.2.27 REDUCED PRESSURE BACKFLOW ASSEMBLY

All Reduced Pressure Backflow Assemblies shall be as listed on the most current copy of "Accepted Cross-Connection Control Assemblies" published by Washington State Department of Health (D.O.H.). The assembly shall include a tightly closing resilient seated shut-off valve on each end of the body and each assembly shall be fitted with four properly located resilient seated test cocks.

6.2.28 REDUCED PRESSURE BACKFLOW ASSEMBLY WITH DETECTOR

This assembly shall include a line-sized D.O.H. approved (listed on the most current copy of "Accepted Cross-Connection Control Assemblies" published by Washington State D.O.H.) Reduced Pressure Backflow Assembly with a parallel 3/4" meter and 3/4" D.O.H. approved Reduced Pressure Backflow Assembly. Each assembly shall include a tightly closing resilient seated shut-off valve on each end of the body and each assembly shall be fitted with four properly located resilient seated test cocks.

6.2.29 DOUBLE CHECK VALVE ASSEMBLY

All Double Check Valve Assemblies shall be as listed on the most current copy of "Accepted Cross-Connection Control Assemblies" published by Washington State D.O.H. The assembly shall include a tightly closing resilient seated shut-off valve on each end of the body and each assembly shall be fitted with four properly located resilient seated test cocks.

6.2.30 DOUBLE CHECK VALVE ASSEMBLY WITH DETECTOR

This assembly shall include a line sized D.O.H. approved (listed on the most current copy of "Accepted Cross-Connection Control Assemblies" published by Washington State D.O.H.) Double Check Valve Assembly with a parallel 3/4" meter and 3/4" D.O.H. approved double check Valve Assembly. Each assembly shall include a tightly closing resilient seated shut-off valve on each end of the body and each assembly shall be fitted with four properly located resilient seated test-cocks.

6.2.31 BACKFLOW DEVICE RESILIENT SEATED SHUT-OFF VALVES

Each valve shall be marked with model number with designation of resilient seat; such as "RS" or "R", which must be cast, molded, or affixed onto the body or bonnet of the valve. All ferrous-bodied valves shall be coated with a minimum of 4 mls. of epoxy or equivalent polymerized coating. 2" and smaller R.P.B.A.s and D.C.V.A.s shall use ball valves, and all 2-1/2" and larger R.P.B.A.s and D.C.V.A.s shall use resilient seated gate valves for domestic supply and resilient seated O.S. and Y. valves for fire lines.

The minimum requirements for all resilient seated gate valves shall, in design, material and workmanship, conform to the standards of AWWA C509.

6.2.32 STEEL CASING

Steel casing shall be black steel pipe conforming to ASTM A53.

Casing wall thickness shall be 0.250" for casings 24" or less in diameter and 0.375" for casings over 24" in diameter.

Carrier pipe for water shall be Ductile Iron, Class 52.

6.2.33 CASING SPACER

Casing spacer shell shall be manufactured in two pieces from heavy gauge T-304 stainless steel or 14 gauge hot rolled pickled steel joined with ribbed flanges. The shell shall be lined with a PVC liner 0.090" thick with 85-90 durometer.

Carbon steel casing spacer shell and risers shall be coated with a heat fused polyvinyl chloride coating, or hot-dip galvanized.

Polyvinyl Chloride Coating Specifications:

Durometer - Shore A2 (10 Sec.) (ASTM D1706-61T)	-	80
Maximum operating temperature (constant)	-	150° (65°C)
Electrical properties (ASTM D149-61) (short time .010")	-	1380 V/Mil

Resistance:

Salt spray (ASTM B117)	-	Excellent
Acids	-	Good
Alkalies	-	Good

All nuts and bolts shall be 18-8 stainless steel.

Runners shall be supported by risers made from heavy gauge T-304 stainless steel or 12 gauge hot rolled pickled steel.

Runners shall be ultra high molecular weight polymer with high resistance to abrasion and sliding wear.

TYPICAL DATA			
PROPERTY	ASTM METHOD	UNITS	VALUE
Specific Gravity	D-792	gm/cc	.934
Tensile Strength (Break)	D-638	PSI	3500
Elongation (Break)	D-638	%	380
Izod Impact	D-256	Ft.Lbs./in. of notch	No break
Hardness	D-2240	Shore D	67
Coefficient of Friction	D-1894	-	0.11 - 0.13
Heat Distortion Temp. 66 PSI	D-648	C	88
Coefficient of Thermal	D-696	F-1	5.5 x 10 ⁻⁵
ABRASION CHARACTERISTICS:			
Taber Abrasion	D-1044	Mg/loss	N
Sand Slurry *			7

**Sand slurry condition - 7 hours in one part sand/ one part water slurry at 1725 RPM. Carbon steel - 100, Hifax - 15. The lower the value, the more resistant to abrasion.*

Casing spacers shall be "center positioning" type. Height of risers and runners combined shall be sufficient to keep the carrier pipe bell, couplings, or fittings at least 0.75" from the casing pipe wall at all times and provide at least 1" clearance between runners and top of casing wall, to prevent jamming during installation.

Acceptable casing spacers are:

Pipeline Seal and Insulator Co.:

8" band, carbon steel with fusion-bonded coating, Model C8G-2

12" band, carbon steel with fusion-bonded coating, Model C12G-2

Cascade Waterworks Mfg. Co.:

Stainless Steel or hot-dip galvanized carbon steel Casing Spacers (catalog number depends on size)

Advance Products & Systems, Inc.:

8" band, stainless steel, Model SSI8

12" band, stainless steel, Model SSI12

8" band, carbon steel with fusion-bonded coating, Model SI8

12" band, carbon steel with fusion-bonded coating, Model SI12

Acceptable Casing End Seals are:

Pipeline Seal and Insulator Co.:

Standard Pull-on (Model S)

Custom Pull-on (Model G)

Cascade Waterworks Mfg. Co.:

CCES End Seal

Advance Products & Systems, Inc.

Molded End Seal, Model AM

6.3 WATER METHODS OF CONSTRUCTION

6.3.01 GENERAL CONSTRUCTION REQUIREMENTS

The improvements shall be constructed as shown on the plans and in accordance with these Standards, Standard Details, and Standard Specifications. Manufacturer's equipment shall be installed in compliance with specifications of the manufacturer, except where a higher quality of workmanship is required by the plans and specifications. All materials and work shall be in strict accordance with any applicable regulations of the State, County and local authorities. The Contractor shall arrange for such inspection by these agencies as may be required and shall submit evidence of their approval, if requested by the City's Engineer.

The plans may show the approximate locations of various existing utilities known to the engineer, such as gas lines, water mains, storm drainage, power lines, telephone lines, television cables, and other obstructions based on information obtained from various sources. This information is not guaranteed to be accurate, and the Contractor is directed to check for interferences and obstructions by inquiry from the different utilities and by underground exploration ahead of his regular excavation.

The Contractor shall request field locates and notify the owners of underground facilities about the scheduled commencement of excavation through a one-call number:

(1-800-424-5555).

Notice shall be made to owners of underground utilities not less than three (3) business days or more than ten (10) business days prior to scheduled date of commencement of excavation.

The Contractor shall excavate around and under service pipes with special care and shall support and maintain them in service. Where it is necessary to cut, move or reconnect any service lines, arrangements shall be made with the respective utility.

All excavations shall be in accordance with OSHA excavation, trenching, and shoring standards.

6.3.02 ALIGNMENT & STAKING

All work done under a Project shall be to the lines shown on the approved plans or to approved revisions. All surveying and/or staking shall be performed by a surveying or engineering firm currently licensed by the State of Washington to perform said tasks. All construction staking shall be inspected by the City prior to construction. Cut sheets shall be delivered to the City at least 48 hours prior to the commencement of construction. Video or DVD footage shall be provided to the City showing the pre-existing condition of the construction site and all staking of all proposed fire hydrants, blow-offs, air vac, tees, elbows, bends, valves, and meters, etc.

The minimum staking of water systems shall be as follows:

- A. Provide staking sufficient to satisfy City Utilities Superintendent. In new plat development roadway centerline staking must be readily identifiable.
- B. Stake locations of all proposed fire hydrant, blow-off, air-vac, tees, elbows, bends, valves, meters, etc. prior to construction.

6.3.03 LAYING DUCTILE IRON PIPE

Work shall be accomplished in accordance with AWWA Standard C600 and the manufacturer's recommendation.

Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the line. After placing a length of pipe in the trench, the spigot end shall be centered in the bell and pipe forced home and brought to correct line and grade. The pipe shall be secured in place with 5/8" minus crushed rock backfill tamped under it. Precaution shall be taken to prevent dirt from entering the joint space. At times when pipe laying is not in progress, the open ends of pipe shall be closed by a water-tight plug. If water is in the trench when work resumes, the seal shall remain in place until the trench is completely dewatered. No pipe shall be laid in water or when trench conditions are unsuitable.

The cutting of pipe for inserting fittings or closure pieces shall be done in a neat and workmanlike manner, without damage to the pipe or cement lining, and so as to leave a smooth end at right angles to the axis of the pipe. Pipe shall be laid with bell ends facing in the direction of the laying, unless approved or directed otherwise by the City. Wherever it is necessary to deflect pipe from a straight line, the amount of deflection allowed shall not exceed pipe manufacturer's recommendations.

The bottom of the trench shall be finished to grade in such a manner that the pipe will have bearing along the entire length of the barrel. Bolts on mechanical pipe and fittings shall be tightened uniformly with a "Torque" wrench which measures the torque for mechanical joints shall be as follows:

8" - 24" pipe size 3/4" Bolts 60 - 90 ft-lbs torque

Installation of push-on joint (Tyton) pipe shall be in accordance with the manufacturer's instructions.

6.3.04 PIPE ZONE BEDDING AND BACKFILL

Pipe shall be placed on a prepared subgrade of imported material at least 6" deep below the barrel of the pipe and filled around the pipe as shown in the Standard Details. The imported material shall be 5/8" minus crushed rock in conformance with Section 9-03.4(2) of the 2008 WSDOT Standard Specifications. After preparation of the subgrade, bell holes shall be excavated so the pipe, when laid, will have a uniform bearing under the full length of the pipe. The Contractor shall be responsible for adequate support and bedding for the pipe. The trench shall be hand backfilled and compacted from the spring line of the pipe to 6" above the top of the pipe as shown in the Standard Detail. The material shall be placed and compacted to no less than 95 percent of the maximum theoretical density as measured by ASTM D-1557 prior to placement of the next layer.

Where the undisturbed trench below the bedding is unstable, the unstable materials shall be removed and backfilled as necessary to produce a stable foundation upon which to place the bedding. Backfill materials shall be as recommended by a geotech or engineer. The Contractor shall be responsible for providing a stable foundation for placing of the bedding.

Boulders, rocks, and other obstructions shall be entirely removed or cut out the full width of the trench and to a depth 6" below the pipe bottom and backfilled as provided above.

6.3.05 TRENCH BACKFILL

Backfilling and surface restoration shall closely follow installation of pipe so that not more than 100' are left exposed during construction hours without approval of the City. Backfill shall not be deposited in the trench in any manner which will damage or disturb the pipe or the initial backfill. Compaction of the backfill may be accomplished by mechanical tamper, by vibrating, rolling, jetting, or a combination of these methods, as approved by the City. The Contractor shall provide the services of a testing laboratory acceptable to the Engineer to perform in place density tests to show that the specified density has been obtained. The approval of the compaction method and the achievement of the specified density shall, in no way, relieve the Contractor of

responsibility for all repairs caused by settlement of the backfill prior to acceptance and during the two-year period after acceptance of the project.

All trenching shall be backfilled with 5/8" minus crushed rock for trench backfill materials conforming to the WSDOT Standard Specifications Section 9-03.4 (2), unless otherwise approved by the City. The City shall be the sole judge of approving materials to be utilized for backfill. All backfill material shall be free from cinders, ashes, refuse, vegetable or organic material, boulders, rocks or stones, frozen soil, or other unsuitable material.

Backfill shall be compacted to 95% of the maximum density in traveled areas and road prisms, driveways, roadways, shoulders, parking lots or other traveled areas and 90% in all other areas. Backfill compaction shall be performed in 8" to 12" lifts. Compaction test results shall be supplied to the City for review and approval prior to paving.

6.3.06 FIRE HYDRANT INSTALLATION

Fire hydrants shall be set as shown in the Standard Details and AWWA Standard C600. Hydrant and the gate valve must have lugs. The tee on the main line shall not be considered as part of the assembly. The portion of the hydrants above the ground shall be painted with Preservative Brand Caterpillar or International yellow paint. The hydrant run shall be restrained with MEGALUG restrainer at M.J. end on hydrant and gate valve. If more than one pipe is required on hydrant run, connect pipes with mechanical joint sleeve and MEGALUG restrainers.

Between the time that the fire hydrant is installed and the completed facility is placed in operation, the fire hydrant shall at all times be wrapped in burlap, or covered in some other suitable manner to clearly indicate that the fire hydrant is not in service.

6.3.07 AIR VACUUM INSTALLATION

Iron piping and fittings shall be galvanized. Location of the air release valves as shown on the plans is approximate. The installation shall be set at the high point of the line. The water line must be constructed so the air release valve may be installed in a convenient location.

6.3.08 VALVE INSTALLATION

Before installation, valves shall be cleaned of all foreign material. Such blocking as the Engineer may deem necessary shall be provided. The valve and valve box shall be set plumb with the valve box centered on the valve. The top of the valve box shall be set with all valves except auxiliary valves for hydrants. Where valve operating nut is more than 3' below finished grade, a stem extension must be installed. Tapping valves shall be water tested prior to tapping water main.

The top of the valve box base section shall be located a minimum of 6" and maximum of 9" below finished grade. A polyethylene sheet, 8-mils thick, shall be placed between the top and base valve box sections to prevent metal to metal contact where the sections overlap.

Valve box top sections shall be adjusted flush with the finished pavement and, in those areas to be excavated for future roadway grades, enough adjustment shall be provided in the valve box to allow the top of the box to be adjusted to the required grade.

6.3.09 VALVE BOX MARKER INSTALLATION

Concrete marker posts, painted with two coats Preservative Brand No. 43-616 yellow enamel paint, shall be set for all valves except auxiliary hydrant valves. The marker shall be set on a line through the valve at right angles to the center line of the road. The marker shall generally be set on the property line unless the Engineer decides another location is safer or more conspicuous. Distance to the valves shall be neatly stenciled on the post with 2" numerals. Valve markers shall be installed only in unimproved or unpaved areas.

6.3.10 VAULT INSTALLATION

Vaults for water facilities (pressure reducing station, water service, backflow device, etc.) shall be constructed at the locations shown in the plan and as staked. It shall be constructed as shown in the plans, Standard Details and as directed by the Engineer.

The excavation shall have minimum 1' clearance between the vault outer surfaces and the earth bank. The vault shall be placed on firm soil. If the foundation material is inadequate, the contractor shall use foundation gravel or bedding concrete to support the vault. The vault shall be plumb and watertight. The access cover shall be seated properly to prevent rocking and shall be adjusted to match the finished grade.

Vault floor shall drain to daylight, or to location shown on the plan. Drain pipe shall be minimum 4" diameter.

Where knockout locations for pipe do not coincide with locations of pipe penetrations into the vault, the Contractor shall core drill openings for pipe.

6.3.11 SERVICE LINES

6.3.11.1 TAPPING SLEEVES FOR NEW SERVICE INSTALLATIONS

Tapping sleeves shall be rated for a working pressure of 200 psi minimum and furnished complete with joint accessories. Tapping sleeves shall be constructed in two sections for ease of installation

and shall be assembled around the main without interrupting service.

Mechanical joint style sleeves shall be ductile iron and is required for size-on-size connection to cast-iron pipe. Mechanical joint sleeves shall be cast by Clow, Dresser, Mueller, Tyler, U.S. Pipe, or owner approved equal.

Fabricated steel style sleeves shall be fusion bonded coated, acceptable for potable water, and is acceptable for A.C. pipe taps only. Fabricated steel sleeves shall be manufactured by JCM, Romac, or approved equal.

6.3.11.2 SERVICE LINES

All service lines shall be one-inch minimum, 200 psi poly pipe, and shall be continuous from the corporation stop to meter setter. Install service connections under paving by boring. Bore or tunnel under sidewalks and curbs. Damages shall be repaired by Contractor. Provide 30" minimum cover on service lines. Install service at 90-degrees horizontally to the main to intercept the existing meters. A deviation of not more than 3-degrees will be allowed. Blow off service prior to connection to meter.

Install meter setter and boxes as shown on the Standard Detail and where directed by the Engineer.

Service connections shall not be transferred to the new main until it has been successfully flushed, disinfected and tested. When transferring services from the existing main to the new main, the Contractor shall take sanitary precautions to protect the potable water supply in both the existing and new mains.

No reconnection to sub-standard service lines shall be allowed.

Substandard plastic service pipe is usually 160 psi or below polyethylene or cast iron. The Engineer shall decide if existing service lines are substandard.

6.3.12 CONCRETE BLOCKING

All bends, tees, and valves shall be blocked in accordance with the Standard Details. All poured in place blocking shall have a minimum measurement of 12" between the pipe and the undisturbed bank. The Contractor shall install blocking which is adequate to withstand full test pressure, as well as, to continuously withstand operating pressures

under all conditions of service. All concrete shall be mechanically mixed and shall be a minimum of 2,500 psi.

6.3.13 INSPECTIONS & TESTS

- A. The City intends to have an inspector on site for the purpose of quality control, inspecting, and testing. The Contractor shall provide proper facilities, equipment, and access and such inspection and testing.
- B. If any work is covered up without approval or consent of the City, it must be uncovered for inspection.
- C. Before a performance test is to be observed by the City the Contractor shall make whatever preliminary tests are necessary to assure that the material and/or equipment are in accordance with the plans and specifications.
- D. Written notice of deficiencies, adequately describing the same, shall be given to the Contractor upon completion of each inspection and the Contractor shall correct such deficiencies within seven days of the notice and before final inspection will be made by the City, unless otherwise approved.
- E. If the Contractor wants to work on the weekend or after hours, they shall make prior arrangements with the City and will be responsible for all overtime costs.
- F. The Contractor shall provide the City notice when the project will be shut down, the days and working hours and when the project is to start up again.

6.3.14 WATER QUALITY

The Contractor is required to implement water pollution controls and maintain these until the project is accepted by the City. The Contractor shall familiarize himself with the requirement of the Department of Ecology and other regulatory agencies having jurisdiction over such matters.

The following list of requirements is a summary of the construction activity requirements of the Department of Ecology and is provided as a guide to the Contractor. The Department of Ecology may have additional requirements with which the Contractor shall comply.

6.3.14.1 CHLORINE RESIDUAL FROM WATER MAIN TESTING OR DISINFECTION

Water with chlorine residual shall be disposed of by the Contractor. Methods of disposal include through sanitary sewers, storing and aerating or percolation into the ground. Water containing a chlorine residual shall not be disposed of into the storm drainage system or any waterway. Disposal may be made to the sanitary sewer

system upon prior approval by the City. Water shall be discharged to the storm drainage system only after dechlorination.

6.3.14.2 OIL AND CHEMICAL STORAGE AND HANDLING

Storage area shall be diked. No disposal of oil products or waste on the site, including oil filters. The Contractor shall provide a waste oil disposal tank, if needed.

6.3.15 WATER PIPE TESTING AND DISINFECTING

All pipelines shall be tested and disinfected prior to acceptance of work. A water hydrant meter shall be required and procured from the City for all water utilized for flushing pipelines. All pumps, gauges, plugs, saddles, corporation stops, miscellaneous hose and piping, and measuring equipment necessary for performing the test shall be furnished, installed and operated by the Contractor. Feed for the pump shall be from a barrel or other container within the actual amount of "makeup" water, so that it can be measured periodically during the test period.

The pipeline shall be backfilled sufficiently to prevent movement of the pipe under pressure. All thrust blocks shall be in place and time allowed for the concrete to cure before testing. Where permanent blocking is not required, the Contractor shall furnish and install temporary blocking. As soon as pipe is secured against movement under pressure, it may be filled with water. Satisfactory performance of air valves shall be checked while the line is filling.

After the pipe is filled and all air expelled, it shall be pumped to a test pressure of 250 psi, and this pressure shall be maintained for a period of not less than fifteen (15) minutes to insure the integrity of the thrust and anchor blocks. The contractor/developer is cautioned regarding pressure limitations on butterfly valves. All tests shall be made with the hydrant auxiliary gate valves open and pressure against the hydrant valve. Hydrostatic tests shall be performed on every complete section of water main between two valves, and each valve shall withstand the same test pressure as the pipe with no pressure active in the section of pipe beyond the closed valve.

In addition to the hydrostatic pressure test, a leakage test shall be conducted on the pipeline. The leakage test shall be conducted at 150 psi for a period of not less than one (1) hour. The quantity of water lost from the main shall not exceed the number of gallons per hour determined by the formula:

$$L = \frac{ND(P)}{7,400}^{0.5}$$

in which:

L = Allowable leakage, gallons/hour

N = Number of joints in the length of pipeline tested

D = Nominal diameter of the pipe in inches

P = Average test pressure during the leakage test, psi

Defective materials or workmanship, discovered as a result of the tests, shall be replaced by the Contractor at the Contractor's expense. Whenever it is necessary to replace defective material or correct the workmanship, the tests shall be re-run at the Contractor's expense until a satisfactory test is obtained.

As sections of pipe are constructed and before pipelines are placed in service, they shall be sterilized in conformance with the requirements of the State of Washington Department of Health Services.

The Contractor shall be responsible for flushing all water mains prior to water samples being acquired. The water mains shall be flushed at a rate to provide a minimum 2.5 feet per second velocity in the main.

In all disinfection processes, the Contractor shall take particular care in flushing and wasting the chlorinated water from the mains to assure that the flushed and chlorinated water does no physical or environmental damage to property, streams, storm sewers or any waterways. The Contractor shall chemically or otherwise treat the chlorinated water to prevent damage to the affected environment, particularly aquatic and fish life of receiving streams.

Chlorine shall be applied in the following manner, to secure a concentration in the pipe of at least 50 ppm.

- 1) Injection of chlorine-water mixture from chlorinating apparatus through corporation cock at beginning of section after pipe has been filled, and with water exhausting at end of section at a rate controlled to produce the desired chlorine concentration;

After the desired chlorine concentration has been obtained throughout the section of line, the water in the line shall be left standing for a period of twenty-four (24) hours. Following this, the line shall be thoroughly flushed and a water sample collected. The line shall not be placed in service until a satisfactory bacteriological report has been received.

City forces only will be allowed to operate existing and new tie-in valves. The Contractor's forces are expressly forbidden to operate any valve on any section of line which has been accepted by the City.

6.3.16 CONNECTION TO EXISTING WATERMAIN

Points of connection to existing water mains shall be exposed prior to trenching of the new line, and not less than 48 hours prior to the anticipated connection time. The contractor shall notify the City 48 hours in advance prior to any watermain shut-off or connection. Watermain shut-offs shall not be scheduled to take place on Fridays, or on the day before a City holiday, unless otherwise approved by the City. The Contractor shall ensure that the existing fittings are in accordance with the Contract Plans and that the connection can be made in accordance with the Contract Plans. The Contractor shall immediately notify the Engineer if the connection cannot be made in accordance with the plans in order that the connection detail may be revised.

Connection to the existing main shall take place only after the new main is flushed, disinfected, has satisfactorily passed a hydrostatic pressure test, and satisfactory bacteriological sample results are obtained. An approved backflow prevention assembly shall be installed between the existing and new water lines during disinfection and flushing of new main. All connections to the existing system and all testing of the new line must be with the authorization of, and in the presence of, the authorized representative of the City. Opening and closing of valves and use of water from the City's system will be done only by the City. The backflow preventer and supply hose must be disconnected during hydrostatic pressure testing of new main.

Connections may be made to existing pipes under pressure with a tapping machine by determining the size and type of pipe and installing tapping tee to fit complete with tapping gate valve. Where a cut-in is permitted to be made in an existing pipe, the work shall be conducted at such a time and in such a manner as to minimize the interruption of service. Cut-in time must be approved by the City. Necessary pipe, fittings and gate valves shall be assembled at the site ready for installation prior to the shutting-off of water in the existing main. Once the water has been shut off, the work shall be prosecuted vigorously and shall not be halted until the line is restored to service. The interiors of all pipe and fittings to be used in final connection shall be swabbed or sprayed with a 1% available chlorine solution.

Unless specifically provided for elsewhere in these specifications, the Contractor shall have the responsibility of giving at least forty-eight (48) hours notice to the City and affected water customers of intention to disrupt service.

6.3.17 ADJUST EXISTING STRUCTURE TO GRADE

6.3.17.1 VAULT COVER ADJUSTMENT

Existing vault covers affected by a pavement overlay, or adjustment in surface grade, shall be adjusted to grade within three working days

6.3.17.2 VALVE BOX ADJUSTMENT - PAVEMENT OVERLAYS AND SIDEWALKS

Raising the existing valve box cover less than 2" shall be accomplished by adjusting the existing top section of the valve box.

Raising the existing valve box cover 2" or more, shall be accomplished by either adjusting the existing top section or by inserting a valve box paving riser into the existing valve box top. The paving riser shall be epoxied to the valve box.

If the valve box base section needs to be extended, the contractor shall install a 4" diameter cast iron soil pipe, with bell-end of the soil pipe inserted over the top of the existing valve box base section.

The spigot-end of the soil pipe shall be located a minimum of 6" and maximum of 9" below finished grade. The valve box top section shall be slipped over the soil pipe and adjusted to final grade. A polyethylene sheet, 8-mils thick, shall be placed between the valve box and soil pipe to prevent metal to metal contact where the sections overlap.

Final box adjustment shall leave the top of the valve box no higher than final grade, and no lower than 0.25" below final grade.

In asphalt concrete pavement overlay areas, excavation of the valve box to be raised shall be accomplished by sawcutting or neat-line jackhammering the pavement a minimum of 12" around the perimeter of the valve box.

Final adjustment of valve boxes shall be made within 20 calendar days following the final overlay.

6.3.17.3**VALVE BOX ADJUSTMENT - UNIMPROVED AREAS**

Adjustment of valve box covers located outside paved areas or sidewalks can be accomplished using a 12" valve box adjusting sleeve inserted into the existing valve box top section.

6.3.18 ABANDONING FACILITIES**6.3.18.1 ABANDONING PIPE IN PLACE**

The Contractor shall plug the open ends of all pipes, fittings, etc. to be abandoned with end cap coupling on asbestos cement or steel pipe, with mechanical joint cap or plug on cast or ductile iron pipe.

6.3.18.2 ABANDONING STRUCTURES

Abandonment of structures shall be completed only after piped systems have been properly abandoned. Structures within the public right-of-way, a public easement or which are part of the publicly-owned and maintained system must be:

- Removed completely; or
- Abandoned, provided no conflicts with new utilities or improvements arise.

6.3.19 HIGHWAY AND RAILROAD CROSSINGS

Interstate, state, or county highway and railroad crossings require the placing of steel, cast iron or concrete pipe casing by jacking or tunneling and laying the carrier pipe within the casing.

6.3.20 BORING AND JACKING STEEL CASING

The Contractor shall verify the vertical and horizontal location of existing utilities. If required to avoid conflicts and maintain minimum clearances, adjustment shall be made to the grade of the casing.

The pipe shall be bored and jacked where indicated. The Contractor shall remove or penetrate all obstructions encountered. If groundwater is found to be a problem during boring operations, the Contractor shall do all that is necessary to control the flow sufficiently to protect the excavation, pipe and equipment so that the work is not impaired. Any pipe damaged during the boring and jacking operation shall be repaired by the Contractor in a manner approved by the Engineer.

Special care shall be taken during the installation of the bored and jacked pipe to ensure that no settlement or caving be caused to the above surface. Any such caving caused by the placement of the pipe shall be the Contractor's responsibility and he shall repair any area so affected as directed by the Engineer.

During the jacking operations, particular care shall be exercised to prevent caving ahead of the pipe which will cause voids outside of the pipe. If voids exist, the Contractor shall drill through the wall of the pipe and fill the voids with a pumped cement grout. All voids shall be filled to the satisfaction of the Engineer.

The carrier pipe shall be installed in the casing. The Contractor shall support carrier pipe with casing spacers. The casing pipe shall not be backfilled with sand and grout. The casing ends shall be sealed with asphaltic material 1' minimum on each end, or with manufactured rubber end seal device.

Boring pits shall be backfilled with select native material and compacted to 95% maximum dry density as determined by ASTM D-1557. The contractor shall provide sufficient select backfill material to make up for the rejected material.

All disturbed ground shall be restored to its original condition or better.

6.3.21 WORKING WITH ASBESOS CEMENT PIPE

When working with asbestos cement pipe, the Contractor is required to maintain workers' exposure to asbestos material at or below the exposure limit as prescribed in WAC 296-62-07705 and adhere to all State and Federal Guidelines and Certification.

6.3.22 ASBESTOS CEMENT WATERMAIN CROSSINGS

Where new utility line crosses below an existing AC main, excavation shall be accomplished with water jetting, vacuum excavation, or by hand. City inspector shall be present during excavation. Trench shall be backfilled with controlled density fill (CDF,

aka flowable fill) from bottom of trench to bottom of the AC main. If the AC main appears to be damaged or at risk of failure, the City will require section replacement according to the Standard Detail for "Typical AC Watermain Crossing Replacement Detail".

6.3.23 CLEARANCES / OTHER UTILITIES

Required clearance from other utilities are outlined in Section 6.1.08. If the minimum vertical distance between utility pipes is less than 6" and such installation is approved by the City, a pad shall be placed between the pipes. The pad shall be O.D. x O.D. x 2.5" thick minimum or as required to protect the pipes. Above O.D. is equal to the outside diameter of the larger pipe. The pad shall be a polyethylene foam plank (Dow Plastics Ethafoam™ 220), or approved equal. Additional measures may be necessary to ensure system integrity and may be required as evaluated by the City on a case by case basis.

6.3.24 RECORD DRAWINGS

Record drawings shall be submitted to the City Engineer reflecting "as-built" conditions for all improvements within the City right-of-way. Record drawings shall be submitted to the City within thirty (30) calendar days after completion of the work. Record drawings shall be submitted on permanent, stable, reproducible mylar with a signature and data which verifies the "as-built" condition of the project.

6.3.25 FINISHING AND CLEANUP

After all other work on this project is completed and before final acceptance, the entire roadway, including the roadbed, planting, sidewalk areas, shoulders, driveways, alley and side street approaches, slopes, ditches, utility trenches, and construction areas shall be neatly finished to the lines, grades and cross sections of a new roadway consistent with the original section, and as hereinafter specified.

For construction projects where all or portions of the construction is in undeveloped areas, the entire area which has been disturbed by the construction shall be shaped so that upon completion the area will present a uniform appearance, blending into the contour of the adjacent properties.

Slopes, sidewalk areas, planting areas and roadway shall be smoothed and finished to the required cross section and grade by means of a grading machine insofar as it is possible to do so without damaging existing improvements, trees and shrubs. Machine dressing shall be supplemented by hand work to meet requirements outlined herein, to the satisfaction of the City Inspector.

Upon completion of the cleaning and dressing, the project shall appear uniform in all respects. All graded areas shall be true to line and grade. Where the existing surface is below sidewalk and curb, the area shall be filled and dressed out to the walk.

Wherever fill material is required in the planting area, the finished grade shall be elevated to allow for final settlement, but nevertheless, the raised surface shall present a uniform appearance.

All rocks in excess of one (1) inch diameter shall be removed from the entire construction area and shall be disposed of the same as required for other waste material. In no instance shall the rock be thrown onto private property.

Overhang on slopes shall be removed and slopes dressed neatly so as to present a uniform, natural, well-sloped surface.

All excavated material at the outer lateral limits of the project shall be removed entirely.

Trash of all kinds resulting from clearing and grubbing or grading operations shall be removed and not placed in areas adjacent to the project.

Where machine operations have broken down brush and trees beyond the lateral limits of the project, the Developer and/or Contractor shall remove and dispose of same and restore said disturbed areas at his own expense.

Drainage facilities such as inlets, catch basins, culverts, and open ditches shall be cleaned of all debris which is the result of the Developer and/or Contractor's operations.

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

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

CHAPTER 7

RECLAIMED WATER

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CHAPTER 7 – RECLAIMED WATER

RESERVED CHAPTER

This chapter is reserved for the future development of reclaimed water standards.

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CHAPTER 8 STANDARD FORMS AND DOCUMENTS

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CHAPTER 8 – STANDARD FORMS AND DOCUMENTS

SAMPLE EASEMENT DOCUMENT

EASEMENT FOR UTILITY MAINS & APPURTENANCES

_____ (herein called the "grantor") hereby dedicates, conveys, and grants to City of Black Diamond (herein called the "grantee") and its successors and assigns for the consideration of One Dollar (\$1.00) and other valuable consideration, an easement for City utility mains and appurtenances thereto under and upon the following described property situated in King County, Washington, more particularly described as follows:

(Described here or attach legal description to form):

That said grantee shall have the right without prior institution of any suit or proceeding at law, at times as may be necessary, to enter upon said property and adjoining property owned by the grantor and his assigns and successors to install, lay, construct, renew, operate and maintain mains and necessary facilities and other equipment, for the purposes of serving the property or other properties with water and other utility service.

The grantor covenants that no permanent structure shall be erected, and no large trees or large shrubs shall be planted in the area of ground for which the easement in favor of City of Black Diamond has been provided herein.

This easement and the covenants herein shall be covenants running with the land and shall be binding on the successors, heirs, and assigns of both parties hereto.

The grantor warrants that the grantor has good title to the above property and warrants the grantee title to and quiet enjoyment of the easement conveyed herein.

No other easements for utilities shall be granted within the afore described easement area except for necessary crossings as may be mutually approved by the grantor and grantee and the grantee shall have exclusive right to construct and/or maintain City owned utilities within the easement area except for necessary crossings.

By _____ By _____
Grantor Grantor

NOTARY

State of Washington)
County of King) ss.

I certify that I know or have satisfactory evidence that _____ is the person who appeared before me, and said person acknowledged that (he/she) signed this instrument and acknowledged it to be (his/her) free and voluntary act for the uses and purposes mentioned in the instrument.

Dated: _____

By: _____

Print Name: _____

NOTARY PUBLIC in and for the State of
Washington, residing at _____

My commission expires: _____

Note: Different notary form is required for Corporate Ownership.

SAMPLE "BILL OF SALE" DOCUMENT

KNOW ALL BY THESE PRESENTS that for and in consideration of the sum of One Dollar (\$1.00) and other good and sufficient consideration, receipt whereof is hereby acknowledged, the undersigned grantor(s) _____ do(es) by these presents hereby convey, set over, assign, transfer and sell to the City of Black Diamond, King County, Washington, a municipal corporation, the following described water/sanitary/storm or roadway system and all appurtenances thereto, situated in the City of Black Diamond, King County, Washington:

<u>DESCRIPTION</u>	<u>ALONG</u>	<u>FROM</u>	<u>TO</u>	<u>SIZE</u>	<u>LENGTH</u>
--------------------	--------------	-------------	-----------	-------------	---------------

The said grantor(s) hereby warrants that he, they, it, is/are the sole owner(s) of all the property above described; that they have full power to convey all rights herein conveyed and agree to hold the City of Black Diamond harmless from any and all claims which might result from execution of this document.

By _____ By _____
Grantor Grantor

NOTARY

State of Washington)
County of King) ss.

I certify that I know or have satisfactory evidence that _____ is the person who appeared before me, and said person acknowledged that (he/she) signed this instrument and acknowledged it to be (his/her) free and voluntary act for the uses and purposes mentioned in the instrument.

Dated: _____

By: _____

Print Name: _____

NOTARY PUBLIC in and for the State of
Washington, residing at _____

My commission expires: _____

Note: Different notary form is required for Corporate Ownership.

SAMPLE AFFIDAVIT OF "NO LIENS" ON PROJECT**AFFIDAVIT OF NO LIENS**

Re: _____

The undersigned, being first duly sworn upon oath, depose and say:

I am the developer of a road and/or utility systems, or additions thereto, for the above-referenced project, and hereby certify as follows:

1. That there are no liens against or which may be filed against said project.
2. That all debts, labor bills, and the state sales taxes have been paid in connection with the above-referenced project.

By: _____

Printed Name: _____

NOTARY

State of Washington)
) ss.
County of King)

I certify that I know or have satisfactory evidence that _____ is the person who appeared before me, and said person acknowledged that (he/she) signed this instrument and acknowledged it to be (his/her) free and voluntary act for the uses and purposes mentioned in the instrument.

Dated: _____

By: _____

Print Name: _____

NOTARY PUBLIC in and for the State of
Washington, residing at _____

My commission expires: _____

Note: Different notary form is required for Corporate Ownership.

DEVELOPER EXTENSION AGREEMENT

THIS AGREEMENT, by and between the City of Black Diamond, a municipal corporation, hereinafter referred to as "City", and _____, hereinafter referred to as "Developer":

WITNESSETH: That whereas the City of Black Diamond, a municipal corporation, provides water/sanitary sewer/storm/roadway service within this area, and the above-named Developer is preparing to construct an extension or modification or additions thereto, and said development requires the City's service;

WHEREFORE, THE PARTIES AGREE AS FOLLOWS:

A. RESPONSIBILITIES

The Developer shall perform all work necessary to accomplish the proposed extensions including, but not limited to, design, specifications, permitting and construction. All work shall be performed by qualified personnel. The work shall be in accordance with this Agreement, the City of Black Diamond Engineering Design and Construction Standards, Black Diamond City Codes, ordinances and regulations, applicable requirements of other governmental agencies and good engineering principles.

The City will review and inspect all work performed by the Developer to assure that the work meets the purpose for which it is intended and is in compliance with all requirements and conditions contained herein. Such review and approval will not relieve the Developer from complying with all said conditions and requirements.

B. LOCATION

The improvements, extension, or additions thereto, shall be located under and upon the following described property, referred to hereinafter as "Premises", situated in King County, Washington, more particularly described as follows:

(Described here or attach legal description to form):

C. FEES TO BE PAID BY THE DEVELOPER

The extensions to the water/sanitary sewer/storm/roadway system shall be installed in accordance with this agreement, the City of Black Diamond Engineering Design and Construction Standards, and the plans and specifications approved by the City, at the sole cost and expense of the Developer as hereinafter provided.

1. Design Review Services

- a. Administration of this Agreement by the City.

- b. Review and approval of plans, specifications, and necessary documents.
- c. Consultation with other agencies (i.e. other City departments, other governmental agencies) regarding plans and specifications, as necessary.
- d. Submittal of plans and specifications to other agencies (i.e. other City departments, other governmental agencies) for required approvals, as necessary.
- e. Final review of the required documents to assure that the City has legal title to necessary right-of-way and easements, review and approval of the Bill of Sale provided by the Developer, and acceptance of the utility extensions by the City.
- f. A deposit for Design Review and Inspection Fees, as estimated by the City of Black Diamond, is hereby submitted with this agreement. Design Review services shall be charged to the project at the current hourly rate, as established by the City. The Developer agrees to pay outstanding Design Review fees prior to the City accepting the utility extensions.

2. Construction Inspection Services

- a. Preconstruction Conference
- b. Daily inspection of the construction in progress, as needed to ensure that construction of the extensions are in accordance with this Agreement, the Plans and Specifications, the Black Diamond Engineering Design and Construction Standards and any other City requirements.
- c. Inspection, review, and approval of required testing.
- d. Final inspection of the completed extension and preparation of the inspection report, which shall set forth any deficiencies that may exist.
- e. Reinspection of any deficient work.
- f. Review of the record drawings.
- g. Reinspection at the end of the warranty period.
- h. Construction Inspection services shall be charged to the project at the current hourly rate, as established by the City, including the established overtime rate, for time outside regular business hours. The Developer agrees to pay outstanding Construction Inspection fees prior to the City accepting the extensions.

D. OMISSIONS AND DISCREPANCIES

The Developer shall carefully study and compare all plans and specifications and other documents and shall, prior to ordering materials or performing work, report in writing to

the City any error, inconsistency, or omission in respect to the plans and specifications, mode of construction, or costs which it discovers. If the Developer, in the course of this study or in the accomplishment of the work, finds any discrepancy between the plans and specifications and the physical condition of the locality as represented in the plans and specifications, it shall be his duty to inform the City immediately in writing, and the Developer shall promptly investigate. Any work performed after such discovery will be done at the Developer's risk and responsibility for cost.

E. INSURANCE

The Developer shall procure and maintain, for the duration of this Agreement, insurance against claims for injuries to persons or damages to property which may arise from, or in connection with, the performance of the work hereunder proposed by the Developer, his agents, representatives, employees, and subcontractors. The cost of said insurance shall be paid by the Developer.

F. HOLD HARMLESS

The Developer shall protect, defend, indemnify and save harmless the City, its officers, employees and agents from any and all costs, claims judgments or awards of damages, including attorney costs and fees, arising out of or in any way resulting from the negligent acts or omissions of Developer, its officers, employees, contractors and agents in performing this Agreement.

G. PERMITS

All permits required by any governmental agency, shall be obtained by the developer unless the City is required by the agency to obtain the permit. Permits must be obtained prior to commencing with construction.

H. BONDING

Prior to construction, the Developer shall furnish to the City a Performance Bond in a form acceptable to the City, and in an amount equal to the engineers estimate or contractor's bid price to complete all work within the public right-of-way, connection to the water, sanitary sewer, storm drainage, and/or street systems and restoration of public right-of-way and easements.

Upon acceptance of the extension by the City, the Developer shall furnish to the City a Maintenance Bond in an amount of not less than 10% of the construction cost for the portion of the water, sanitary sewer, storm drainage, and/or roadway extensions accepted and owned by the City.

I. PROCEDURE FOR ACCEPTANCE

Compliance with and completion of all the terms and conditions of this Agreement, the plans and specifications prepared hereunder, and other City requirements, and payment of any additional fees for Design Review and Construction Inspection Services shall be conditions precedent to the City's obligation to accept the extensions and to the City's agreement to maintain and operate the public portion of the extensions.

The City will not allow any connection to the utilities systems by any portion of the real property described in this Agreement if there are any fees or costs unpaid to the City under this Agreement, or if there are fees arising under other City requirements which are unpaid. The City shall not be obligated to provide utilities service to the property described in this Agreement if the construction by third parties of facilities to be deeded to the City has not been completed and accepted by the City, if such third party facilities are necessary to provide utility service to the property described in this Agreement.

The City will accept the extensions at such time that all work which may, in any way, affect the extensions has been completed, any damage to said extensions which may exist has been repaired, and the City has made final inspection and given its approval to the extensions as having been completed in accordance with this Agreement, the plans and specifications, and other requirements of the City. Such acceptance by the City shall not relieve the Developer of the obligation to correct defects in the labor and/or materials as herein provided and /or the obligations set forth in applicable paragraphs hereof.

Acceptance of the extensions shall be made in writing by the City. Prior to such acceptance, executed bill of sale documents, in a form approved by the City, and the warranties required by this Agreement, shall be executed by the Developer and any additional owners and delivered to the City for the City owned portion of the extensions. Acceptance by the City shall cause the public portion of the utility extensions to be subject to the control, use, and operation of the City and all regulations and conditions of service and service charges as the City determines to be reasonable and proper.

J. LIMITED PERIOD FOR ACCEPTANCE

The extensions shall be completed and accepted within eighteen (18) months of the date of this Agreement. If the extensions are not completed and accepted within the time period then the Developer's rights under this Agreement shall cease and no additional construction of the extensions shall take place until the Developer makes a new application to the City to complete the extensions, or the City consents to the renewal of the existing Agreement. The Developer shall pay any additional administrative, legal, engineering, and inspection costs involved as determined by the City. Any such agreement entered into pursuant to a new application, or renewal of the original Agreement, shall be subject to any new or amended ordinances, regulations, Codes, Standards or fee schedules which have taken effect since execution of the Agreement.

If the Utility determines that it is necessary to complete the utility extensions to provide utility service to other property, then the Utility may give the Developer notice that construction of the utility extensions must be commenced within sixty (60) days of the notice by the Utility to the Developer, provided that the plans and specifications have been prepared and submitted by the Developer. If construction is not commenced within the time specified then the Utility may terminate this Agreement and shall retain all payments made by the Developer to the Utility and shall be free to proceed with construction of the utility extensions within the area described in this Agreement

K. EXTENSION OF THE AGREEMENT

The Developer shall work diligently to complete all work within eighteen (18) months of the date of this Agreement. The City may issue one extension, up to six (6) months in duration, to this Agreement, at the sole discretion of the City, upon receipt of notice to the City prior to the expiration of the original 18-month period. Failure of the Developer to work diligently to complete the extensions shall be grounds to deny a time extension. The Developer must then apply for a new extension agreement and be subject to all new fees and requirements. It is incumbent upon the Developer to complete all the work in a timely manner.

L. DEVELOPER'S CERTIFICATION

I certify that I am the owner or owners authorized agent. If acting as an authorized agent, I further certify that I am authorized to act as the Owners agent regarding the property described herein for the purpose of filing applications for decisions, permits or review under applicable Black Diamond City Codes and I have full power and authority to perform, on behalf of the Owner, all acts required to enable the City to process and review such applications.

I hereby certify that the information on this application furnished by me is true and correct and that the application requirements of the City of Black Diamond will be met.

DATED this _____ day of _____, 20____.

DEVELOPER

(Signature must be notarized)

By: _____

Its: _____

Print Name: _____

Business Name: _____

Business Address: _____

City/State/Zip: _____

Phone: _____

CITY OF BLACK DIAMOND

By: _____

Its: _____

Print Name: _____

APPROVED AS TO FORM:

By: _____

City Attorney

NOTARY

State of Washington)
) ss.
County of King)

I certify that I know or have satisfactory evidence that _____ is the person who appeared before me, and said person acknowledged that (he/she) signed this instrument and acknowledged it to be (his/her) free and voluntary act for the uses and purposes mentioned in the instrument.

Dated: _____

By: _____

Print Name: _____

NOTARY PUBLIC in and for the State of
Washington, residing at _____

My commission expires: _____

Note: Different notary form is required for Corporate Ownership.

DEVELOPER EXTENSION CHECKLIST

PROJECT: _____

DEVELOPER: _____

DEVELOPER'S ENGINEER: _____

CONTRACTOR: _____

CHECKLIST ITEM	TO BE COMPLETED BY CITY STAFF		
	APPLIES TO PROJECT (Y / N)	INITIALS	DATE
SUBMITTAL PHASE			
Development Proposal Provided to City			
Developer Extension Agreement Signed			
SEPA Checklist received by City			
DNS, MDNS, or DS made			
EIS Required/Approved			
Completed Certificate of Water and/or Sewer Availability			
Design plans/report received by City			
DESIGN REVIEW PHASE			
1 st City Review Completed and Redlined plans/reports/review comments provided to developer			
1 st set of revised plans/reports received			
2 nd City Review Completed and Redlined plans/reports/review comments provided to developer			
2 nd set of revised plans/reports received			
3 rd City Review Completed and Redlined plans/reports/review comments provided to developer			
3 rd set of revised plans/reports received			
Mylar plans received for approval			
Mylar plans signed and approved by City			
PRECONSTRUCTION PHASE			
Required Federal, State, County, City and other regulatory approvals/permits received			
Bill of Sale Received, Reviewed and Approved by City (May be delayed until project completion, but are required prior to acceptance)			
Easements Received, Reviewed, Recorded and Approved by City (On-site easements may be delayed until project completion, but are required prior to acceptance).			
Performance Bond Received, Reviewed and Approved by City			
Contractor Insurance Certificate Received, Reviewed and Approved by City			
Preconstruction Conference			

CONSTRUCTION PHASE			
Construction – Project Officially Begins			
Material Testing Results Submitted to City			
Preliminary Walkthrough Completed			
Punchlist Items Completed			
Final Inspection			
CLOSEOUT PHASE			
Outstanding Invoices / Fees paid by Developer			
City Staff Approval of Construction			
Maintenance Bond Received, Reviewed, and Approved by City			
Record Drawings Submitted and Approved by City			
City Final Approval and Acceptance of Project			
Maintenance Bond Inspection Performed			
Maintenance Punchlist of Inspection provided to Developer			
Correction of Maintenance Punchlist items by Developer			
City releases Maintenance Bond			

PERFORMANCE BOND

DEVELOPER: _____

SURETY: _____

AMOUNT: _____

DEVELOPMENT: _____

KNOW ALL PERSONS BY THESE PRESENTS: That we, _____, (hereinafter called the "Developer"), and _____ a corporation organized under the laws of the State of _____, and authorized to transact surety business in the State of Washington (hereinafter called the "Surety"), are held and firmly bound unto the City of Black Diamond, Washington, in the sum of _____ (\$ _____), lawful money of the United States of America, for the payment of which sum we and each of us bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, by these presents. THE CONDITIONS of the above obligation are such that:

WHEREAS, the above named Developer has entered into a certain agreement with the City, or has been granted approval by the City, for _____ within the City; and

WHEREAS, the agreement or the approval granted by the City requires that certain improvements be made in connection with construction of the project; and that such improvements be constructed in full compliance with City standards, and the plans and specifications submitted with the project, as required by the City; and

WHEREAS, the agreement or the approval granted by the City requires that the improvements are to be made or constructed within a certain period of time, unless an extension is granted in writing by the City; and

NOW, THEREFORE, it is understood and agreed that this obligation shall continue in effect until released in writing by the City of Black Diamond, but only after the Developer has performed and satisfied the following conditions:

A. CONDITIONS

1. The improvements to be constructed by the Developer include:
(insert complete description here)

2. The Developer must construct the improvements to conform to the design, location, materials and other specifications for the indicated site improvements, as required by the City in. In addition, the Developer must construct the improvements according to the applicable ordinances and standards of the City and/or state statutes, as the same now exist or are hereafter amended.
3. The Developer must have completed all improvements required by the above-referenced conditions, and plans within _____, which time period shall begin to run from the earlier of _____ unless an extension is granted by the City.
4. The Developer must have paid all sums owing to laborers, contractors, mechanics, subcontractors, material men and suppliers or others as a result of such work for which a lien against any City property has arisen or may arise.
5. The Developer must obtain acceptance by the City of the work completed, all on or before thirty (30) days after the completion date set forth above.

B. DEFAULT

1. If the Developer defaults and does not perform the above conditions within the time specified, then the Surety shall, within twenty (20) days of demand of the City, make a written commitment to the City that it will either:
 - a. remedy the default itself with reasonable diligence pursuant to a time schedule acceptable to the City; or
 - b. tender to the City within an additional ten (10) days the amount necessary, as determined by the City, for the City to remedy the default, up to the total bond amount.

Upon completion of the Surety's duties under either of the options above, the Surety shall then have fulfilled its obligations under this bond. If the Surety elects to fulfill its obligation pursuant to the requirements of subsection B(1)(b), the City shall notify the Surety of the actual cost of the remedy, upon completion of the remedy. The City shall return, without interest, any overpayment made by the Surety, and the Surety shall pay to the City any actual costs, which exceeded the City's estimate, limited to the bond amount.

2. In the event the Developer fails to complete all of the above referenced improvements within the time period specified by the City, then the City, its employees and agents shall have the right at the City's sole election to enter onto said property described above for the purpose of completing the improvements. This provision shall not be construed as creating an obligation on the part of the City or its representatives to complete such improvements.

C. CORRECTIONS

Any corrections required by the City shall be commenced within seven (7) days of notification by the City and completed within thirty (30) days of the date of notification. If the work is not performed in a timely manner, the City shall have the right, without recourse to legal action, to take such action under this bond as described in Section B above.

D. EXTENSIONS AND CHANGES

No change, extension of time, alteration or addition to the work to be performed by the Developer shall affect the obligation of the Developer or Surety on this bond, unless the City specifically agrees, in writing, to such alteration, addition, extension or change. The surety waives notice of any such change, extension, alteration or addition thereunder.

E. ENFORCEMENT

It is specifically agreed by and between the parties that in the event any legal action must be taken to enforce the provisions of this bond or to collect said bond, the prevailing party shall be entitled to collect its costs and reasonable attorney fees as a part of the reasonable costs of securing the obligation hereunder. In the event of settlement or resolution of these issues prior to the filing of any suit, the actual costs incurred by the City, including reasonable attorney fees, shall be considered a part of the obligation hereunder secured. Said costs and reasonable legal fees shall be recoverable by the prevailing party, not only from the proceeds of this bond, but also over and above said bond as a part of any recovery (including recovery on the bond) in any judicial proceeding. The Surety hereby agrees that this Agreement shall be governed by the laws of the State of Washington. Venue of any litigation arising out of this Agreement shall be in King County Superior Court.

A. BOND EXPIRATION

This bond shall remain in full force and effect until the obligations secured hereby have been fully performed and a bond guaranteeing maintenance of all improvements for a period of twenty-four (24) months from acceptance has been submitted to the City in an amount to be determined by the City Engineer, in a form suitable to the City and until released in writing by the City.

DATED this _____ day of _____, 20____.

SURETY COMPANY

(Signature must be notarized)

By: _____

Its: _____

Print Name: _____

DEVELOPER

(Signature must be notarized)

By: _____

Its: _____

Print Name: _____

Business Name: _____

Business Name: _____

Business Address: _____

Business Address: _____

City/State/Zip: _____

City/State/Zip: _____

Phone: _____

Phone: _____

CITY OF BLACK DIAMOND

By: _____

Its: _____

Print Name: _____

APPROVED AS TO FORM:By: _____
City Attorney**NOTARY**State of Washington)
County of King) ss.

I certify that I know or have satisfactory evidence that _____ is the person who appeared before me, and said person acknowledged that (he/she) signed this instrument and acknowledged it to be (his/her) free and voluntary act for the uses and purposes mentioned in the instrument.

Dated: _____

By: _____

Print Name: _____

NOTARY PUBLIC in and for the State of
Washington, residing at _____

My commission expires: _____

Note: Different notary form is required for Corporate Ownership.

MAINTENANCE BOND

DEVELOPER: _____

SURETY: _____

AMOUNT: _____

DEVELOPMENT: _____

KNOW ALL PERSONS BY THESE PRESENTS: That we, _____, (hereinafter called the "Developer"), and _____ a corporation organized under the laws of the State of _____, and authorized to transact surety business in the State of Washington (hereinafter called the "Surety"), are held and firmly bound unto the City of Black Diamond, Washington, in the sum of _____ (\$ _____), lawful money of the United States of America, for the payment of which sum we and each of us bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, by these presents. THE CONDITIONS of the above obligation are such that:

WHEREAS, the above named Developer has constructed and installed certain improvements in connection with a project as described above within the City; and

WHEREAS, in order to provide security for the obligation of the Developer to repair and/or replace said improvements against defects in workmanship, materials, or installation for a period of twenty-four (24) months after written and final acceptance of the same and approval by the City; and

WHEREAS, in order to enable to the City to release the performance bond filed by the Developer with the City in connection with such improvements

NOW, THEREFORE, this maintenance bond has been secured and is hereby submitted to the City. It is understood and agreed that this obligation shall continue in effect until released in writing by the City of Black Diamond, but only after the Developer has performed and satisfied the following conditions:

A. CONDITIONS

1. The work or improvements installed by the Developer and subject to the terms and conditions of this Bond are as follows:
(insert complete description here)

2. The Developer and Surety agree that the work and improvements installed pursuant to the Performance Bond or other security instrument filed with the City in the above-referenced project shall remain free from defects in material, workmanship, and installation (or, in the case of landscaping, shall survive,) for a period of twenty-four (24) months after written and final acceptance of the same and approval by the City. Maintenance is defined as acts carried out to prevent a decline, lapse, or cessation of the state of the project or improvements as accepted by the City during the twenty-four (24) month period after final and written acceptance, and includes, but is not limited to, repair or replacement of defective workmanship, materials, or installations.
3. The Developer shall, at its sole cost and expense, carefully replace and/or repair any damage or defects in workmanship, materials or installation to the City-owned real property on which improvements have been installed, and leave the same in as good condition as it was before commencement of the work.
4. The Developer and Surety agree that in the event of any of the improvements or restoration work installed or completed by the Developer as described herein, fail to remain free from defects in materials, workmanship or installation (or in the case of landscaping, fail to survive), for a period of twenty-four (24) months from the date of acceptance of the work by the City, the Developer shall repair and/or replace the same within ten (10) days of demand by the City, and if the Developer should fail to do so, then the Surety shall:
 1. Within twenty (20) days of demand of the City, make written commitment to the City that it will either:
 - a. Remedy the default itself with reasonable diligence pursuant to a time schedule acceptable to the City; or
 - b. Tender to the City within an additional ten (10) days the amount necessary, as determined by the City, for the City to remedy the default, up to the total bond amount.

Upon completion of the Surety's duties under either of the options above, the Surety shall then have fulfilled its obligations under this bond. If the Surety elects to fulfill its obligation pursuant to the requirements of subsection 4(1)(b), the City shall notify the Surety of the actual cost of the remedy, upon completion of the remedy. The City shall return, without interest, any overpayment made by the Surety, and the Surety shall pay to the City any actual costs, which exceeded the City's estimate, limited to the bond amount.

2. In the event the Developer fails to make repairs or provide maintenance within the time period requested by the City, then the City, its employees and agents shall have the right at the City's sole election to enter onto said property described above for the purpose of repairing or maintaining the improvements. This provision shall not be construed as creating an

obligation on the part of the City or its representatives to repair or maintain such improvements.

B. CORRECTIONS

Any corrections required by the City shall be commenced within ten (10) days of notification by the City and completed within thirty (30) days of the date of notification. If the work is not performed in a timely manner, the City shall have the right, without recourse to legal action, to take such action under this bond as described in Section A above.

D. EXTENSIONS AND CHANGES

No change, extension of time, alteration or addition to the work to be performed by the Developer shall affect the obligation of the Developer or Surety on this bond, unless the City specifically agrees, in writing, to such alteration, addition, extension or change. The surety waives notice of any such change, extension, alteration or addition thereunder.

E. ENFORCEMENT

It is specifically agreed by and between the parties that in the event any legal action must be taken to enforce the provisions of this bond or to collect said bond, the prevailing party shall be entitled to collect its costs and reasonable attorney fees as a part of the reasonable costs of securing the obligation hereunder. In the event of settlement or resolution of these issues prior to the filing of any suit, the actual costs incurred by the City, including reasonable attorney fees, shall be considered a part of the obligation hereunder secured. Said costs and reasonable legal fees shall be recoverable by the prevailing party, not only from the proceeds of this bond, but also over and above said bond as a part of any recovery (including recovery on the bond) in any judicial proceeding. The Surety hereby agrees that this Agreement shall be governed by the laws of the State of Washington. Venue of any litigation arising out of this Agreement shall be in King County Superior Court.

B. BOND EXPIRATION

This bond shall remain in full force and effect until the obligations secured hereby have been fully performed and until released in writing by the City at the request of the Surety or the Developer.

DATED this _____ day of _____, 20____.

SURETY COMPANY

(Signature must be notarized)

By: _____

Its: _____

Print Name: _____

DEVELOPER

(Signature must be notarized)

By: _____

Its: _____

Print Name: _____

Business Name: _____

Business Name: _____

Business Address: _____

Business Address: _____

City/State/Zip: _____

City/State/Zip: _____

Phone: _____

Phone: _____

CITY OF BLACK DIAMOND

By: _____

Its: _____

Print Name: _____

APPROVED AS TO FORM:By: _____
City Attorney**NOTARY**State of Washington)
County of King) ss.

I certify that I know or have satisfactory evidence that _____ is the person who appeared before me, and said person acknowledged that (he/she) signed this instrument and acknowledged it to be (his/her) free and voluntary act for the uses and purposes mentioned in the instrument.

Dated: _____

By: _____

Print Name: _____

NOTARY PUBLIC in and for the State of
Washington, residing at _____

My commission expires: _____

Note: Different notary form is required for Corporate Ownership.

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CHAPTER 9

STANDARD DETAILS

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CHAPTER 9 – STANDARD DETAILS

TESC, CLEARING AND GRADING DETAILS

EC-1	CONSTRUCTION ENTRANCE
EC-2	SILT FENCE
EC-3	INLET PROTECTION – FILTER FABRIC FENCE
EC-4	INLET PROTECTION – GRAVEL AND FILTER FABRIC
EC-5	INLET PROTECTION – BLOCK AND GRAVEL FILTER
EC-6	STRAW BALE BARRIER
EC-7	GRAVEL FILTER BERM
EC-8	TEMPORARY INTERCEPTOR DIKES AND SWALES

TRANSPORTATION DETAILS

TR-1	PRINCIPAL ARTERIAL
TR-2	MINOR ARTERIAL
TR-3	COLLECTOR
TR-4	NEIGHBORHOOD COLLECTOR
TR-5	LOCAL ACCESS INDUSTRIAL
TR-6	LOCAL ACCESS COMMERCIAL
TR-7	LOCAL ACCESS RESIDENTIAL (WITH THICKENED EDGE)
TR-8	LOCAL ACCESS RESIDENTIAL (WITH SWALE)
TR-9	ALLEY SECTION
TR-10	CUL-DE-SAC
TR-11	STANDARD UTILITY LOCATIONS
TR-12	SIGHT OBSTRUCTION
TR-13	TRENCH RESTORATION
TR-14	CONCRETE CURBS
TR-15	SIDEWALK
TR-16	SIDEWALK SPACING
TR-17	SIDEWALK ACCESS RAMP
TR-18	DETECTABLE WARNING PATTERN
TR-19	CEMENT CONCRETE DRIVEWAY
TR-20	PRECAST CONCRETE MONUMENT
TR-21	CAST-IN-PLACE MONUMENT
TR-22	MONUMENT CASE
TR-23	MAILBOX
TR-24	IN-FILL DEVELOPMENT STREET SECTIONS
TR-25	IN-FILL SECTION 1
TR-26	IN-FILL SECTION 2
TR-27	IN-FILL SECTION 3
TR-28	IN-FILL SECTION 4
TR-29	STREET SIGNS

STORM DRAINAGE DETAILS

SD-1	CATCH BASIN, TYPE 1
SD-2	CATCH BASIN, TYPE 2
SD-3	CATCH BASIN FRAME AND GRATES
SD-4	DEBRIS BARRIER
SD-5	DOWNSPOUT INFILTRATION TRENCH
SD-6	DETENTION POND – PLAN VIEW
SD-7	DETENTION POND – CROSS SECTIONS
SD-8	STORM WATER POND SIGN
SD-9	OVERFLOW STRUCTURE
SD-10	EMERGENCY OVERFLOW SPILLWAY
SD-11	PRIVATE DETENTION TANK
SD-12	DETENTION TANK ACCESS
SD-13	DETENTION VAULT
SD-14	FLOW RESTRICTOR
SD-15	FLOW DISPERSAL TRENCH
SD-16	BIOFILTRATION SWALE
SD-17	WETPOND – PLAN VIEW
SD-18	WETPOND – CROSS SECTIONS
SD-19	POND SLOPE REQUIREMENTS
SD-20	WETVAULT
SD-21	MEDIAN DUAL MEDIA FILTER DRAIN WITH UNDERDRAIN
SD-22	SIDE SLOPE MEDIA FILTER DRAIN WITH UNDERDRAIN
SD-23	SIDE SLOPE MEDIA FILTER DRAIN WITHOUT UNDERDRAIN
SD-24	STANDARD UTILITY LOCATIONS
SD-25	TRENCH RESTORATION

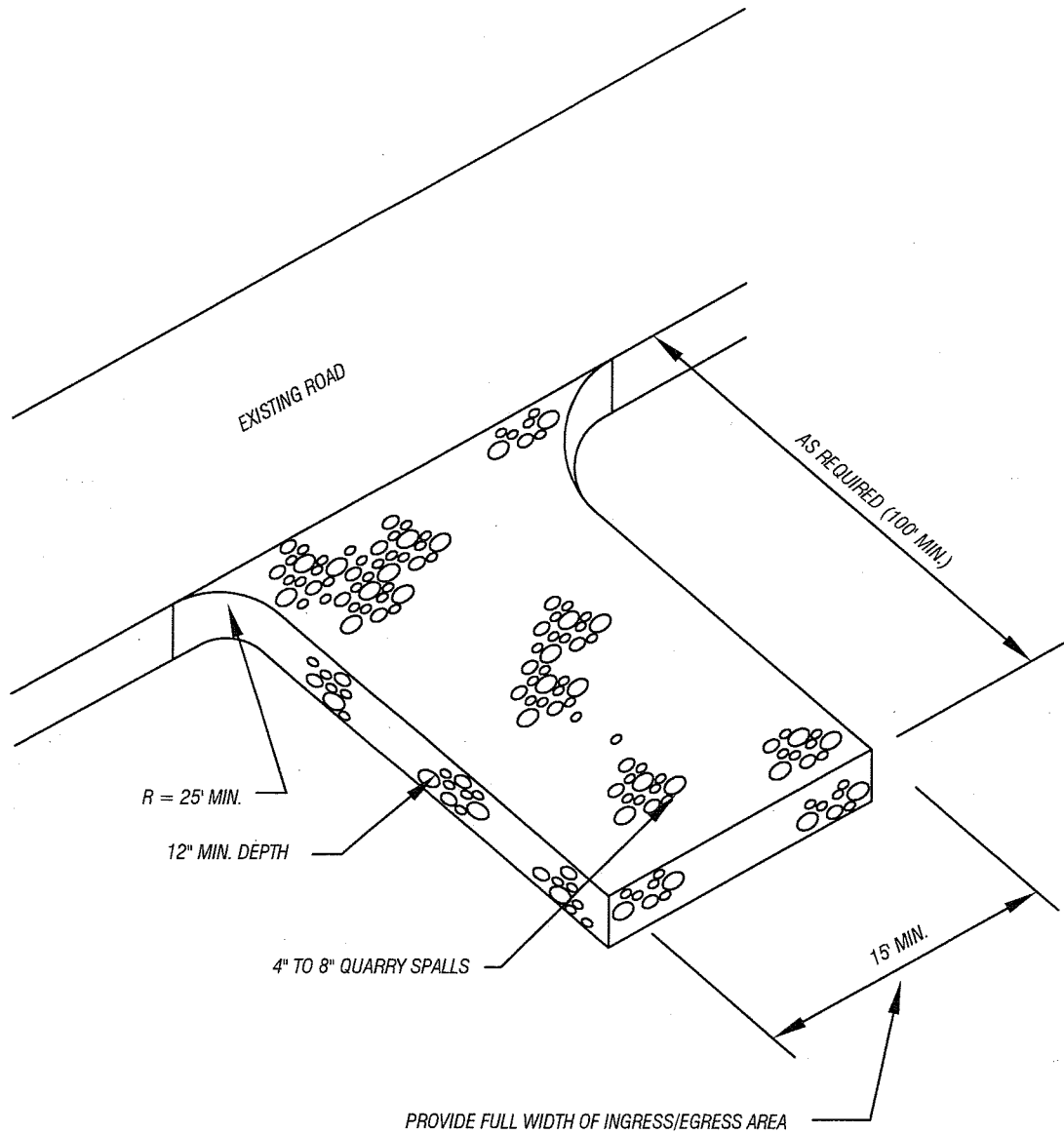
SANITARY SEWER DETAILS

S-1	STANDARD MANHOLE
S-2	OUTSIDE DROP STRUCTURE
S-3	STANDARD SHALLOW MANHOLE
S-4	MANHOLE RING ADJUSTMENT DETAIL
S-5	24" MANHOLE RING AND COVER
S-6	24" BOLT-LOCKING MANHOLE RING AND COVER
S-7	LADDER AND MANHOLE STEP
S-8	CLEANOUT
S-9	LATERAL SEWERS
S-10	SIDE SEWERS
S-11	GRINDER PUMPS
S-12	PRESSURE LINE CONNECTION
S-13	SOIL/CEMENT PIPE ANCHOR
S-14	100 GALLON BAFFLE TYPE OIL/WATER SEPARATOR
S-15	450 GALLON BAFFLE TYPE OIL/WATER SEPARATOR
S-16	800 & 1000 GALLON BAFFLE TYPE OIL/WATER SEPARATOR
S-17	GREASE INTERCEPTOR
S-18	NEW MANHOLE ON EXISTING SEWER
S-19	MANHOLE SECTION ADJUSTMENT
S-20	MANHOLE TYPE 2 (72" & 96")
S-21	MANHOLE TYPE 3 (72" & 96")
S-22	STANDARD UTILITY LOCATIONS
S-23	TRENCH RESTORATION

WATER DETAILS

W-1	CUSTOMER WATER SERVICE DETAIL WITH INDIVIDUAL PRESSURE REDUCING VALVE ASSEMBLY (RESIDENTIAL)
W-2	DUAL METER INSTALLATION
W-3	5/8", 3/4", AND 1" WATER SERVICE
W-4	1-1/2" AND 2" WATER SERVICE
W-5	3" TO 10" WATER SERVICE
W-6	INDIVIDUAL PRESSURE REDUCING VALVE ASSEMBLY (MULTI-FAMILY OR COMMERCIAL)
W-7	INDIVIDUAL PRESSURE REDUCING VALVE ASSEMBLY WITH PRESSURE RELIEF (MULTI-FAMILY OR COMMERCIAL)
W-8	DETECTOR DOUBLE CHECK VALVE ASSEMBLY
W-9	DOUBLE CHECK DETECTOR WITH FIRE CONNECTION
W-10	REDUCED PRESSURE PRINCIPLE BACKFLOW ASSEMBLY WITH DETECTOR
W-11	TAPPING TEES
W-12	CUT IN CONNECTION
W-13	CASING INSTALLATION
W-14	TYPICAL A.C. WATERMAIN CROSSING REPLACEMENT DETAIL
W-15	FILLING NEW WATER MAINS
W-16	VALVE BOX INSTALLATION
W-17	VALVE OPERATING EXTENSION
W-18	FIRE HYDRANT ASSEMBLY
W-19	FIRE HYDRANT LOCATION IN CUT OR FILL
W-20	FIRE HYDRANT GUARD POST & VALVE MARKER POST
W-21	WATER SAMPLING STATION
W-22	PERMANENT IN-LINE BLOW-OFF ASSEMBLY
W-23	1" AIR & VACUUM RELEASE VALVE ASSEMBLY
W-24	CONCRETE BLOCKING
W-25	VERTICAL BLOCKING WITH RESTRAINED JOINTS FOR NEW LINES
W-26	VERTICAL BLOCKING FOR CONNECTING TO EXISTING MAIN
W-27	CONCRETE SLOPE ANCHOR DETAIL
W-28	TIMBER BAFFLE/HILL HOLDER
W-29	STANDARD UTILITY LOCATIONS
W-30	TRENCH RESTORATION

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NOTE:

INSTALL DRIVEWAY CULVERT IF THERE IS A ROADSIDE DITCH PRESENT.

6-04-09



Robert L. Smith



**CITY OF
BLACK DIAMOND**

CONSTRUCTION ENTRANCE

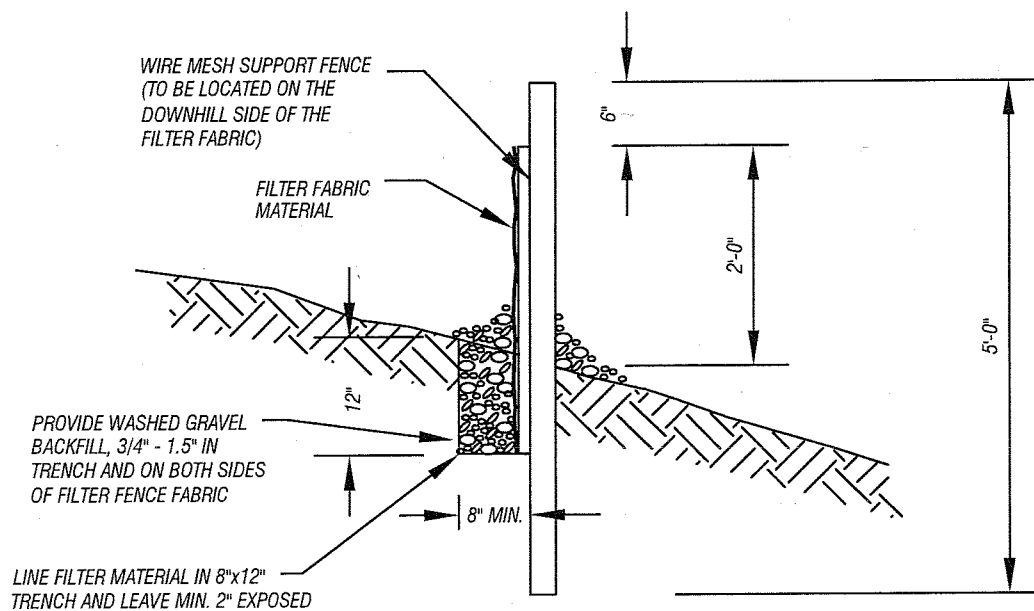
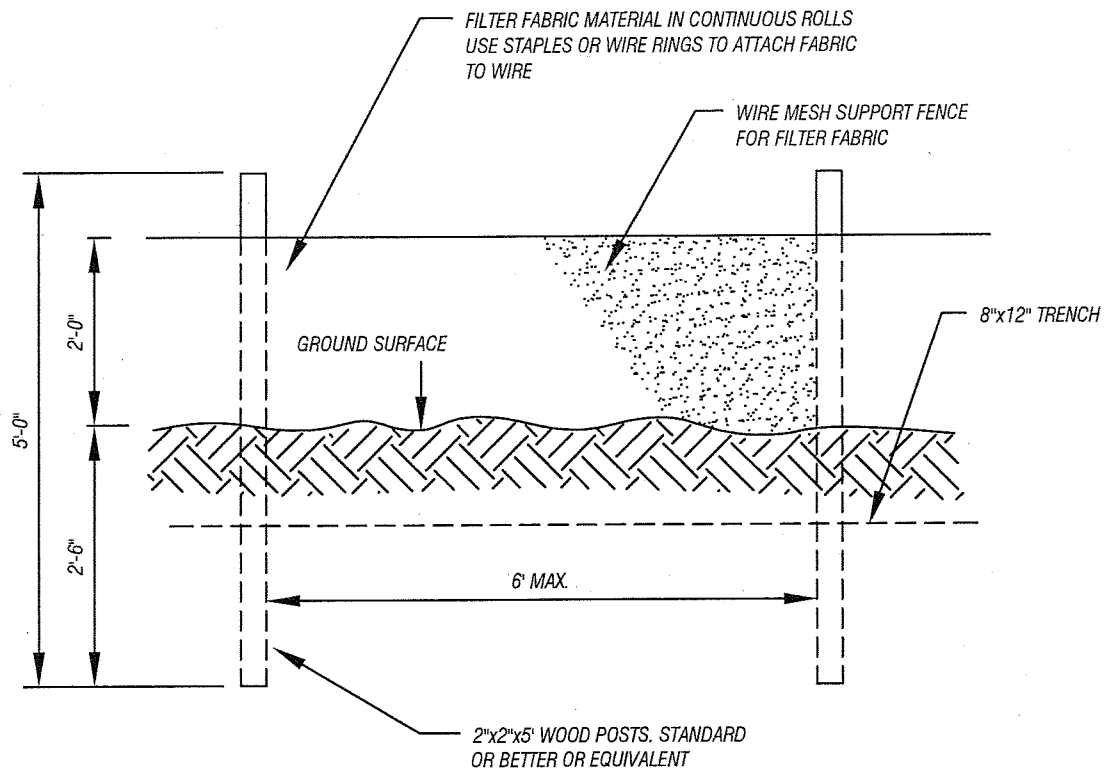
STANDARD DWG EC-1

NOT TO SCALE

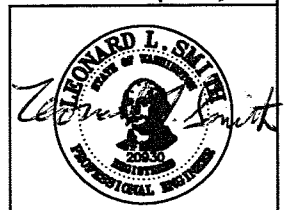
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SILT FENCE

STANDARD DWG EC-2

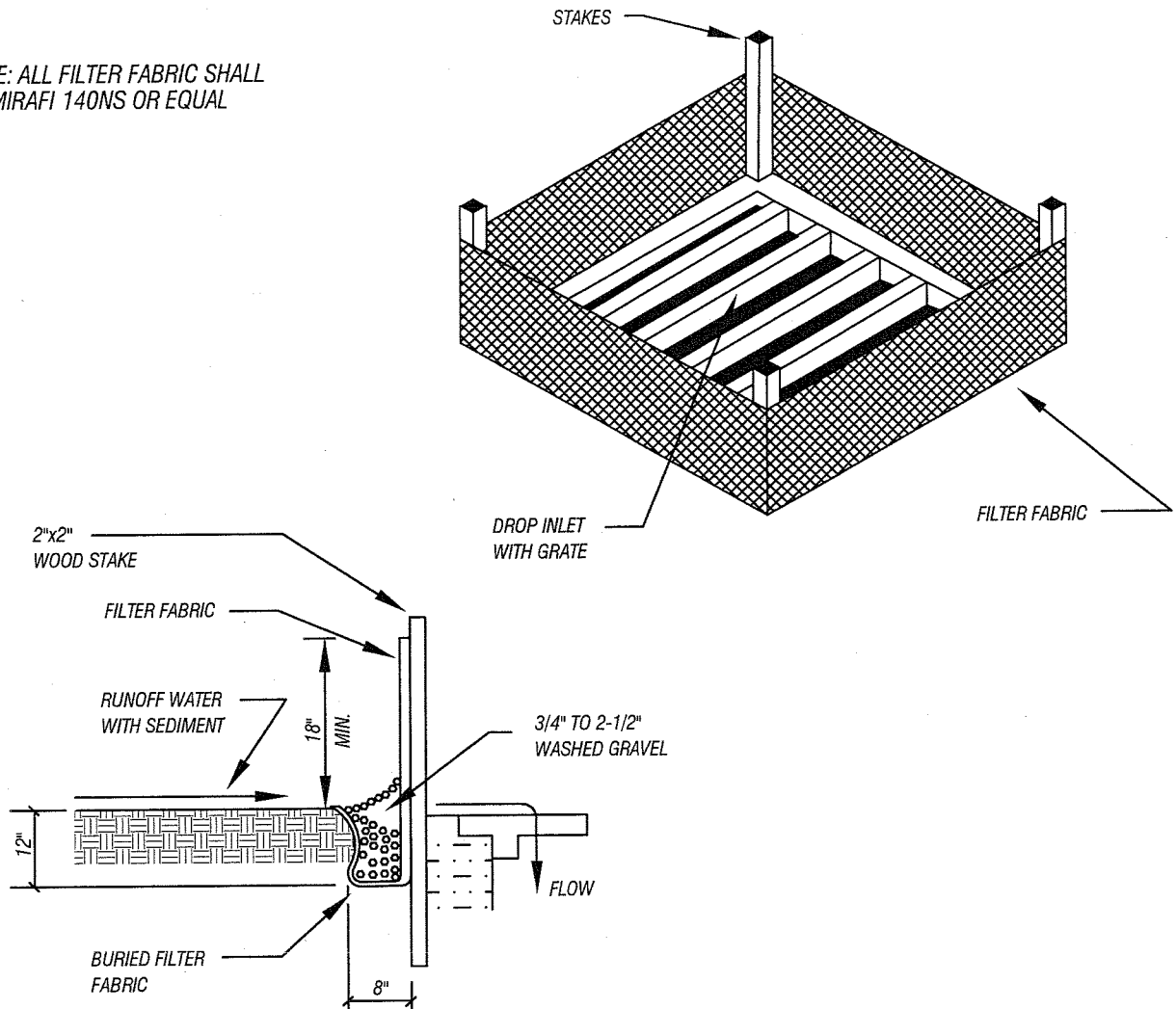
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NOTE: ALL FILTER FABRIC SHALL
BE MIRAFI 140NS OR EQUAL



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INLET PROTECTION - FILTER FABRIC FENCE

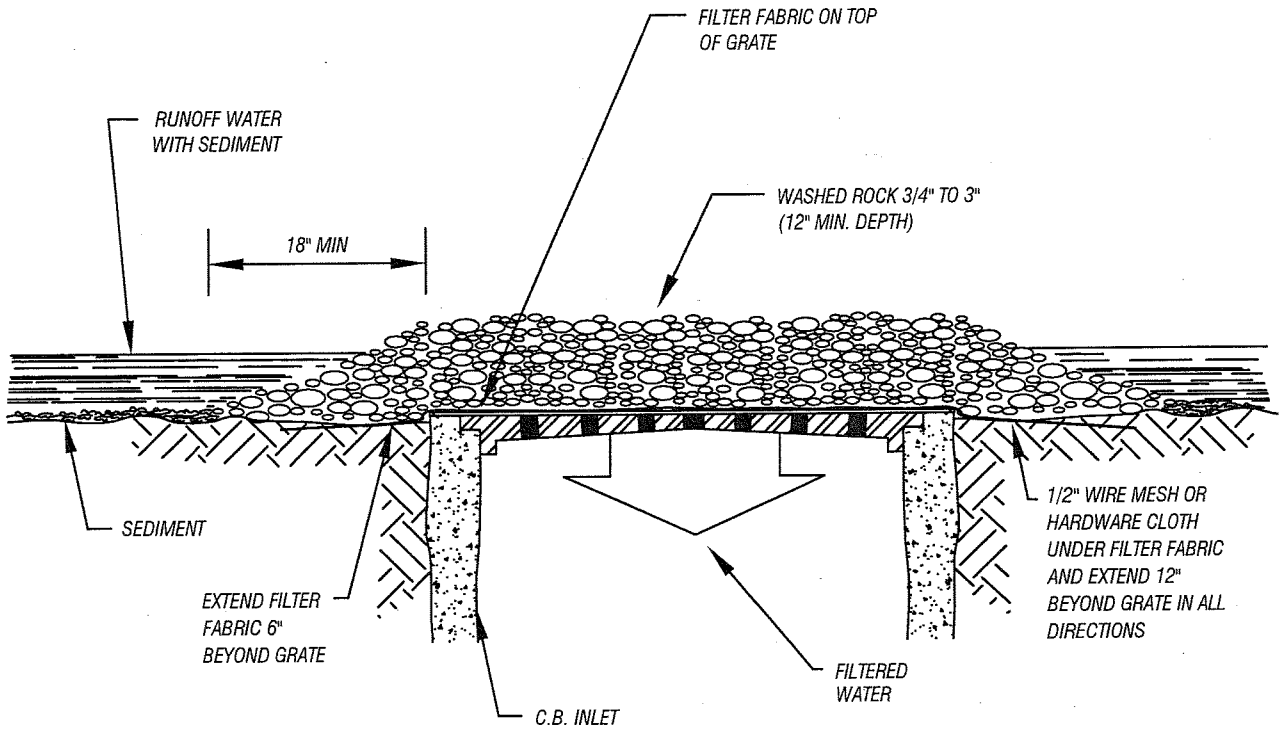
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NOT TO SCALE

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INLET PROTECTION - GRAVEL AND FILTER FABRIC

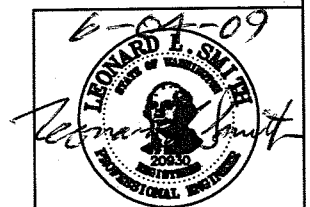
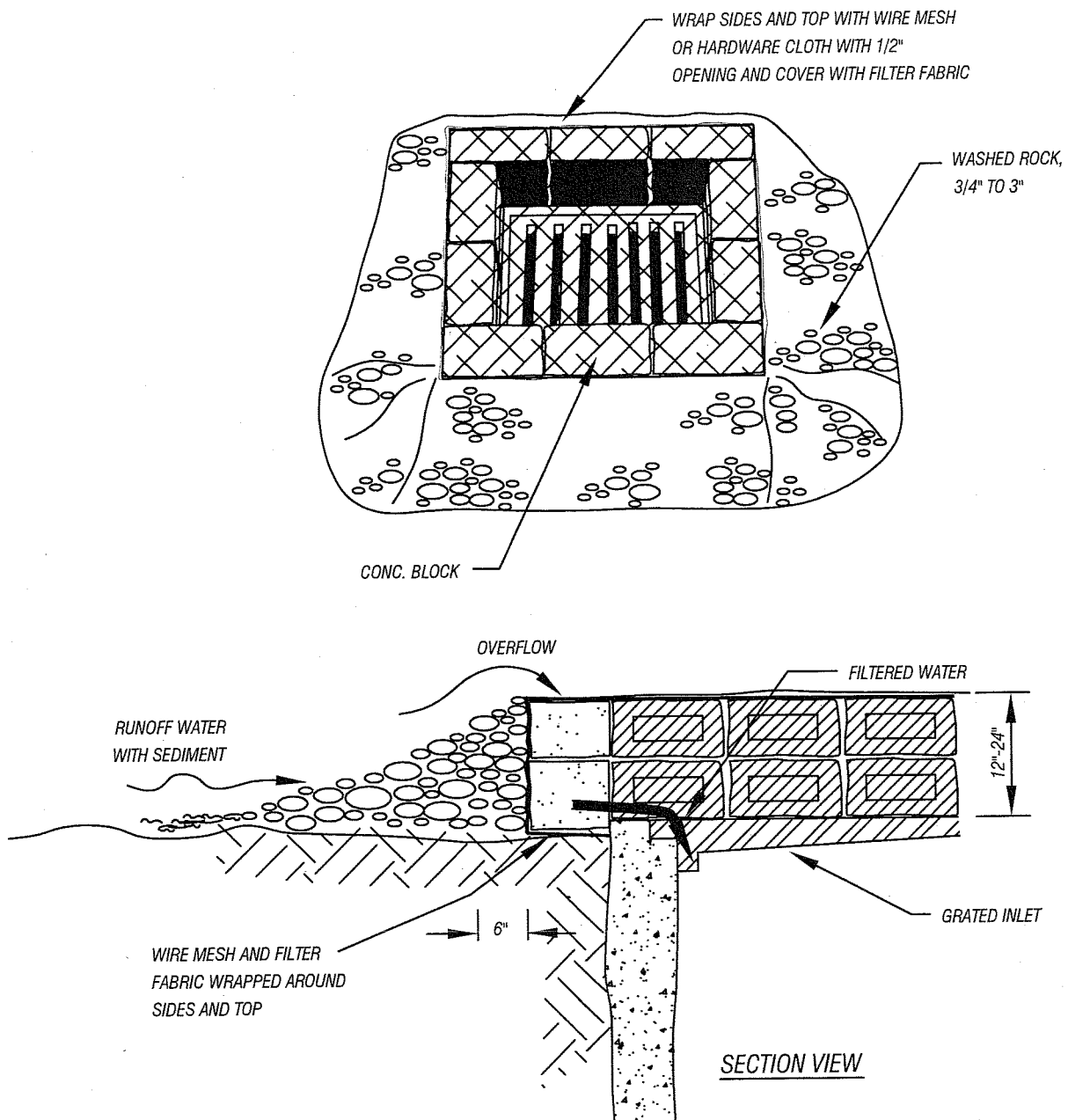
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NOT TO SCALE

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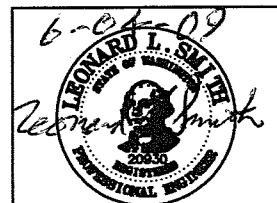
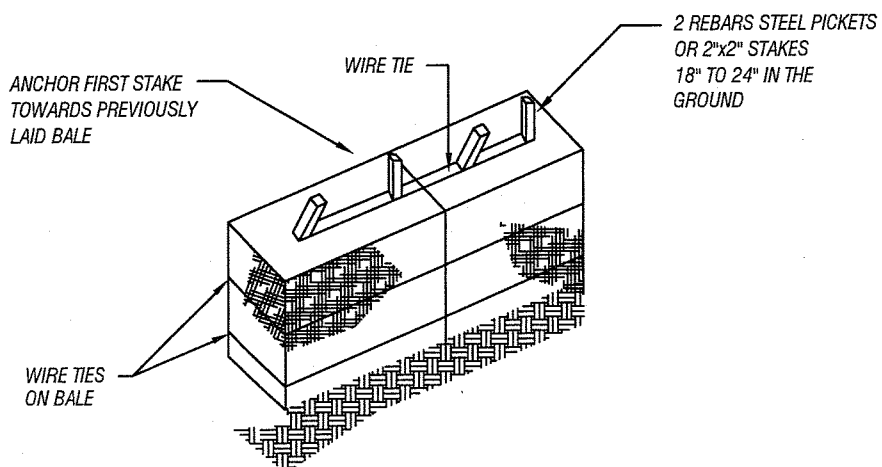
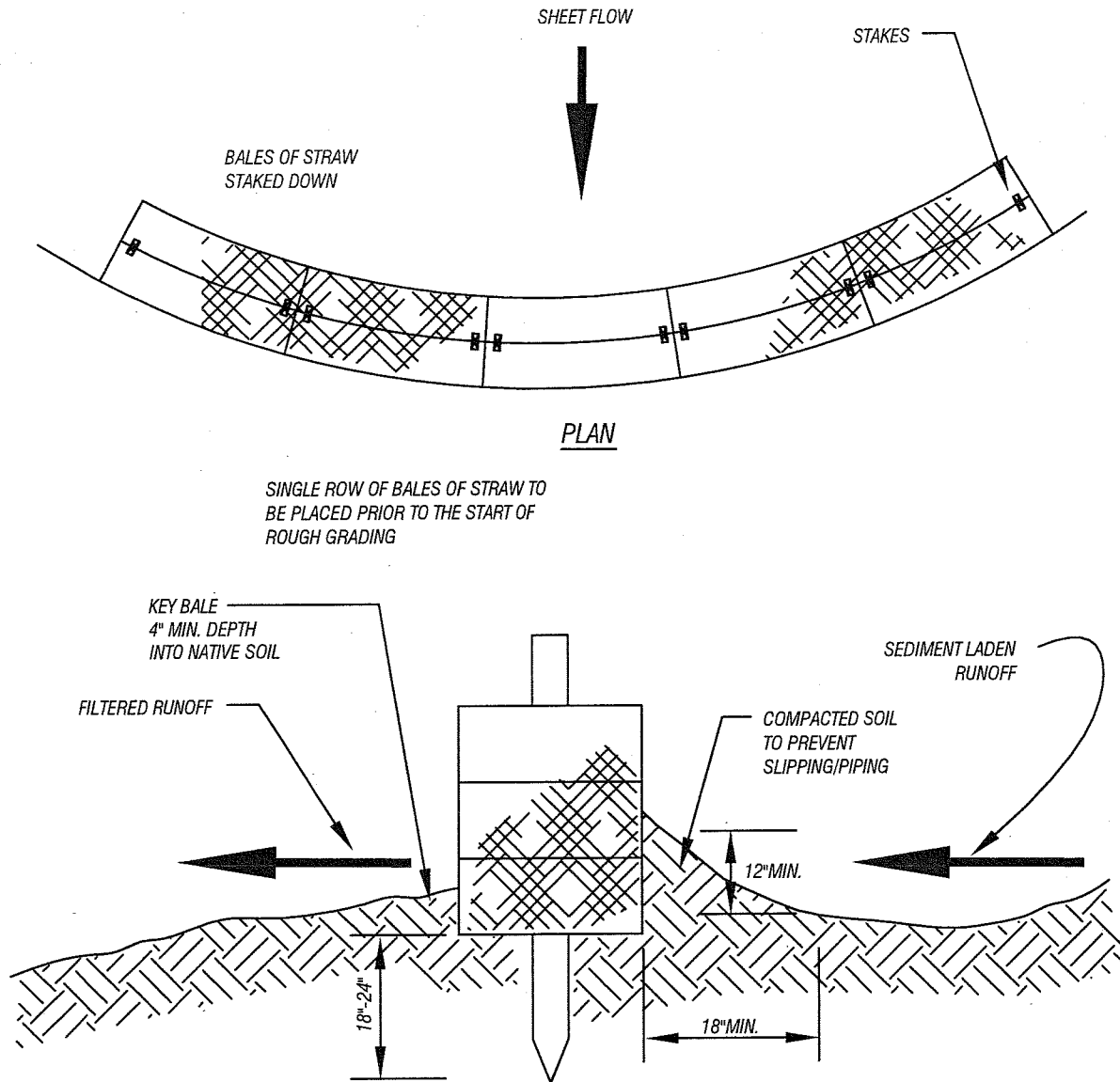
INLET PROTECTION - BLOCK AND GRAVEL FILTER

STANDARD DWG EC-5

NOT TO SCALE

01/01/08





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STRAW BALE BARRIER

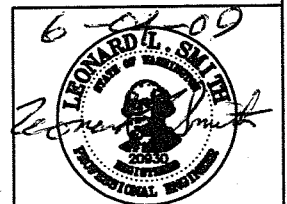
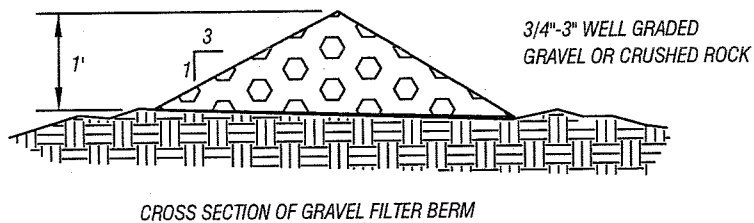
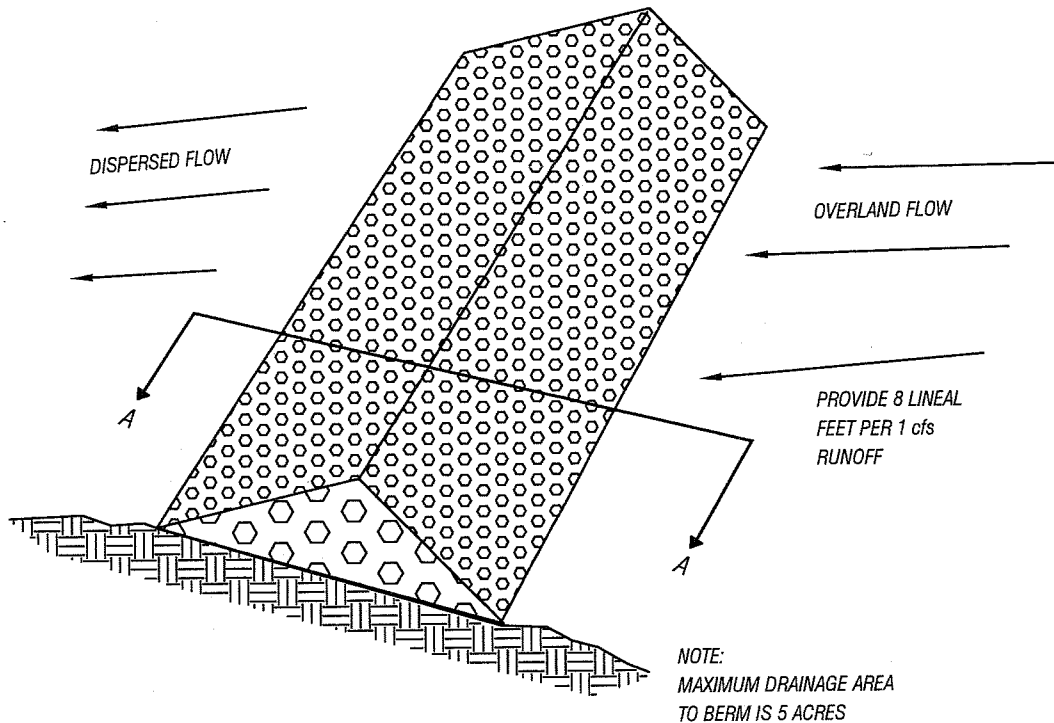
STANDARD DWG EC-6

NOT TO SCALE

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GRAVEL FILTER BERM

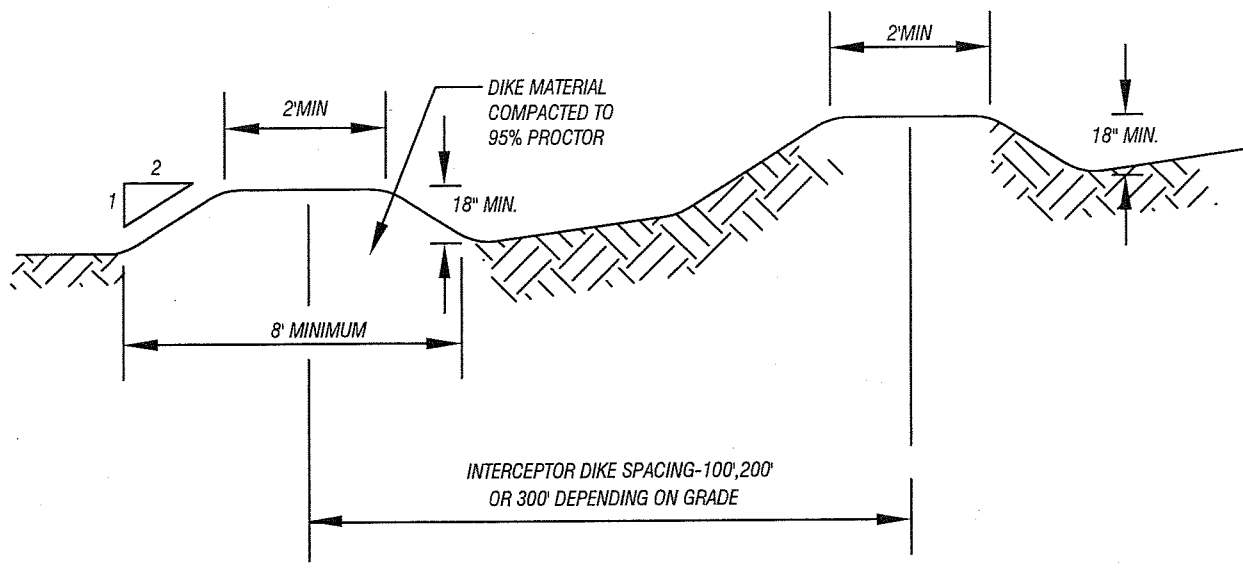
STANDARD DWG EC-7

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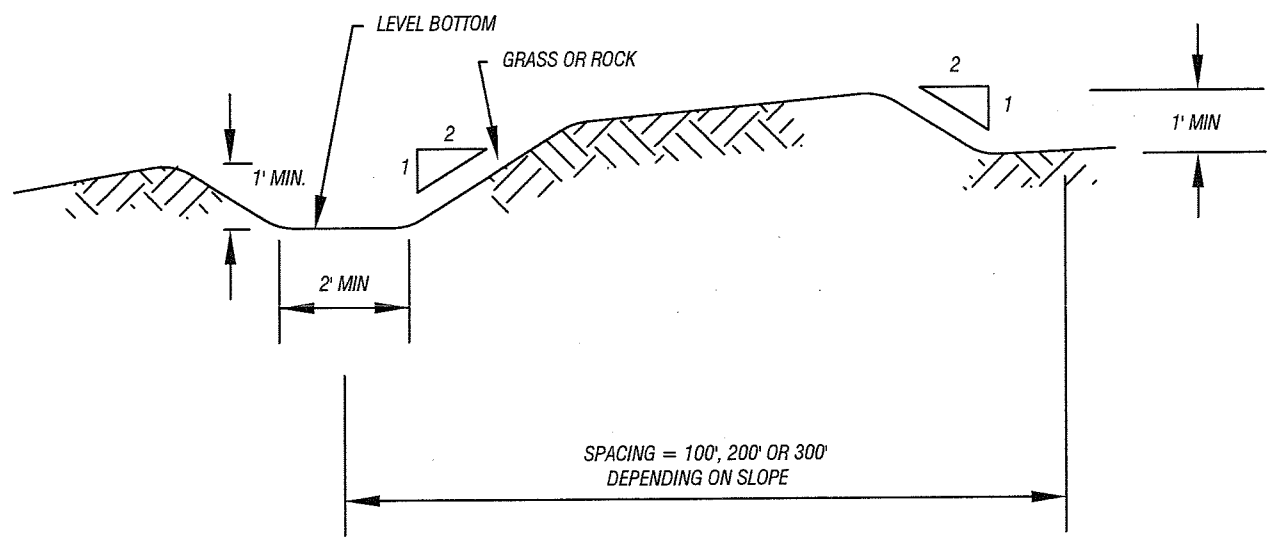
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INTERCEPTOR DIKES
N.T.S.



INTERCEPTOR SWALE
N.T.S.

6-04-09
LEONARD L. SMITH
Professional Engineer
PacWest Engineering
Fife, Washington

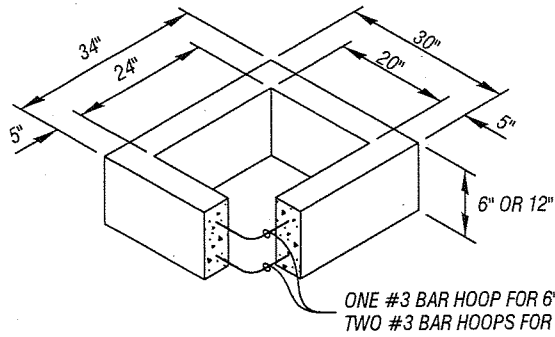


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BLACK DIAMOND**

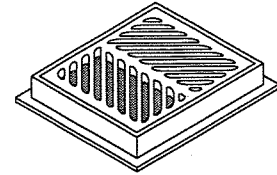
**TEMPORARY INTERCEPTOR
DIKES AND SWALES**

STANDARD DWG EC-8 NOT TO SCALE 01/01/08

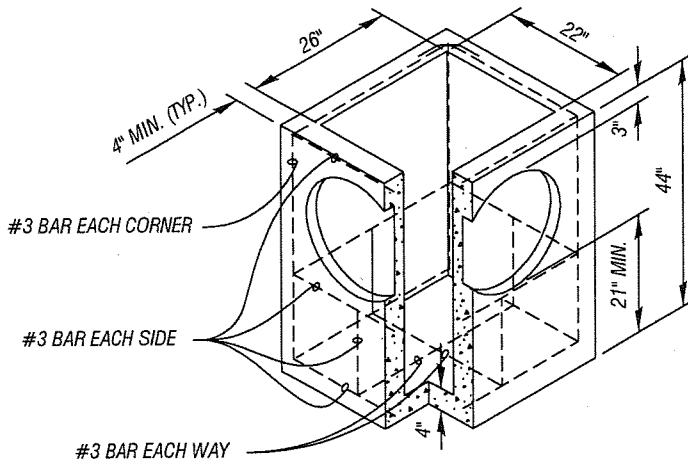




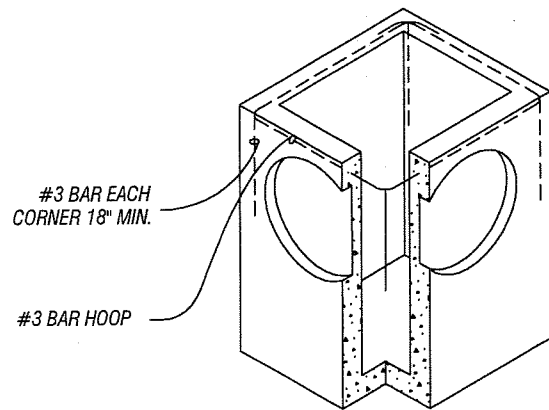
RECTANGULAR ADJUSTMENT SECTION



FRAME AND HERRINGBONE GRATE



PRECAST BASE SECTION



ALTERNATIVE PRECAST BASE SECTION

NOTES:

1. AS ACCEPTABLE ALTERNATIVES TO THE REBAR SHOWN IN THE PRECAST BASE SECTION, FIBERS (PLACED ACCORDING TO WSDOT STANDARD SPECIFICATIONS), OR WIRE MESH HAVING A MINIMUM AREA OF 0.12 SQUARE INCHES PER FOOT SHALL BE USED WITH THE MINIMUM REQUIRED REBAR SHOWN IN THE ALTERNATIVE PRECAST BASE SECTION. WIRE MESH SHALL NOT BE PLACED IN THE KNOCKOUTS.
2. THE KNOCKOUT DIAMETER SHALL NOT BE GREATER THAN 20". KNOCKOUTS SHALL HAVE A WALL THICKNESS OF 2" MINIMUM TO 2.5" MAXIMUM. PROVIDE A 1.5" MINIMUM GAP BETWEEN THE KNOCKOUT WALL AND THE OUTSIDE OF THE PIPE. AFTER THE PIPE IS INSTALLED, FILL THE GAP WITH JOINT MORTAR IN ACCORDANCE WITH WSDOT STANDARD SPECIFICATION.
3. THE MAXIMUM DEPTH FROM THE FINISHED GRADE TO THE LOWEST PIPE INVERT SHALL BE 5'.
4. THE FRAME AND GRATE MAY BE INSTALLED WITH THE FLANGE UP OR DOWN. THE FRAME MAY BE CAST INTO THE ADJUSTMENT SECTION.
5. THE PRECAST BASE SECTION MAY HAVE A ROUNDED FLOOR, AND THE WALLS MAY BE SLOPED AT A RATE OF 1:24 OR STEEPER.
6. THE OPENING SHALL BE MEASURED AT THE TOP OF THE PRECAST BASE SECTION.
7. ALL PICKUP HOLES SHALL BE GROUTED FULL AFTER THE BASIN HAS BEEN PLACED.

PIPE ALLOWANCES	
PIPE MATERIAL	MAXIMUM INSIDE DIAMETER
REINFORCED OR PLAIN CONCRETE	12"
ALL METAL PIPE	15"
PVC	15"
HDPE	12"



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CATCH BASIN, TYPE 1

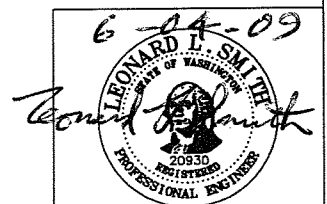
STANDARD DWG SD-1

NOT TO SCALE

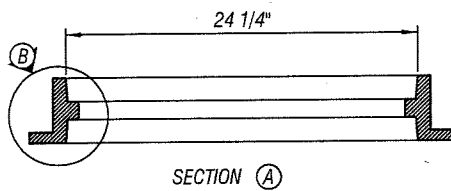
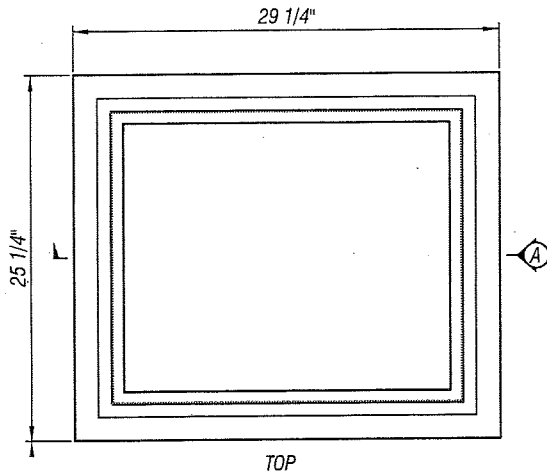
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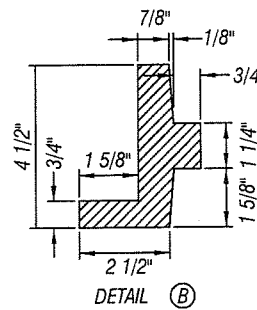


RECTANGULAR FRAME (REVERSIBLE)

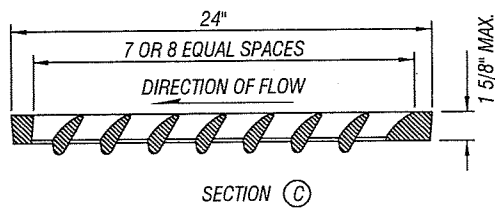
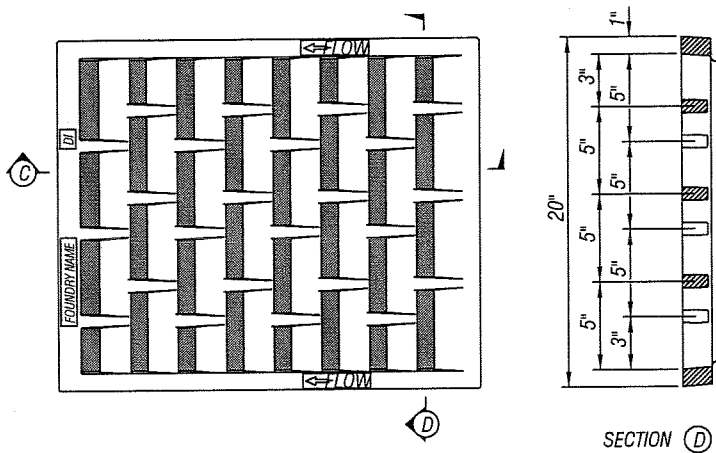


NOTES:

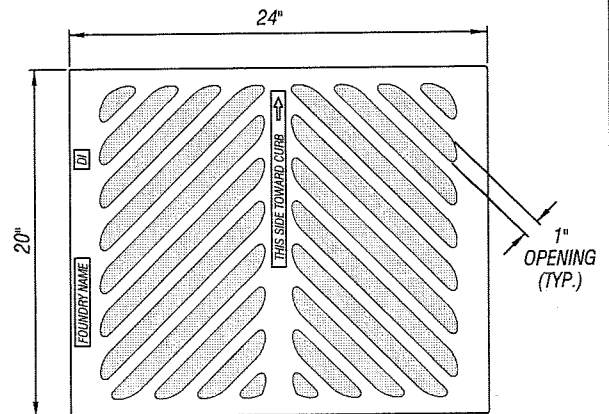
1. MAXIMUM THICKNESS OF THE GRATE SHALL BE 1-5/8".
2. WHEN ROAD PROFILE EXCEEDS 6%, VANED GRATES SHALL BE USED IN LIEU OF HERRINGBONE GRATES.



VANED GRATE



HERRINGBONE GRATE



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CATCH BASIN FRAME & GRATES

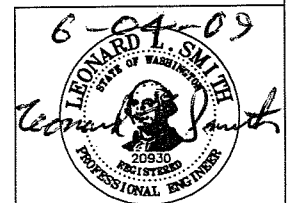
STANDARD DWG SD-3

NOT TO SCALE

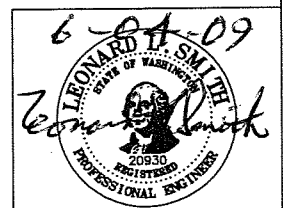
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1. ALL STEEL PARTS MUST BE GALVANIZED AND ASPHALT COATED (TREATMENT 1 OR BETTER).

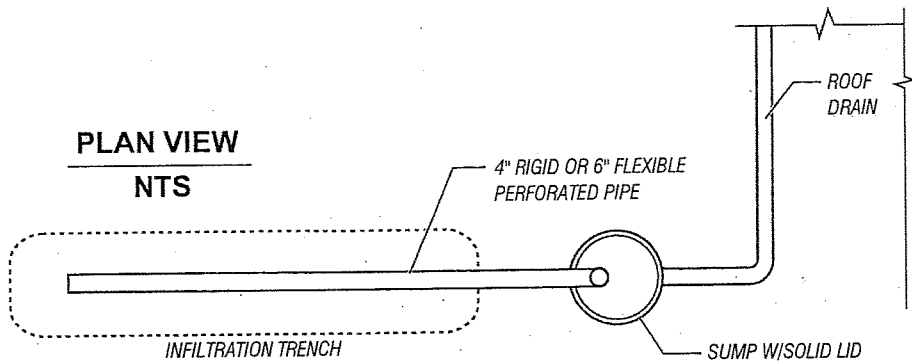


STANDARD DWG SD-4

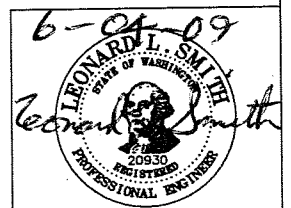
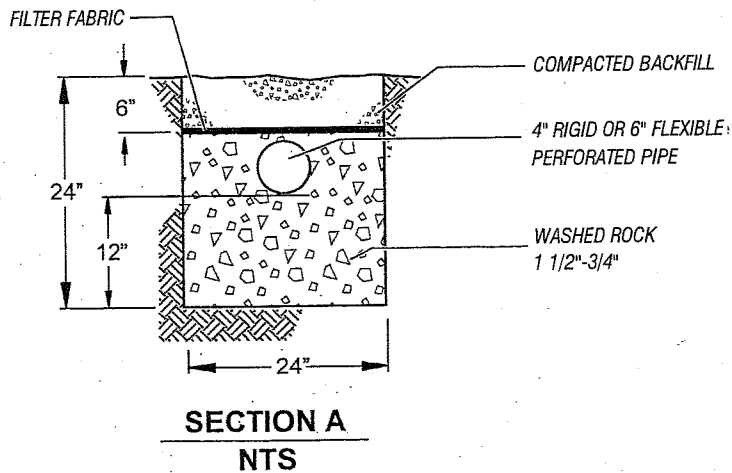
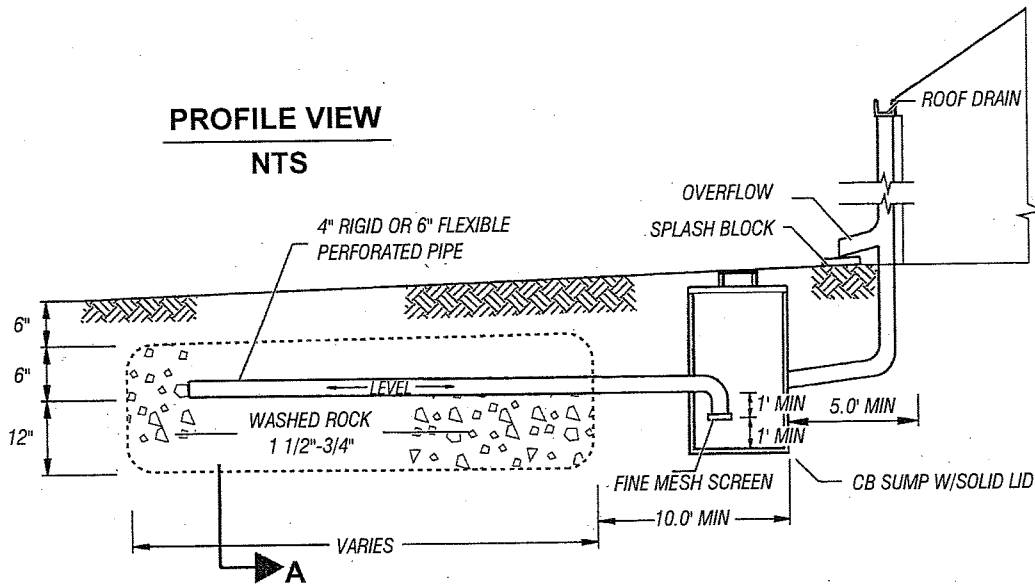
01/01/08



PLAN VIEW
NTS



PROFILE VIEW
NTS



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BLACK DIAMOND

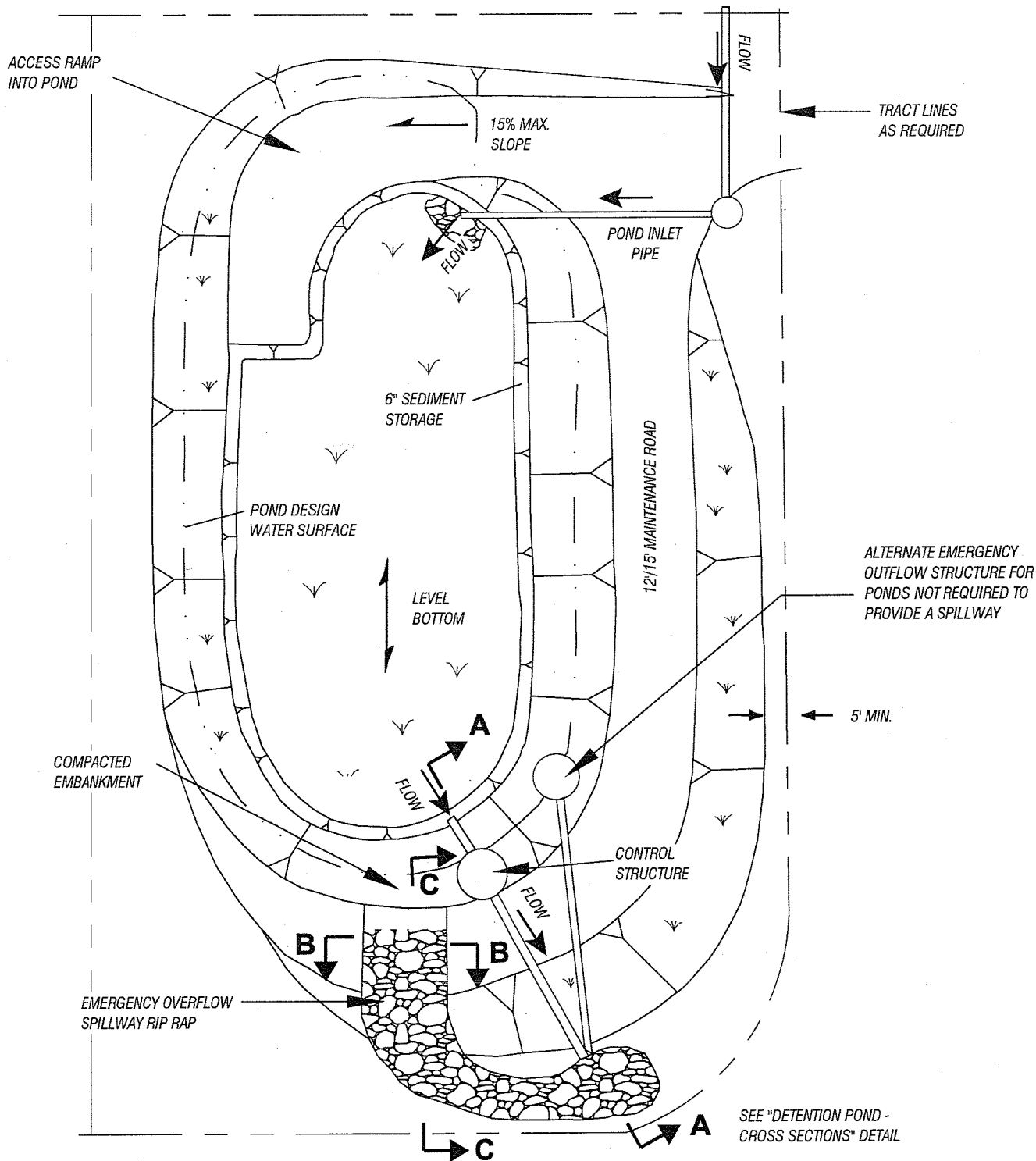
DOWNSPOUT INFILTRATION TRENCH
FOR SINGLE FAMILY RESIDENCE

STANDARD DWG SD-5

NOT TO SCALE

01/01/08

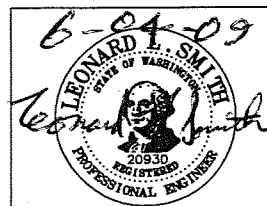




NOTES:

1. THIS DETAIL IS A SCHEMATIC REPRESENTATION ONLY. ACTUAL CONFIGURATION WILL VARY DEPENDING ON SPECIFIC SITE CONSTRAINTS AND APPLICABLE DESIGN CRITERIA.
2. MAINTENANCE ROAD SHALL BE A GRAVEL SURFACED ROAD CONSTRUCTED BY REMOVING ALL UNSUITABLE MATERIAL, LAYING A GEOTEXTILE FABRIC OVER NATIVE SOIL, PLACING 2"-4" QUARRY SPALLS 6" THICK, WITH A 2" THICK CRUSHED ROCK SURFACE.

SEE "DETENTION POND - CROSS SECTIONS" DETAIL



**CITY OF
BLACK DIAMOND**

**DETENTION POND -
PLAN VIEW**

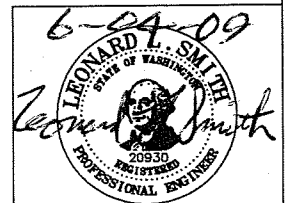
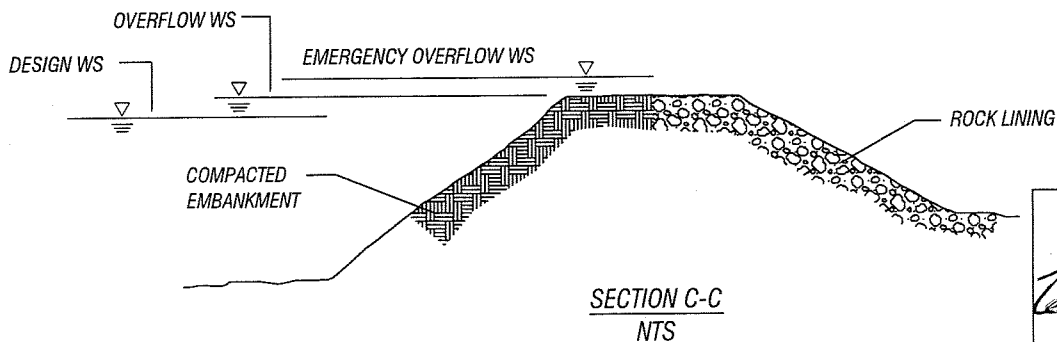
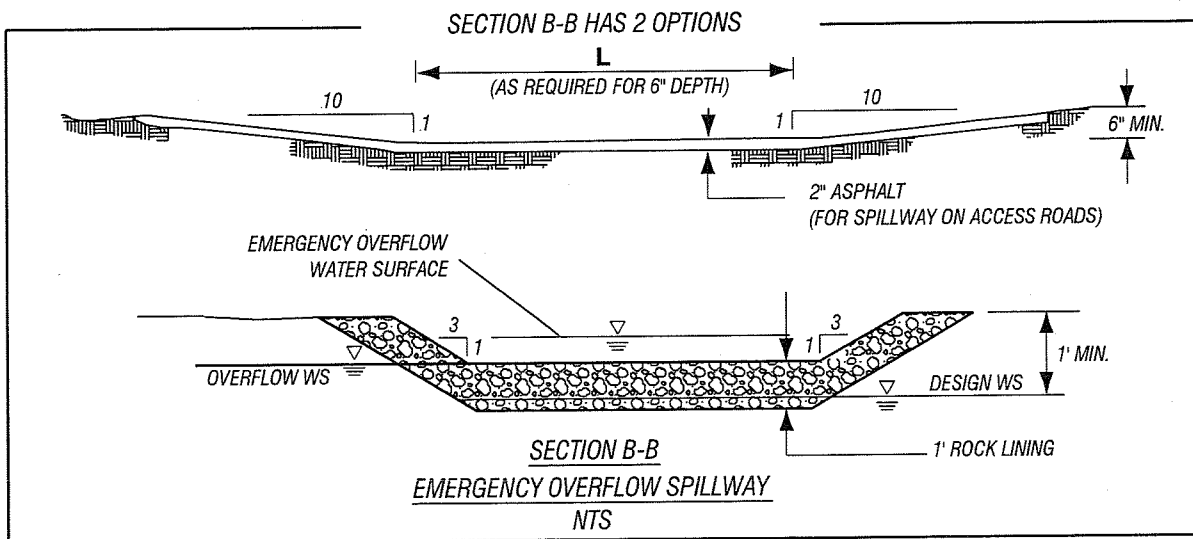
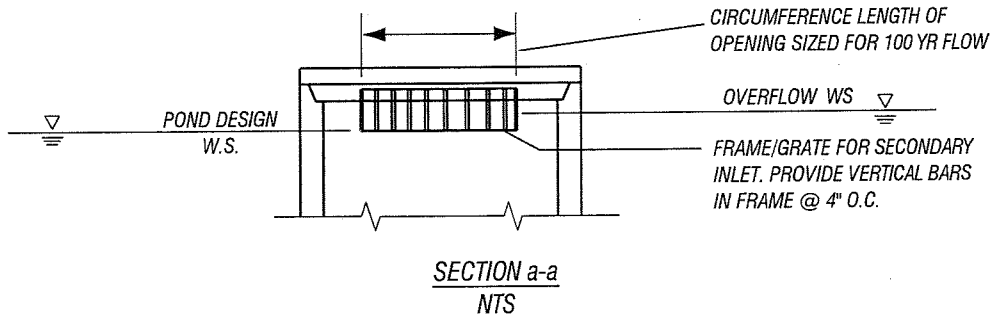
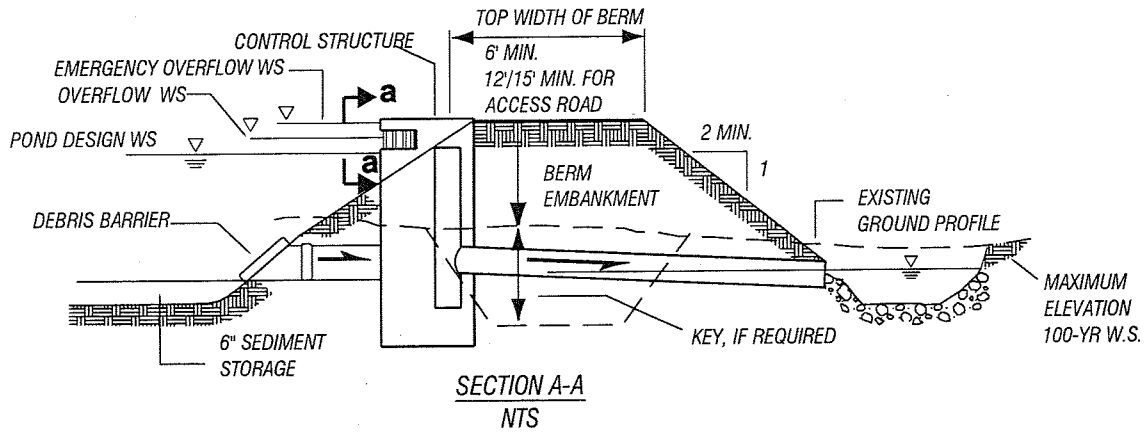
STANDARD DWG SD-6

NOT TO SCALE

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**CITY OF
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DETENTION POND - CROSS SECTIONS

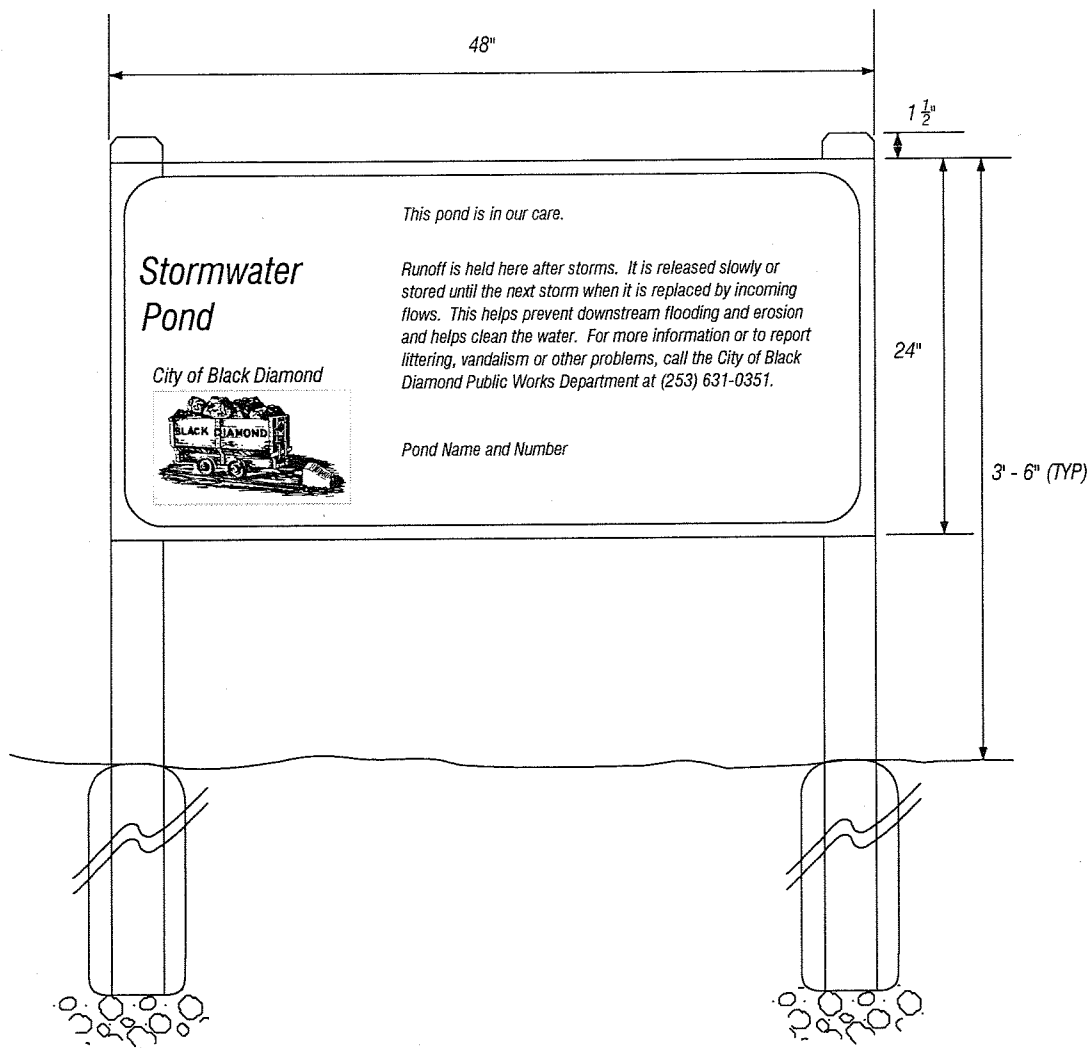
STANDARD DWG SD-7

NOT TO SCALE

01/01/08

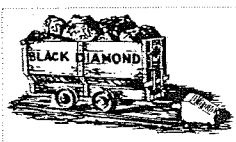
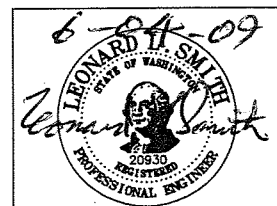


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SPECIFICATIONS:

- SIZE:** 48 INCHES BY 24 INCHES
MATERIAL: 0.125-GAUGE ALUMINUM
FACE: NON-REFLECTIVE VINYL OR 3 COATS OUTDOOR ENAMEL (SPRAYED).
LETTERING: SILK SCREEN ENAMEL WHERE POSSIBLE, OR VINYL LETTERS.
COLORS: BEIGE BACKGROUND, TEAL LETTERS.
TYPE FACE: HELVETICA CONDENSED. TITLE: 3 INCH; SUB-TITLE: 1 1/2 - INCH; TEXT: 1 INCH
BORDER: OUTER BORDER 1/8 INCH BORDER DISTANCE FROM EDGE: 1/4 - INCH; ALL TEXT 1 3/4 - INCH FROM BORDER.
POSTS: PRESSURE TREATED 4X4, BEVELED TOPS, 1/2 - INCH HIGHER THAN SIGN
INSTALLATION: SECURE TO CHAIN LINK FENCE IF AVAILABLE. OTHERWISE INSTALL TWO 4"x4" POSTS, PRESSURE TREATED, MOUNTED ATOP A GRAVEL BED, INSTALLED IN 30-INCH CONCRETE FILLED POST HOLES (8-INCH MINIMUM DIAMETER), WITH THE TOP OF SIGN NO HIGHER THAN 42" FROM GROUND SURFACE.
PLACEMENT: FACE SIGN IN DIRECTION OF PRIMARY VISUAL OR PHYSICAL ACCESS. DO NOT BLOCK ANY ACCESS ROAD. DO NOT PLACE WITHIN 6 FT OF STRUCTURAL FACILITIES (E.G. MANHOLES, SPILLWAYS, PIPE INLETS).



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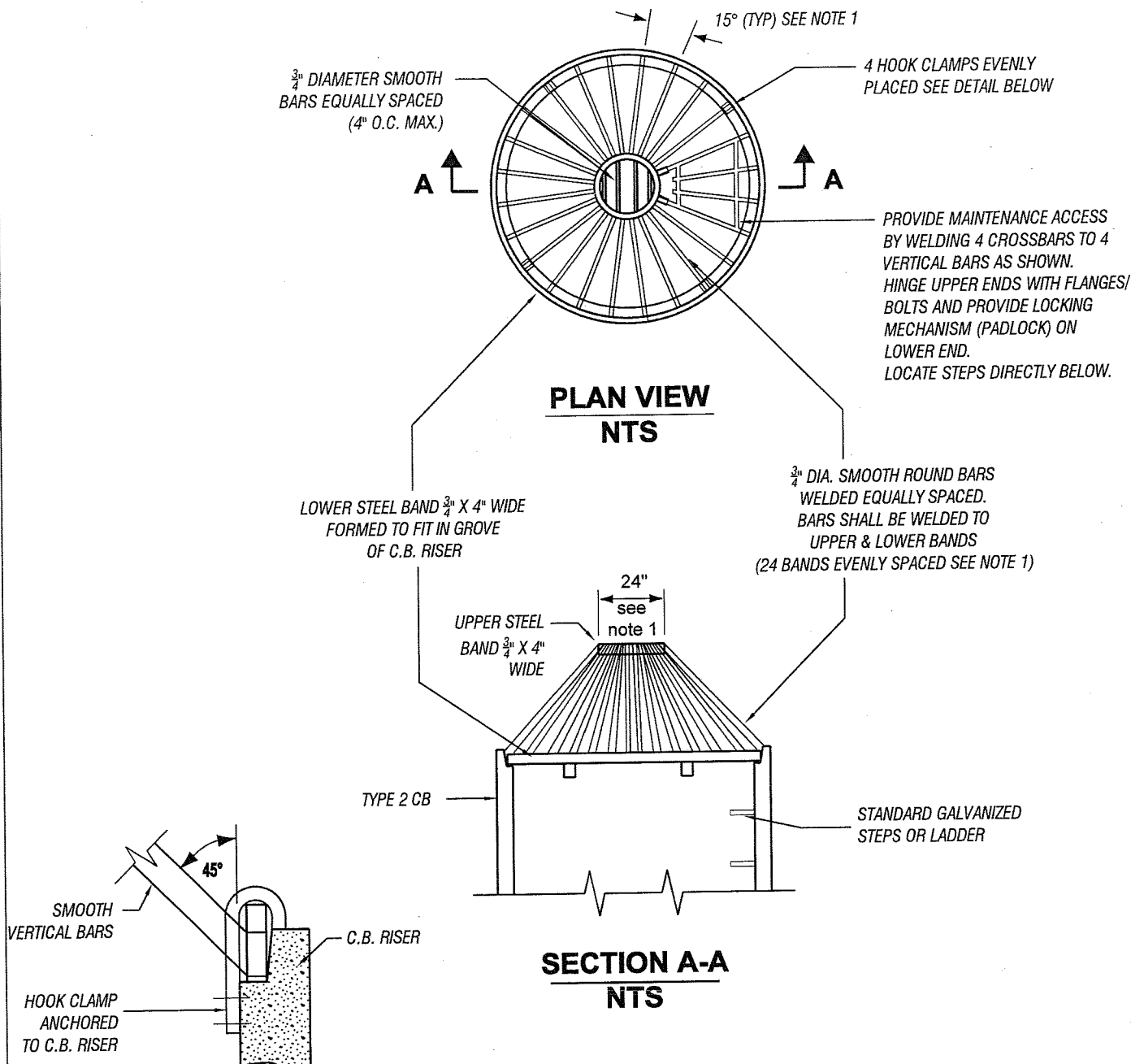
STORM WATER POND SIGN

STANDARD DWG SD-8

NOT TO SCALE

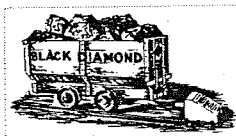
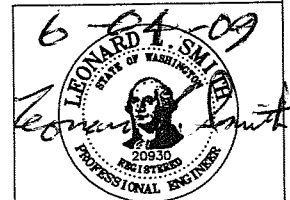
01/01/08





NOTES:

1. DIMENSIONS ARE FOR ILLUSTRATION ON 54" DIAMETER CB. FOR DIFFERENT DIAMETER CB'S ADJUST TO MAINTAIN 45° ANGLE ON "VERTICAL" BARS AND 7" O.C. MAXIMUM SPACING OF BARS AROUND LOWER STEEL BAND.
2. METAL PARTS MUST BE CORROSION RESISTANT; STEEL BARS MUST BE GALVANIZED.
3. THIS DEBRIS BARRIER IS ALSO RECOMMENDED FOR USE ON THE INLET TO ROADWAY CROSS-CULVERTS WITH HIGH POTENTIAL FOR DEBRIS COLLECTION (EXCEPT ON TYPE 2 STREAMS)



**CITY OF
BLACK DIAMOND**

OVERFLOW STRUCTURE

STANDARD DWG SD-9

NOT TO SCALE

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ROCK LINING OUTLET PROTECTION

		Velocity at Design Flow (fps)		Min. Height Required Above Design Water Surface
Greater than	Less than or equal to	Protection	Thickness	
0	5	Grass Lining***	N/A	0.5 ft.
5	8	Riprap*, ***	1 ft.	2 ft.
8	12	Riprap**	2 ft.	2 ft.
12	20	Slope mattress Gabion, etc.	Varies	1 ft.

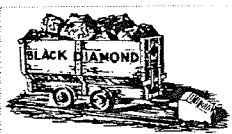
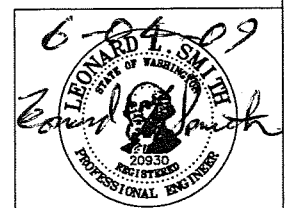
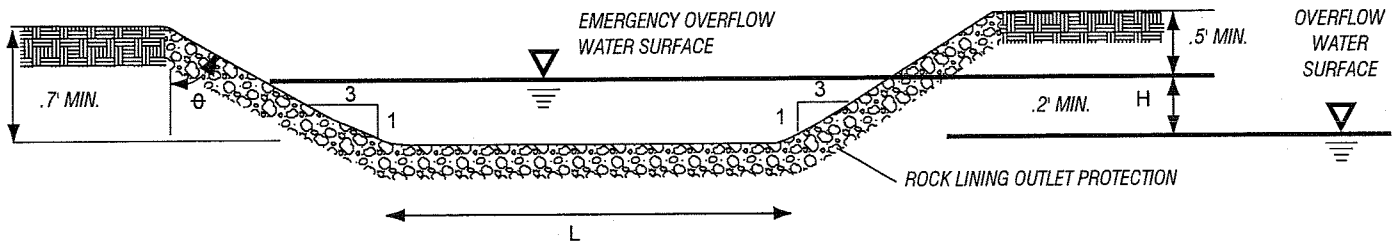
* Riprap shall be in accordance with section 9-13.1 of the WSDOT/APWA Standard Specifications.

* Riprap shall be a reasonably well graded assortment of rock with the following gradation:
Maximum stone size 12"
Median stone size 8"
Minimum stone size 2"

** Riprap shall be reasonably well graded assortment of rock with the following gradation:
Maximum stone size 24"
Median stone size 16"
Minimum stone size 4"

Note: Riprap sizing governed by side slopes on channel, assumed ~3.1.

*** Bioengineered lining allowed for design flow up to 8 fps.



**CITY OF
BLACK DIAMOND**

EMERGENCY OVERFLOW SPILLWAY

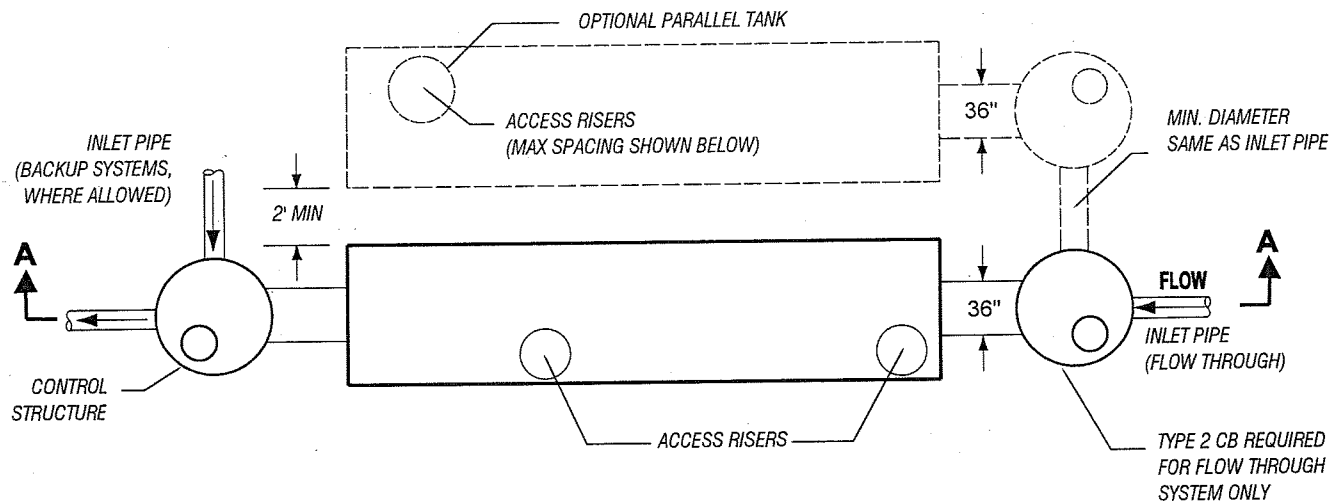
STANDARD DWG SD-10

NOT TO SCALE

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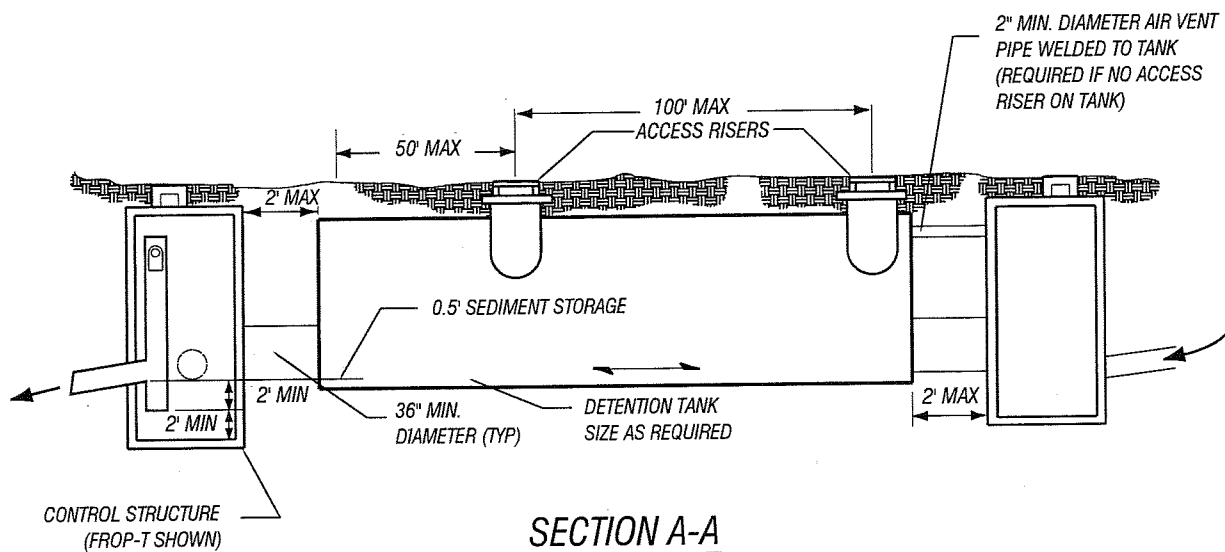
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PLAN VIEW

NTS

"FLOW-THROUGH" SYSTEM SHOWN SOLID.
DESIGNS FOR "FLOW BACKUP" SYSTEM AND
PARALLEL TANKS SHOWN DASHED



SECTION A-A

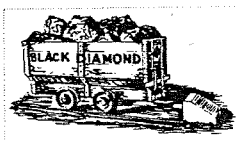
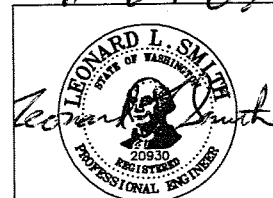
NTS

"FLOW-THROUGH" SYSTEM SHOWN SOLID.

NOTES:

1. ALL METAL PARTS CORROSION
RESISTANT. STEEL PARTS GALVANIZED
AND ASPHALT COATED (TREATMENT 1 OR
BETTER)
2. THE USE OF DETENTION TANKS FOR
PUBLIC FACILITIES IS PROHIBITED.

6-04-09



**CITY OF
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PRIVATE DETENTION TANK

STANDARD DWG SD-11

NOT TO SCALE

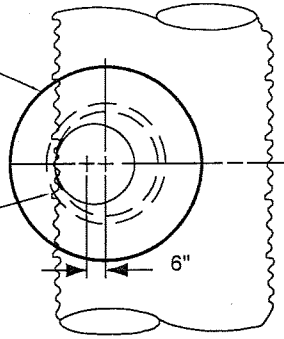
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STANDARD TYPE 2-60" DIAM.
CB CONCRETE TOP SLAB

36" CMP RISER



FRAME LOCKING LID
(MARKED "DRAIN")
MOUNTED OVER 24" DIAM.
ECCENTRIC OPENING

PLAN
NTS

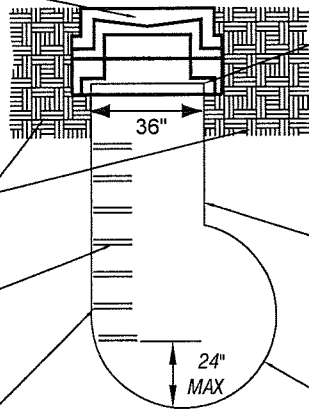
STANDARD LOCKING
M.H. FRAME & COVER SEE

MAINTAIN 1" GAP BETWEEN
BOTTOM OF SLAB & TOP OF
RISER - PROVIDE PLIABLE
GASKET TO EXCLUDE DIRT

COMPACTED PIPE BEDDING

M.H. STEPS 12" O.C.

WELD OR BOLT
STANDARD M.H. STEPS



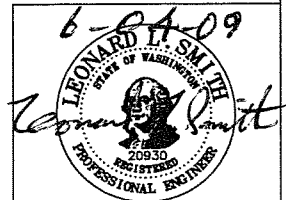
RISER, 36" DIAM. MIN.,
SAME MATERIAL & GAGE AS
TANK WELDED OR FUSED TO TANK

DETENTION TANK

SECTION
NTS

NOTES:

1. USE ADJUSTING BLOCKS AS REQUIRED TO BRING FRAME TO GUIDE.
2. ALL MATERIALS TO BE ALUMINUM OR GALVANIZED AND ASPHALT COATED (TREATMENT 1 OR BETTER).
3. MUST BE LOCATED FOR ACCESS BY MAINTENANCE VEHICLES.
4. MAY SUBSTITUTE WSDOT SPECIAL TYPE IV MANHOLE (RCP ONLY).



**CITY OF
BLACK DIAMOND**

DETENTION TANK ACCESS

STANDARD DWG SD-12

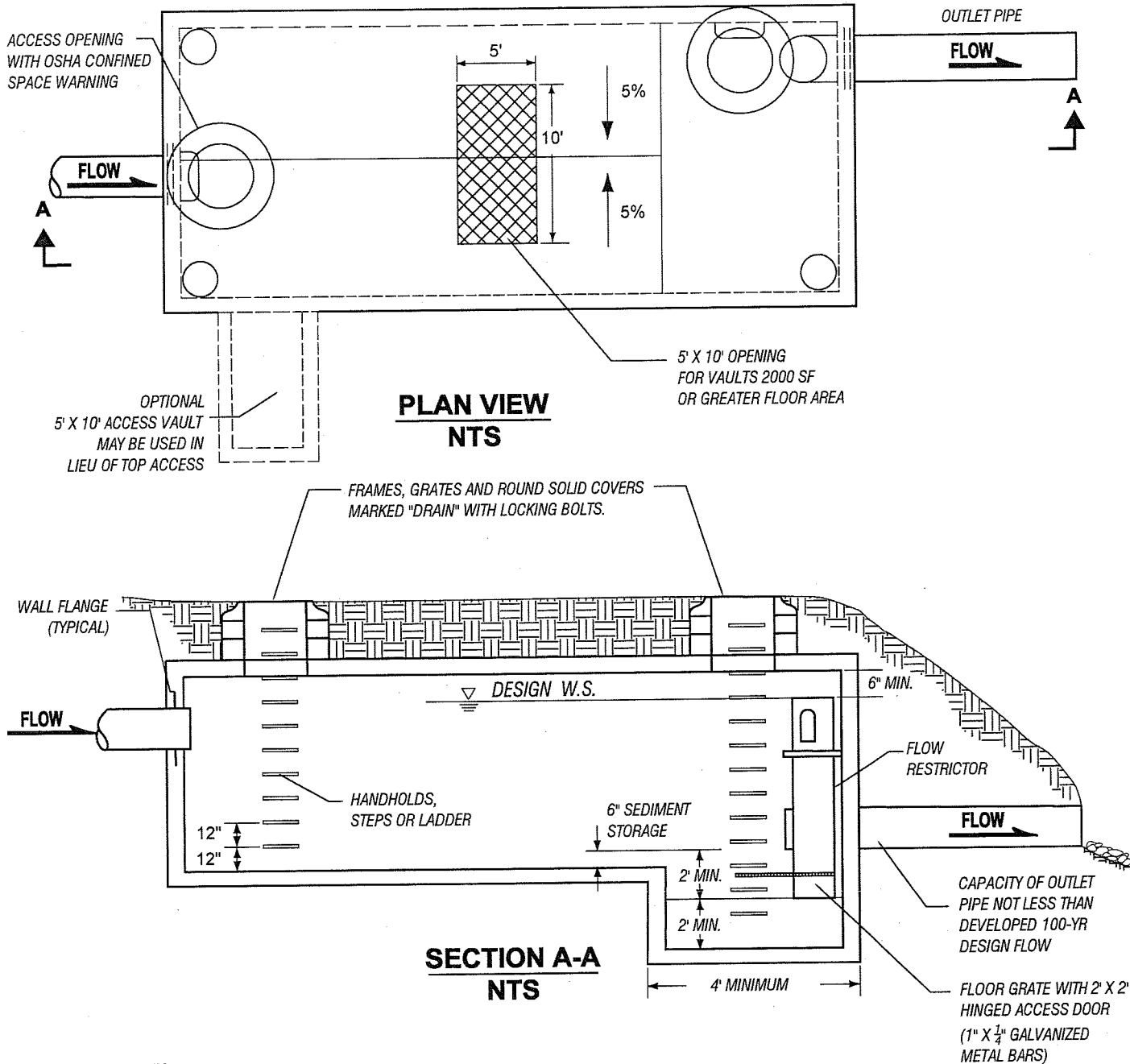
NOT TO SCALE

01/01/08



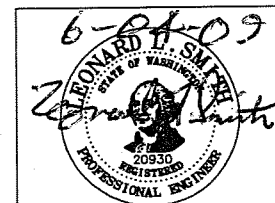
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NOTE: ALL VAULT AREAS MUST BE WITHIN 50' OF AN ACCESS POINT



NOTES:

1. ALL METAL PARTS MUST BE CORROSION RESISTANT. STEEL PARTS MUST BE GALVANIZED AND ASPHALT COATED (TREATMENT 1 OR BETTER).
2. PROVIDE WATER STOP AT ALL CAST-IN-PLACE CONSTRUCTION JOINTS. PRECAST VAULTS SHALL HAVE APPROVED RUBBER GASKET SYSTEM.
3. VAULTS $\leq 10'$ WIDE MUST USE REMOVABLE LIDS.
4. PREFABRICATED VAULT SECTIONS MAY REQUIRE STRUCTURAL MODIFICATIONS TO SUPPORT 5' X 10' OPENING OVER MAIN VAULT. ALTERNATIVELY, ACCESS CAN BE PROVIDED VIA A SIDE VESTIBULE AS SHOWN.



**CITY OF
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DETENTION VAULT

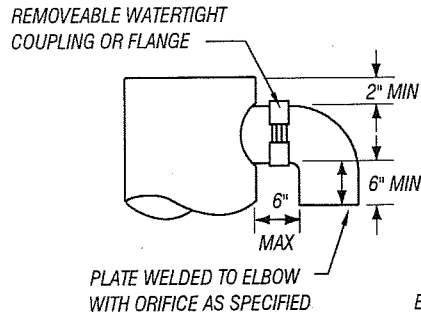
STANDARD DWG SD-13

NOT TO SCALE

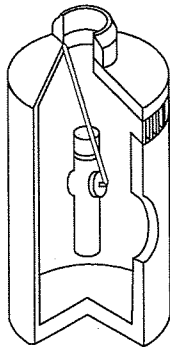
01/01/08



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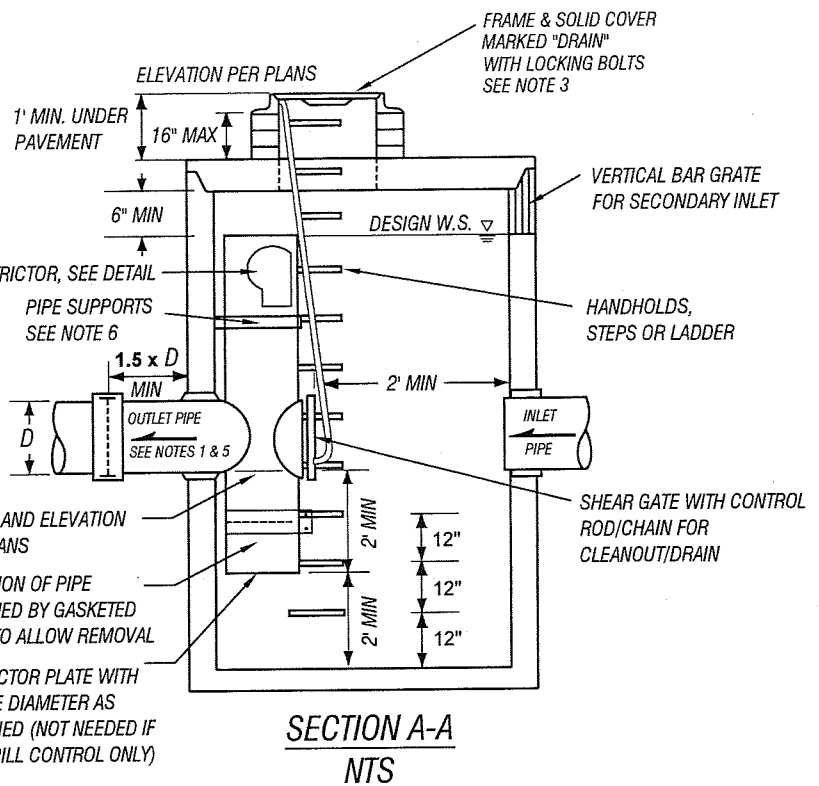
ELBOW RESTRICTOR DETAIL
NTS



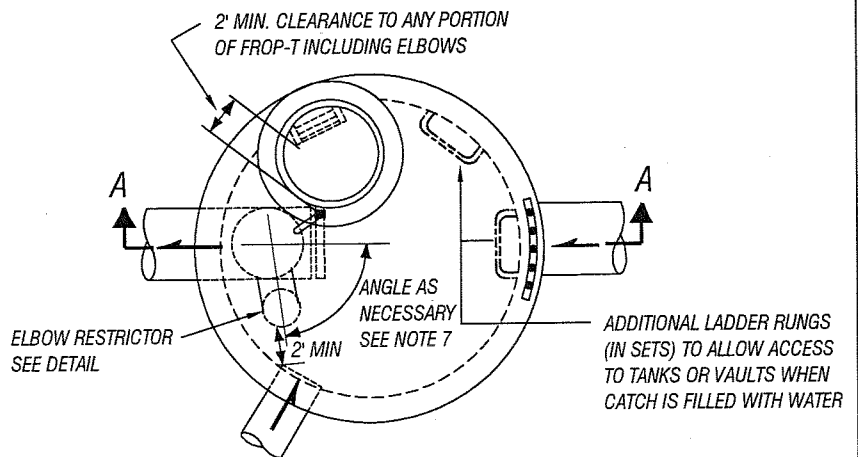
ISOMETRIC
NTS

NOTES:

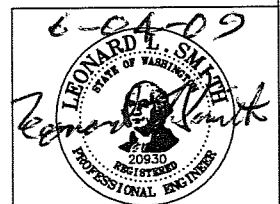
1. USE A MINIMUM OF A 54" DIAMETER TYPE 2 CATCH BASIN.
2. OUTLET CAPACITY: 100-YEAR DEVELOPED PEAK FLOW.
3. METAL PARTS: CORROSION RESISTANT. NON-GALVANIZED PARTS PREFERRED. GALVANIZED PIPE PARTS TO HAVE ASPHALT TREATMENT 1.
4. FRAME AND LADDER OR STEPS OFFSET SO:
A. CLEANOUT GATE IS VISIBLE FROM TOP.
B. CLIMB-DOWN SPACE IS CLEAR OF RISER AND CLEANOUT GATE.
C. FRAME IS CLEAR OF CURB.
5. IF METAL OUTLET PIPE CONNECTS TO CEMENT CONCRETE PIPE: OUTLET PIPE TO HAVE SMOOTH O.D. EQUAL TO CONCRETE PIPE I.D. LESS $\frac{1}{4}$ ".
6. PROVIDE AT LEAST ONE 3" X .090 GAGE SUPPORT BRACKET ANCHORED TO CONCRETE WALL. (MAXIMUM 3'-0" VERTICAL SPACING)
7. LOCATE ELBOW RESTRICTOR(S) AS NECESSARY TO PROVIDE MINIMUM CLEARANCE AS SHOWN.
8. LOCATE ADDITIONAL LADDER RUNGS IN STRUCTURES USED AS ACCESS TO TANKS AND VAULTS TO ALLOW ACCESS WHEN CATCH BASIN IS FILLED WITH WATER.
9. ALTERNATIVE FLOW RESTRICTION DEVICES (I.E. BAFFLES, WEIRS, ETC.) MAY ALSO BE USED AS APPROVED BY THE CITY ENGINEER.



SECTION A-A
NTS



PLAN VIEW
NTS



**CITY OF
BLACK DIAMOND**

FLOW RESTRICTOR

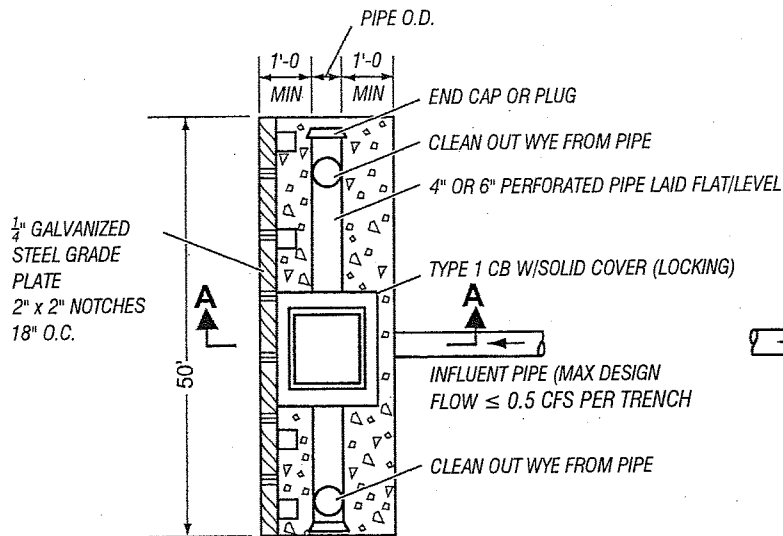
STANDARD DWG SD-14

NOT TO SCALE

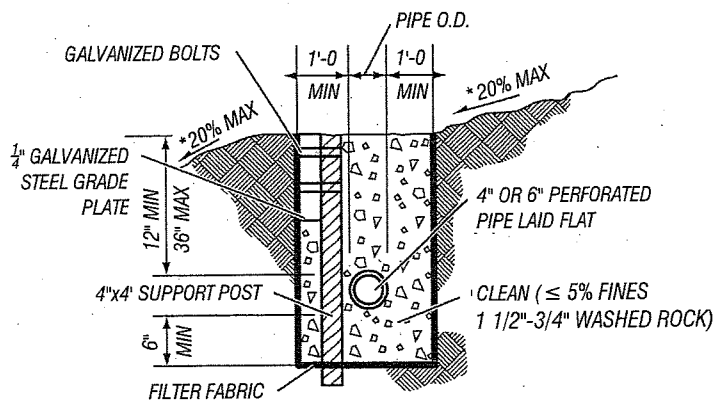
01/01/08



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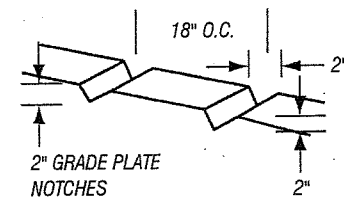
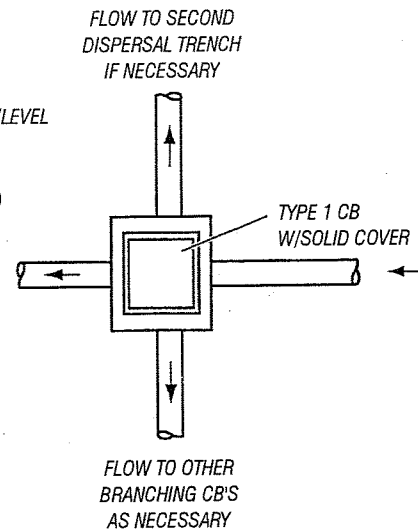


PLAN
NTS



15% MAX FOR FLOW CONTROL/WATER QUALITY
TREATMENT IN RURAL AREAS.

SECTION A-A
NTS



NOTES:

1. THIS TRENCH SHALL BE CONSTRUCTED SO AS TO PREVENT POINT DISCHARGE AND/OR EROSION.
2. TRENCHES MAY BE PLACED NO CLOSER THAN 50 FEET TO ONE ANOTHER. (100 FEET ALONG FLOWLINE)
3. TRENCH AND GRADE PLATE MUST BE LEVEL. ALIGN TO FOLLOW CONTOURS OF SITE.
4. SUPPORT POST SPACING AS REQUIRED BY SOIL CONDITIONS TO ENSURE GRADE BOARD REMAINS LEVEL.



**CITY OF
BLACK DIAMOND**

FLOW DISPERSAL TRENCH

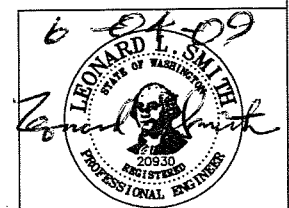
STANDARD DWG SD-15

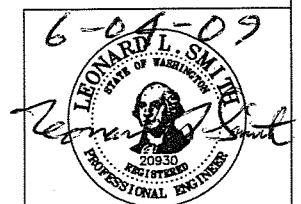
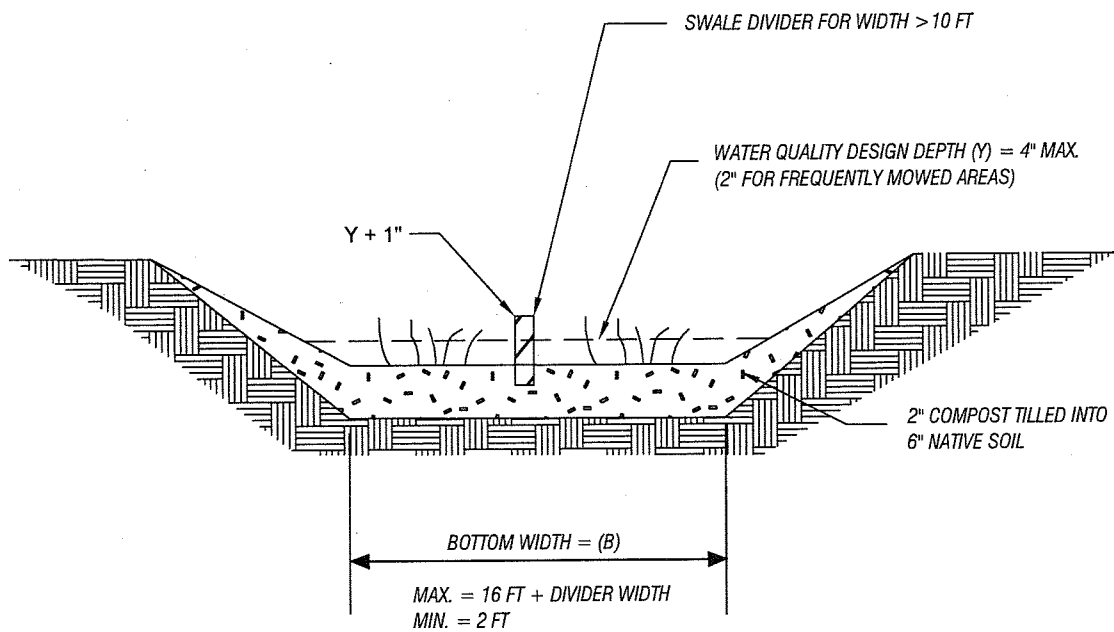
NOT TO SCALE

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**CITY OF
BLACK DIAMOND**

BIOFILTRATION SWALE

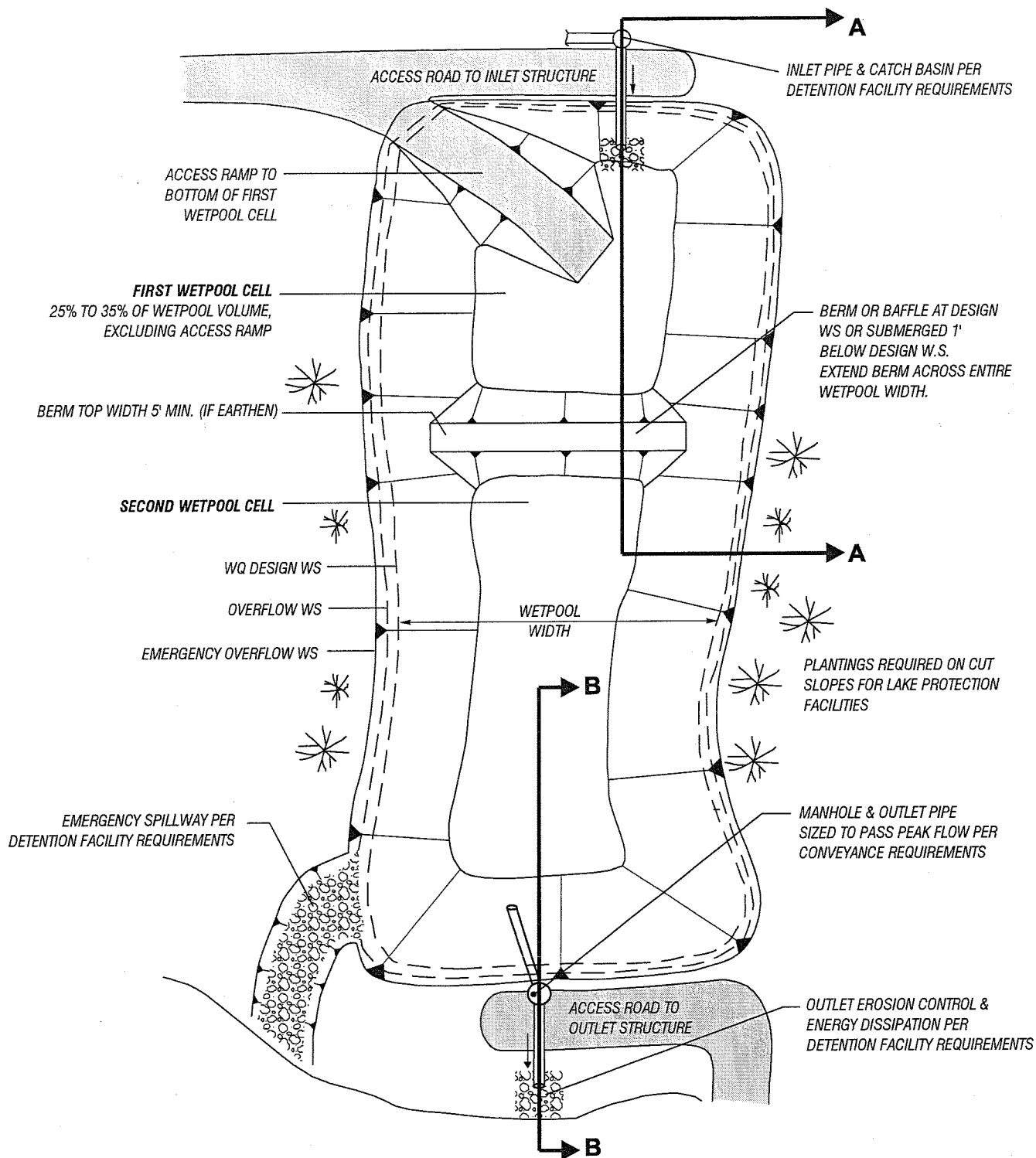
STANDARD DWG SD-16

NOT TO SCALE

01/01/08

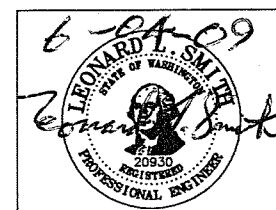


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PLAN VIEW
NTS

NOTE: BERM NOT REQUIRED FOR PONDS WITH LENGTH TO WIDTH RATIO 4:1 OR IF VOLUME LESS THAN 4000 C.F.



CITY OF
BLACK DIAMOND

WETPOND - PLAN VIEW

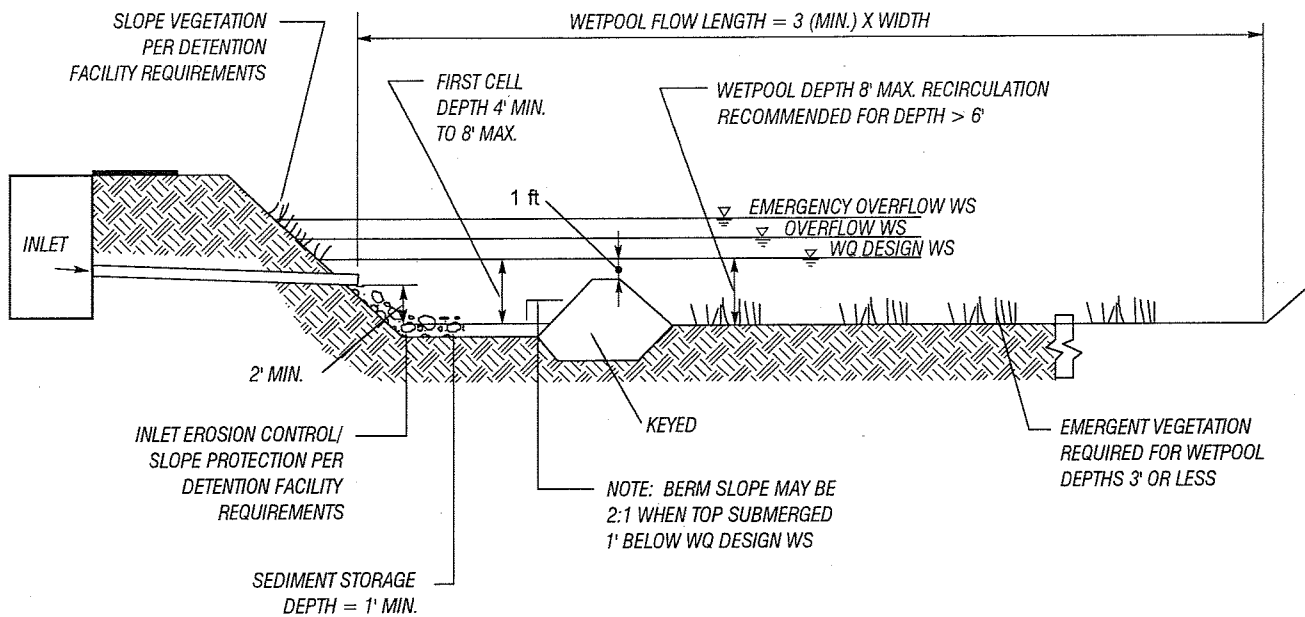
STANDARD DWG SD-17

NOT TO SCALE

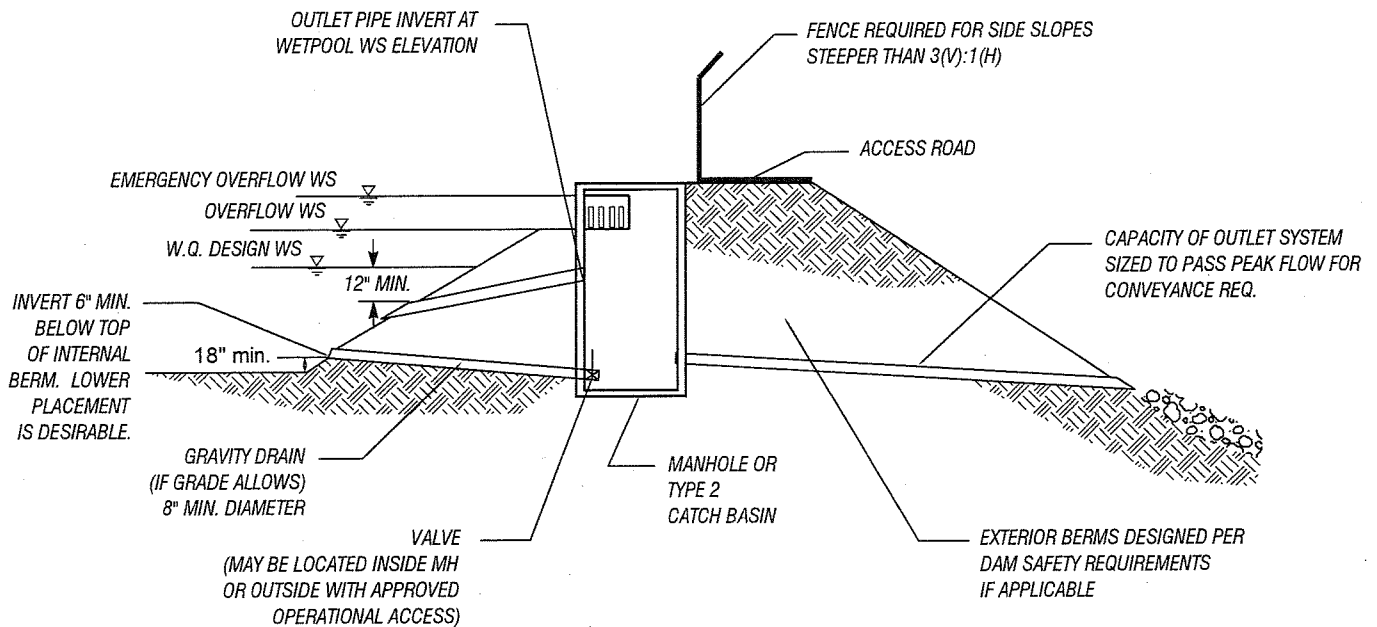
01/01/08



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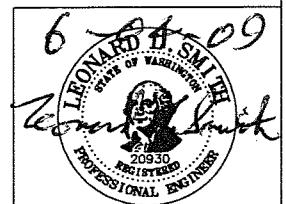


SECTION A-A
NTS



SECTION B-B
NTS

NOTE: SEE DETENTION FACILITY REQUIREMENTS FOR LOCATION AND SETBACK REQUIREMENTS.



**CITY OF
BLACK DIAMOND**

WETPOND - CROSS SECTIONS

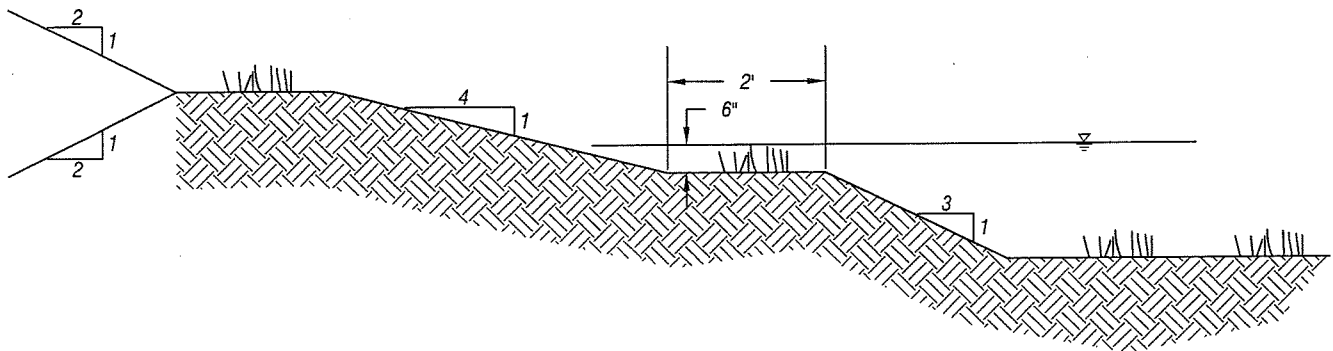
STANDARD DWG SD-18

NOT TO SCALE

01/01/08

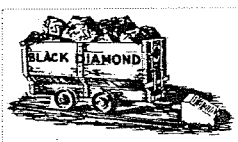
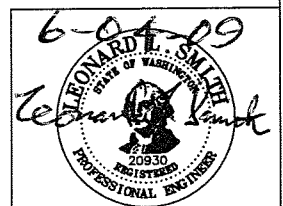


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NOTES:

1. UP TO 2 OF THE INTERIOR FACES CAN BE RETAINING WALLS
 - IF AESTHETIC NATURAL LOOKING
 - IF FENCED AT THE TOP



**CITY OF
BLACK DIAMOND**

POND SLOPE REQUIREMENTS

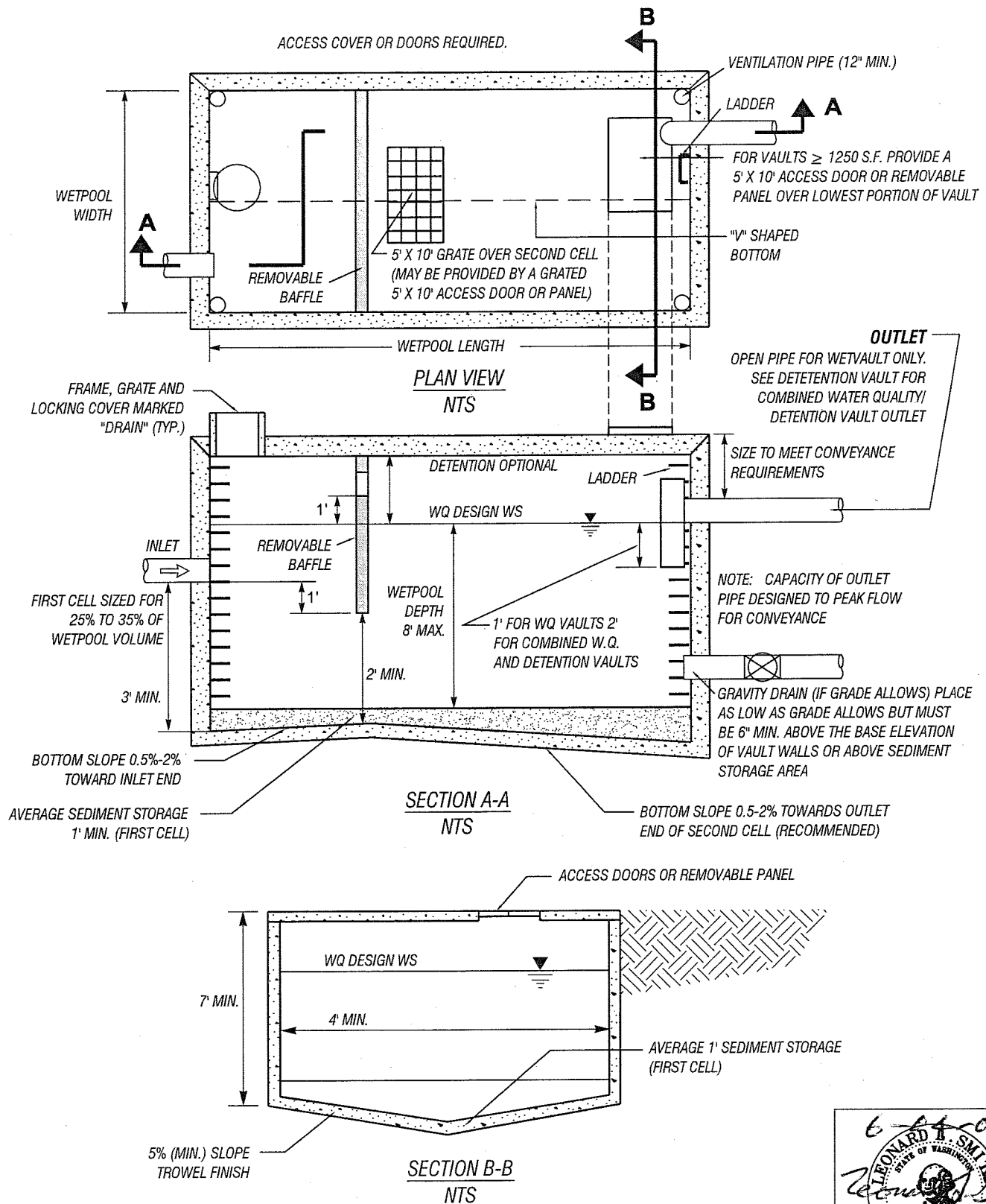
STANDARD DWG SD-19

NOT TO SCALE

06/02/09



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**CITY OF
BLACK DIAMOND**

WETVAULT

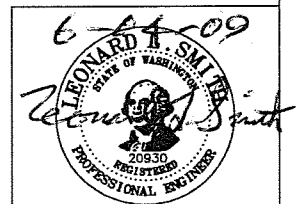
STANDARD DWG SD-20

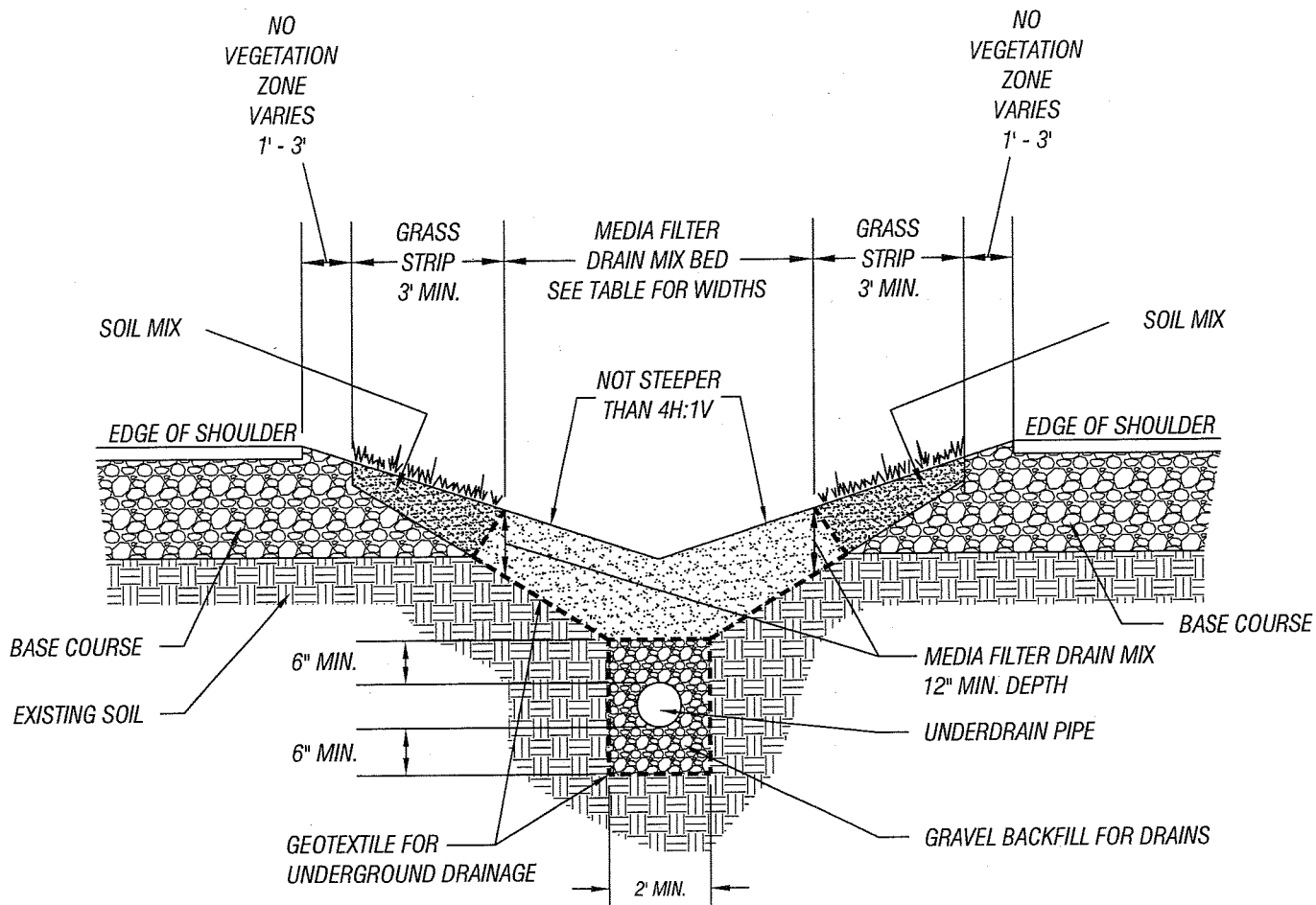
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01/01/08



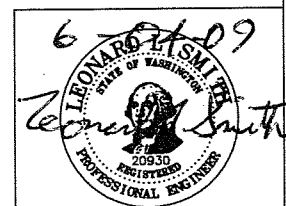
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PAVEMENT WIDTH THAT CONTRIBUTES RUNOFF TO THE <u>MEDIA FILTER DRAIN</u>	MINIMUM MEDIA FILTER DRAIN WIDTH*
< 20 FEET	2 FEET
≥ 20 AND ≤ 35 FEET	3 FEET
> 35 FEET	4 FEET

* WIDTH DOES NOT INCLUDE THE REQUIRED 1-3 FOOT GRAVEL VEGETATION-FREE ZONE OR THE 3 FOOT FILTER STRIP WIDTH.



**CITY OF
BLACK DIAMOND**

DUAL MEDIA FILTER DRAIN
MEDIAN APPLICATION WITH UNDERDRAIN

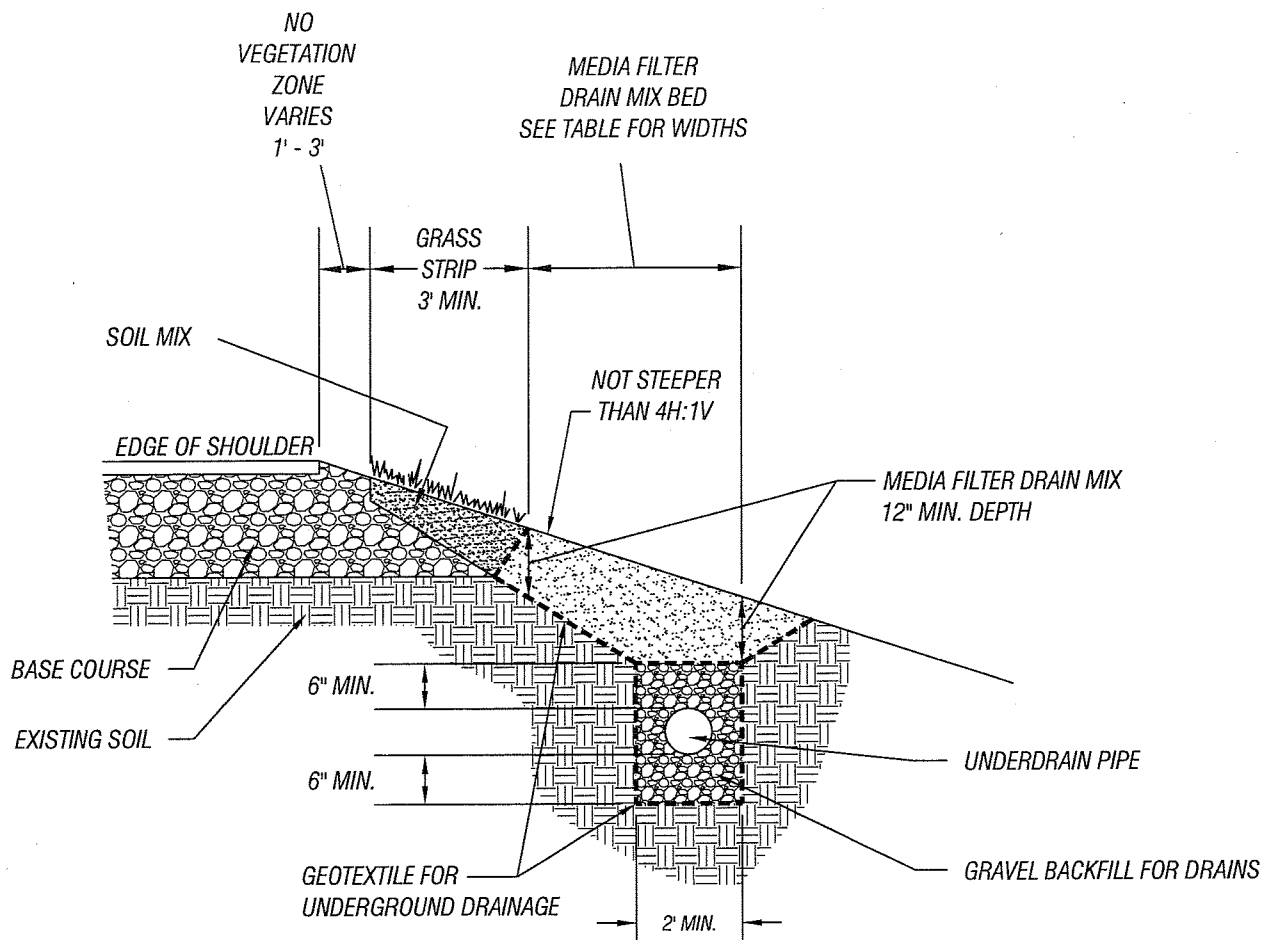
STANDARD DWG SD-21

NOT TO SCALE

09/22/08

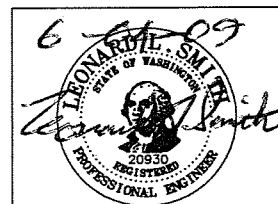


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PAVEMENT WIDTH THAT CONTRIBUTES RUNOFF TO THE MEDIA FILTER DRAIN	MINIMUM MEDIA FILTER DRAIN WIDTH*
< 20 FEET	2 FEET
≥ 20 AND ≤ 35 FEET	3 FEET
> 35 FEET	4 FEET

* WIDTH DOES NOT INCLUDE THE REQUIRED 1-3 FOOT GRAVEL VEGETATION-FREE ZONE OR THE 3 FOOT FILTER STRIP WIDTH.



**CITY OF
BLACK DIAMOND**

MEDIA FILTER DRAIN SIDE SLOPE APPLICATION WITH UNDERDRAIN

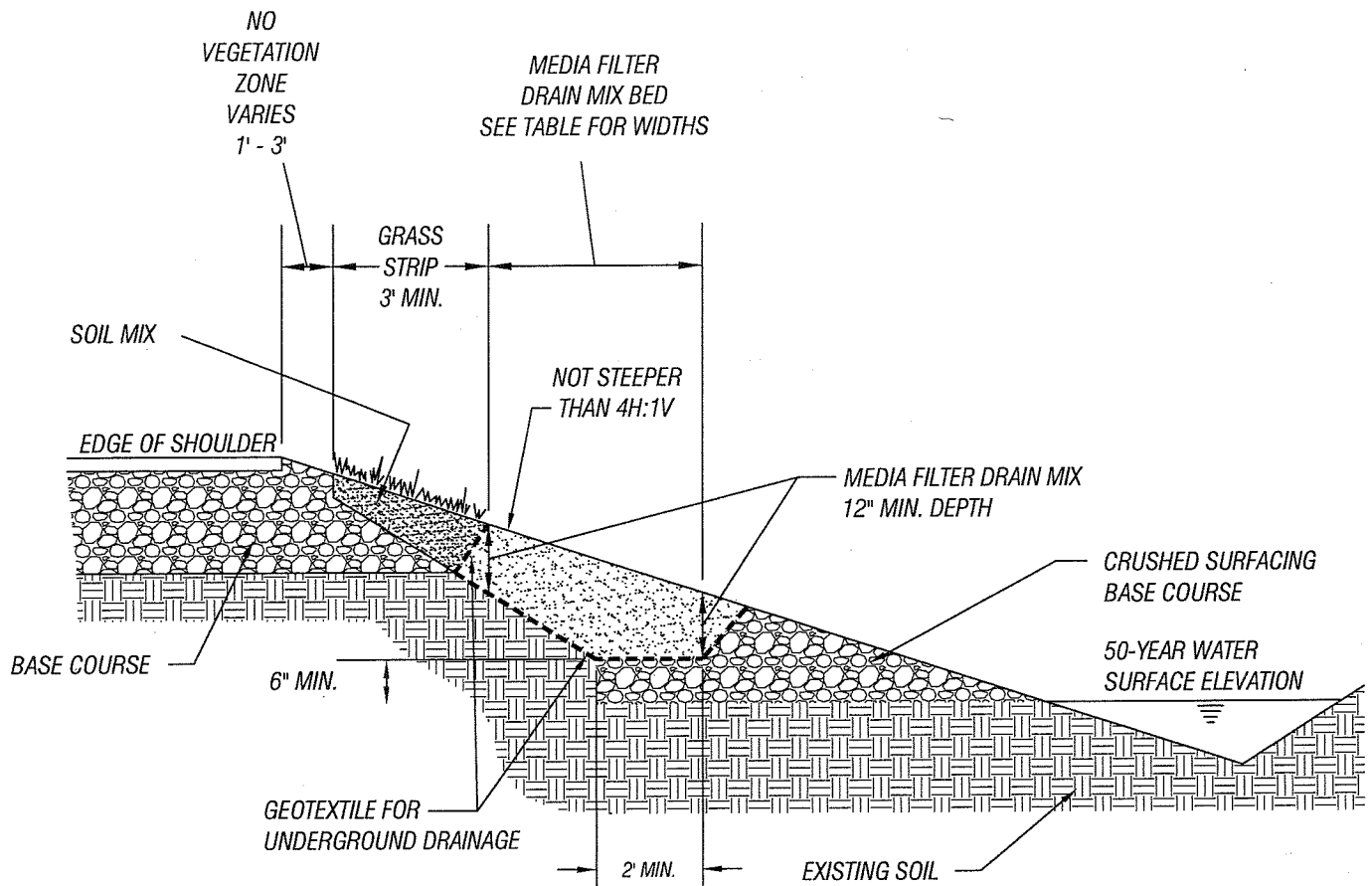
STANDARD DWG SD-22

NOT TO SCALE

09/22/08

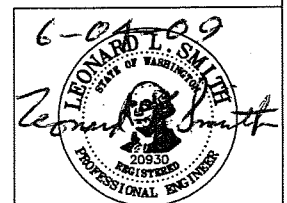


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PAVEMENT WIDTH THAT CONTRIBUTES RUNOFF TO THE MEDIA FILTER DRAIN	MINIMUM MEDIA FILTER DRAIN WIDTH*
< 20 FEET	2 FEET
≥ 20 AND ≤ 35 FEET	3 FEET
> 35 FEET	4 FEET

* WIDTH DOES NOT INCLUDE THE REQUIRED 1-3 FOOT GRAVEL VEGETATION-FREE ZONE OR THE 3 FOOT FILTER STRIP WIDTH.



**CITY OF
BLACK DIAMOND**

MEDIA FILTER DRAIN
SIDE SLOPE APPLICATION WITHOUT UNDERDRAIN

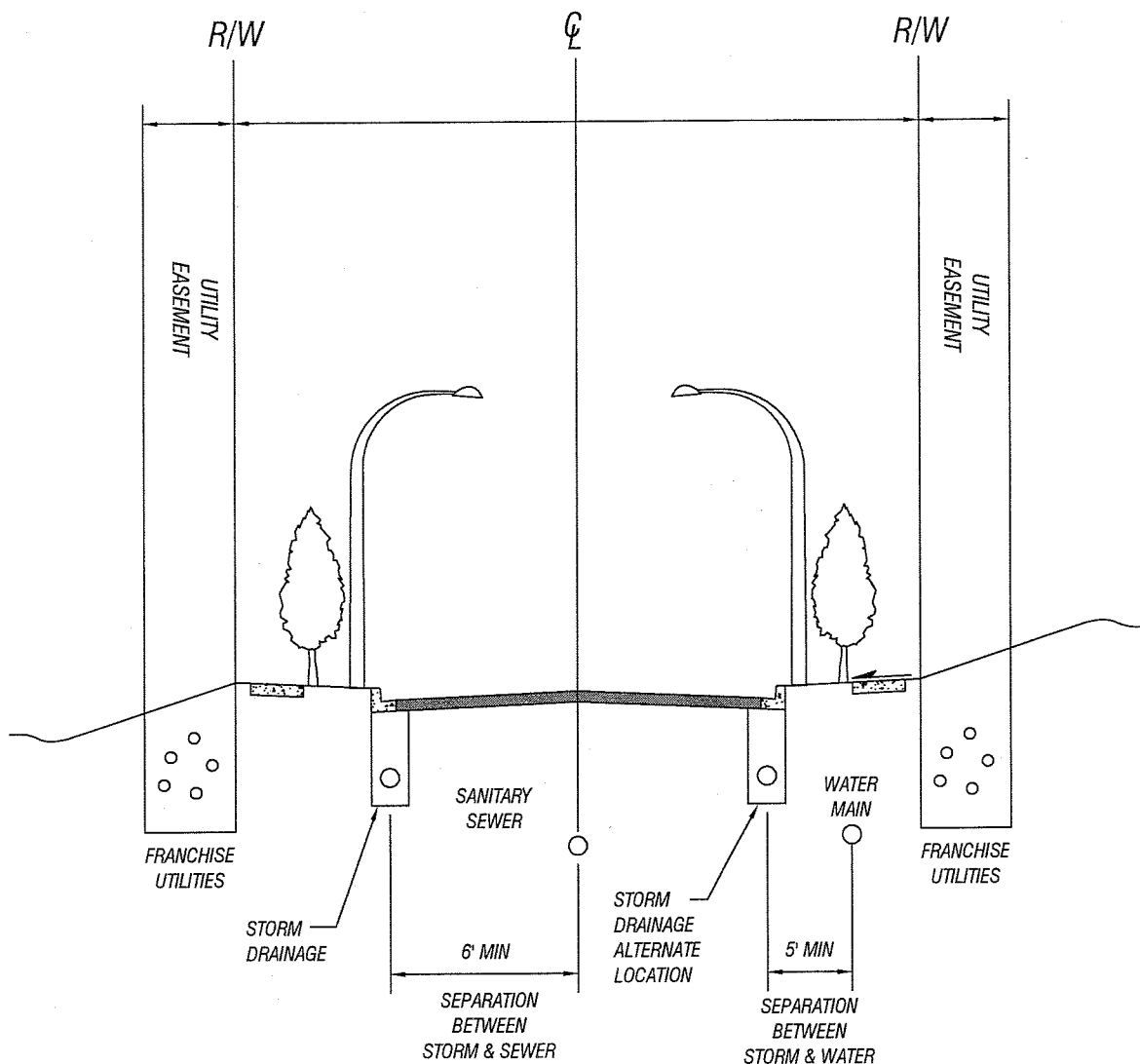
STANDARD DWG SD-23

NOT TO SCALE

09/22/08



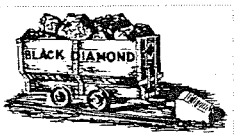
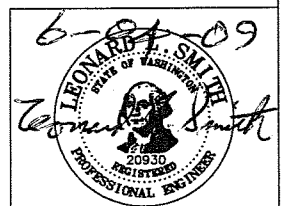
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FACING NORTH OR WEST

NOTES:

1. MAINTAIN HORIZONTAL & VERTICAL UTILITY SEPARATIONS PER WASHINGTON STATE DEPARTMENT OF ECOLOGY & DEPARTMENT OF HEALTH MINIMUM REQUIREMENTS.



**CITY OF
BLACK DIAMOND**

STANDARD UTILITY LOCATIONS

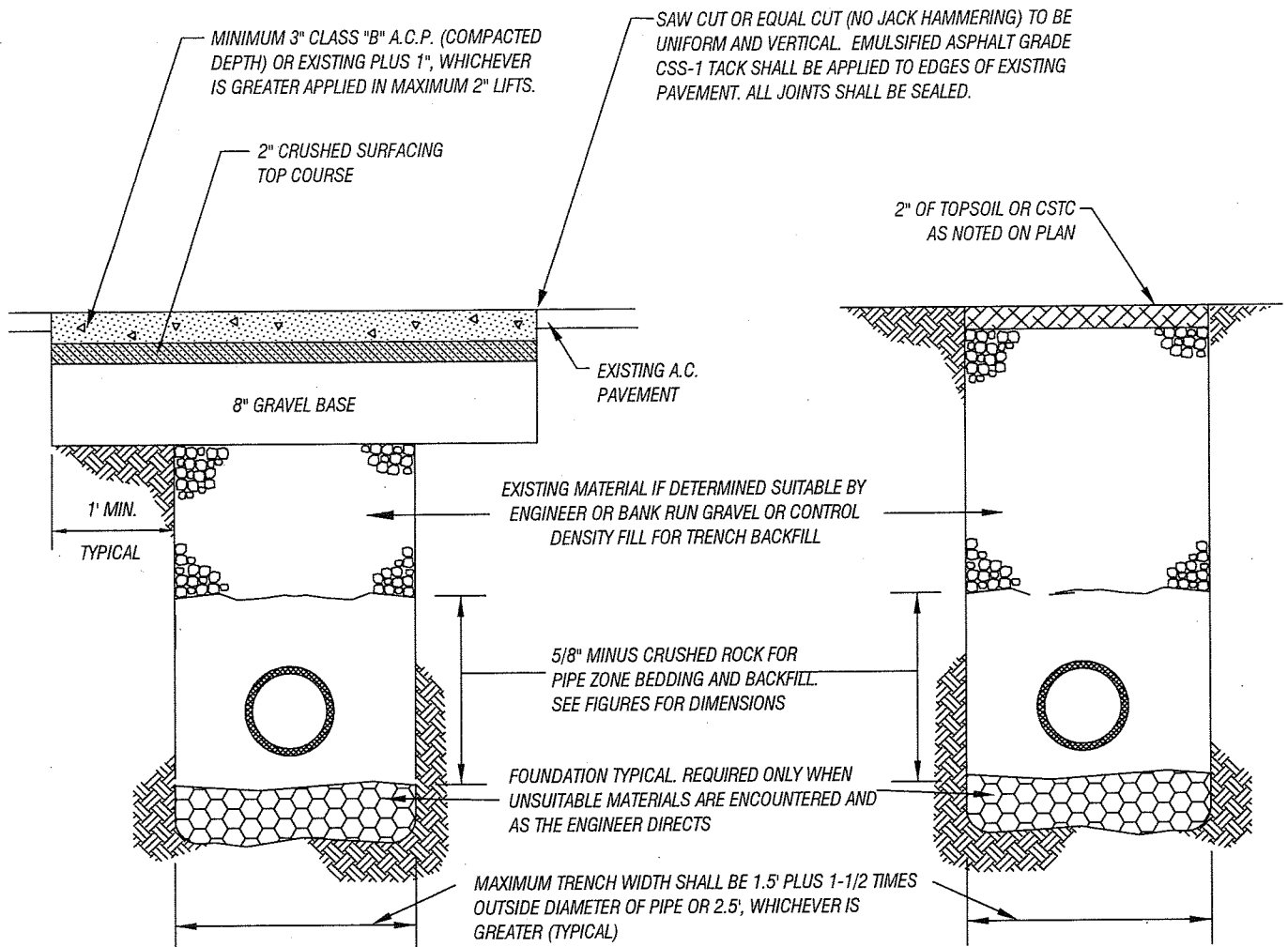
STANDARD DWG SD-24

NOT TO SCALE

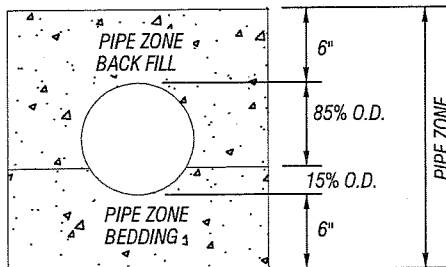
04/01/09



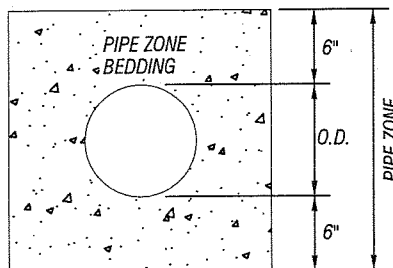
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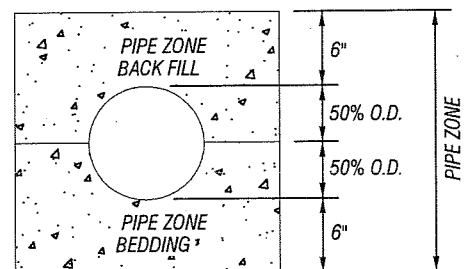
CONCRETE AND DUCTILE IRON PIPE



THERMOPLASTIC PIPE

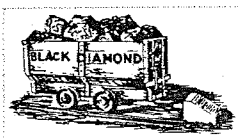
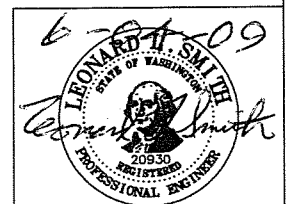


METAL PIPE



NOTES:

1. ALL MATERIALS EXCEPT A.C.P. AND BEDDING MATERIAL SHALL BE COMPACTED IN 6-INCH MAXIMUM LIFTS TO 95% DENSITY.
2. COMPACTION: BEDDING AND BACKFILL WITHIN THE PIPE ZONE SHALL BE COMPACTED TO 95% MAX. AS DETERMINED BY ASTM D1557. BACKFILL ABOVE THE PIPE ZONE SHALL BE COMPACTED TO 90% IN UNPAVED AREA, AND 95% IN PAVED OR SHOULDER AREAS AS DETERMINED BY ASTM D1557.



**CITY OF
BLACK DIAMOND**

TRENCH RESTORATION

STANDARD DWG SD-25

NOT TO SCALE

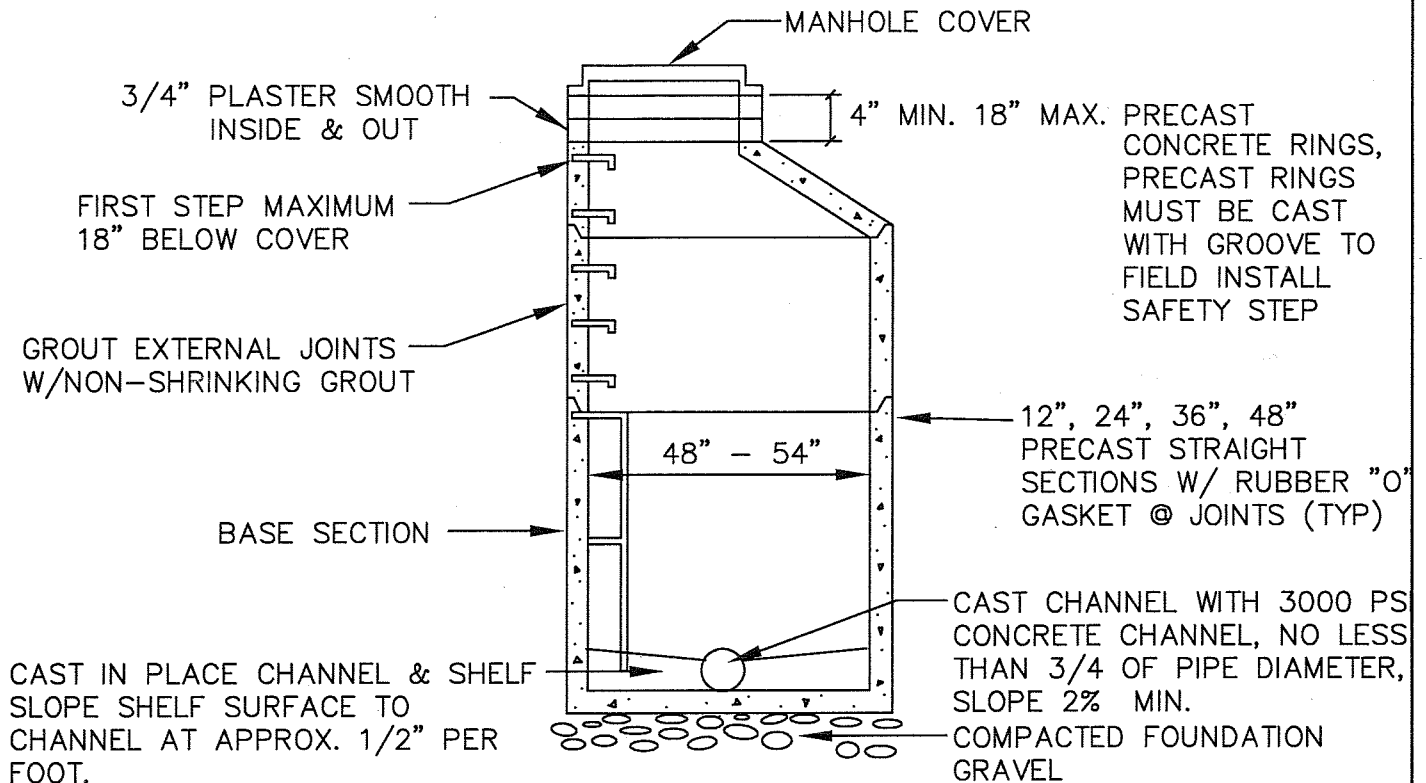
04/01/09



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STANDARD MANHOLE

(WHERE STANDARD MANHOLE CANNOT BE INSTALLED, A CUSTOM MANHOLE SHALL BE DETAILED ON THE CONSTRUCTION PLANS)



GENERAL NOTES (APPLY TO ALL MANHOLES):

1. PRECAST SECTIONS SHALL BE REINFORCED PER ASTM SPECS FOR CORRESPONDING SEWER PIPE.
2. GALVANIZED OR PLASTIC SAFETY STEPS.
3. STEPS IN PRECAST BASE SECTION MAY BE CAST IN PLACE OR MOVABLE SAFETY LADDER GROUTED IN PLACE.
4. ALL HOLES FOR PIPE SHALL BE BLOCKED OUT AT THE TIME OF CASTING THE SECTION.
5. ALL RUBBER GASKETED MANHOLES SHALL BE FURNISHED WITH RUBBER GASKET JOINT CONFORMING TO ASTM C443.
6. MANHOLES OVER 10' HIGH SHALL BE FURNISHED WITH MIN. 5" WALL.
7. MANHOLE DIAMETER IN ACCORDANCE WITH CITY OF BLACK DIAMOND STANDARDS.
8. MORTAR SHALL BE PLACED BETWEEN EACH LEVEL OF ADJUSTING RINGS, TOP OF CONE SECTION, AND BOTTOM OF IRON RING.
9. GROUT EXTERNAL JOINTS WITH NON-SHRINK GROUT.
10. PROVIDE EPOXY COATING OR HEAT SHRINK WRAP AROUND THE OUTSIDE OF MANHOLE.
11. PROVIDE KOR-N-SEAL BOOTS AT CONNECTIONS TO MANHOLES.



**CITY OF
BLACK DIAMOND**

STANDARD MANHOLE

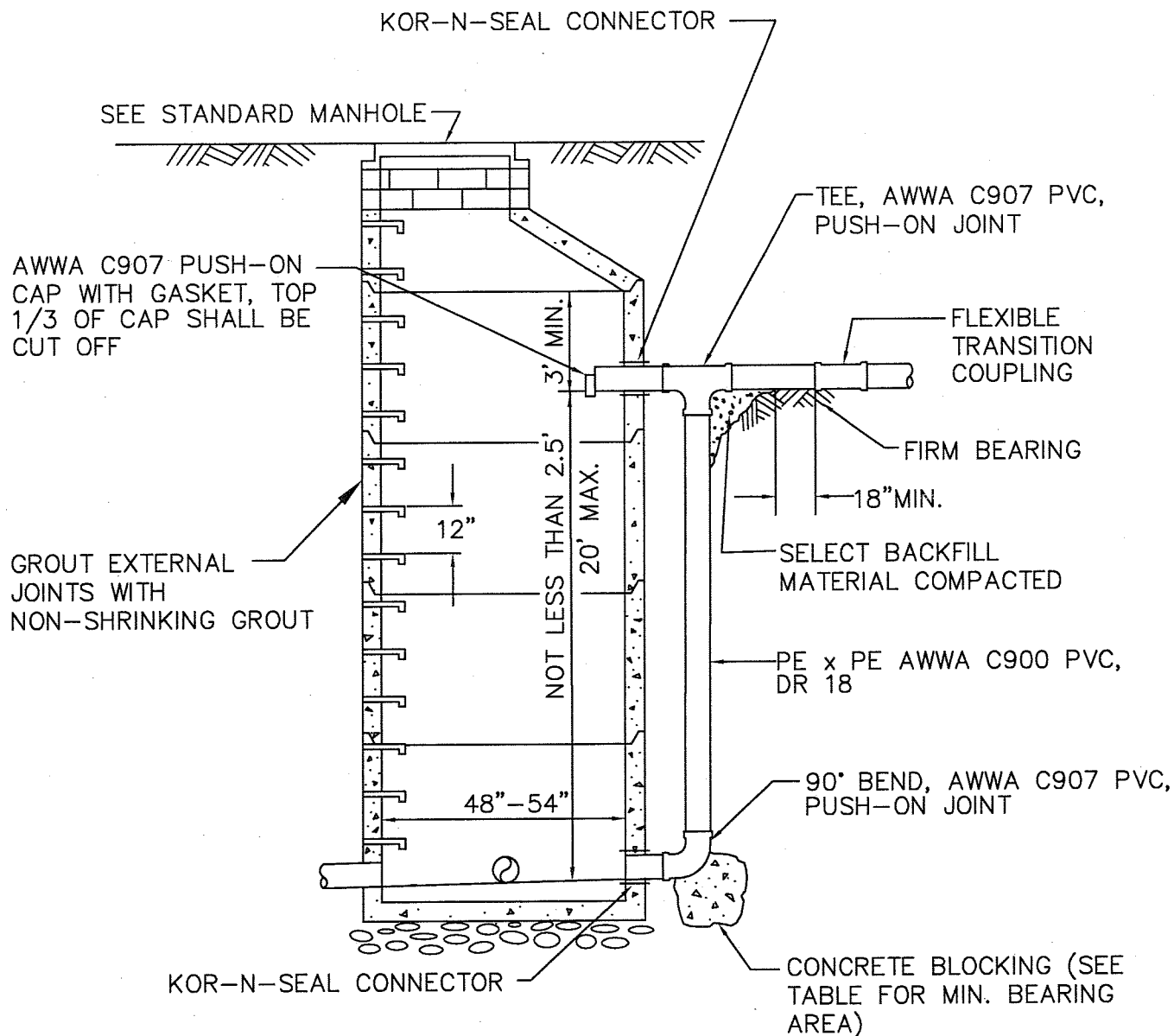
STANDARD DWG S-1

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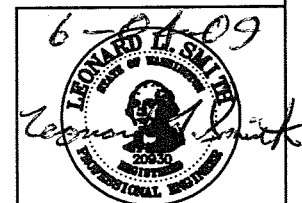


HEIGHT OF DROP (FT)	MINIMUM BEARING AREA (SF)
2.5 - 5	1.0
6 - 10	2.0
11 - 15	2.5
16 - 20	3.0

BEARING AREA BASED ON 2000 PSF
SAFE BEARING LOAD (UP TO 18 IN.)

NOTES: WHERE OUTSIDE DROP IS INSTALLED ON EXISTING MANHOLE:

- CORE DRILL OPENINGS FOR NEW PIPE.
- RECHANNEL BASE WITH 3000 PSI CONCRETE. HEIGHT OF CHANNELS SHALL BE NO LESS THAN 3/4 OF PIPE DIAMETERS.



**CITY OF
BLACK DIAMOND**

OUTSIDE DROP STRUCTURE

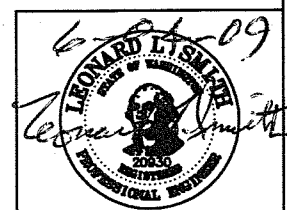
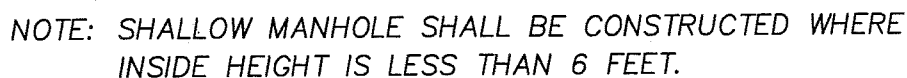
STANDARD DWG S-2

NOT TO SCALE

04/01/09

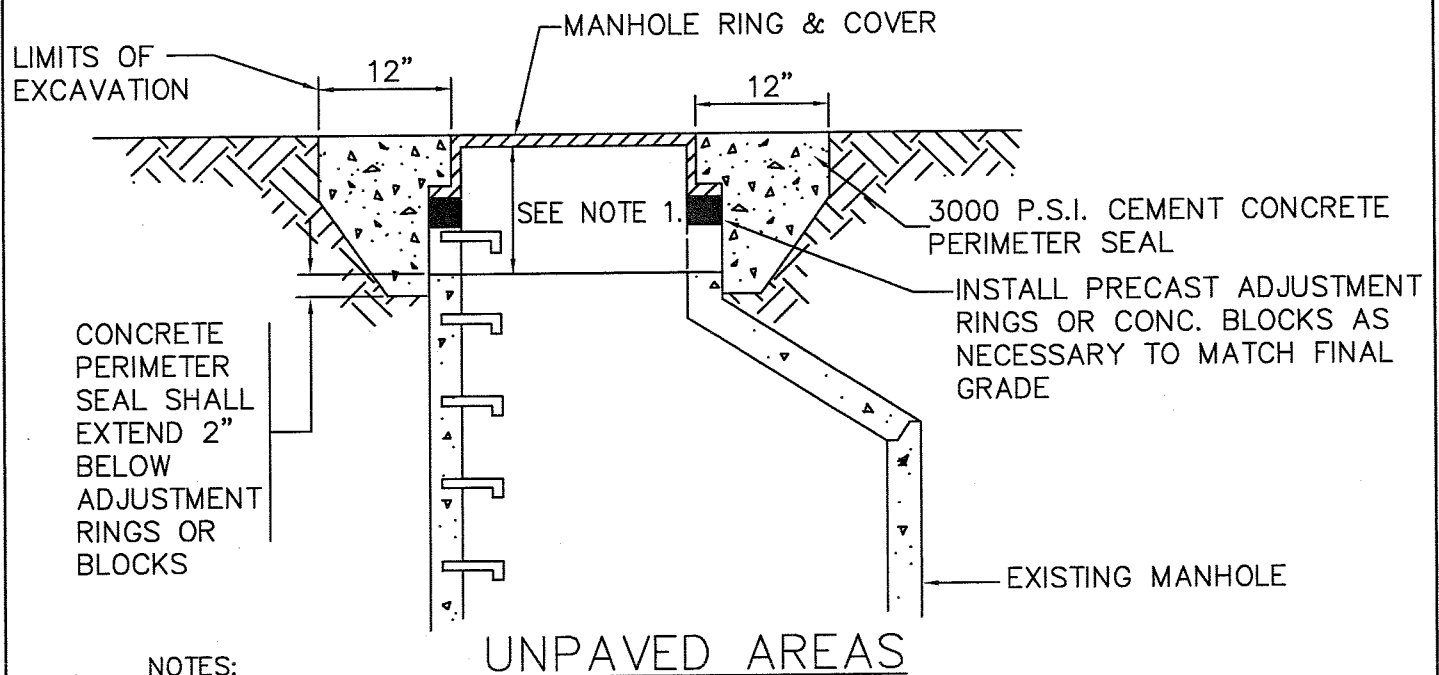
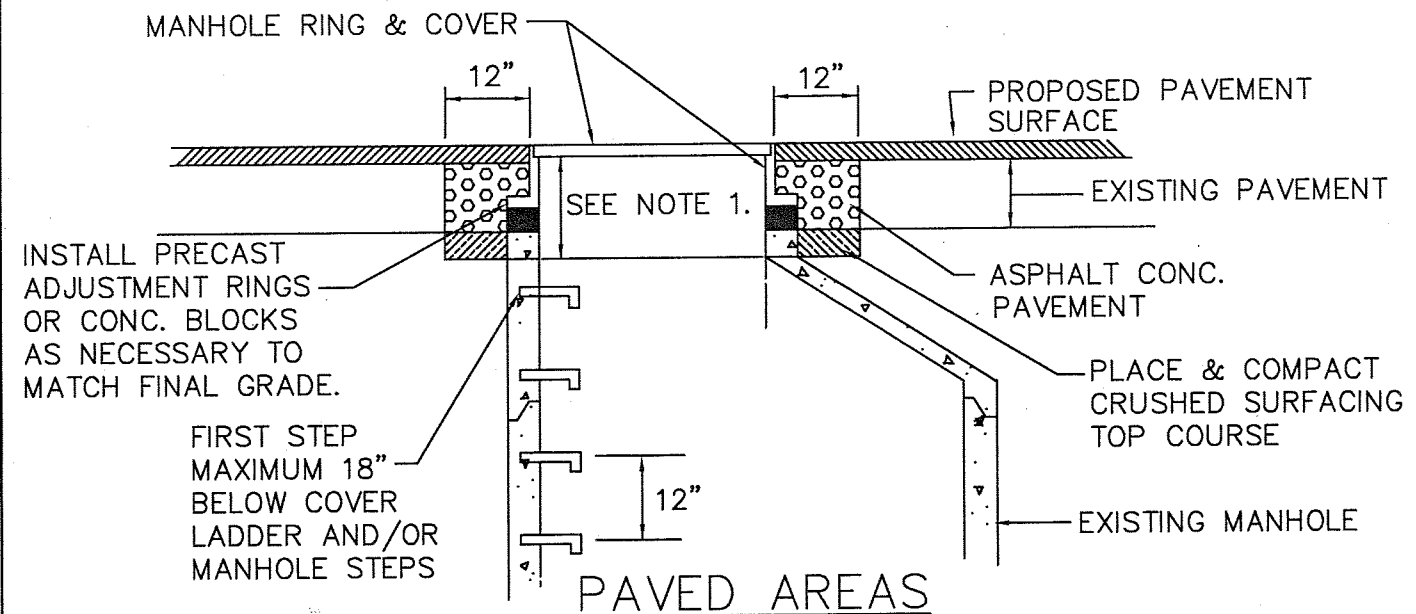


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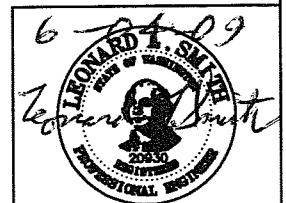
04/01/09





NOTES:

1. WHERE DEPTH OF NECK EXCEEDS 24 INCHES, ADJUST MANHOLE TO GRADE BY INSERTING NEW MANHOLE BARREL SECTION BETWEEN THE CONE AND EXISTING BARREL.
2. ADJUSTMENT RINGS/BLOCK SHALL BE SET IN 3/4" NON-SHRINK GROUT, PLASTER SMOOTH INSIDE AND OUT.
3. STEPS OR RUNGS SHALL BE ADDED AS NEEDED.
4. PRECAST ADJUSTMENT RINGS MUST BE CAST WITH GROOVE TO ALLOW FIELD INSTALLATION OF SAFETY STEP.
5. REPLACE EXISTING RING AND COVER IF NON-CONFORMING.
6. MORTAR SHALL BE PLACED BETWEEN EACH LEVEL OF ADJUSTING CONC. BLOCKS, ADJUSTMENT RINGS, TOP OF CONE SECTION AND BOTTOM OF IRON RING.
7. MANHOLE COVER SHALL BE SET ABOVE ADJACENT GRADE IN UNPAVED AREAS TO PREVENT COLLECTION OF SURFACE WATER.



**CITY OF
BLACK DIAMOND**

**MANHOLE RING
ADJUSTMENT DETAIL**

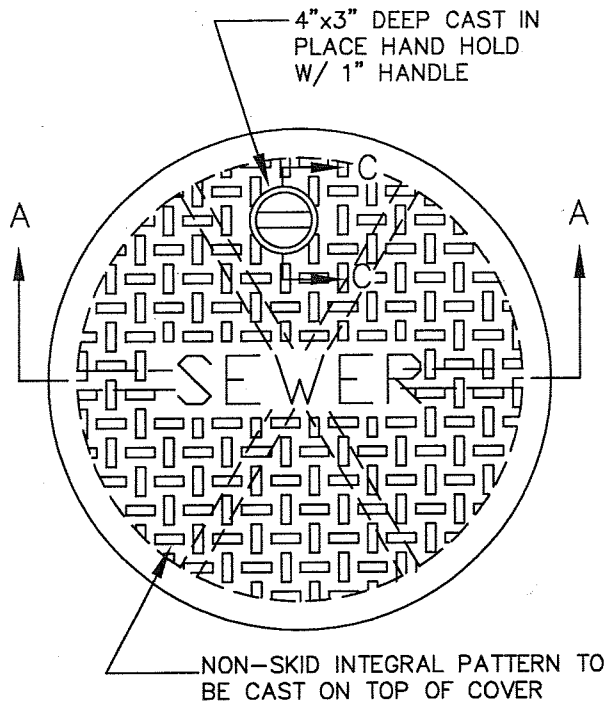
STANDARD DWG S-4

NOT TO SCALE

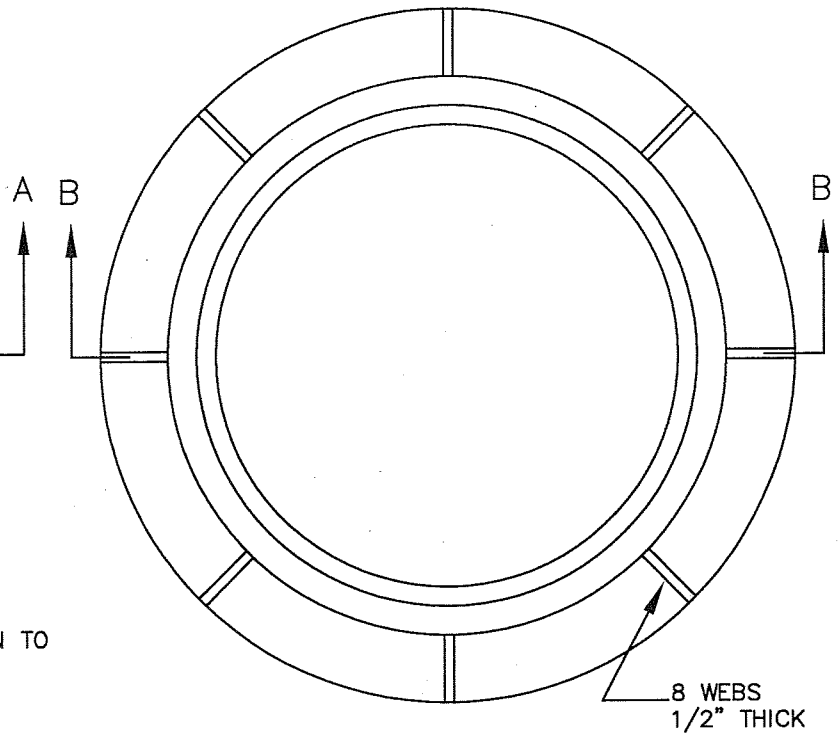
04/01/09



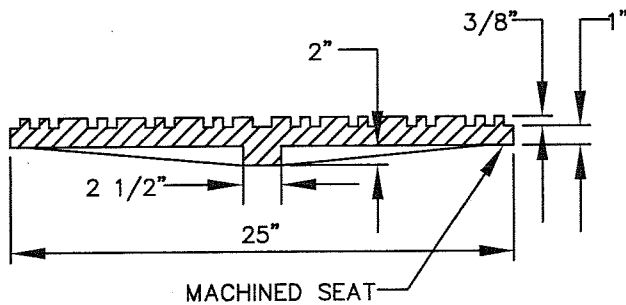
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COVER PLAN

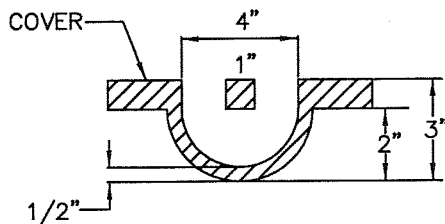


RING PLAN

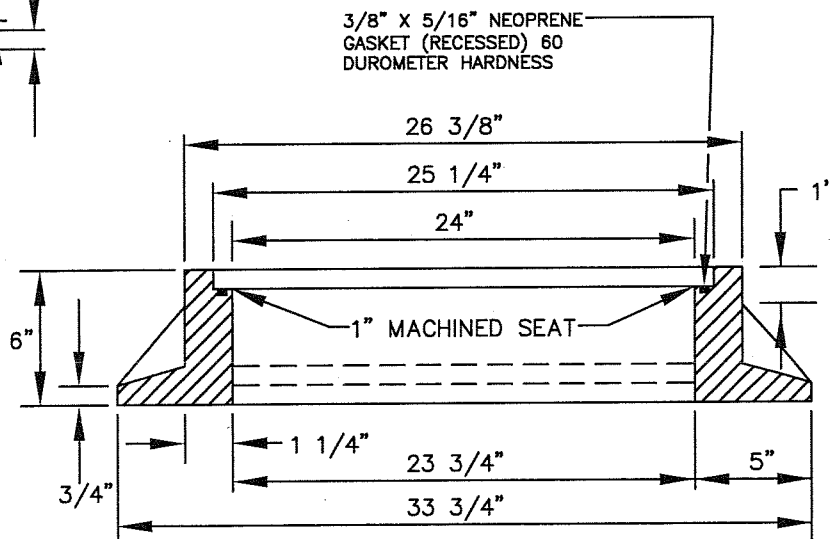


SECTION A-A

DUCTILE OR CAST IRON NON-LOCKING COVER
MINIMUM WEIGHT 150 LBS.



SECTION C-C

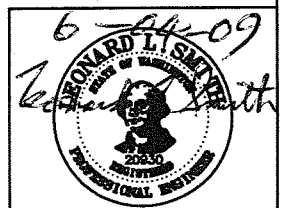


SECTION B-B

DUCTILE OR CAST IRON
RING MINIMUM WEIGHT
210 LBS.

NOTE:

1. COVERS SHALL HAVE THE WORD "SEWER" IN 2" RAISED LETTERS.
2. FOR USE IN PUBLIC RIGHT-OF-WAY (PAVED AREAS, UNPAVED AREAS AND SIDEWALKS).



**CITY OF
BLACK DIAMOND**

24" MANHOLE AND RING COVER

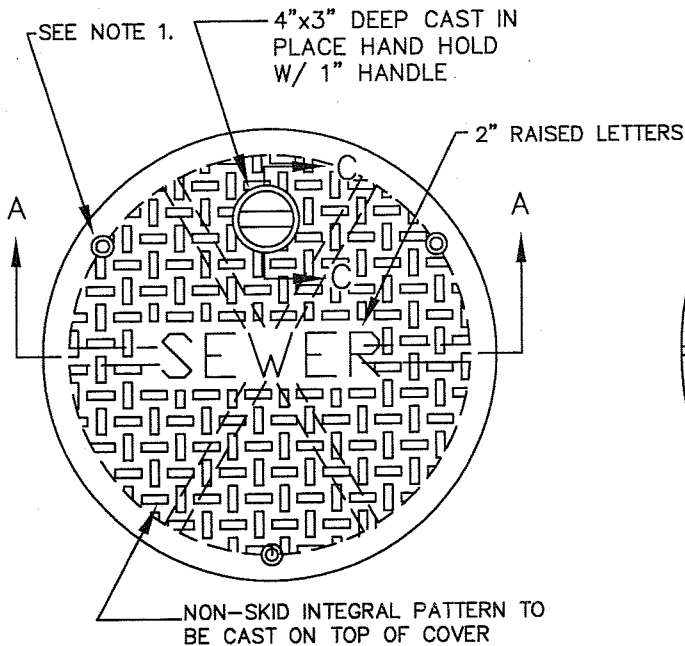
STANDARD DWG S-5

NOT TO SCALE

04/01/09

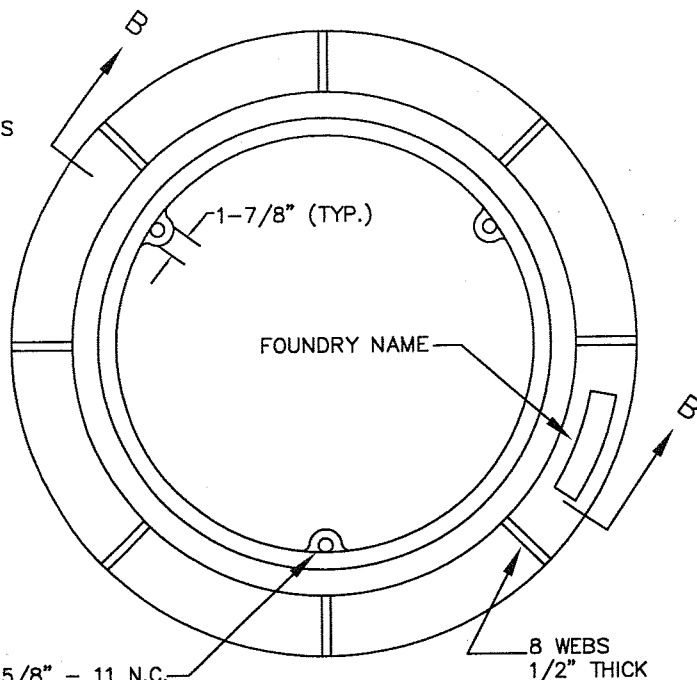


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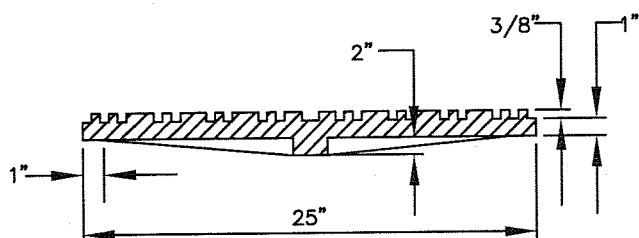


COVER PLAN

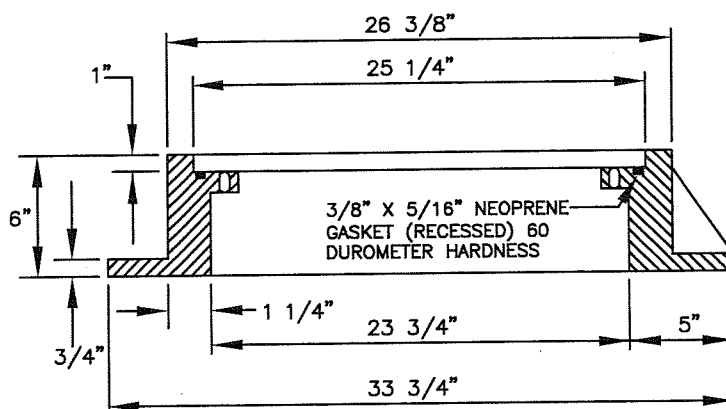
DRILL & TAP: 5/8" - 11 N.C.
120 DEGREES (TYP. 3PL.)



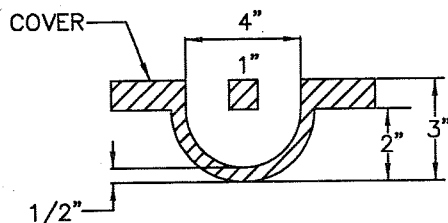
RING PLAN



SECTION A-A



SECTION B-B



SECTION C-C

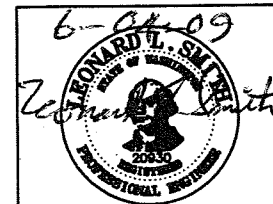
COVER NOTES:

1. USE WITH THREE LOCKING BOLTS 5/8"-11 NC STAINLESS TYPE 304 STEEL SOCKET HEAD (ALLEN HEAD) BOLTS, 2" LONG. DRILL HOLES SPACED 120°, TO MATCH HOLES IN RING.
2. COVER MATERIAL IS DUCTILE IRON ASTM A536 GRADE 80-55-06.
3. SHALL CONFORM TO SEC. 9-05.15 OF THE STANDARD SPECIFICATIONS, AS MODIFIED HEREIN.
4. APPROXIMATE WEIGHT OF COVER IS 150 LBS.
5. RATING - H20.

RING NOTES:

1. DRILL AND TAP THREE 5/8"-11 NC HOLES THROUGH RING AT 120°.
2. RING MATERIAL IS GREY IRON, ASTM A-48, CLASS 30.
3. SHALL CONFORM TO SEC. 9-05.15 OF THE STANDARD SPECIFICATIONS. AS MODIFIED HEREIN.
4. APPROXIMATE WEIGHT OF RING IS 215 LBS.
5. RATING - H20.

NOTE: FOR USE IN APPLICATIONS SUSEPTIBLE TO SURFACE WATER RUNOFF.



**CITY OF
BLACK DIAMOND**

**24" BOLT-LOCKING MANHOLE
RING & COVER**

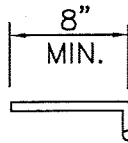
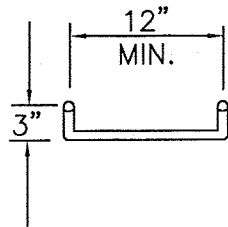
STANDARD DWG S-6

NOT TO SCALE

04/01/09

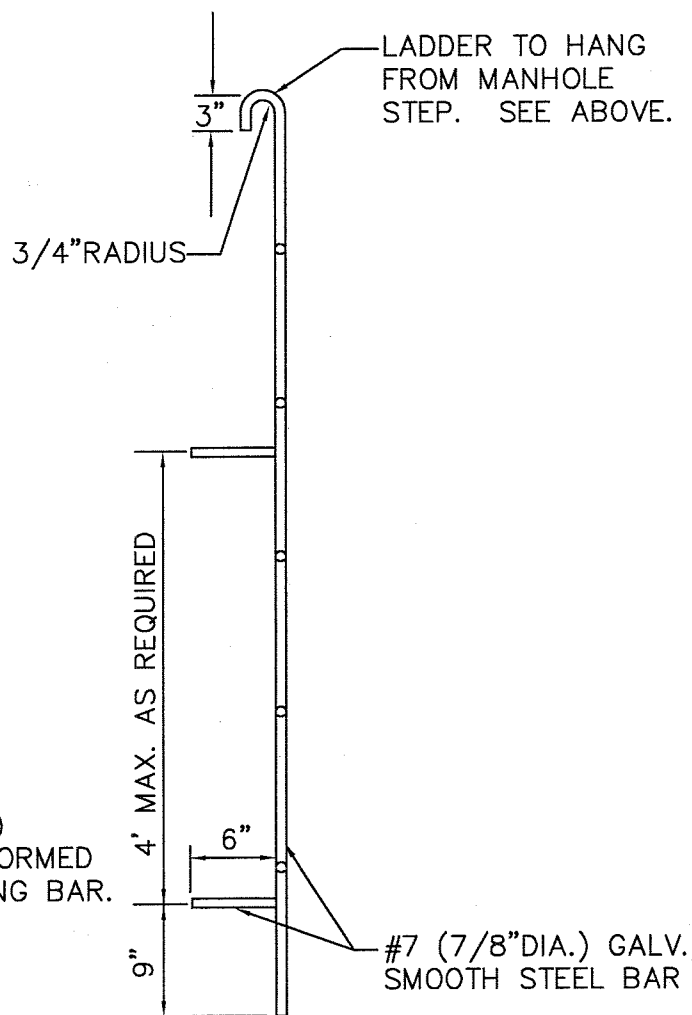
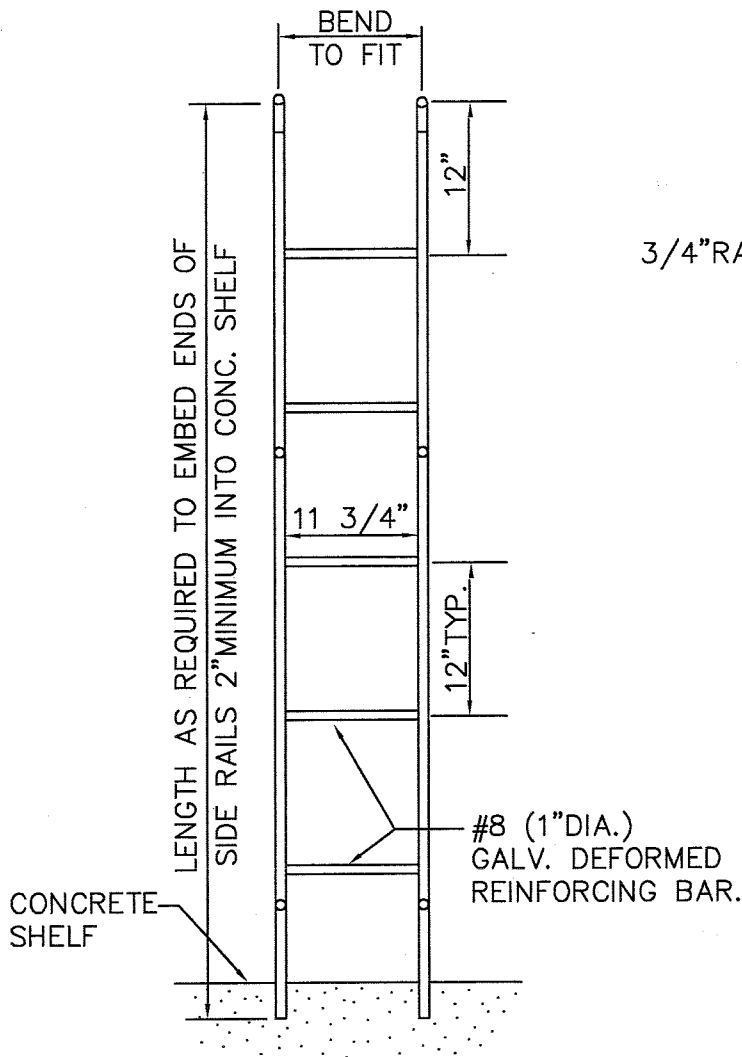


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#8 (1"DIA.)
GALV. DEFORMED
REINFORCING BAR
OR PLASTIC STEP.

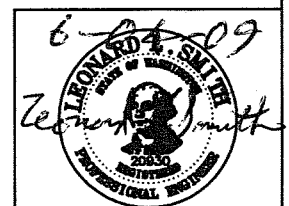
SAFETY STEP



PREFABRICATED LADDER

NOTES:

1. DEFORMED REINFORCING BAR SHALL CONFORM TO ASTM A 615.
2. GALVANIZE SHALL CONFORM TO ASTM A 123.
3. PLASTIC STEP SHALL BE POLY-PROPYLENE CONFORMING TO ASTM D-4101 WITH 1/2" ASTM A-615 GRADE 60 STEEL REINFORCING BAR. LANE P-13938, M.A. PS2-PF, OR EQUAL.



**CITY OF
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LADDER AND MANHOLE STEP

STANDARD DWG S-7

NOT TO SCALE

04/01/09



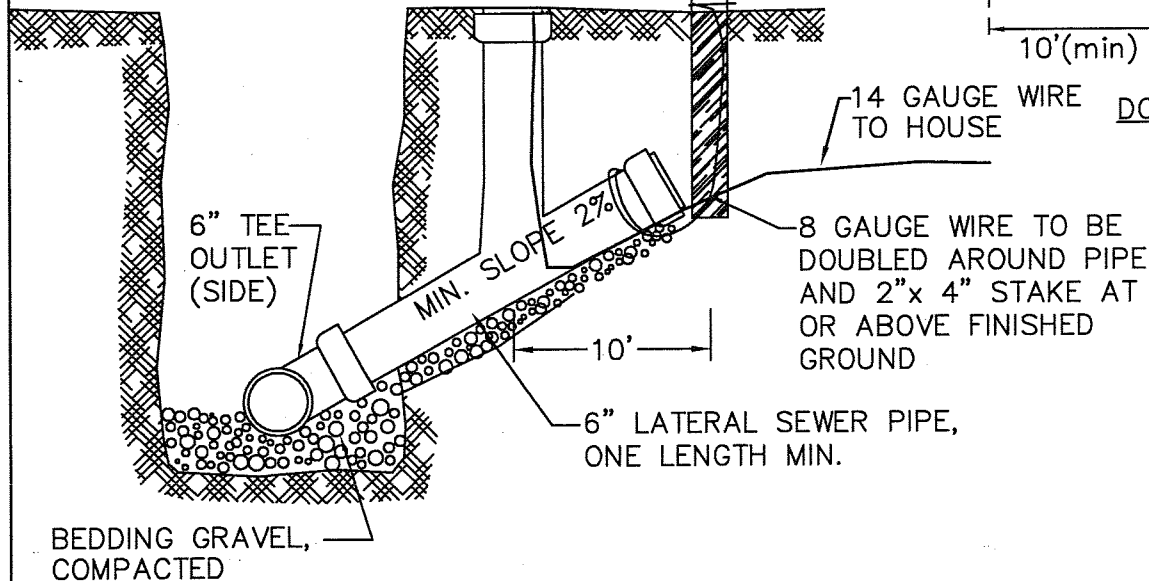
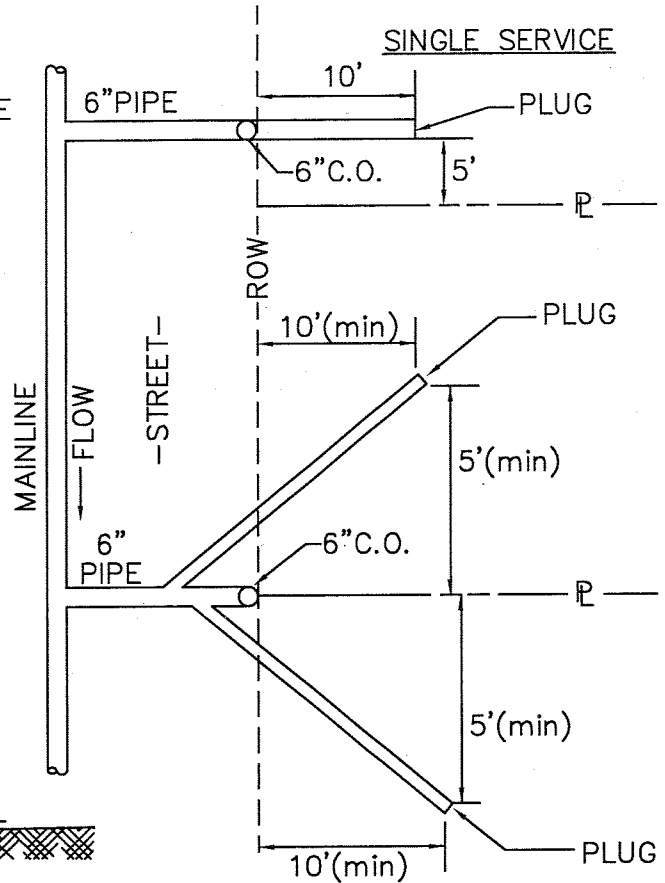
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*SEE DETAIL S-11
FOR INSPECTION TEE
PLACEMENT.

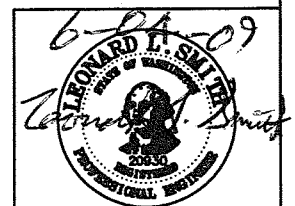
MARK 2"x4" STAKE WITH
"SEWER" AND DEPTH TO
PIPE INVERT FROM FINISHED
GROUND LEVEL.

12' LONG 2"x4" STAKE BURIED
TO DEPTH OF PIPE INVERT,
PAINTED WHITE ABOVE GROUND.
EXTEND MINIMUM 3 FEET ABOVE
GRADE.



GENERAL NOTES:

1. WHERE LATERAL SEWER CONNECTS TO MANHOLE: INVERT TO SIDE SEWER SHALL BE EQUAL TO OR ABOVE MAIN SEWER CROWN, BUT NOT TO EXCEED 18" ABOVE INVERT OF MAIN SEWER.
2. UNLESS OTHERWISE INDICATED ON PLAN, LATERAL SEWER SHALL BE MIN. OF 5' DEEP AT PROPERTY LINE, OR 5' LOWER THAN THE LOWEST ELEVATION, WHICHEVER IS LOWER.
3. PIPE CAN BE REDUCED TO 4" DIAMETER ON PRIVATE PROPERTY FOR RESIDENTIAL SERVICES. COMMERCIAL SERVICES SHALL BE 6" DIAMETER. (SEE ENGINEERING STANDARDS FOR EXCEPTIONS).



**CITY OF
BLACK DIAMOND**

LATERAL SEWER

STANDARD DWG S-9

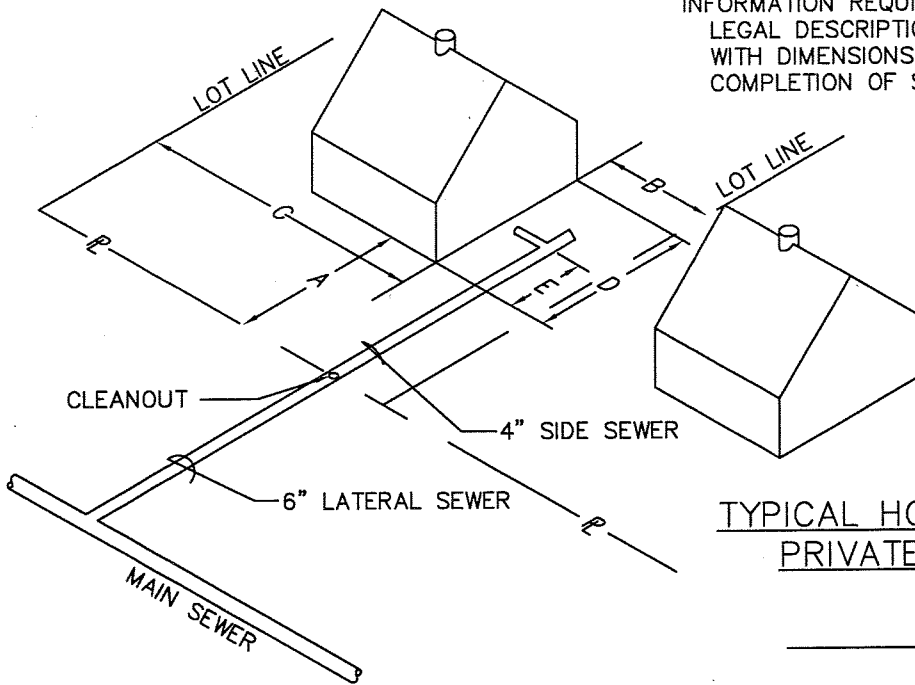
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04/01/09



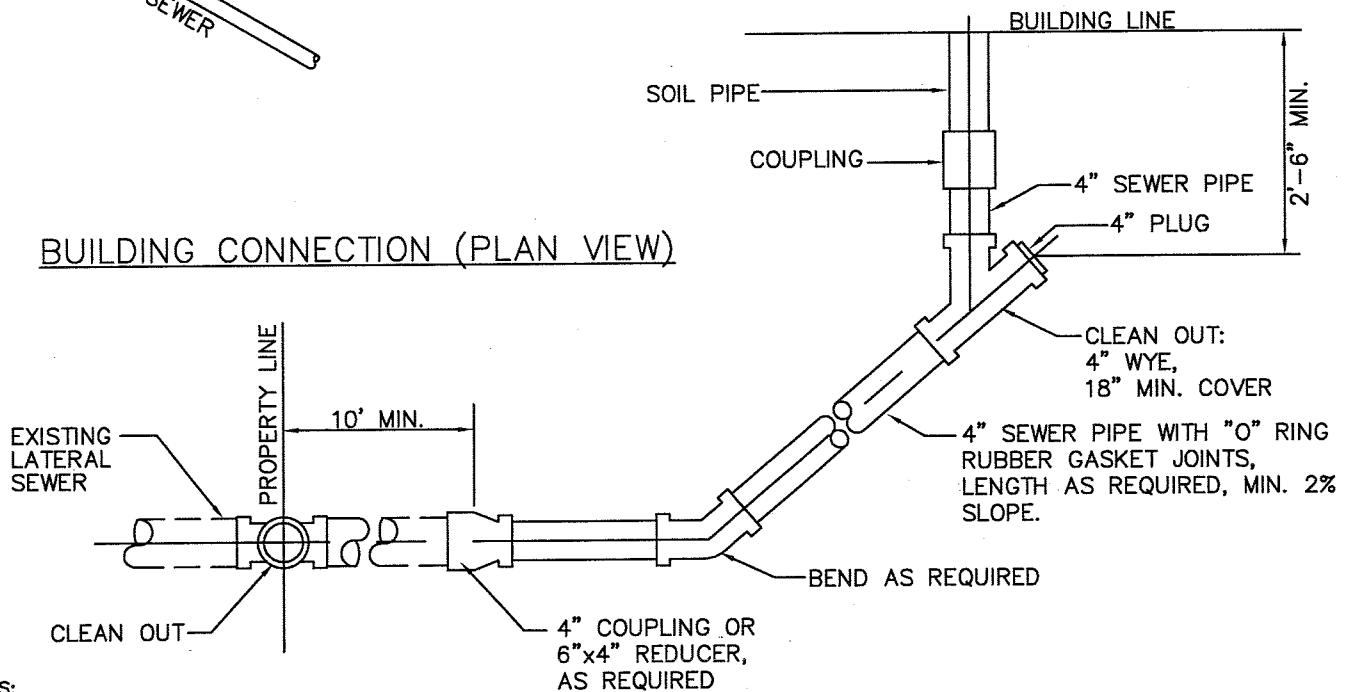
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INFORMATION REQUIRED FOR SEWER CONNECTION PERMIT:
LEGAL DESCRIPTION, STREET ADDRESS, PLAN
WITH DIMENSIONS A THRU E SHOWN, AND
COMPLETION OF SIDE SEWER APPLICATION.



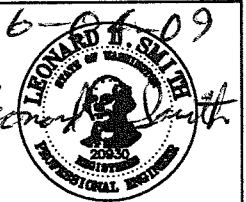
TYPICAL HOUSE SEWER IN
PRIVATE PROPERTY

BUILDING CONNECTION (PLAN VIEW)



NOTES:

1. ELBOWS SHALL NOT BE GREATER THAN 45°.
2. CLEAN OUT IS REQUIRED FOR EACH PIPE LENGTH GREATER THAN 100' AND FOR EACH 90° ACCUMULATED ELBOW/100'.
3. RIGHT OF WAY RESTORATION SHALL MATCH OR EXCEED THE ORIGINAL CONDITION.
4. BACKFILL FOR PAVED AREA SHALL BE 5/8" MINUS CRUSHED SURFACING TOP COURSE, COMPACTED IN 12" LIFTS.
5. ALL PLUMBING OUTLETS SHALL BE CONNECTED TO THE SEWER. NO DOWNSPOUTS OR STORM DRAINAGE MAY BE CONNECTED TO THE SEWER SYSTEM.
6. 18" MINIMUM COVERAGE OF PIPE.
7. 6' MINIMUM COVERAGE AT PROPERTY LINE.
8. LAY PIPE IN STRAIGHT LINE BETWEEN BENDS. MAKE ALL CHANGES IN GRADE OR LINE WITH AN ELBOW OR WYE. 90° CHANGE WITH AN ELBOW AND WYE.
9. 6" SEWER PIPE MINIMUM SIZE IN RIGHT OF WAY 2% MINIMUM GRADE, 45% MAXIMUM.
10. 4" SEWER PIPE MINIMUM SIZE ON PRIVATE RESIDENTIAL PROPERTY. 6" SEWER PIPE MIN. SIZE ON COMMERCIAL PROPERTIES. 2% MINIMUM GRADE, 45% MAXIMUM.
11. CONSTRUCTION IN RIGHT OF WAY SHALL BE PERFORMED BY A REGISTERED LICENSED CONTRACTOR.
12. ALL CONSTRUCTION REQUIRES A PERMIT AND PAYMENT OF FEE. COMPLETE LEGAL DESCRIPTION OF PROPERTY AND DIMENSIONS.
13. AS-BUILT DRAWING SHOWING LOCATION OF SIDE SEWER IN RELATION TO THE HOUSE IS REQUIRED AFTER INSTALLATION.
14. BEDDING 5/8" CRUSHED ROCK OR PEA GRAVEL.
15. IN NO CASE SHALL THE DISTANCE BETWEEN CLEAN OUTS EXCEED 100'.
16. 14 GAUGE LACCOATING WIRE SHALL BE INSTALLED.
17. PIPE BEDDING SHALL BE MIN. 6" OF BEDDING GRAVEL BELOW THE BARREL OF PIPE & FILLED AROUND PIPE.



**CITY OF
BLACK DIAMOND**

SIDE SEWERS

STANDARD DWG S-10

NOT TO SCALE

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GRINDER PUMP INSTALLATION NOTES:

1. PACKAGED GRINDER LIFT STATION SHALL BE ENVIRONMENT ONE MODEL DH071 (EXTREME) OR APPROVED EQUAL.

2. PACKAGED STATION TO INCLUDE THE FOLLOWING:

- SEWAGE GRINDER PUMP, SEMI-POSITIVE DISPLACEMENT TYPE, ENVIRONMENT ONE PROGRESSING CAVITY WITH A 1 HP, 1800 RPM MOTOR.
- CORRUGATED HDPE TANK WITH SINGLE POSITION INSTALLATION. THE DH071 (EXTREME) IS PACKAGED IN A SINGLE COMPLETE UNIT, READY FOR INSTALLATION. TANK WILL HAVE A 1-1/4" NPT DISCHARGE CONNECTION AND A 4 INCH INLET GROMMET FOR DWV PIPE.
- INTERNAL CHECK VALVE ASSEMBLY
- BREAKER PANEL SHALL INCLUDE TWO 15 AMP BREAKERS FOR THE PUMP SYSTEM AND ONE 15 AMP BREAKER FOR THE ALARM. PANEL FEATURES ARE PUSH TO RUN, AUDIBLE ALARM WITH SILENCE BUTTON, AND RED LIGHT ALARM. ALL WIRES AND CONNECTORS ARE COLOR CODED FOR EASE OF INSTALLATION
- 25 FEET OF DIRECT BURY CABLE, (SUPPLY CABLE)

3. ELECTRICAL SERVICE REQUIREMENTS:

240/120 VOLTS SINGLE PHASE POWER WITH TWO POLE 30 AMP BREAKER, 4 WIRE CIRCUIT REQUIRED.

4. CONTROL PANEL SHALL BE ATTACHED TO THE OWNER'S HOUSE

... ATTACHED TO A 4" x 4" PRESSURE TREATED POST SET 3' INTO CONCRETE, 5 FEET HIGH FROM FINISHED GRADE TO BOTTOM OF PANEL.

5. SEE TYPICAL CIRCUIT DIAGRAM FOR WIRING BETWEEN THE OWNER'S DISTRIBUTION PANEL AND THE BREAKER PANEL.

6. E-ONE ELECTRICAL PUMP PANEL: PLUG CONDUIT HOLE(S) FROM PUMP & ELECTRICAL PANEL WITH DUCT SEAL TO PREVENT MOISTURE OR INSECTS FROM GETTING INTO THE PANEL.

7. THE FINISHED GRADE SHALL BE FREE DRAINING AROUND & AWAY FROM THE TANK SO SURFACE WATER CANNOT POND.

8. POSITION GRINDER PUMP TANK TO MINIMIZE NUMBER OF BENDS IN DISCHARGE PRESSURE PIPING. INSTALL BENDS IN GRAVITY HOUSE SEWER PIPING INSTEAD.

9. 1 1/4" SDR11 HDPE FORCE MAIN SERVICE LINE

1-1/4" FEMALE THREADED FIXED COUPLING DISCHARGE LINE CONNECT TO GRINDER PUMP PUMP CLEANOUT (SEE DETAIL)

SEE GRINDER PUMP PLAN FOR SYSTEM LAYOUT

NOTE:

74" TANK INSTALLATION SHOWN. FOR TYPICAL 58" AND 74" TANK INSTALLATIONS, SEE DETAILS FOR DIMENSIONS.

CONCRETE ANCHOR IS REQUIRED TO PREVENT TANK FROM FLOATING.

UNDISTURBED NATIVE MATERIAL

MIN. 6" PEA GRAVEL

4" x 4" PRESSURE TREATED POST

E-ONE SUPPLIED BREAKER PANEL (SEE NOTE 5)

INSTALL NEW SILENCE LABEL TO LOWER LEFT CORNER OF PANEL.

1-1/4" SCH. 40 PVC CONDUIT AND FITTINGS (AS REQUIRED)

4.5'

FINISHED GRADE SEE NOTE 7.

E-ONE SUPPLIED CABLE INSIDE SOLID PIECE OF 1-1/4" SCHEDULE 40 PVC PIPE

2' COVER

6" INSTALL TEST TEE

ASTM D3034

GASKET TO FIT PIPE SIZE

GRAVITY SIDE SEWER

NOTE:

- 2% MINIMUM GRAVITY SIDE SEWER INSTALLATION AS PER DISTRICT STANDARDS
- CLEANOUT 3' MAX. FROM BUILDING
- CLEANOUT SHALL BE FLUSH WITH FINISHED GRADE OR BURIED 6" BELOW EXISTING GRADE, IF NOT IN PAVEMENT
- MUST MEET ALL DISTRICT, COUNTY AND STATE REGULATIONS.

VERIFY EXISTING SEWER OUTLET BEFORE INSTALLING GRINDER PUMP TANK

GRINDER PUMP INSTALLATION DETAIL



CITY OF
BLACK DIAMOND

GRINDER PUMPS

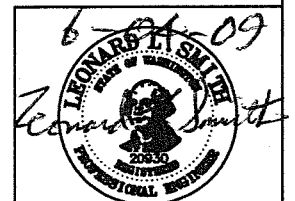
STANDARD DWG S-11

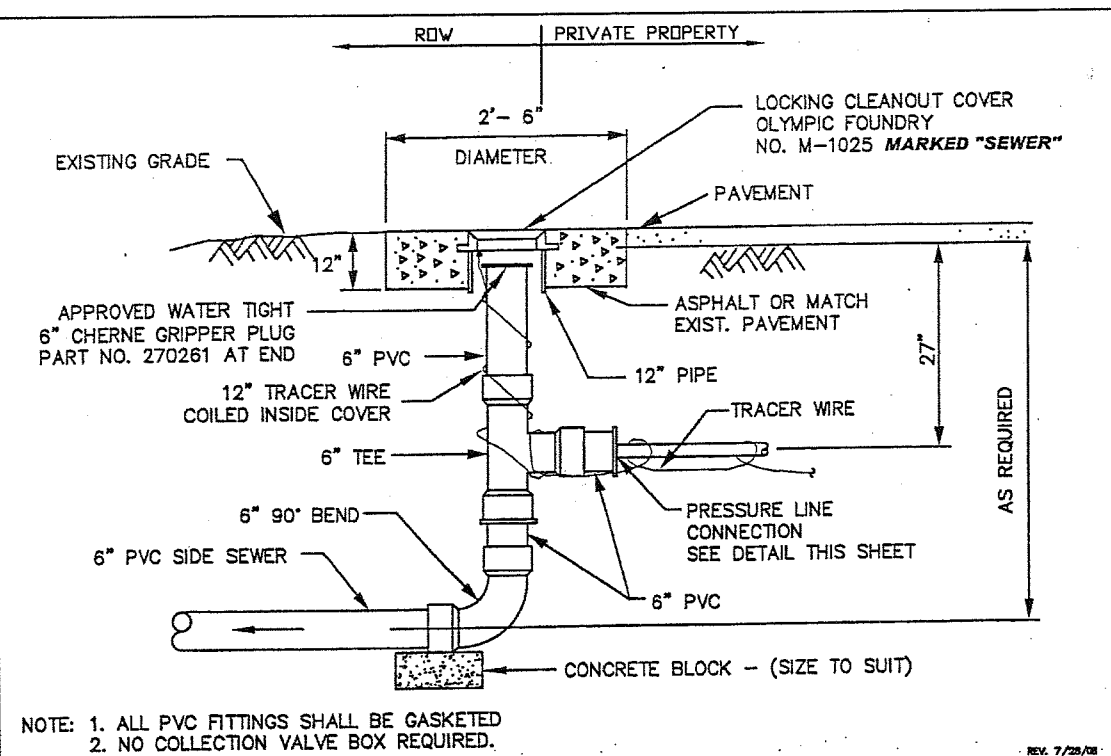
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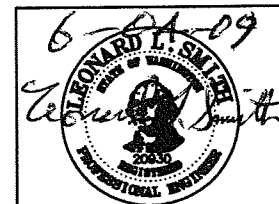
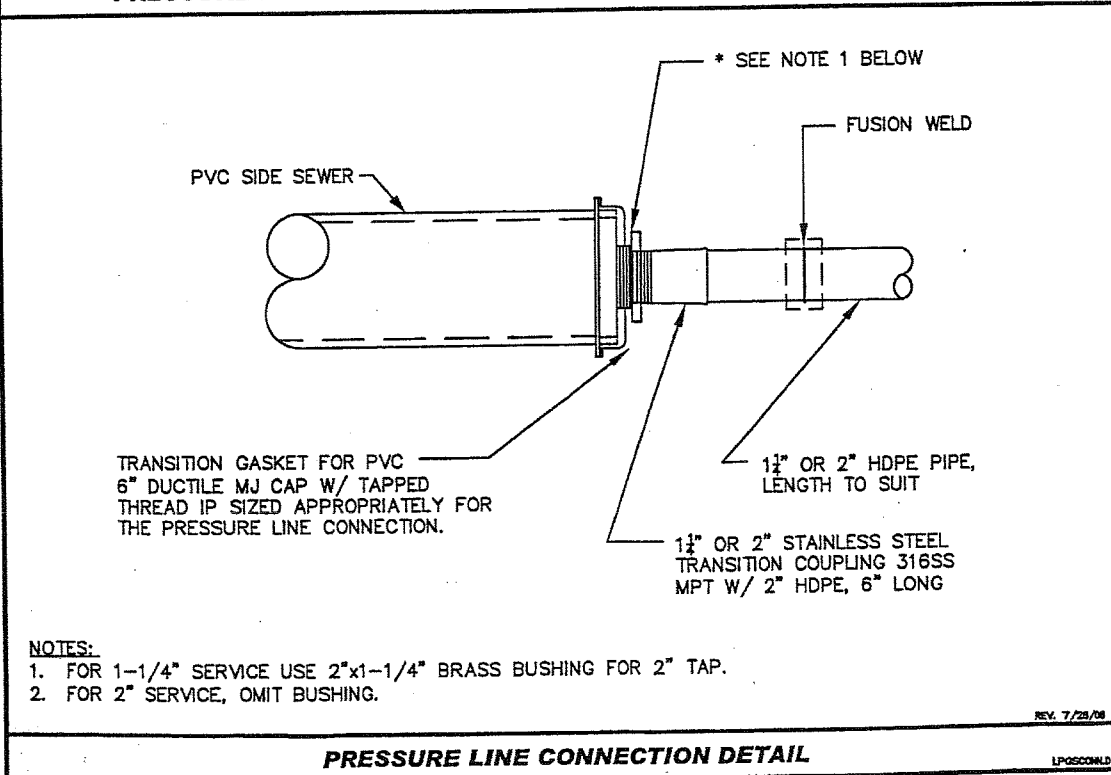


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PRESSURE LINE CONNECTION TO GRAVITY SANITARY SEWER DETAIL



**CITY OF
BLACK DIAMOND**

PRESSURE LINE CONNECTION

STANDARD DWG S-12

NOT TO SCALE

04/01/09



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NATIVE BACKFILL COMPACTED
TO DENSITY OF ADJACENT
SOIL, PER STANDARDS.

SOIL-CEMENT MIX
PLACED AS DIRECTED
BY ENGINEER

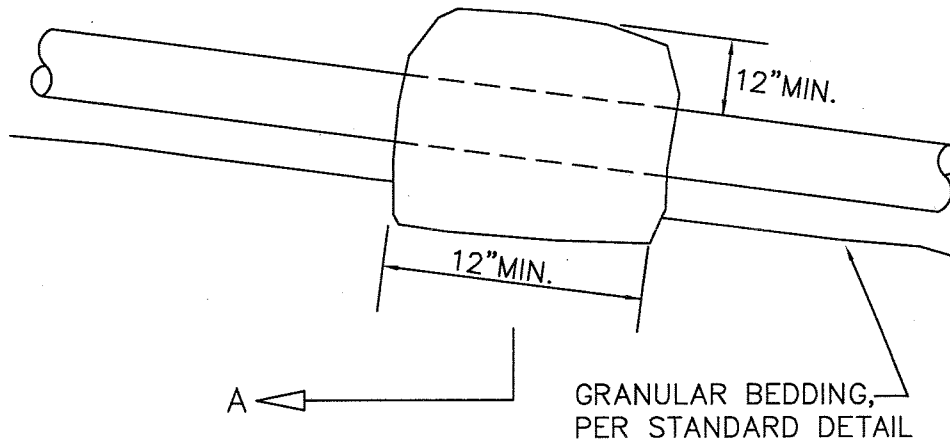
PIPE

12" MIN.

12" MIN.

SECTION A-A

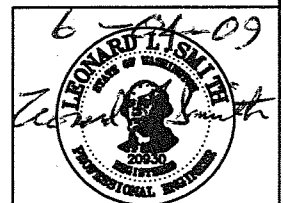
A



GRANULAR BEDDING,
PER STANDARD DETAIL

NOTE:

SOIL CEMENT BLOCKS PLACED OVER AND
AROUND PIPE. TAMPED INTO PLACE BEFORE
PLACING BACKFILL. USE 10% CEMENT WITH
90% NATIVE SOIL AND WATER TO SUIT TO
FORM A DRY MIX THAT WILL HOLD ITS
SHAPE WHEN MOLDED INTO A BALL. SOIL
CEMENT BLOCKS REQUIRED ON SLOPES 20%
OR GREATER.



**CITY OF
BLACK DIAMOND**

SOIL/CEMENT PIPE ANCHOR

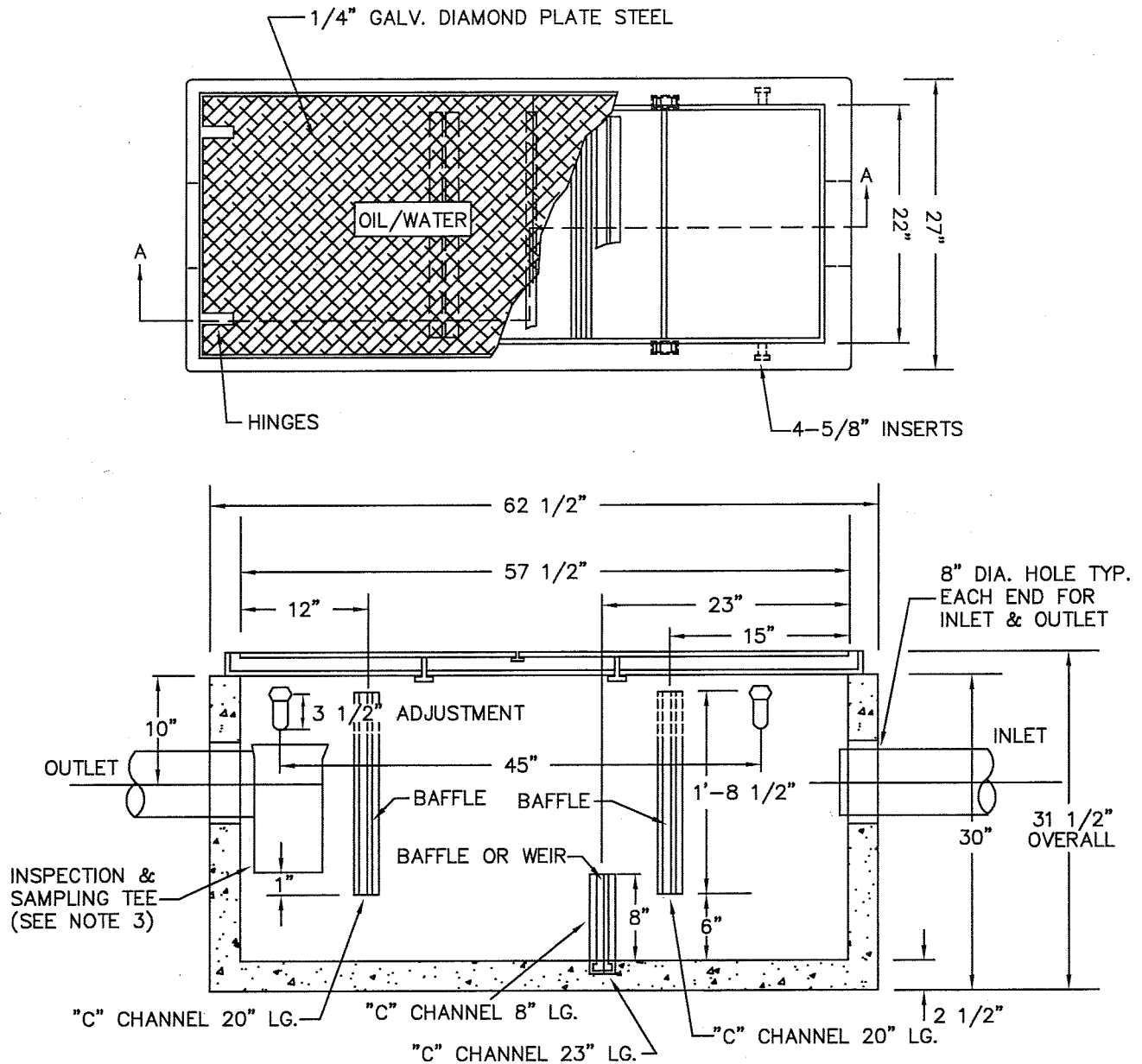
STANDARD DWG S-13

NOT TO SCALE

04/01/09

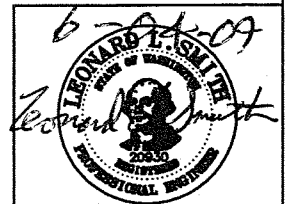


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NOTES:

1. UTILITY VAULT COMPANY, INC., #25-SA, OR EQUAL. PRECAST VAULT SHALL HAVE KNOCKOUTS AT ALL PIPE OPENINGS. IF KNOCKOUTS ARE NOT PRESENT THEN PIPE OPENINGS SHALL BE CORE-DRILLED. PIPE OPENINGS SHALL BE 2" LARGER THAN PIPE DIAMETER.
2. LOCATE WITHIN 20 FEET OF DRIVE FOR ACCESS BY MAINTENANCE VEHICLE.
3. INSPECTION AND SAMPLING TEE TO BE INSTALLED BY CONTRACTOR. LINE-SIZED PVC TEE SHALL BE USED WHERE LINE IS 6" DIA. OR GREATER. SIX INCH PVC TEE SHALL BE USED WHERE LINE IS LESS THAN 6" DIA.
4. FILL WITH CLEAN WATER PRIOR TO START-UP OF SYSTEM.
5. GRAY AND BLACK WATER SHALL BE CARRIED BY SEPARATE SIDE SEWER.
6. CONNECTIONS TO CONCRETE WALLS WITH P.V.C. PIPE REQUIRE PVCxCONC. MANHOLE ADAPTERS. SEAL ALL PIPE CONNECTIONS WITH NONSHRINK GROUT.



**CITY OF
BLACK DIAMOND**

**100 GALLON BAFFLE TYPE
OIL/WATER SEPARATOR**

STANDARD DWG S-14

NOT TO SCALE

04/01/09



**PacWest Engineering
Fife, Washington**

2 NO. 1012P
DIAMOND PLATE
INSPECTION COVERS
(12"X 12")

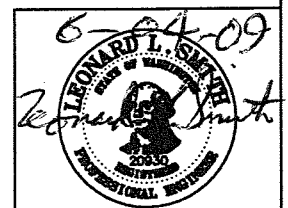
NO. 222P DIAMOND
PLATE ACCESS DOOR
(24"X 24")

INSPECTION &
SAMPLING TEE
(SEE NOTE 3)

8" DIA. HOLE TYP
EA. END FOR
INLET & OUTLET

NOTES:

1. UTILITY VAULT COMPANY, INC., #660-SA, OR EQUAL. PRECAST VAULT SHALL HAVE KNOCKOUTS AT ALL PIPE OPENINGS. IF KNOCKOUTS ARE NOT PRESENT THEN PIPE OPENINGS SHALL BE CORE-DRILLED. PIPE OPENINGS SHALL BE 2" LARGER THAN PIPE DIAMETER.
2. LOCATE WITHIN 20 FEET OF DRIVE FOR ACCESS BY MAINTENANCE VEHICLE.
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4. FILL WITH CLEAN WATER PRIOR TO START-UP OF SYSTEM.
5. GRAY AND BLACK WATER SHALL BE CARRIED BY SEPARATE SIDE SEWER.
6. CONNECTIONS TO CONCRETE WALLS WITH P.V.C. PIPE REQUIRE PVCxCONC. MANHOLE ADAPTERS. SEAL ALL PIPE CONNECTIONS WITH NONSHRINK GROUT.



**CITY OF
BLACK DIAMOND**

**450 GALLON BAFFLE TYPE
OIL/WATER SEPARATOR**

STANDARD DWG S-15

NOT TO SCALE

04/01/09



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Fife, Washington**

2 NO. 1012P
DIAMOND PLATE
INSPECTION COVERS
(12"X 12")

NO. 222P DIAMOND
PLATE ACCESS DOOR
(24"X 24")

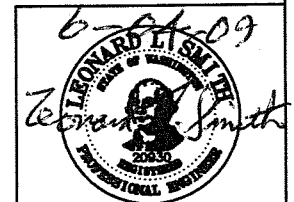
INSPECTION &
SAMPLING TEE
(SEE NOTE 3)

8" DIA. HOLE TYP
EA. END FOR
INLET & OUTLET

NOTES:

1. UTILITY VAULT COMPANY, INC., #48-SA, OR EQUAL. PRECAST VAULT SHALL HAVE KNOCKOUTS AT ALL PIPE OPENINGS. IF KNOCKOUTS ARE NOT PRESENT THEN PIPE OPENINGS SHALL BE CORE-DRILLED. PIPE OPENINGS SHALL BE 2" LARGER THAN PIPE DIAMETER.
2. LOCATE WITHIN 20 FEET OF DRIVE FOR ACCESS BY MAINTENANCE VEHICLE.
3. INSPECTION AND SAMPLING TEE TO BE INSTALLED BY CONTRACTOR. LINE-SIZED PVC TEE SHALL BE USED WHERE LINE IS 6"DIA. OR GREATER. SIX INCH PVC TEE SHALL BE USED WHERE LINE IS LESS THAN 6"DIA.
4. FILL WITH CLEAN WATER PRIOR TO START-UP OF SYSTEM.
5. GRAY AND BLACK WATER SHALL BE CARRIED BY SEPARATE SIDE SEWER.
6. CONNECTIONS TO CONCRETE WALLS WITH P.V.C. PIPE REQUIRE PVCxCONC. MANHOLE ADAPTERS. SEAL ALL PIPE CONNECTIONS WITH NONSHRINK GROUT.

WATER DEPTH	GALLONS	FLOW RATE AT 45 MINUTE RETENTION
4'-0"	800	17.8 G.P.M.
5'-0"	1000	22.2 G.P.M.



**CITY OF
BLACK DIAMOND**

**800 & 1000 GALLON BAFFLE
TYPE OIL/WATER SEPARATOR**

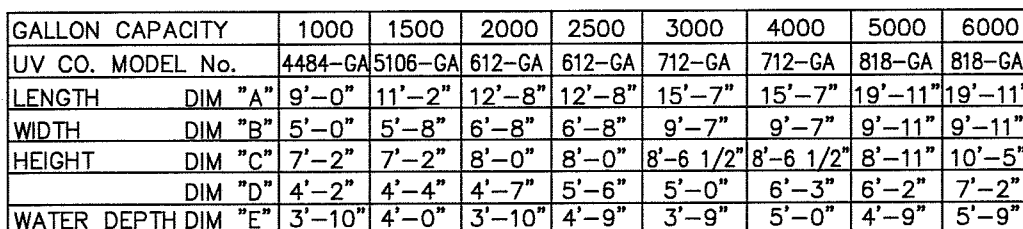
STANDARD DWG S-16

NOT TO SCALE

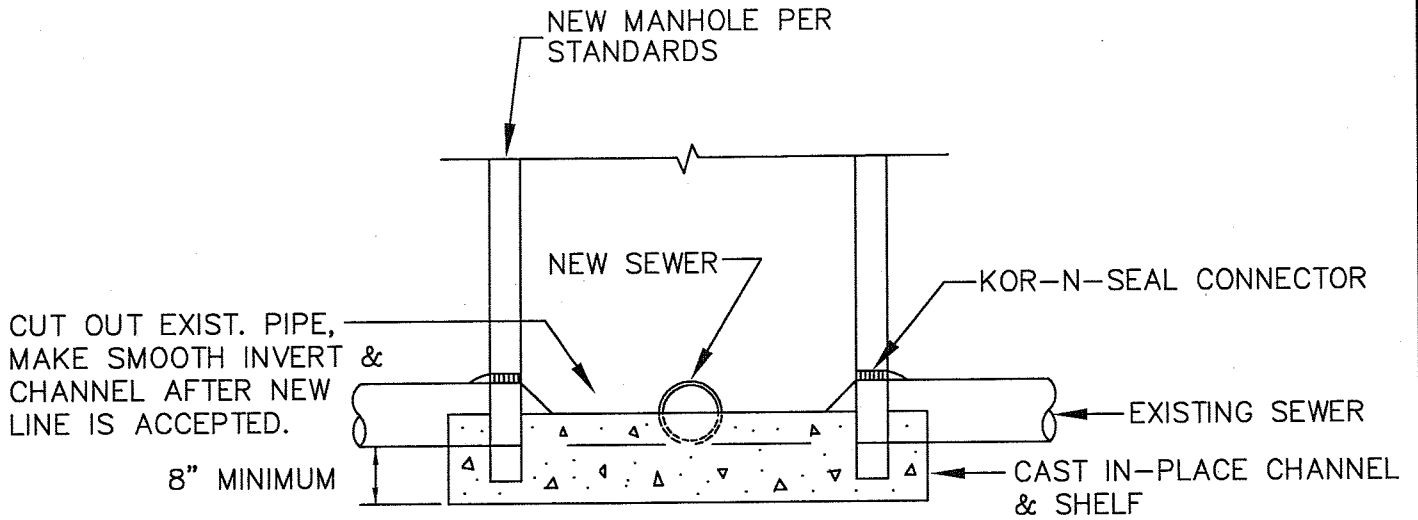
04/01/09



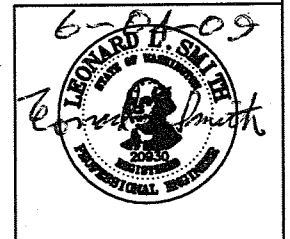
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MANHOLE BASE – NEW MANHOLE ON EXISTING SEWER



**CITY OF
BLACK DIAMOND**

**NEW MANHOLE ON
EXISTING SEWER**

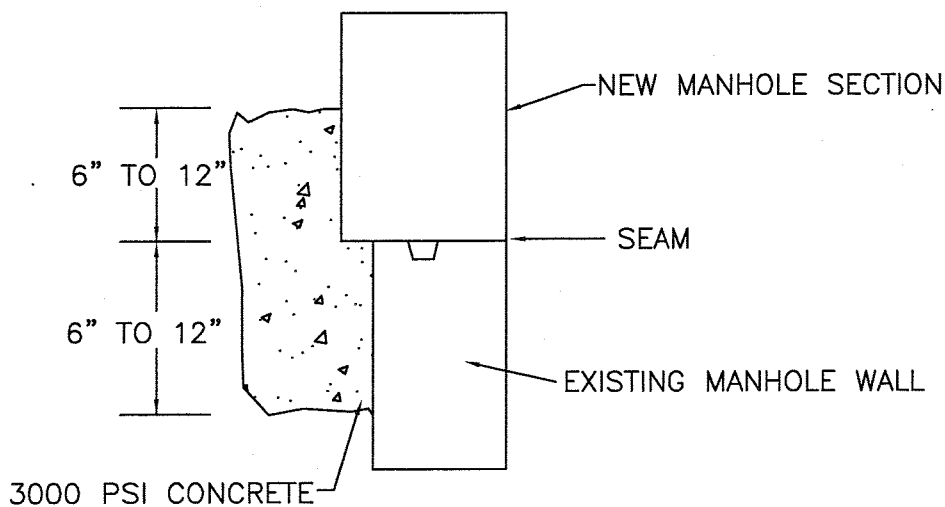
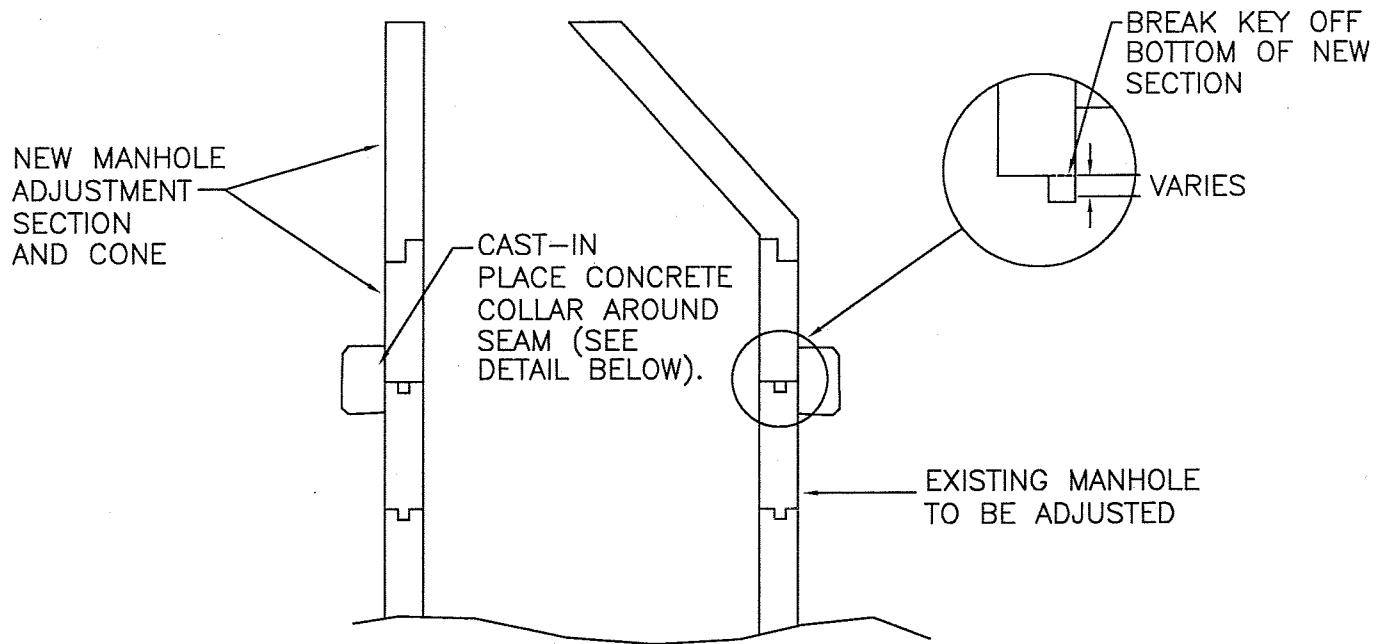
STANDARD DWG S-18

NOT TO SCALE

04/01/09



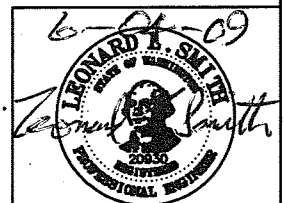
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CONCRETE COLLAR DETAIL

NOTES:

1. WHERE KEY SECTIONS OF NEW AND EXISTING MANHOLES ARE NOT COMPATIBLE, BREAK KEY OFF BOTTOM OF NEW SECTION AND PROVIDE CAST-IN-PLACE CONCRETE COLLAR AROUND MANHOLE PERIMETER.
2. UPWARD ADJUSTMENT OF EXISTING MANHOLES MUST BE DONE WITH ALL NEW PARTS, AS NECESSARY, TO ENSURE ONLY ONE INCOMPATIBLE SEAM.



**CITY OF
BLACK DIAMOND**

MANHOLE SECTION ADJUSTMENT

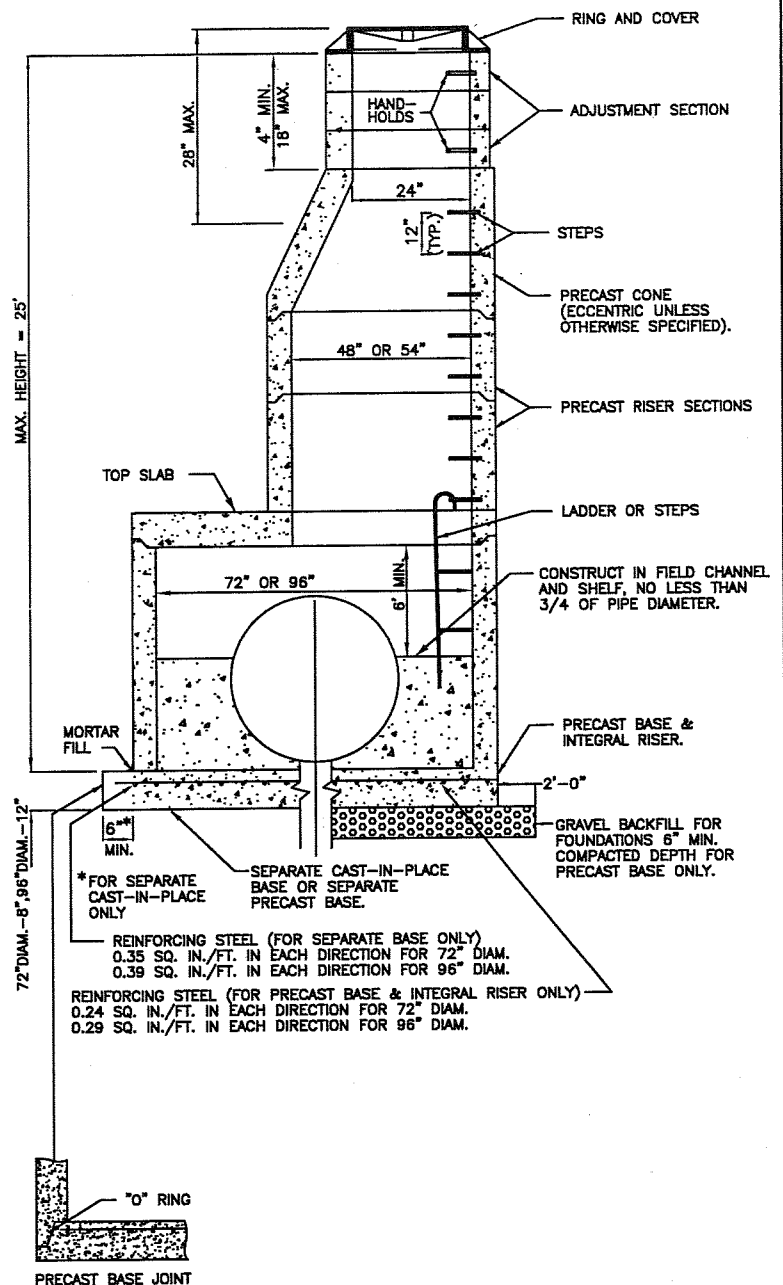
STANDARD DWG S-19

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NOTES:

1. MANHOLE SHALL CONFORM TO GENERAL NOTES AND ALL APPLICABLE REQUIREMENTS OF STANDARD DETAIL S-1.
2. MANHOLES SHALL BE CONSTRUCTED IN ACCORDANCE WITH AASHTO M199 UNLESS OTHERWISE SHOWN ON PLANS OR NOTED IN THE STANDARD SPECIFICATIONS.
3. ALL REINFORCED CAST-IN-PLACE CONCRETE SHALL BE CLASS 4000. NON-REINFORCED CONCRETE IN CHANNEL AND SHELF SHALL BE CLASS 3000. ALL PRECAST CONCRETE SHALL BE CLASS 4000.
4. PRECAST BASES SHALL BE FURNISHED WITH CUTOUTS OR KNOCKOUTS. KNOCKOUTS SHALL HAVE WALL THICKNESS OF 2" MIN. UNUSED KNOCKOUTS NEED NOT BE GROUTED IF WALL IS LEFT INTACT. PIPES SHALL BE INSTALLED ONLY IN FACTORY KNOCKOUTS UNLESS OTHERWISE APPROVED BY THE ENGINEER.
5. KNOCKOUT OR CUTOUT HOLE SIZE SHALL EQUAL PIPE OUTER DIAM. PLUS MANHOLE WALL THICKNESS. MAX. HOLE SIZE SHALL BE 60" FOR 72" MANHOLE, 84" FOR 96" MANHOLE. MIN. DISTANCE BETWEEN HOLES SHALL BE 12".
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. FOR HEIGHTS OF 12' OR LESS, MIN. SOIL BEARING VALUE SHALL EQUAL 3,300 POUNDS PER SQUARE FOOT. FOR HEIGHTS OVER 12', MIN. SOIL BEARING VALUE SHALL EQUAL 3,800 POUNDS PER SQUARE FOOT.
8. SEE THE STANDARD SPECIFICATIONS SEC. 7-05.3 FOR JOINT REQUIREMENTS.
9. GROUT EXTERNAL JOINTS WITH NON-SHRINK GROUT.
10. PROVIDE EPOXY COATING OR HEAT SHRINK WRAP AROUND THE OUTSIDE OF MANHOLE.
11. PROVIDE KOR-N-SEAL BOOTS AT CONNECTIONS TO MANHOLES.



**CITY OF
BLACK DIAMOND**

**MANHOLE TYPE 2
72" & 96"**

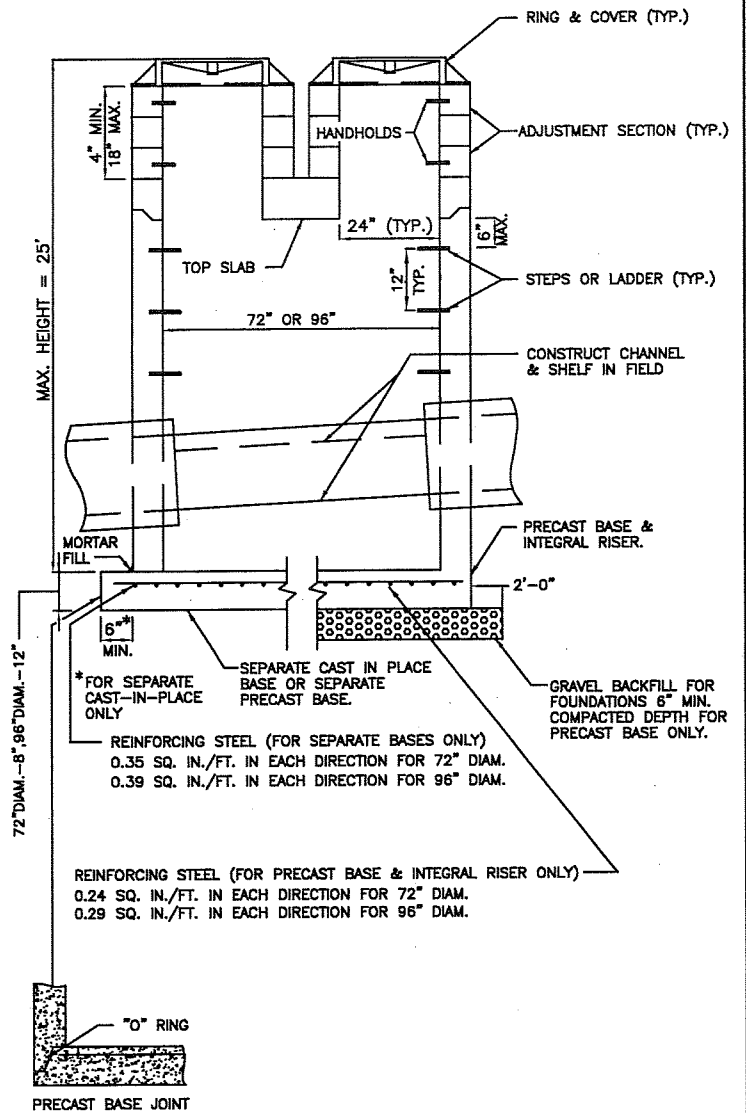
STANDARD DWG S-20

NOT TO SCALE

04/01/09

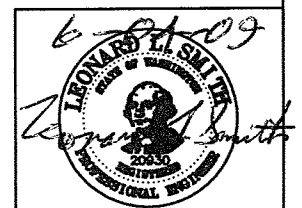


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NOTES:

1. PROVIDE TWO 24" ACCESS LIDS. EACH ACCESS TO BE LOCATED OVER EACH MAJOR PIPE ENTRANCE/EXIT.
2. MANHOLE SHALL CONFORM TO GENERAL NOTES AND ALL APPLICABLE REQUIREMENTS OF STANDARD DETAIL S-1.
3. MANHOLES SHALL BE CONSTRUCTED IN ACCORDANCE WITH AASHTO M199 UNLESS OTHERWISE SHOWN ON PLANS OR NOTED IN THE STANDARD SPECIFICATIONS.
4. ALL REINFORCED CAST-IN-PLACE CONCRETE SHALL BE CLASS 4000. NON-REINFORCED CONCRETE IN CHANNEL AND SHELF SHALL BE CLASS 3000. ALL PRECAST CONCRETE SHALL BE CLASS 4000.
5. PRECAST BASES SHALL BE FURNISHED WITH CUTOUTS OR KNOCKOUTS. KNOCKOUTS SHALL HAVE WALL THICKNESS OF 2" MIN. UNUSED KNOCKOUTS NEED NOT BE GROUTED IF WALL IS LEFT INTACT. PIPES SHALL BE INSTALLED ONLY IN FACTORY KNOCKOUTS UNLESS OTHERWISE APPROVED BY THE ENGINEER.
6. KNOCKOUT OR CUTOUT HOLE SIZE SHALL EQUAL PIPE OUTER DIAM. PLUS MANHOLE WALL THICKNESS. MAX. HOLE SIZE SHALL BE 60" FOR 72" MANHOLE, 84" FOR 96" MANHOLE. MIN. DISTANCE BETWEEN HOLES SHALL BE 12".
7. 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.
8. FOR HEIGHTS OF 12' OR LESS, MIN. SOIL BEARING VALUE SHALL EQUAL 3,300 POUNDS PER SQUARE FOOT. FOR HEIGHTS OVER 12', MIN. SOIL BEARING VALUE SHALL EQUAL 3,800 POUNDS PER SQUARE FOOT.
9. SEE THE STANDARD SPECIFICATIONS SEC. 7-05.3 FOR JOINT REQUIREMENTS.
10. GROUT EXTERNAL JOINTS WITH NON-SHRINK GROUT.
11. PROVIDE EPOXY COATING OR HEAT SHRINK WRAP AROUND THE OUTSIDE OF MANHOLE.
12. PROVIDE KOR-N-SEAL BOOTS AT CONNECTIONS TO MANHOLES.



**CITY OF
BLACK DIAMOND**

MANHOLE TYPE 3 72" & 96"

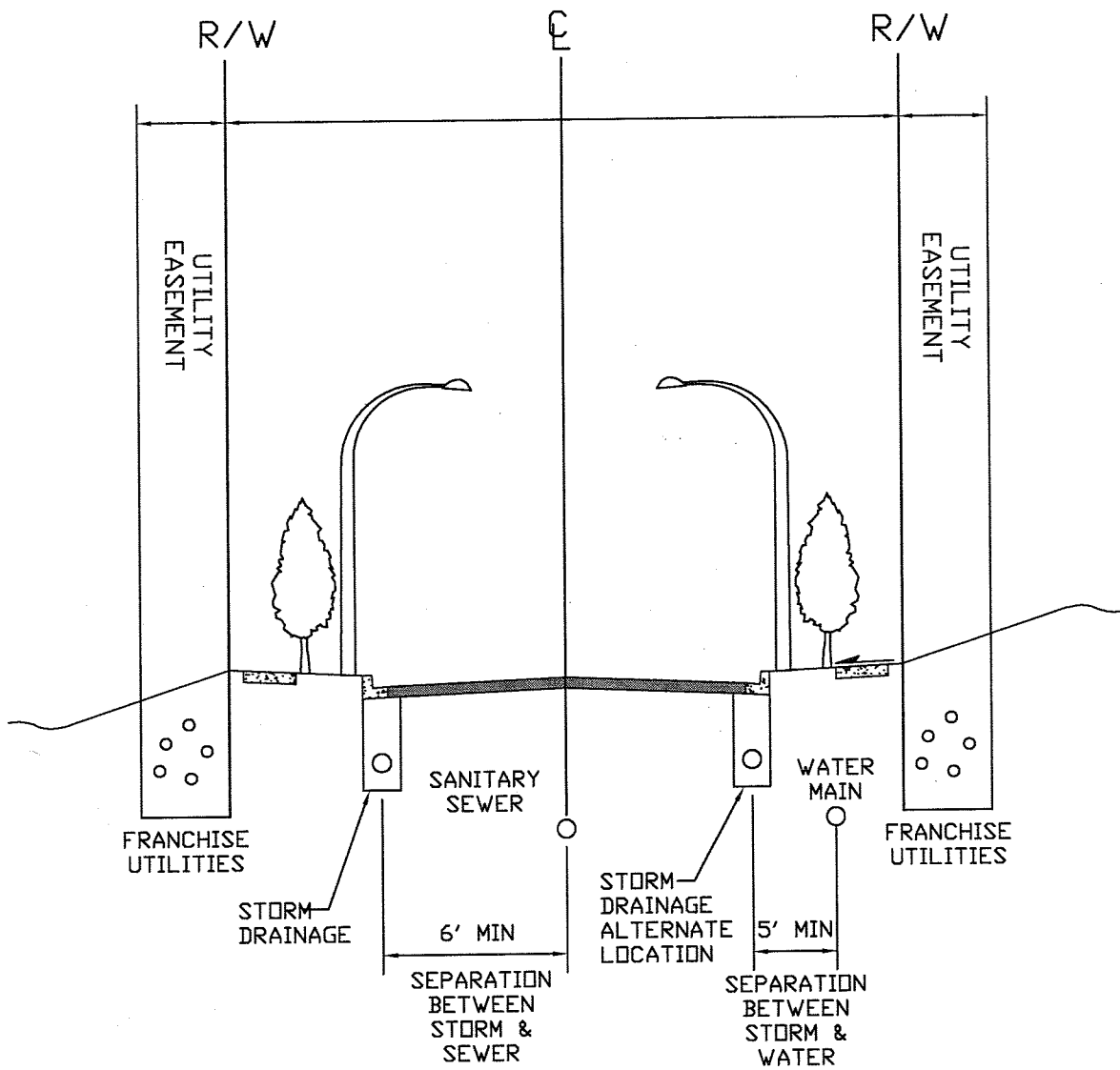
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NOT TO SCALE

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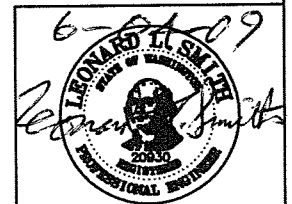
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FACING NORTH OR WEST

NOTES:

1. MAINTAIN HORIZONTAL & VERTICAL UTILITY SEPARATIONS PER WASHINGTON STATE DEPARTMENT OF ECOLOGY & DEPARTMENT OF HEALTH MINIMUM REQUIREMENTS.



**CITY OF
BLACK DIAMOND**

STANDARD UTILITY LOCATIONS

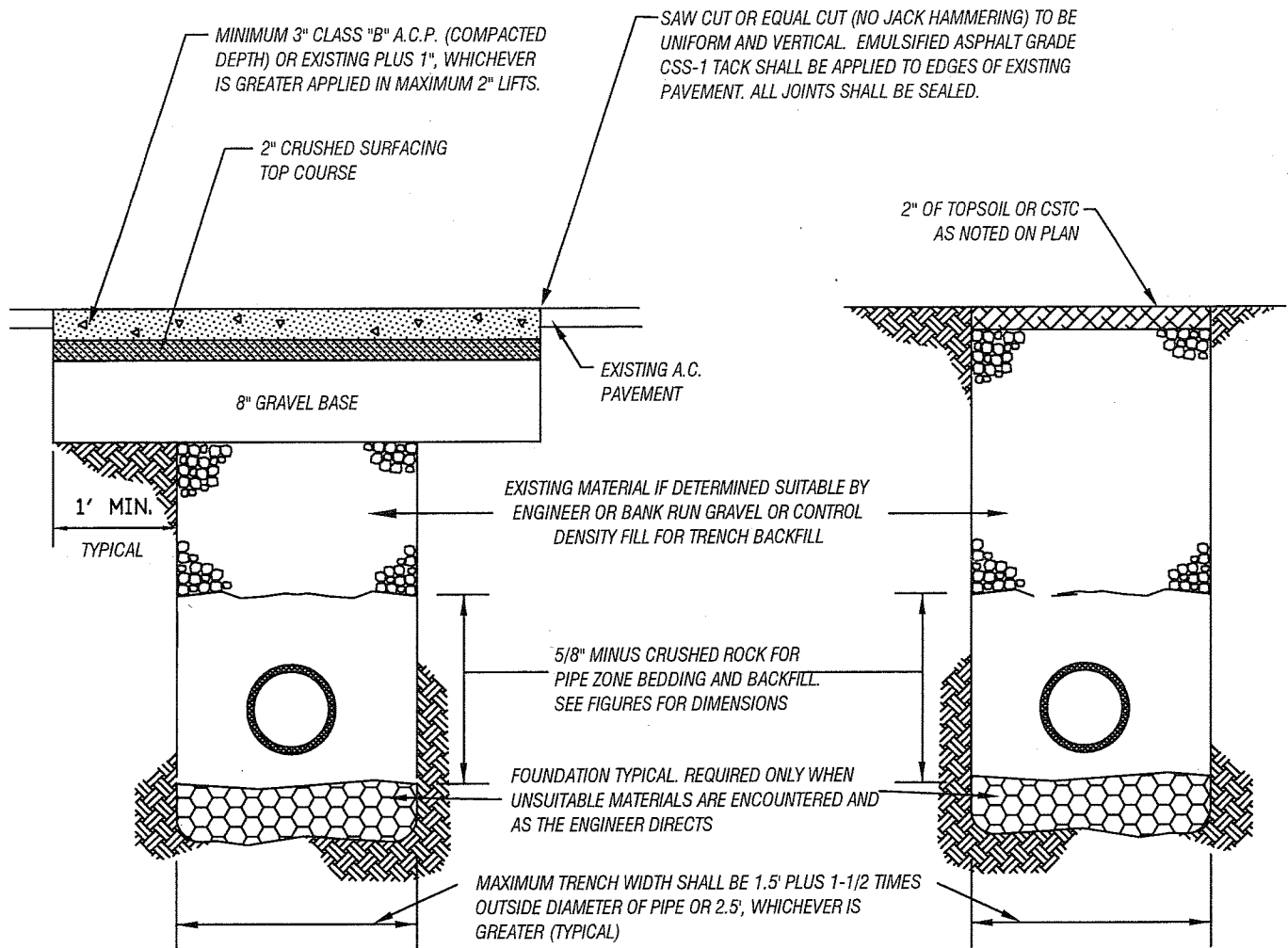
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NOT TO SCALE

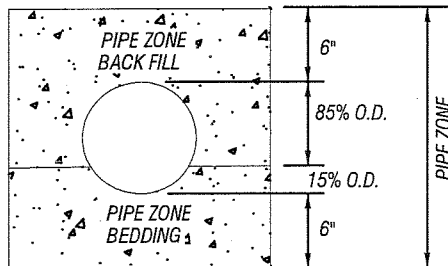
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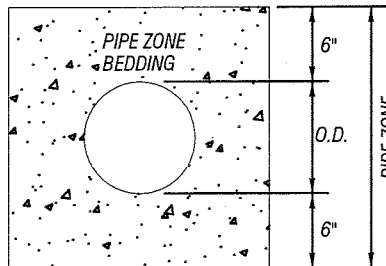
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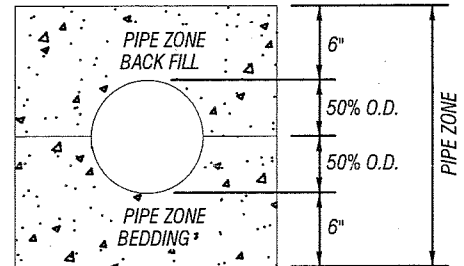
CONCRETE AND DUCTILE IRON PIPE



THERMOPLASTIC PIPE

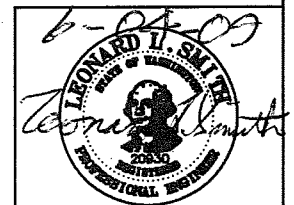


METAL PIPE



NOTES:

1. ALL MATERIALS EXCEPT A.C.P. AND BEDDING MATERIAL SHALL BE COMPACTED IN 6-INCH MAXIMUM LIFTS TO 95% DENSITY.
2. COMPACTION: BEDDING AND BACKFILL WITHIN THE PIPE ZONE SHALL BE COMPACTED TO 95% MAX. AS DETERMINED BY ASTM D1557. BACKFILL ABOVE THE PIPE ZONE SHALL BE COMPACTED TO 90% IN UNPAVED AREA, AND 95% IN PAVED OR SHOULDER AREAS AS DETERMINED BY ASTM D1557.



**CITY OF
BLACK DIAMOND**

TRENCH RESTORATION

STANDARD DWG S-23

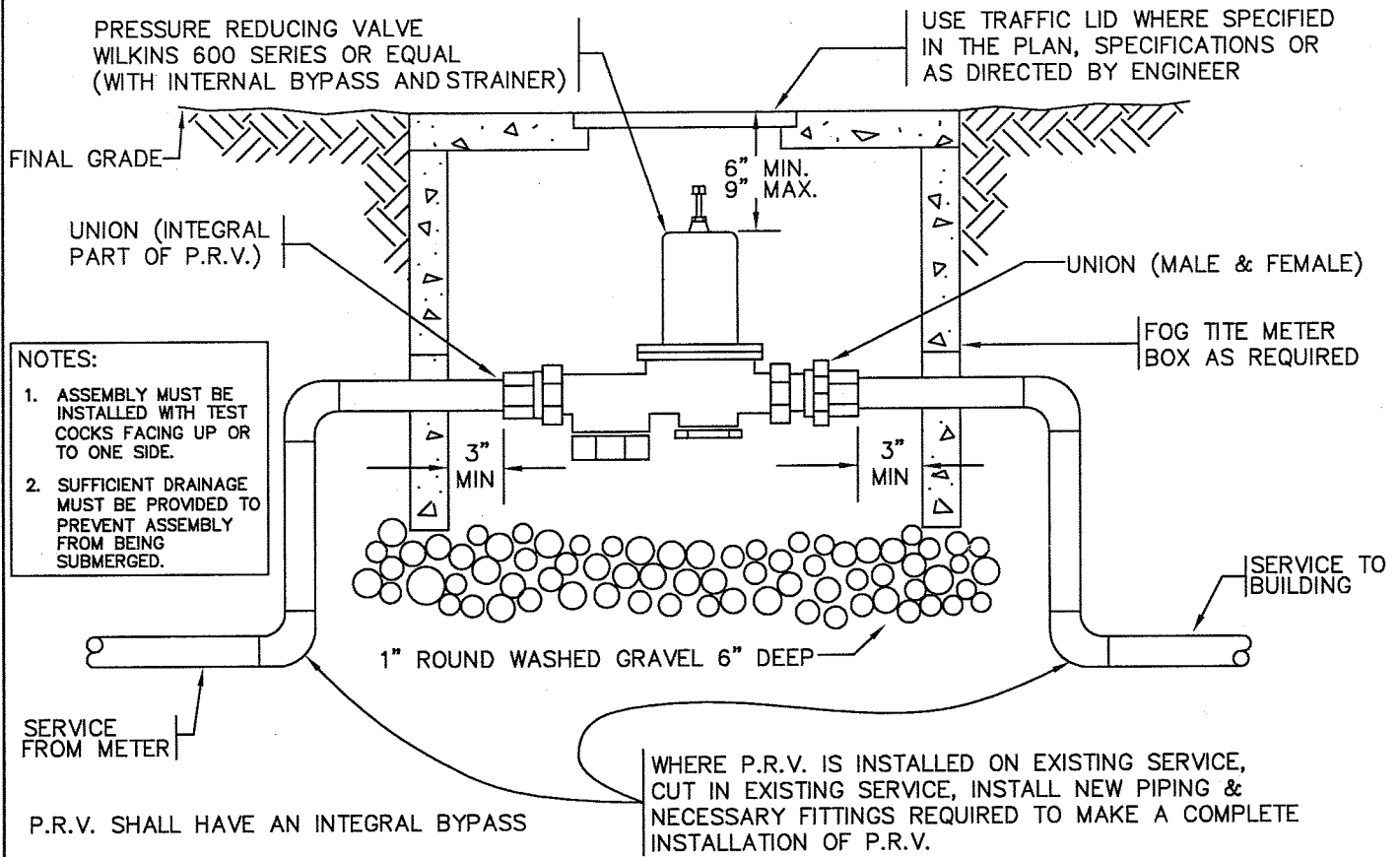
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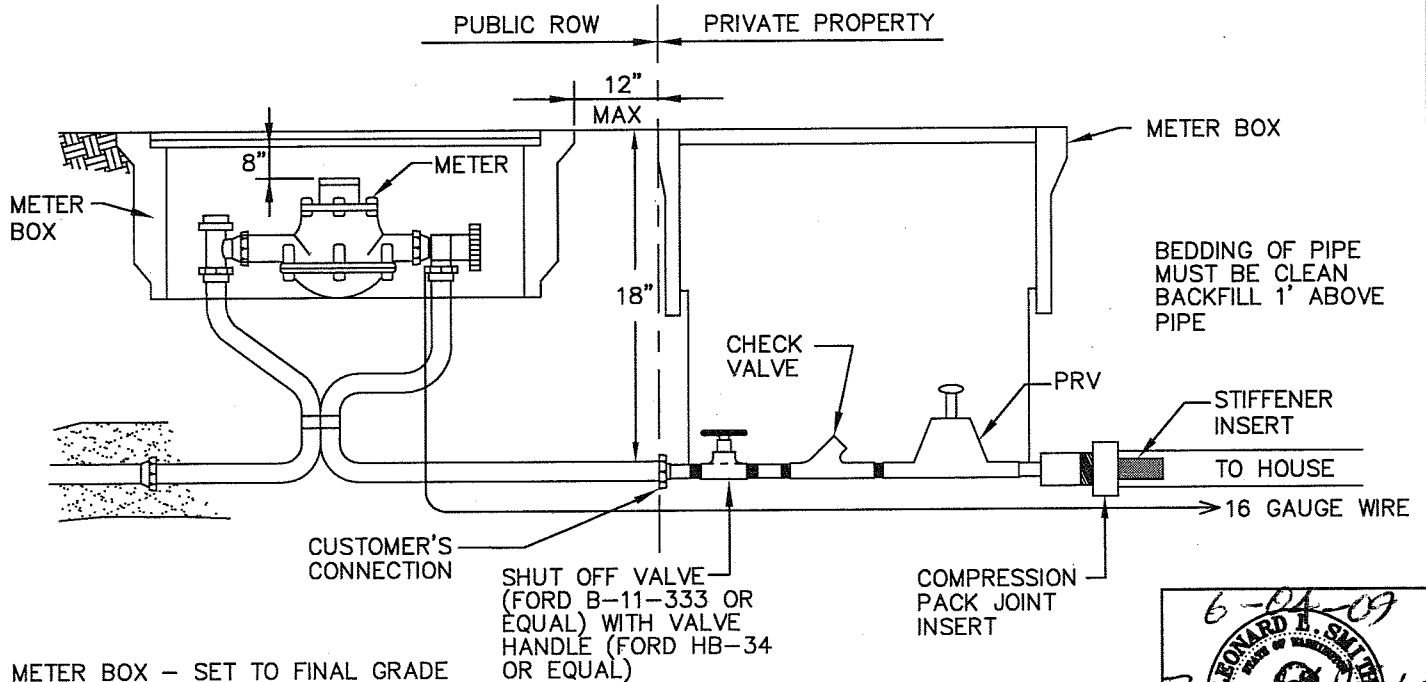


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INDIVIDUAL PRESSURE REDUCING VALVE ASSEMBLY (RESIDENTIAL)

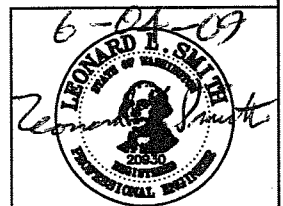


CUSTOMER WATER SERVICE



METER BOX - SET TO FINAL GRADE
SHUT OFF VALVE - B-11-333 OR EQUAL
VALVE HANDLE - HB-34
SINGLE CHECK VALVE
PRV TO CONTROL LINE PRESSURE UP TO 180 PSI (WILKINS 600 SERIES OR EQUAL)

16 GAUGE LOCATING WIRE
200 PSI POLY PIPE SDR 3408
ALL FITTINGS MUST BE BRASS



**CITY OF
BLACK DIAMOND**

**CUSTOMER WATER SERVICE WITH
INDIVIDUAL PRESSURE REDUCING VALVE
ASSEMBLY (RESIDENTIAL)**

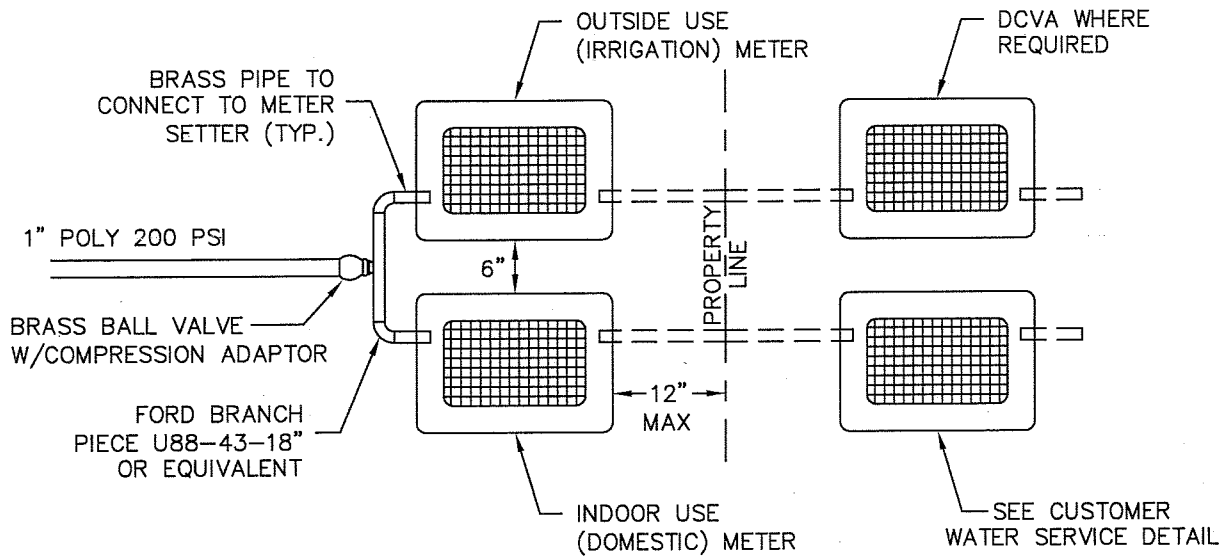
STANDARD DWG W-01

NOT TO SCALE

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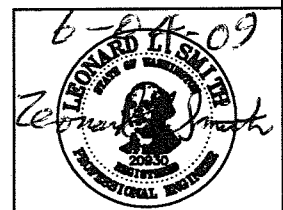


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NOTES:

1. ON EXISTING WATER SERVICES, THE CITY WILL INSTALL DUAL SERVICE AT APPLICANTS EXPENSE. BOTH SERVICES WILL REQUIRE A 12" SETTER EQUAL TO FORD 90 SERIES VBH 92-12W-11-33-A.
2. A PRV SHALL BE INSTALLED ON INDOOR USE SERVICE (AND OUTDOOR USE IF REQUIRED BY UPC) WHERE PRESSURE EXCEEDS 80 PSI.
3. D.O.H. APPROVED DOUBLE CHECK VALVE ASSEMBLY (DCVA) IS REQUIRED FOR IRRIGATION USE.



**CITY OF
BLACK DIAMOND**

**DUAL METER OR IRRIGATION METER
INSTALLATION**

STANDARD DWG W-02

NOT TO SCALE

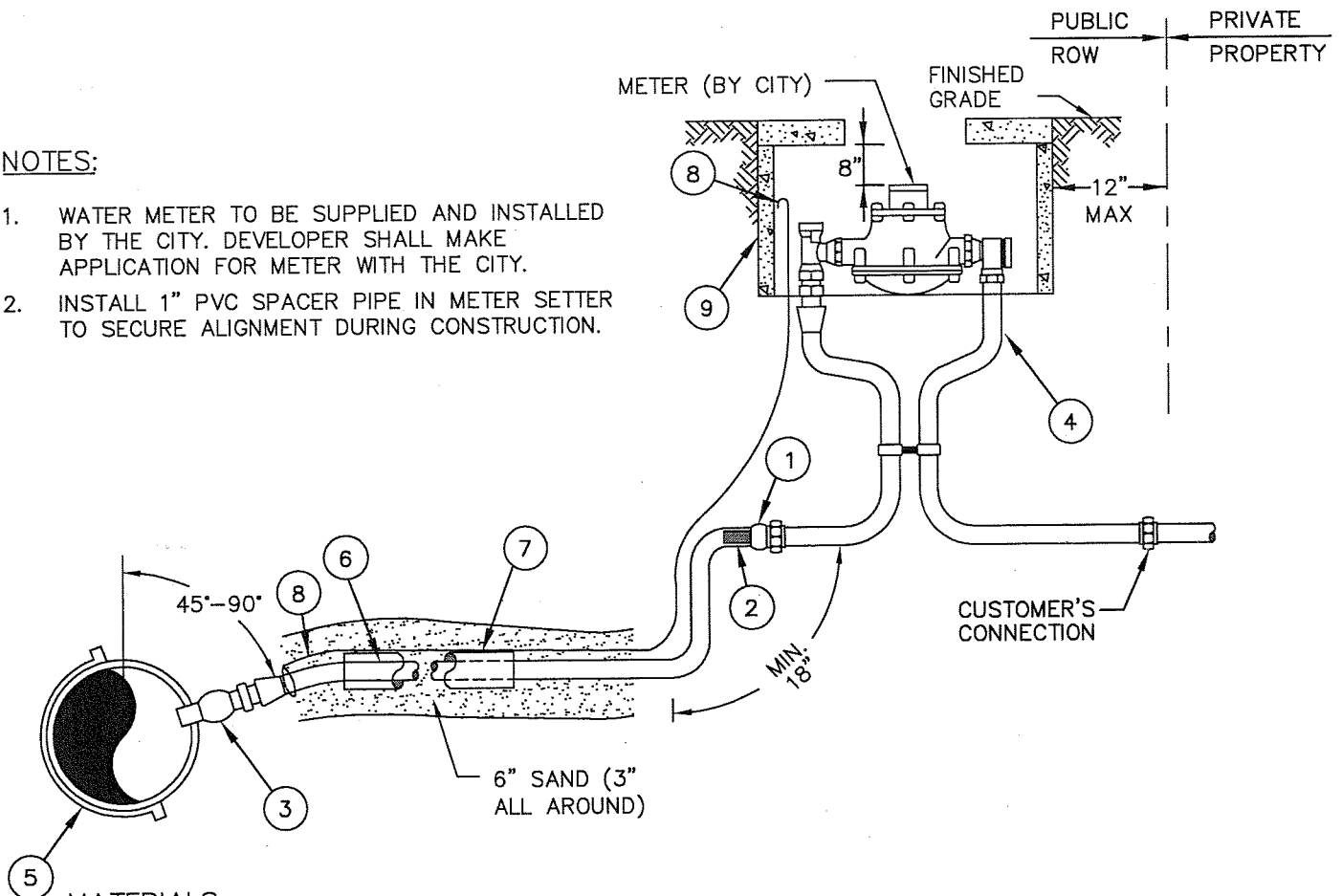
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NOTES:

1. WATER METER TO BE SUPPLIED AND INSTALLED BY THE CITY. DEVELOPER SHALL MAKE APPLICATION FOR METER WITH THE CITY.
2. INSTALL 1" PVC SPACER PIPE IN METER SETTER TO SECURE ALIGNMENT DURING CONSTRUCTION.



MATERIALS:

- ① BRASS BALL VALVE CORP STOP WITH COMPRESSION ADAPTER.
- ② 1" POLY INSERT STIFFENERS.
- ③ 1" CC BALL VALVE CORP STOP WITH COMPRESSION ADAPTER FOR POLY PIPE EQUAL TO MUELLER OR FORD. INSTALL WITH KEY FACING UP.
- ④ 12" COPPER SETTER EQUAL TO FORD 90 SERIES VBH 92-12W-11-33-A EQUIPPED AS FOLLOWS:
 - PADLOCK WINGS ON ANGLE BALL VALVE
 - ANGLE CHECK ON METER OUTLET
 - DUAL PURPOSE CONNECTIONS ON SETTER INLET & OUTLET
 - COMPRESSION ADAPTER ON SETTER INLET
 - 15" EXTENDED OUTLET TUBE
 - INSTALL STREET ELL ON INLET AS NEEDED
 COPPER SETTER SHALL BE SET LEVEL AND CENTERED IN THE METER BOX.
- ⑤ ROMAC SADDLE SINGLE STRAP FOR PIPE DIAMETERS LESS THAN 10" AND DOUBLE STRAP FOR PIPE DIAMETERS 10" AND LARGER. DOUBLE STAINLESS STEEL ON AC & PVC PIPE
- ⑥ 1" "POLY" PIPE-200 PSI (LENGTH AS REQUIRED). (1" MINIMUM DIAMETER)
- ⑦ INSTALL SERVICE LINE IN 2" PVC GUARD PIPE (SCH-80) WHEN CROSSING ROADWAY (BENEATH PAVEMENT SECTION).
- ⑧ 14 GAUGE WIRE FROM MAINLINE TAP TO METER BOX AND EXPOSE 6" MINIMUM IN BOX.
- ⑨ MID-STATE PLASTICS METER BOX MODEL MSBCF1324-18XL WITH DUCTILE IRON LID MANUFACTURED BY CARSON INDUSTRIES.



**CITY OF
BLACK DIAMOND**

5/8", 3/4", AND 1" WATER SERVICE

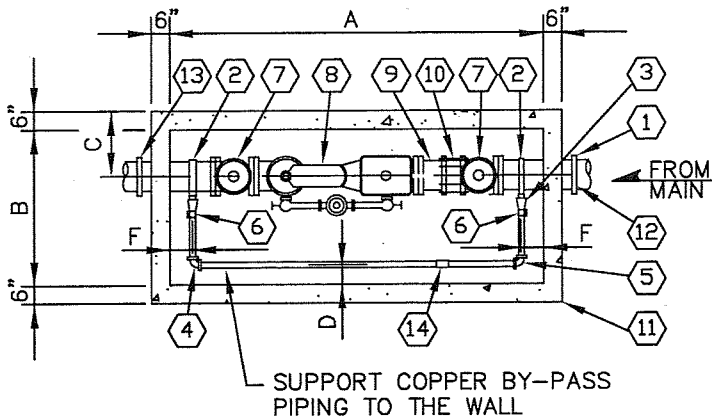
STANDARD DWG W-03

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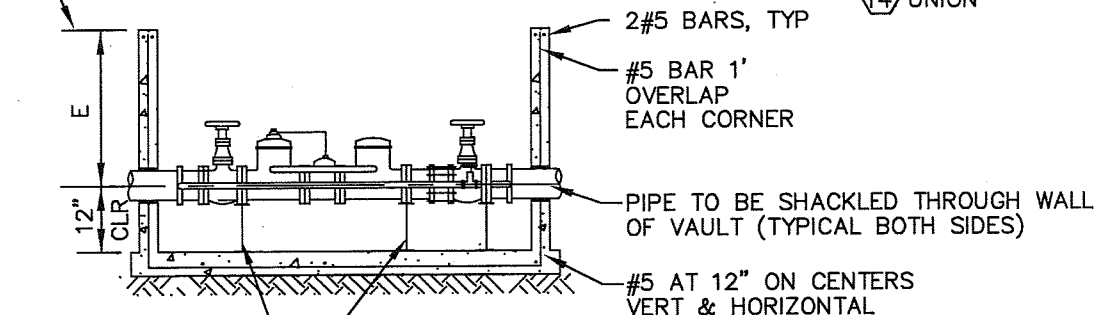
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NOTES

1. METERS SHALL BE SUPPLIED AND INSTALLED BY THE CITY. DEVELOPER SHALL MAKE APPLICATION FOR METER WITH CITY.
2. VAULT SHALL BE PRECAST, UTILITY VAULT OR OWNER APPROVED EQUAL
3. ALL PIPE & FITTINGS 4" AND LARGER SHALL BE CEMENT LINED.
4. PIPING FROM MAIN TO VAULT SHALL BE 4" ON 3" METER INSTALLATION, TEE WITH VALVE ON EXISTING MAIN REQUIRED.

3" FROM TOP OF VAULT TO FINISHED GRADE IN PLANTED AREAS



STANDON OR GRINNEL PIPE SUPPORTS

MATERIAL LIST:

1. 2-FLEX CPLG TO FIT ROCKWELL 441 (4" X 3" REDUCER, M.J. FOR 3" METER)
2. 2-DOUBLE STRAP SERVICE CLAMPS, ROMAC 101 WITH IPS TAP, OR EQUAL
3. 3-STRAIGHT CPLG. BRASS TO OUTSIDE I.P. THREAD MUELLER H-15425, H-15428 110 COMP., OR EQUAL
4. BEND CPLG BRASS TO BRASS MUELLER H-15525.
5. BEND CPLG, BRASS TO OUTSIDE I.P. THREAD MUELLER H-15530, OR EQUAL.
6. 1 BALL VALVE WITH PADLOCK WING OR LOCK CAP, FORD B21-444W OR B-21-666 WITH LOCK CAP OR B21-777 WITH LOCK CAP.
7. 2-RESILIENT SEAT GATE VALVE, FL X FL (RISING STEM)
8. 1-3" TO 10" METER AS SPECIFIED BY CITY SHALL BE FURNISHED BY CONTRACTOR/DEVELOPER.
9. 1 C.I. ADPT. FL X PE (LENGTH TO FIT)
10. 1-CPLG. ADAPT., FL ROCKWELL 912, OR OWNER EQUAL
11. PRECAST CONCRETE VAULT W/TRAFFIC LID FOR H2O LOADING (HATCH SIZE & LOCATION TO BE APPROVED BY CITY)
12. WELDED FL RESTRAINT OR SHAKLE TO THRUST BLOCK TO PREVENT MOVEMENT IF METER IS REMOVED
13. INSULATED CPLG. TO 3" CU SERVICE.
14. UNION

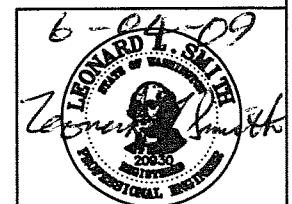
METER SIZE	MAIN-LINE	BYPASS	A	B	C	D	E	F
3"	4" DI.	1 1/2" BRASS	7'-6"	3'-0"	9"	4"	2'-8"	9"
4"	4" DI.	1 1/2" BRASS	7'-6"	3'-0"	12"	4"	2'-8"	9"
6"	6" DI.	2" BRASS	9'-6"	3'-6"	18"	4"	2'-8"	9"
8"	8" DI.	4" DI.	11'-0"	4'-0"	24"	6"	3'-6"	14"
10"	10" DI.	4" DI.	13'-0"	5'-0"	30"	6"	4'-0"	16"

NOTES:

INSTALL 4" DRAIN PIPE TO DAYLIGHT OR STORM DRAINAGE SYSTEM. 1% MIN. SLOPE.

BACKFLOW PREVENTOR REQUIRED FOR ALL FIRE LINES AND IRRIGATION LINES, IN SEPERATE VAULTS.

BRASS DOES NOT NEED TO BE PAINTED, ALL OTHER PIPE TO BE PAINTED WITH MARINE ENAMEL, MARATHON 1065 TAHOE BLUE.



**CITY OF
BLACK DIAMOND**

3" TO 10" WATER SERVICE

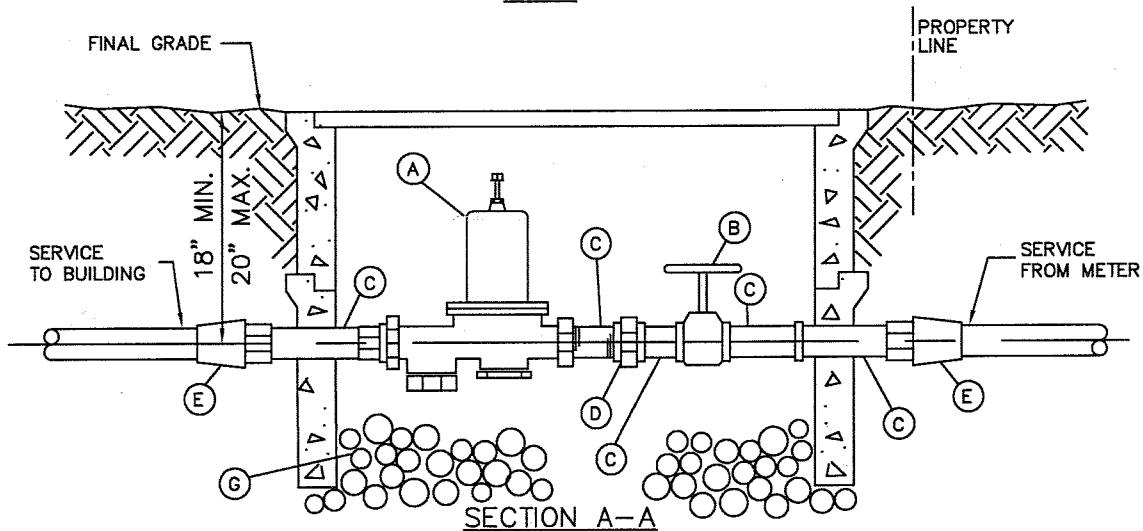
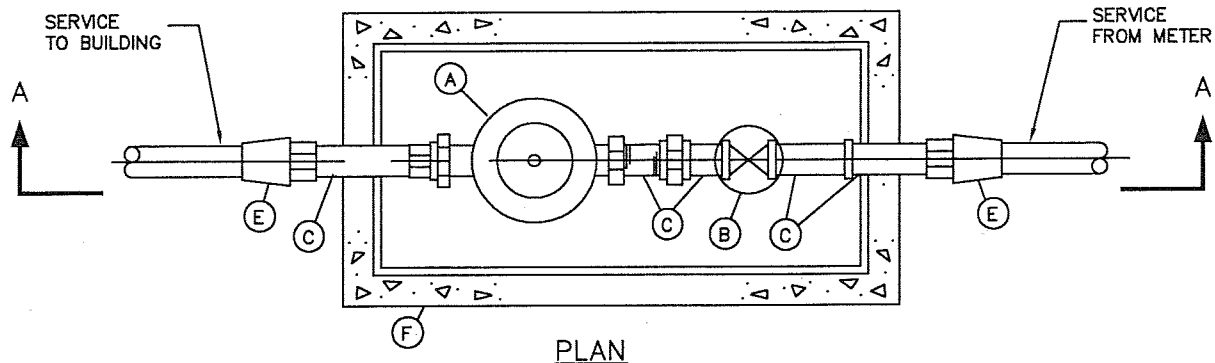
STANDARD DWG W-05

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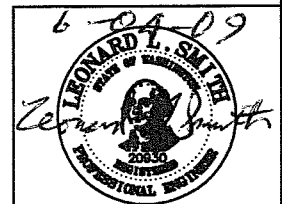


BILL OF MATERIALS

- (A) PRESSURE REGULATOR – WILKINS 600 SERIES OR EQUAL (WITH INTERNAL BYPASS AND STRAINER)
- (B) BRONZE GATE VALVE, 125-POUND, SOLID WEDGE OR DOUBLE DISC, WITH HANDWHEEL, OHIO BRASS, GRINNELL, OR EQUAL
- (C) NIPPLE x 2 1/2" LONG, MALE.
- (D) UNION, FEMALE.
- (E) ADAPTER.
- (F) METER BOX
- (G) 1" ROUND WASHED GRAVEL, 8" MIN. DEPTH.

NOTES:

1. PRESSURE REGULATOR SIZE AS SPECIFIED OR SHOWN ON PLAN.
2. SIZES FOR ITEMS (B) THROUGH (E) SHALL CORRESPOND TO THE SPECIFIED SIZE OF THE PRESSURE REGULATOR.
3. ALL FITTINGS AND NIPPLES ARE BRASS WITH IRON PIPE THREADS.



**CITY OF
BLACK DIAMOND**

INDIVIDUAL PRESSURE
REDUCING VALVE ASSEMBLY
(MULTI-FAMILY OR COMMERCIAL)

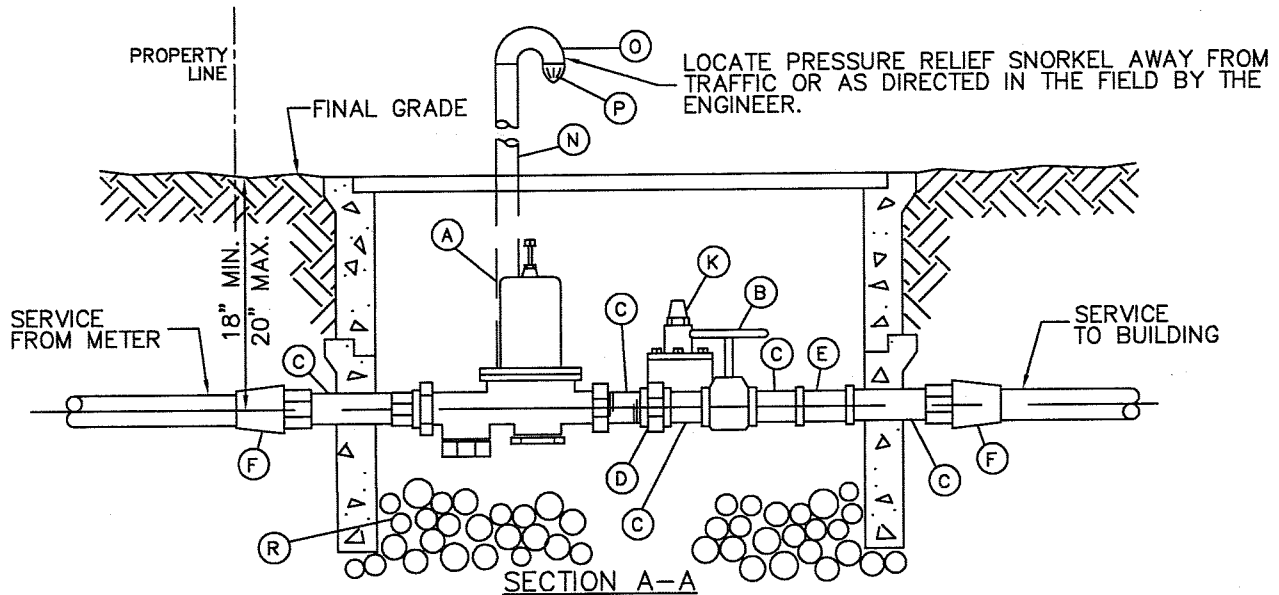
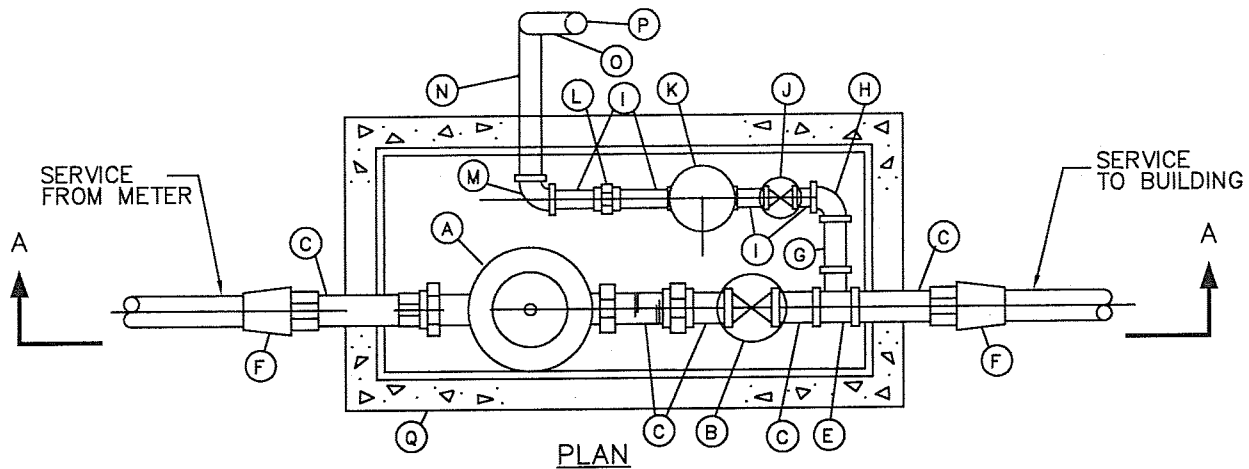
STANDARD DWG W-06

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BILL OF MATERIALS

- | | |
|---|---|
| (A) PRESSURE REGULATOR - WILKINS 600 SERIES OR EQUAL (WITH INTEGRAL BYPASS AND STRAINER) | (J) 3/4" BRONZE GATE VALVE, SOLID WEDGE TYPE - MUELLER H-10914. |
| (B) BRONZE GATE VALVE, 125-POUND, SOLID WEDGE OR DOUBLE DISC, W/HANDWHEEL, OHIO BRASS, GRINNELL OR EQUAL. | (K) 3/4" PRESSURE RELIEF VALVE - CLAVAL 55 F |
| (C) NIPPLE x 2 1/2" LONG MALE. | (L) 3/4" UNION, FEMALE. |
| (D) UNION, FEMALE. | (M) 2"x 3/4" 90° ELBOW, FEMALE. |
| (E) REDUCING TEE x 3/4" DIAMETER BRANCH, FEMALE. | (N) 2" G.I. PIPE x LENGTH TO FIT AS DIRECTED, 10' MAX. INTEGRATED LENGTH. |
| (F) ADAPTER. | (O) 2" OPEN PATTERN RETURN BEND, G.I. |
| (G) 3/4" NIPPLE x LENGTH TO FIT, MALE. | (P) 2" BEEHIVE STRAINER. |
| (H) 3/4" x 90° ELBOW, FEMALE. | (Q) 17"x 30" METER BOX W/ TRAFFIC COVER AND 12" RISER. (SEE NOTE 4.) |
| (I) 3/4" x 2 1/2" NIPPLE, MALE. | (R) 1" ROUND WASHED GRAVEL, 8" MIN. DEPTH. |

NOTES:

- PRESSURE REGULATOR SIZE AS SPECIFIED OR SHOWN ON PLAN.
- SIZES FOR ITEMS (B) THROUGH (F) SHALL CORRESPOND TO THE SPECIFIED SIZE OF THE PRESSURE REGULATOR.
- FITTINGS AND NIPPLES ARE BRASS WITH IRON PIPE THREADS, UNLESS OTHERWISE SHOWN.
- FOR 2" INSTALLATION, LARGER METER BOX IS REQUIRED, MINIMUM INSIDE LENGTH OF BOX SHALL BE 32".



**CITY OF
BLACK DIAMOND**

**INDIVIDUAL PRESSURE REDUCING VALVE
ASSEMBLY W/ PRESSURE RELIEF
(MULTI-FAMILY OR COMMERCIAL)**

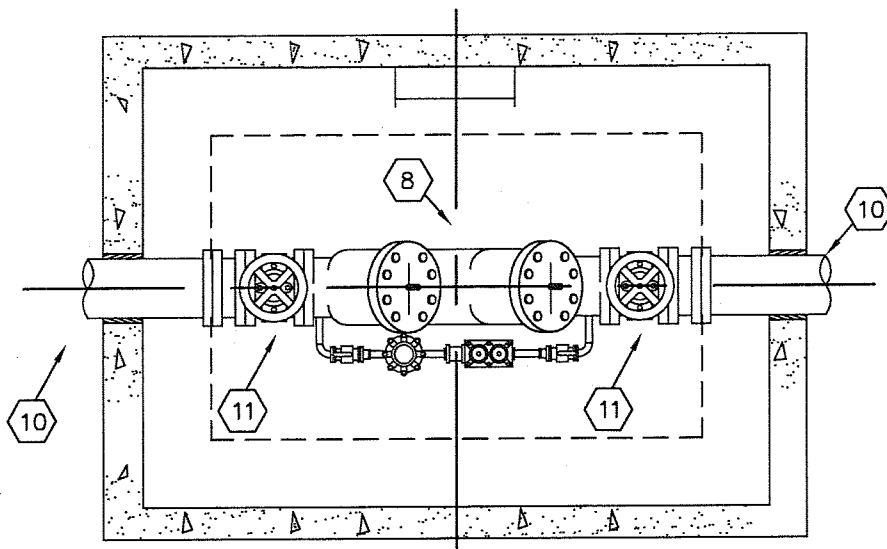
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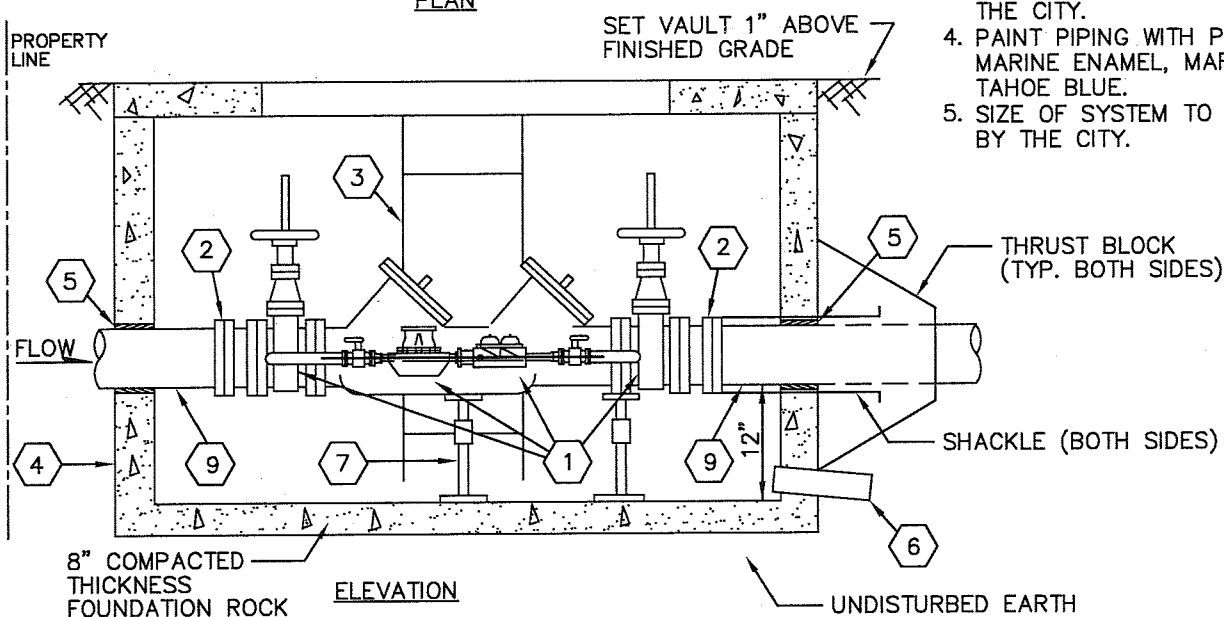
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PLAN



8" COMPACTED
THICKNESS
FOUNDATION ROCK

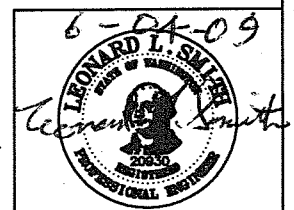
ELEVATION

UNDISTURBED EARTH

NOTES:

1. ASSEMBLY SHALL BE MAINTAINED BY PROPERTY OWNER AND ANNUAL CERTIFICATION REQUIRED.
2. FIRELINE SHALL NOT BE PUT INTO SERVICE UNTIL THE BACKFLOW PREVENTION DEVICE IS APPROVED BY THE DISTRICT.
3. A REDUCED PRESSURE BACKFLOW PREVENTION DEVICE MAY BE REQUIRED BY THE DIRECTION OF THE CITY.
4. PAINT PIPING WITH PARKER PAINT MARINE ENAMEL, MARATHON 1065, TAHOE BLUE.
5. SIZE OF SYSTEM TO BE APPROVED BY THE CITY.

- 1 DETECTOR DOUBLE CHECK VALVE ASSEMBLY. MODEL TO BE PRE-APPROVED BY CITY.
- 2 UNI-FLANGE WITH SET SCREWS
- 3 TELESCOPIC ALUMINUM LADDER TO BE SECURED TO VAULT WITH STAINLESS STEEL FASTENERS AT 3-FT MAX. INTERVALS.
- 4 CONCRETE VAULT (5'x 9'x 7'-2" INSIDE DIMENSIONS) , WITH WATERTIGHT BILCO COVER (H2O LOADING)
- 5 WATER-TIGHT GROUT. RESTRAIN INLET/OUTLET PIPE WITH WELDED FLANGE OR SHACKLE TO THRUST BLOCK TO PREVENT. SHACKLE THROUGH VAULT IF CHECK VALVE ASSEMBLY IS REMOVED.
- 6 4" DRAIN TO DAYLIGHT OR STORM WHERE APPLICABLE. MINIMUM SLOPE 1%.
- 7 ADJUSTABLE PIPE STANCHION, GRINELL PIPE SUPPORTS. (SECURE TO FLOOR)
- 8 VALVE ASSEMBLY TO BE CENTERED IN VAULT
- 9 CL. 53 D.I., MJ WITH MEGALUGS
- 10 STAINLESS STEEL SHACKLES AND THRUST BLOCK (3000PSI) AT BOTH ENDS OF VAULT.
- 11 R.S. GATE VALVE WITH HAND WHEEL OPERATION.



**CITY OF
BLACK DIAMOND**

**DETECTOR DOUBLE CHECK
VALVE ASSEMBLY**

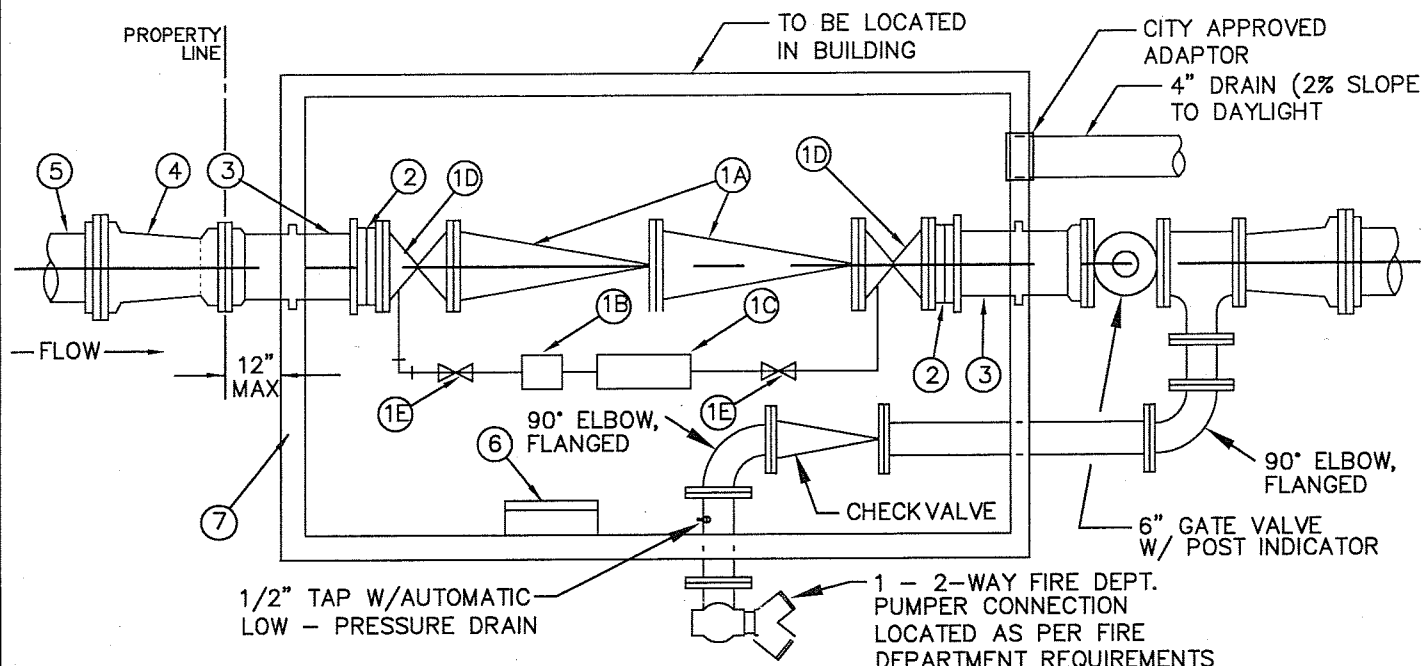
STANDARD DWG W-08

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LEGEND

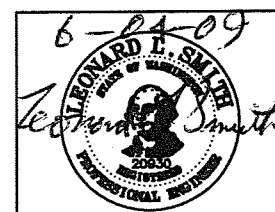
- ①. DOUBLE-CHECK DETECTOR VALVE ASSEMBLY CAPABLE OF METERING WATER USAGE UNDER LOW FLOW CONDITIONS. 10.0 P.S.I. HEAD LOSS AT 1600 GPM FOR 8" SIZE. ASSEMBLY TO BE STATE DOH APPROVED. SIZE AS SPECIFIED ON PLANS (SENSUS TOUCH READ)
 - 1A. 2 - CHECK VALVES, (FL)
 - 1B. 1 - BY-PASS METER 5/8" X 3/4" SENSUS C.F. READING METER COMPLETE WITH SPUD NUT.
 - 1C. 1 - DOUBLE CHECK VALVE ASSEMBLY, (DOH APPROVED.) 3/4" FOR 8" D.D.C.V.
 - 1D. 2 - GATE VALVES, (FL) W/HAND WHEEL; RISING STEM, RESILIENT SEATED AS PER STATE REQUIREMENTS.
 - 1E. 2 - GATE VALVES, (FL) W/HAND WHEEL; RISING STEM, RESILIENT SEATED AS PER STATE REQUIREMENTS.
- ②. 2 - FLANGED COUPLING ADAPTER, SIZE AS SPECIFIED ON PLANS. (LOCATE MINIMUM 6" FROM INNER WALL)
- ③. 2 - PIPE SPOOLS, PLAIN END. SAME SIZE AS SPECIFIED ON PLANS.
- ④. 1- REDUCER (MJ X MJ), IF REQUIRED. SIZE AS SPECIFIED ON PLANS.
- ⑤. WATER MAIN CL52, SIZE AS SPECIFIED ON PLANS.
- ⑥. ALUMINUM (TELESCOPING) LADDER, LOCATE AS DIRECTED BY CITY. USE STAINLESS STEEL FASTENERS AT 3' MAX. SPACING.
- ⑦. UTILITY VAULT CO. VAULT OR APPROVED EQUAL. HINGED AND SPRING LOCKED STEEL DIAMOND P/L COVER 2-332P, (DOUBLE HATCH COVER) 4" C.I. FLOOR DRAIN INTO 6" PVC DRAIN LINE. DAYLIGHT OR STORM SYSTEM CONNECTION. (NO SUMP PUMPS) CHECK VAULT SIZE REQUIRED FOR ENCLOSING COMPLETE ASSEMBLIES.
- ⑧. PROVIDE GRINNEL PIPE SUPPORTS, TO INCLUDE STEEL YOKE, BOLT TO VAULT FLOOR USING RECOMMENDED CONNECTION AND SIZES.

MIN. VAULT SIZES:

4"	5106 LA	--	5'-0" X 10'-6" X 6'-3" HIGH
6"	5106 LA	--	5'-0" X 10'-6" X 6'-3" HIGH
8"	612 LA	--	6'-0" X 12'-0" X 6'-6 1/2" HIGH
10"	612 LA	--	6'-0" X 12'-0" X 6'-6 1/2" HIGH

NOTE:

1. PAINT ALL PIPING WITH PARKER PAINT MARINE ENAMEL, MARATHON 1065 TAHOE BLUE.
2. PROVIDE GRINNEL PIPE SUPPORTS WHERE REQUIRED (3" MIN.)
3. GATE VALVE TO BE LOCATED AT MAIN AND AT LOCATION THAT SEPARATES PUBLIC WATER LINE FROM PRIVATE WATER LINE.



**CITY OF
BLACK DIAMOND**

DOUBLE CHECK DETECTOR WITH FIRE CONNECTION

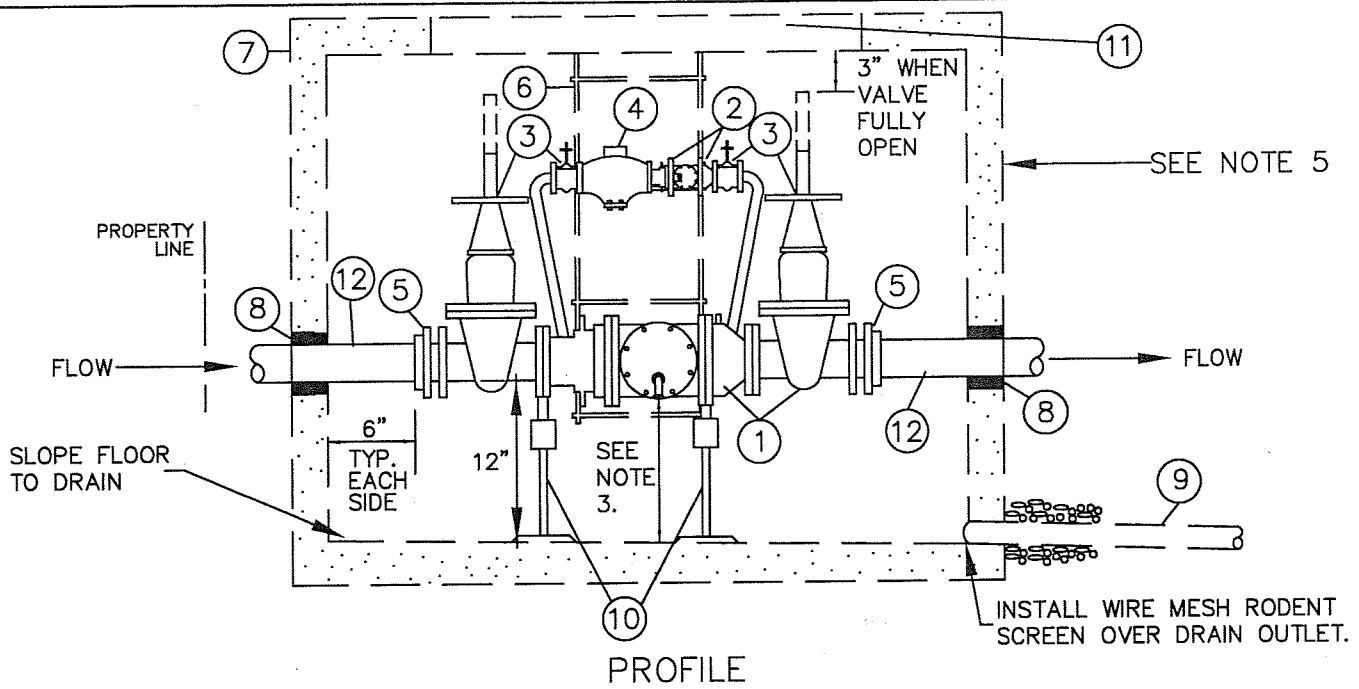
STANDARD DWG W-09

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- ① STATE APPROVED REDUCED PRESSURE PRINCIPLE BACKFLOW ASSEMBLY, COMPLETE WITH (2) RESILIENT SEATED O.S.&Y. GATE VALVES AND (4) RESILIENT SEATED TEST COCKS, AND BRASS OR COPPER DETECTOR BY-PASS, CENTERED IN VAULT.
- ② STATE APPROVED 3/4" REDUCED PRESSURE PRINCIPLE ASSEMBLY ON BY-PASS, COMPLETE WITH (2) RESILIENT SEATED BALL VALVES AND (4) RESILIENT SEATED TEST COCKS.
- ③ EACH VALVE SHALL BE MARKED WITH MODEL NUMBER WITH DESIGNATION OF RESILIENT SEAT: SUCH AS "RS OR "R", WHICH MUST BE CAST, MOLDED, OR AFFIXED ONTO THE BODY OR BONNET OF THE VALVE. ALL FERROUS BODIED VALVES SHALL BE COATED WITH A MIN. OF 4MLS. EPOXY OR EQUIVALENT POLYMERIZED COATING.
- ④ 3/4" METER (CUBIC FEET READING) AS REQUIRED.
- ⑤ UNI-FLANGE WITH SETSCREWS.
- ⑥ ONE GALVANIZED STEEL LADDER TO BE SECURED TO VAULT.
- ⑦ CONCRETE VAULT WITH A MINIMUM OF 2, 3'x3' DIAMOND PLATE DOORS RATED FOR H-20 LOADING, MARKED "WATER". VAULT SHALL BE EQUAL TO UTILITY VAULT CO. MODEL LISTED IN TABLE BELOW.
- ⑧ WATER TIGHT GROUT. RESTRAIN INLET/OUTLET PIPE WITH WELDED FLANGE OR ANCHOR BLOCK.
- ⑨ DRAIN, SLOPE TO DAYLIGHT OR STORM. TO BE LAID IN LINE ON GRADE, DRAIN TO BE TWICE THE DIAMETER OF THE RP DEVICE MINIMUM.
- ⑩ TWO ADJUSTABLE PIPE STANCHIONS, BOLTED TO FLOOR.
- ⑪ ACCESS TO BE CENTERED OVER METER.
- ⑫ CL. 52 D.I., M.J. WITH RETAINER GLANDS.

SIZE	MIN. VAULT SIZE (INSIDE)			UTIL. VAULT CO. MODEL	UTIL. VAULT CO. COVER
3"	4'-9"	4'-8"	3'-11"	675-WA	675-2-332P
4"	5'-0"	5'-3"	4'-7"	675-WA	675-2-332P
6"	5'-1"	6'-6"	5'-5"	676-WA	676-2-332P
8"	5'-9"	7'-7"	7'-1"	687-LA	687-TL-2-332
10"	5'-10"	8'-8"	8'-0"	612-2X	612-3-332P

NOTES:

1. DAYLIGHT DRAIN MUST BE ABLE TO BE LINE SIGHTED, INSTALLED ABOVE MAXIMUM FLOOD LEVEL, AND BE ABLE TO HANDLE THE VOLUME OF WATER THAT CAN BE DISCHARGED FROM THE RELIEF VALVE PORT.
2. WHEN THE REDUCED PRESSURE ASSEMBLY IS LOCATED INSIDE A BUILDING A SIZED DRAIN LINE SHALL BE PROVIDED FOR RELIEF PORT. THERE MUST BE AN APPROVED AIR GAP BETWEEN THE RELIEF PORT AND DRAIN.
3. ALLOW 12"+ NOMINAL DIAMETER OF ASSEMBLY CLEARANCE BELOW RELIEF PORT FOR REPAIR.
4. ASSEMBLY TO BE MAINTAINED BY OWNER AND ANNUAL CERTIFICATION REQUIRED.
5. REDUCED PRESSURE PRINCIPLE BACKFLOW ASSEMBLY WILL BE ALLOWED TO BE INSTALLED IN VAULTS ONLY IN CASES WHERE NO OTHER MEANS OF INSTALLATION IS AVAILABLE AND AS APPROVED BY THE CITY OF BLACK DIAMOND.
6. FIRELINE SHALL NOT BE PUT INTO SERVICE UNTIL THE BACKFLOW PREVENTION ASSEMBLY IS APPROVED BY THE CITY OF BLACK DIAMOND.
7. MINIMUM CLEARANCE BETWEEN ASSEMBLY AND WALL ON LADDER SIDE OF VAULT IS 24". MINIMUM CLEARANCE FROM OPPOSITE WALL 12". ALL CLEARANCES SHOWN ARE MINIMUM.
8. VAULTS SHALL NOT BE INSTALLED IN AREAS WITH VEHICULAR TRAFFIC.
9. TEE AND GATE VALVE REQUIRED ON MAIN.
10. FDC & PIV TO BE LOCATED DOWNSTREAM OF RPBA.



**CITY OF
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**REDUCED PRESSURE PRINCIPLE
BACKFLOW ASSEMBLY W/DETECTOR**

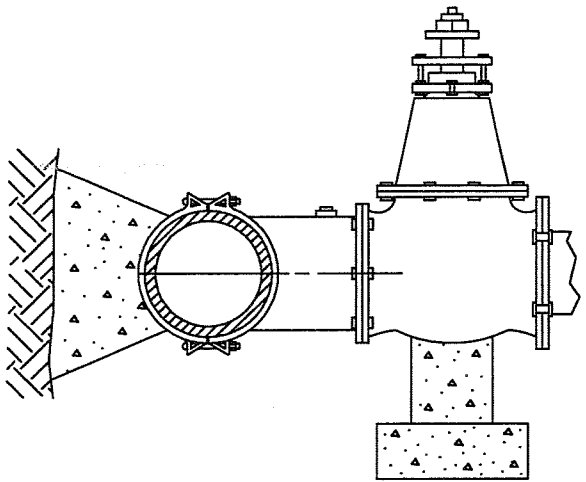
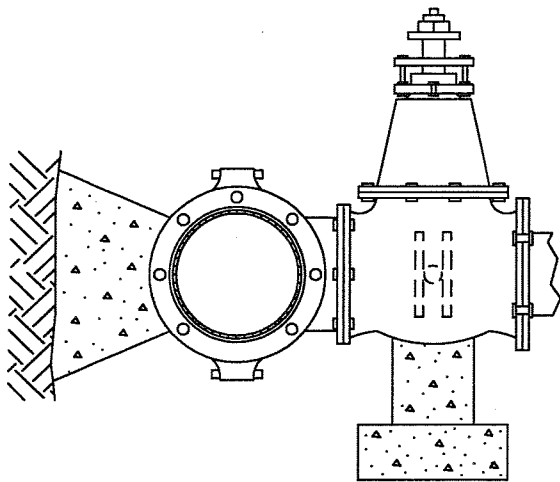
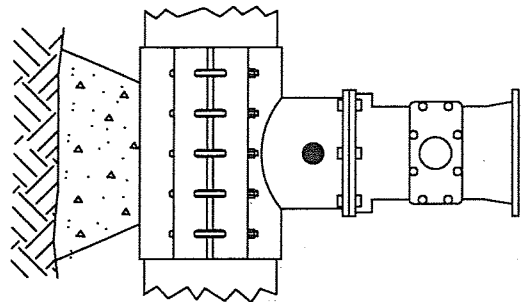
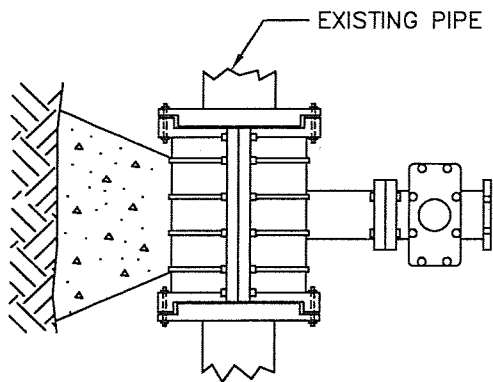
STANDARD DWG W-10

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CAST IRON TAPPING TEE MECHANICAL JOINT SLEEVE

INSTALLED ON ASBESTOS CEMENT PIPE,
CAST IRON PIPE AND DUCTILE IRON PIPE.

STAINLESS STEEL OR STEEL TAPPING TEE

STAINLESS STEEL TAPPING TEE

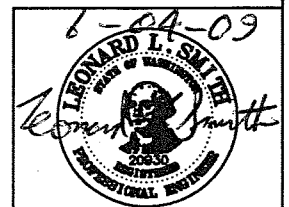
INSTALLED ON ASBESTOS CEMENT PIPE,
CAST IRON PIPE AND DUCTILE IRON
PIPE.

NOTES:

1. STAINLESS STEEL TAPPING TEES SHALL HAVE FULL CIRCLE SEAL. BOLTS AND NUTS SHALL BE STAINLESS STEEL.
2. STEEL TAPPING TEES SHALL BE EPOXY COATED. BOLTS AND NUTS SHALL BE COR-TEN, OR STAINLESS STEEL.
3. ALL TEES AND VALVES TO BE WATER TESTED BEFORE TAP.
4. TAP SHALL BE AT LEAST 2" SMALLER DIAMETER THAN THE EXISTING MAIN. (NO SAME SIZE TAPS SHALL BE ALLOWED.)
5. OPERATION OF GATE VALVE SHALL BE BY CITY PERSONNEL ONLY. CONTRACTOR SHALL NOT OPERATE VALVE.
6. VALVE BOX TO HAVE A LOCKING LID UNTIL ACCEPTED BY CITY.

STEEL TAPPING TEE

INSTALLED ON DUCTILE IRON PIPE ONLY.



**CITY OF
BLACK DIAMOND**

TAPPING TEES

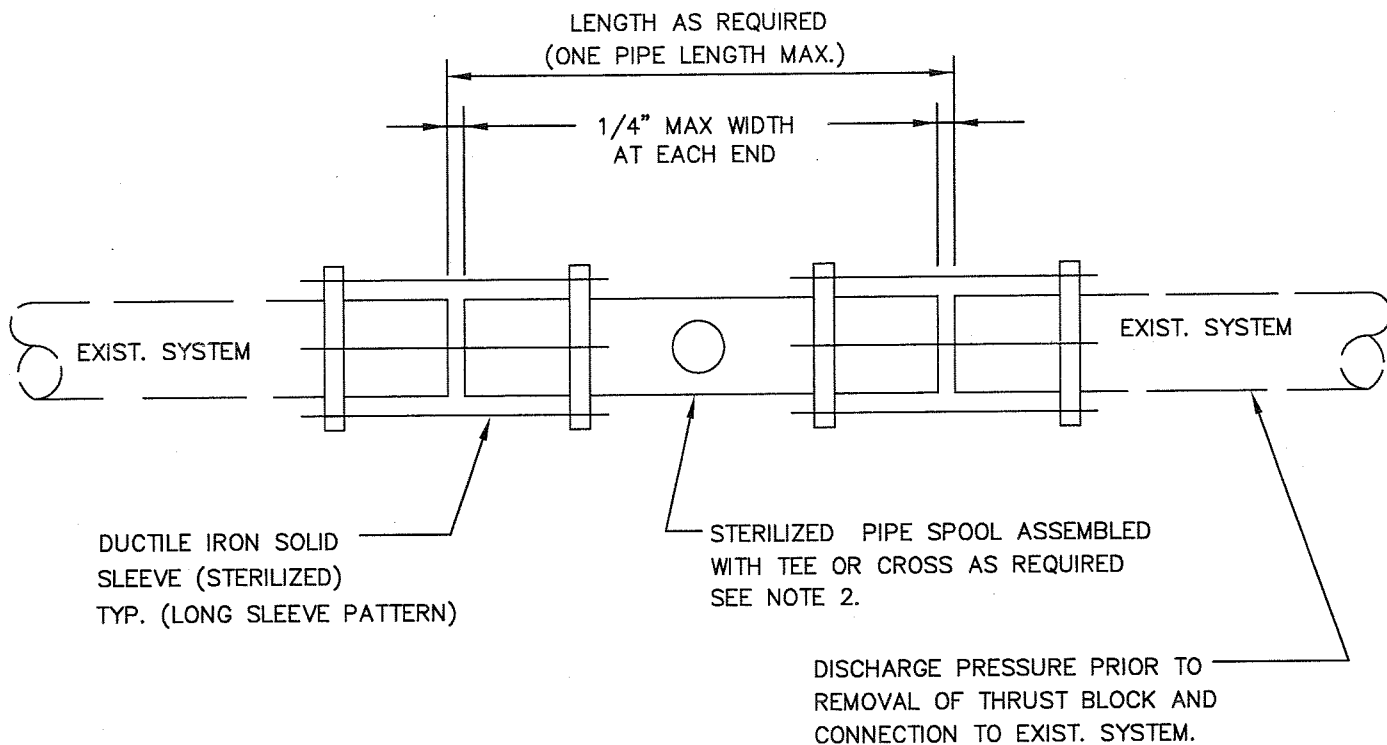
STANDARD DWG W-11

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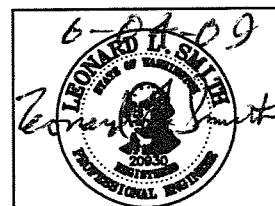


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NOTE:

1. NO DEFLECTION SHALL BE ALLOWED AT EITHER COUPLING.
2. CUT-IN CONNECTIONS ON STEEL PIPE TO USE D.I. X O.D. STEEL TRANSITION COUPLINGS, ROMAC OR EQUAL.
3. IN-LINE VALVE(S) IN EXISTING SYSTEM MAY BE REQUIRED AT THE SOLE DISCRETION OF THE CITY AT ALL NEW INTERTIE LOCATIONS. (NOTE: VALVE(S) ARE NOT SHOWN ABOVE FOR CLARITY.)



**CITY OF
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CUT IN CONNECTION

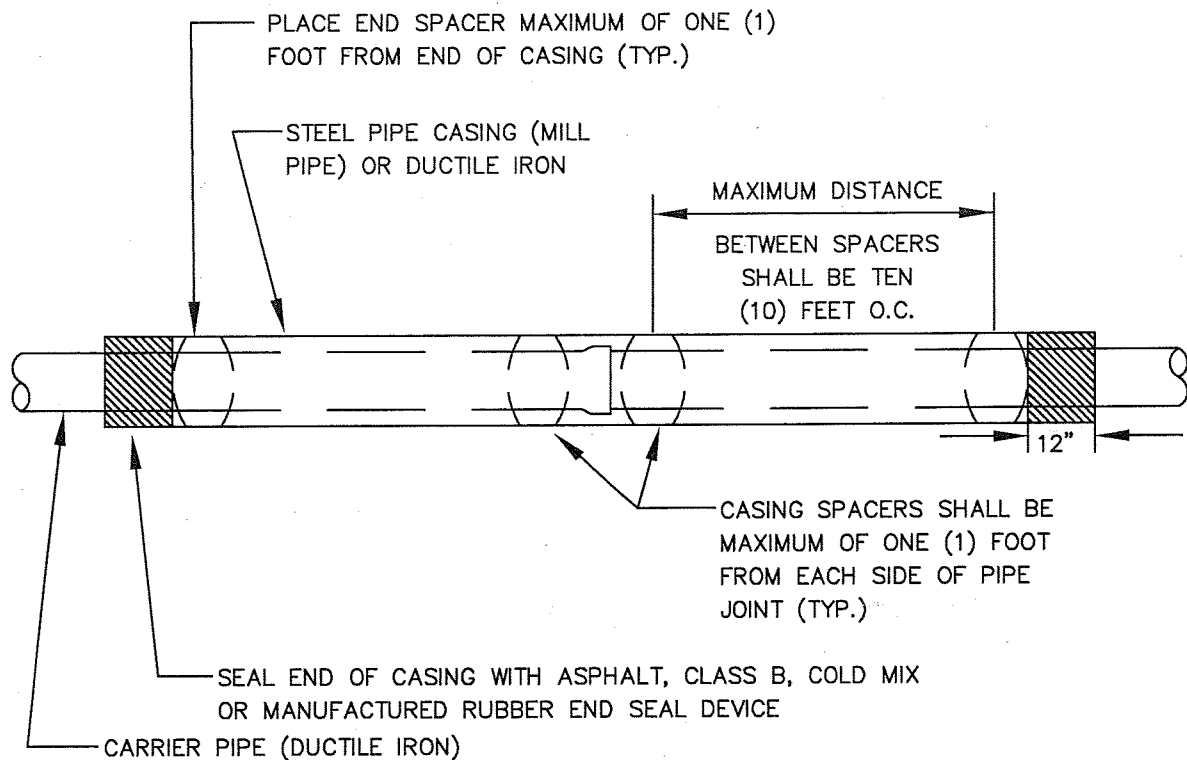
STANDARD DWG W-12

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CASING SPACERS (SEE APPROVED MATERIALS LIST)

CARRIER PIPE DIAMETER	4"	6"	8"	10"	12"
CASING DIAMETER (PUSH-ON JOINT CARRIER PIPE)	10"	12"	14"	16"	20"
CASING DIAMETER (MJ/MEGALUG JOINT CARRIER PIPE)	14"	16"	18"	20"	22" *
STEEL CASING THICKNESS	0.25"	0.25"	0.25"	0.25"	0.25"
SPACER BAND WIDTH	8"	8"	8"	8"	8"

* 24" FOR DUCTILE IRON CASING.

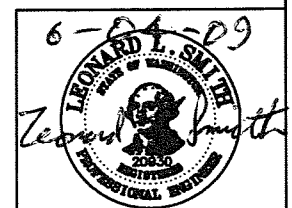
ANTICORROSIVE COATING THICKNESS:

CARRIER - 8 MILLS DFT

CASING - 8 MILLS DFT

NOTES:

- CASING SPACERS SHALL BE "CENTER POSITIONING" TYPE.
- MINIMUM RUNNER WIDTH SHALL BE 2 INCHES.
- RUNNER HEIGHT SHALL BE SIZED TO PROVIDE:
 - MINIMUM 0.75" BETWEEN CARRIER PIPE BELL AND CASING PIPE WALL AT ALL TIMES.
 - MINIMUM 1" CLEARANCE BETWEEN RUNNERS AND TOP OF CASING WALL TO PREVENT JAMMING DURING INSTALLATION.
- STEEL CASING DIAMETERS ARE "OUTSIDE DIAMETER" FOR 16" & LARGER.
- SPACER BAND WIDTH SHALL BE 12" FOR CARRIER PIPES THAT ARE 36" DIAMETER OR GREATER.
- FILL CASING PIPE WITH SAND



**CITY OF
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CASING INSTALLATION

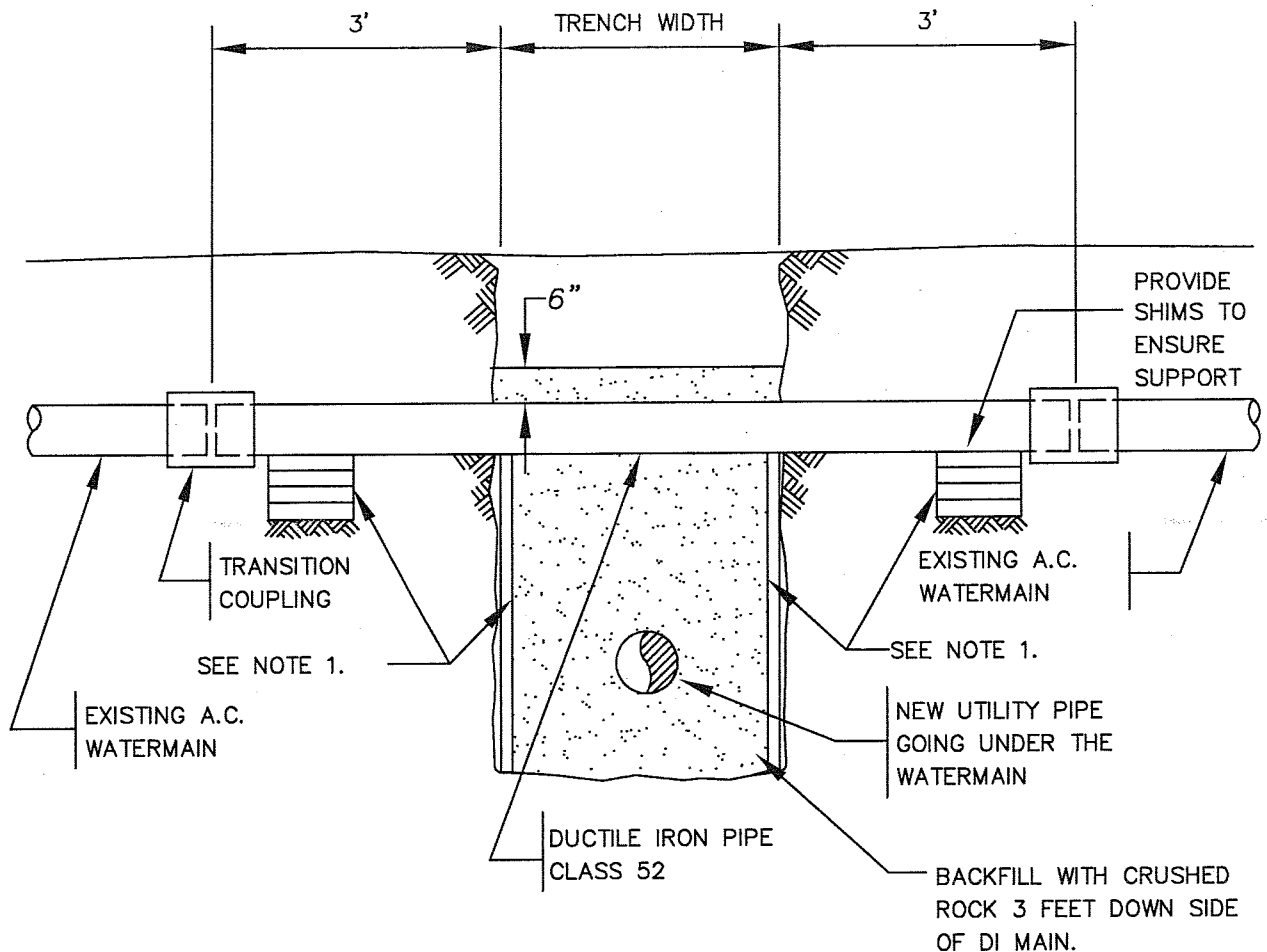
STANDARD DWG W-13

NOT TO SCALE

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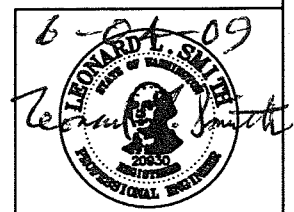


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NOTES:

1. D.I. PIPE SHALL REST ON FIRM BEARING EARTH:
SHORE TRENCH WALL UNDER WATERMAIN AS SHOWN, OR SUPPORT PIPE WITH PATIO BLOCKS (8"x16"x 2"). STACK BLOCKS AS REQUIRED TO REST ON FIRM BEARING SOIL.
2. THE CONTRACTOR IS REQUIRED TO MAINTAIN WORKERS' EXPOSURE TO ASBESTOS MATERIAL AT OR BELOW THE LIMIT PRESCRIBED IN WAC 296-62-07705.
3. ASBESTOS CEMENT PIPE SHALL BE CUT WITH A HAND-OPERATED CARBIDE BLADE CUTTER WITH CONTROLLED FLOWING WATER.
4. THIS DETAIL SHALL BE APPLICABLE IF REQUIRED BY THE CITY.
BACKFILLING OF THE AC WATERLINE TRENCH WITH APPROVED MATERIALS MAY BE SUFFICIENT, AT THE SOLE DISCRETION OF THE CITY.



**CITY OF
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TYPICAL A.C. WATERMAIN CROSSING REPLACEMENT DETAIL

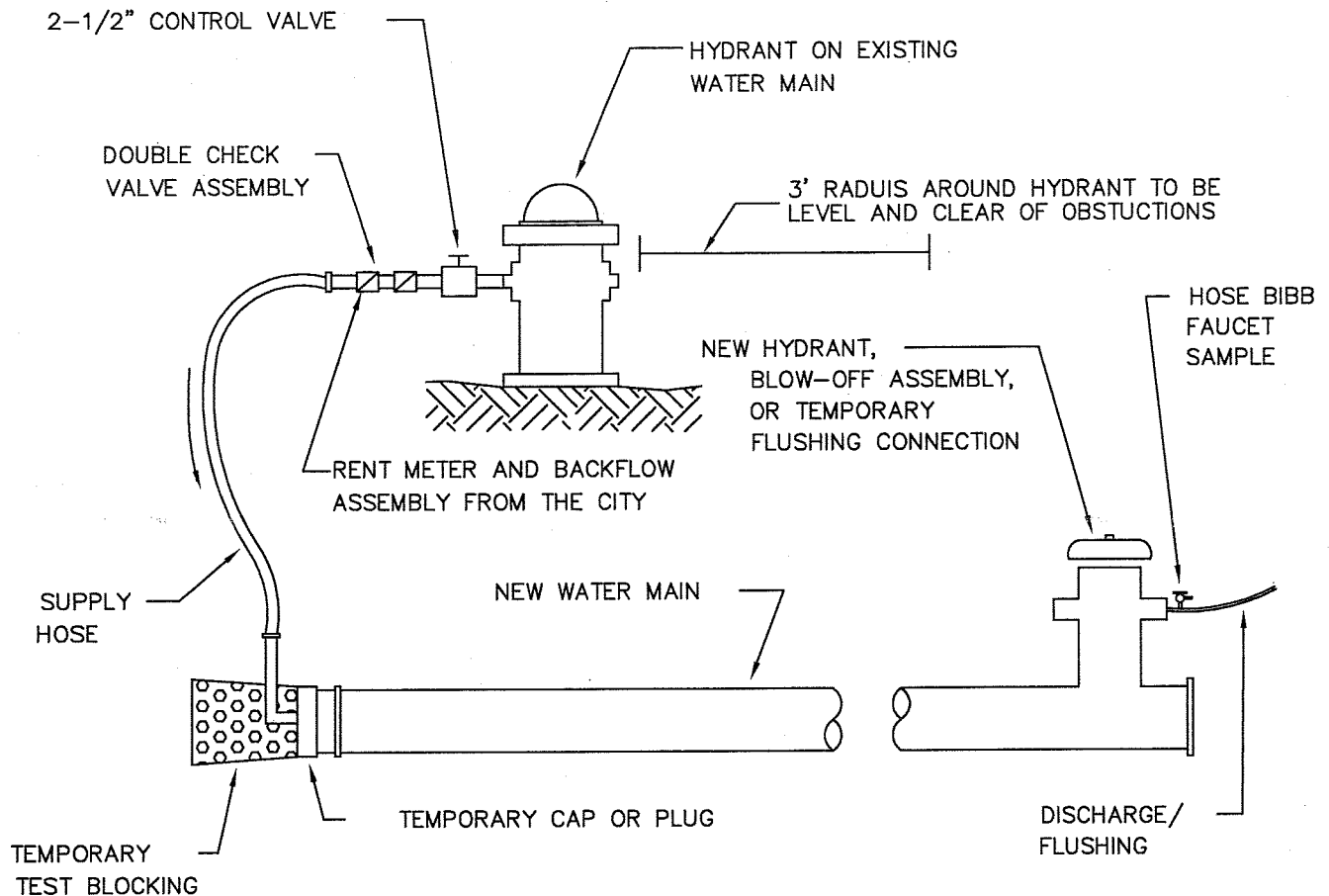
STANDARD DWG W-14

NOT TO SCALE

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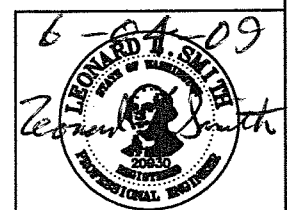


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NOTES:

1. AN APPROVED BACKFLOW PREVENTION ASSEMBLY SHALL BE INSTALLED BETWEEN THE EXISTING AND NEW WATER LINES DURING DISINFECTION AND FLUSHING OF NEW WATERMAIN.
2. THE BACKFLOW PREVENTION ASSEMBLY AND SUPPLY HOSE MUST BE DISCONNECTED DURING HYDROSTATIC PRESSURE TESTING OF THE NEW MAIN.
3. THE NEW WATERMAIN SHALL BE CONNECTED TO THE EXISTING SYSTEM ONLY AFTER NEW MAIN IS FLUSHED, DISINFECTED AND SATISFACTORY BACTERIOLOGICAL SAMPLE RESULTS ARE OBTAINED.
4. THE INTERIORS OF ALL PIPES AND FITTINGS TO BE USED IN FINAL CONNECTION MUST BE SWABBED OR SPRAYED WITH A 1% AVAILABLE CHLORINE SOLUTION.



**CITY OF
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FILLING NEW WATER MAINS

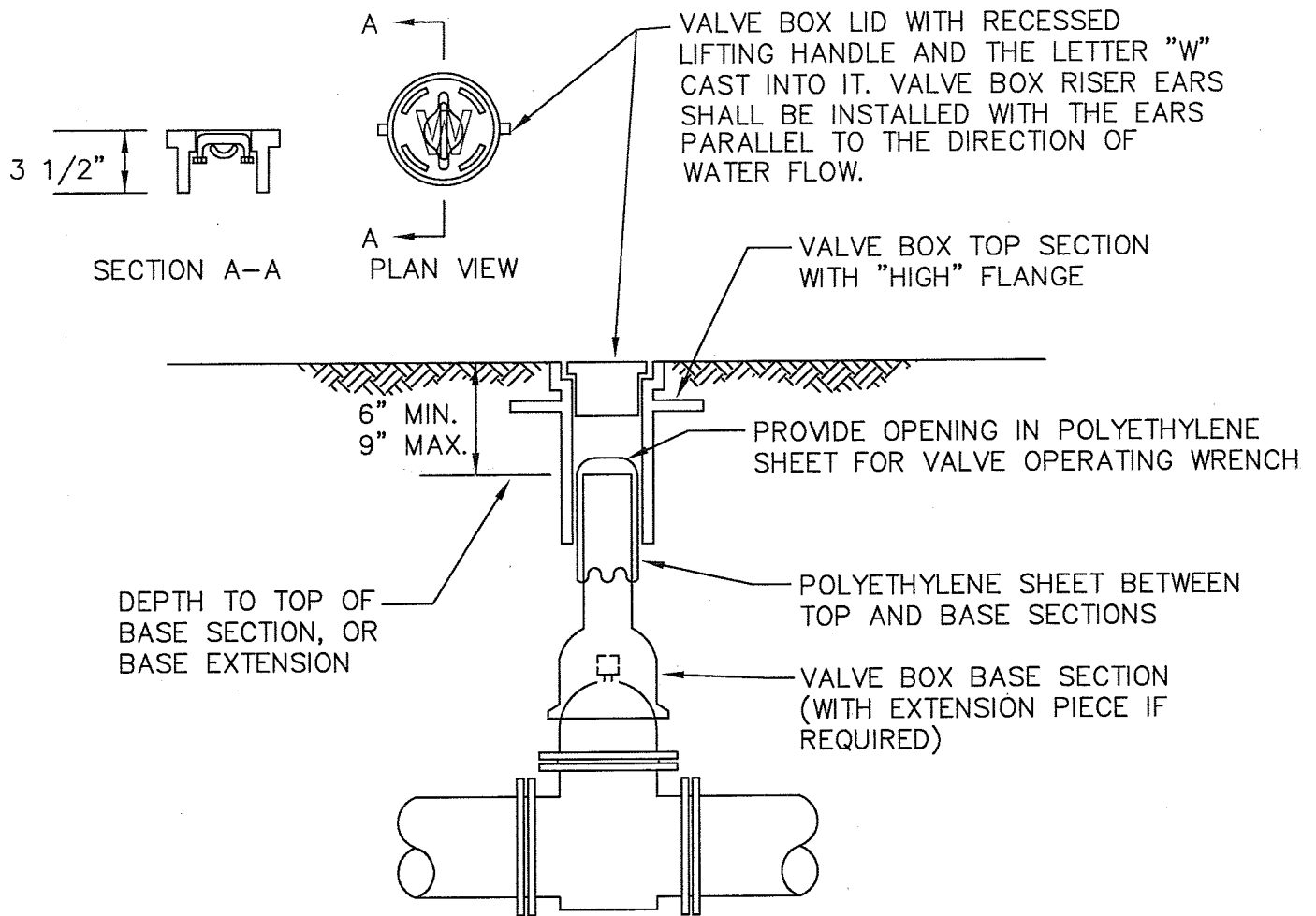
STANDARD DWG W-15

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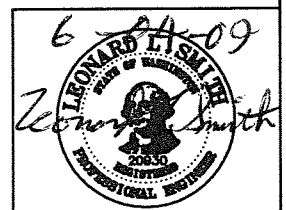
ALL PARTS SHALL BE CAST OR DUCTILE IRON AND COATED WITH ASPHALTIC VARNISH.

OLYMPIC FOUNDRY INC:
TOP AND BASE SECTION

RICH (VANRICH CASTING CORP.):
TOP SECTION AND
WITH RICH STANDARD BASE

INLAND FOUNDRY CO., INC.:
VALVE BOX PAVING RISER #2052-3,
#2052-4, #2052-5 (PAVING RISER
SHALL BE EPOXIED TO EXISTING
VALVE BOX TOP SECTION)

12" ADJUSTING SLEEVE #044A



**CITY OF
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VALVE BOX INSTALLATION

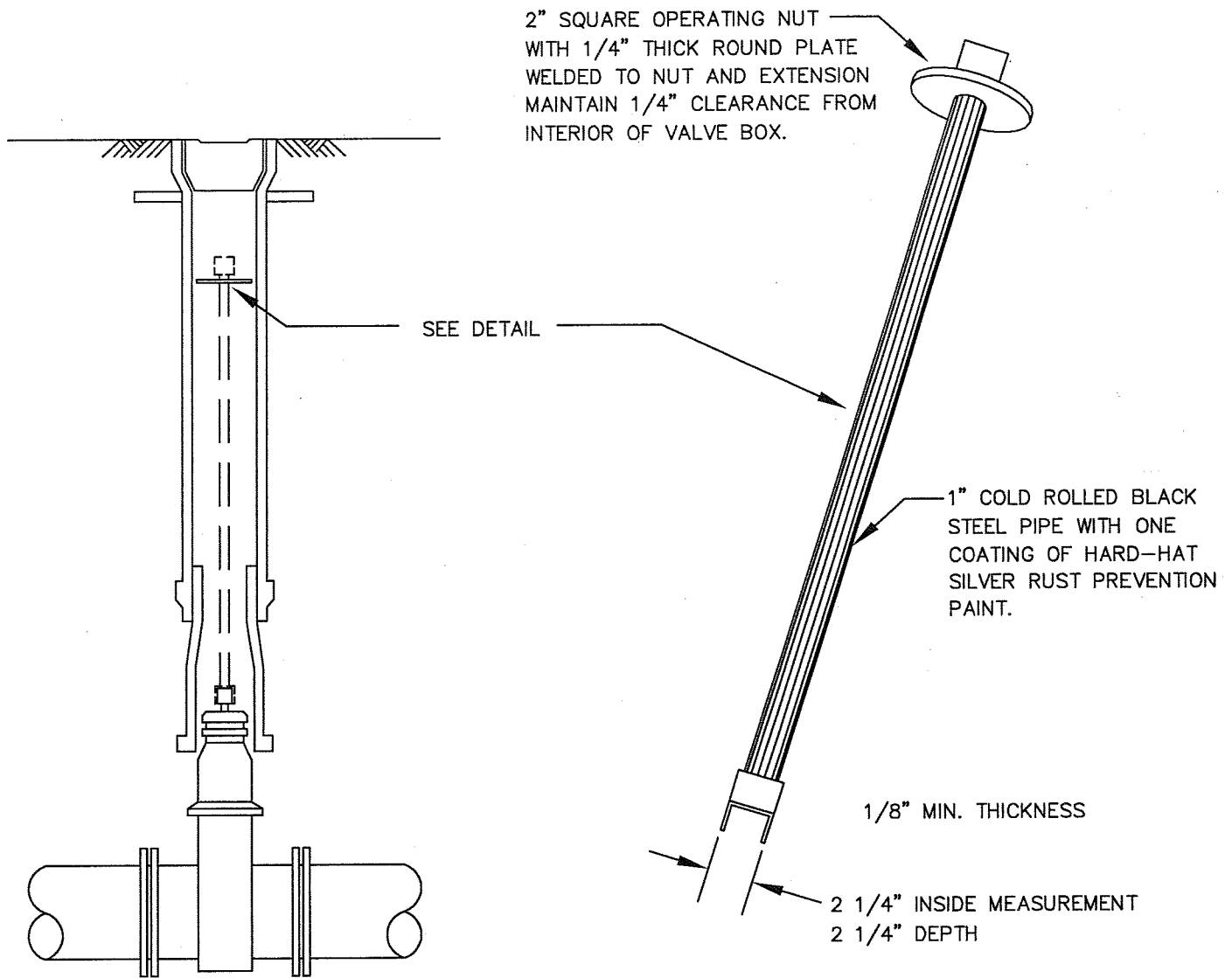
STANDARD DWG W-16

NOT TO SCALE

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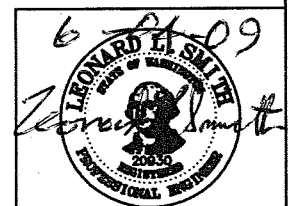


VALVE OPERATING NUT EXTENSION

EXTENSIONS ARE REQUIRED WHEN THE VALVE NUT IS MORE THAN THREE (3) FEET BELOW FINISHED GRADE. EXTENSIONS ARE TO BE A MINIMUM OF ONE (1) FOOT LONG. ONLY ONE EXTENSION TO BE USED PER VALVE.

NOTES:

1. ALL EXTENSIONS ARE TO BE MADE OF STEEL, SIZED AS NOTED, AND PAINTED WITH TWO COATS OF METAL PAINT.



**CITY OF
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VALVE OPERATING EXTENSION

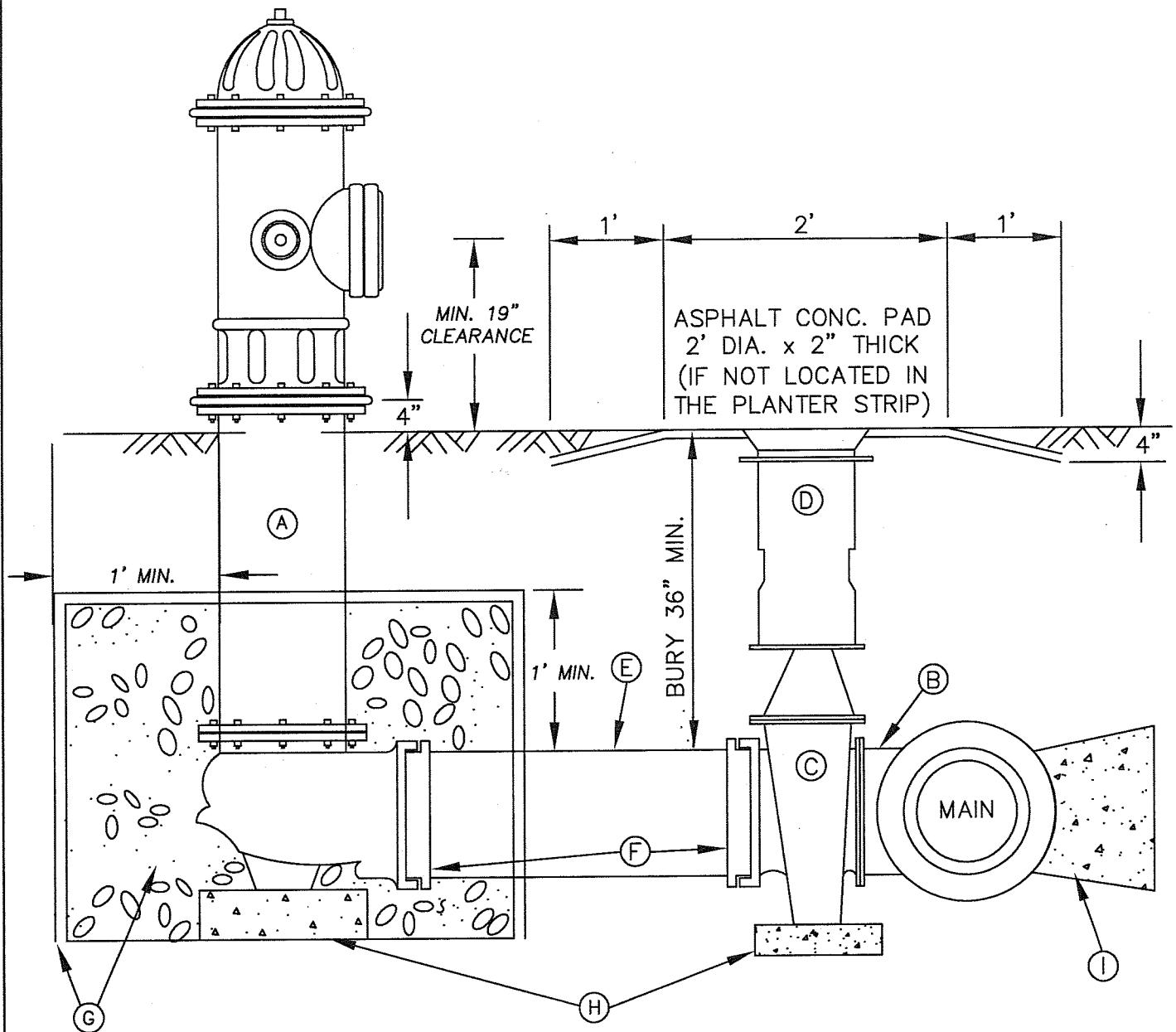
STANDARD DWG W-17

NOT TO SCALE

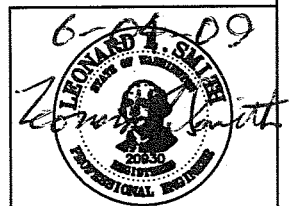
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- A. 1-5 1/4" M.V.O. HYDRANT WITH 2-2 1/2" (N.S.T.) AND 1-4" PUMPER PORT (N.S.T.), WITH PERMANENT 4" STORZ HYDRANT ADAPTOR AND STORZ BLIND CAP. FIRE HYDRANT TO BE PAINTED WITH PRESERVATIVE BRAND CATERPILLAR OR INTERNATIONAL YELLOW PAINT. PUMPER PORT TO FACE STREET, OR AS DIRECTED BY THE FIRE DEPARTMENT.
- B. 6" FLANGE OUTLET ON CAST OR DUCTILE IRON TEE.
- C. 1-AUXILIARY GATE VALVE: 6" AWWA C509, RESILIENT SEAT, M.J.xFL. WITH LUGS.
- D. 1-TWO-PIECE CAST IRON VALVE BOX EQUAL TO RICH TYPE #045 WITH RECESSED HANDLE LID.
- E. 1-6" DUCTILE IRON CLASS 52 CEMENT-LINED PIPE, LENGTH TO FIT. WHERE MORE THAN ONE LENGTH OF PIPE IS REQUIRED, CONNECT PIPES WITH MECHANICAL JOINT SLEEVE, RESTRAIN PIPE AND SLEEVE WITH MEGALUG RESTRAINERS, OR RESTRAIN PIPES WITH UNI-FLANGE SERIES 1300 & 1390 JOINT RESTRAINERS.
- F. RESTRAIN MECHANICAL JOINTS WITH MEGALUG RESTRAINERS.
- G. 1/2 YARD WASHED DRAIN ROCK (3" TO 3/8"), MIN. 1' ABOVE BOOT FLANGE PLACE FILTER FABRIC ENCASEMENT AROUND GRAVEL.
- H. 16"x8"x4" MIN. SIZE CONCRETE BLOCK UNDER HYDRANT AND VALVE.
- I. CONC. BLOCKING.
- J. INSTALL BLUE LANE REFLECTOR IN PAVEMENT.



**CITY OF
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FIRE HYDRANT ASSEMBLY

STANDARD DWG W-18

NOT TO SCALE

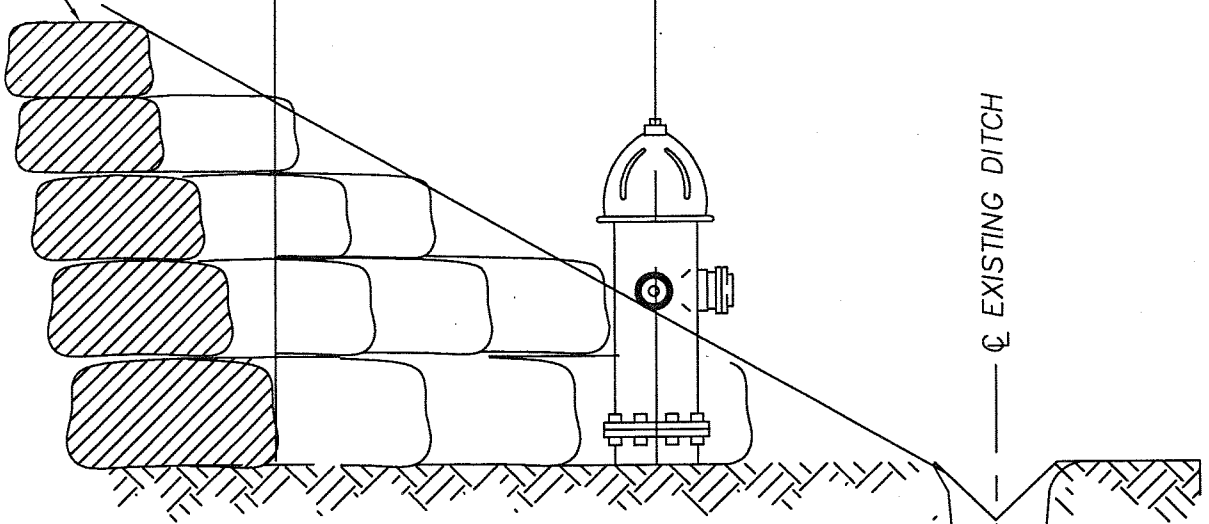
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ROCK RETAINING
WALL

LEVEL ALL AROUND
MIN. 3' RADIUS



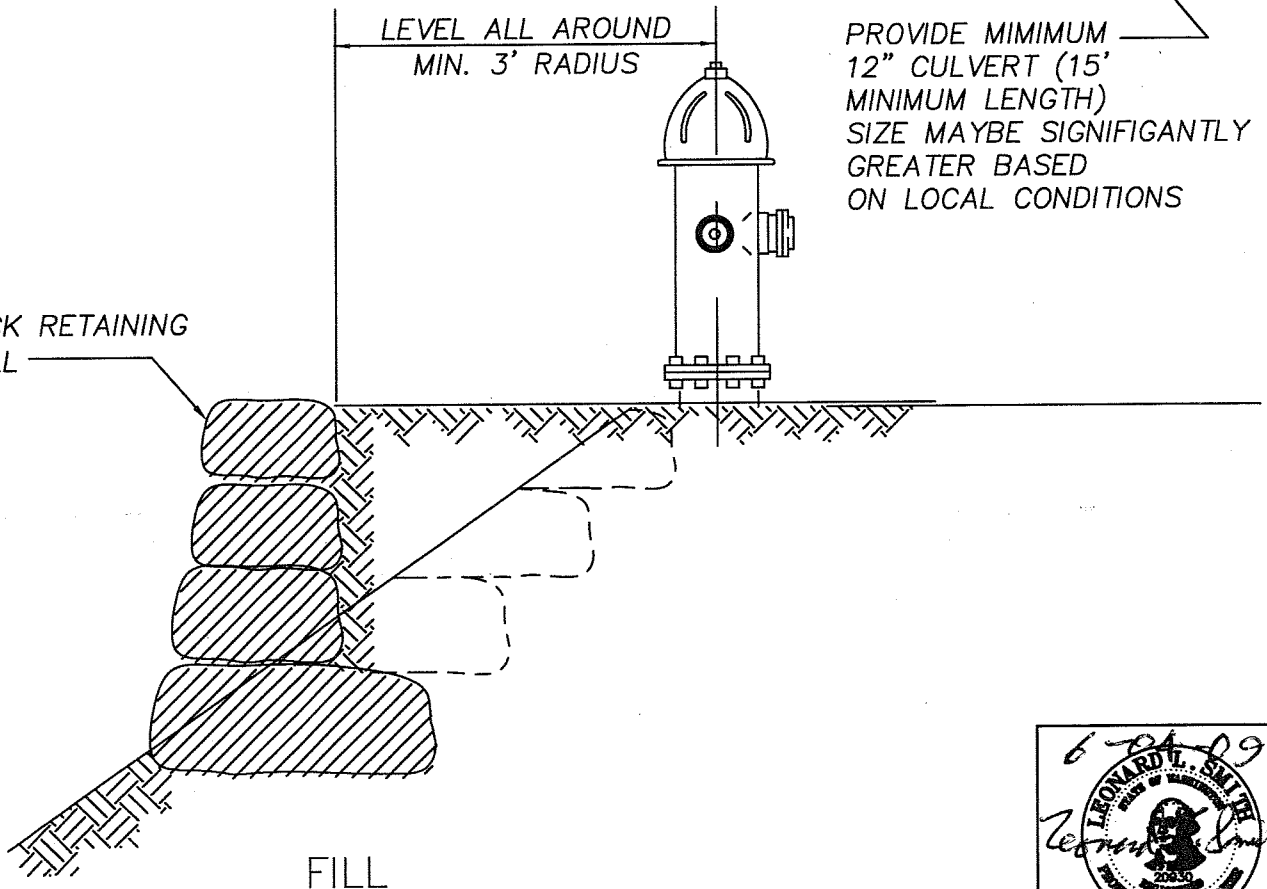
EXISTING DITCH

CUT

LEVEL ALL AROUND
MIN. 3' RADIUS

PROVIDE MINIMUM
12" CULVERT (15'
MINIMUM LENGTH)
SIZE MAYBE SIGNIFIGANTLY
GREATER BASED
ON LOCAL CONDITIONS

ROCK RETAINING
WALL



FILL



**CITY OF
BLACK DIAMOND**

**FIRE HYDRANT LOCATION IN CUT OR
FILL**

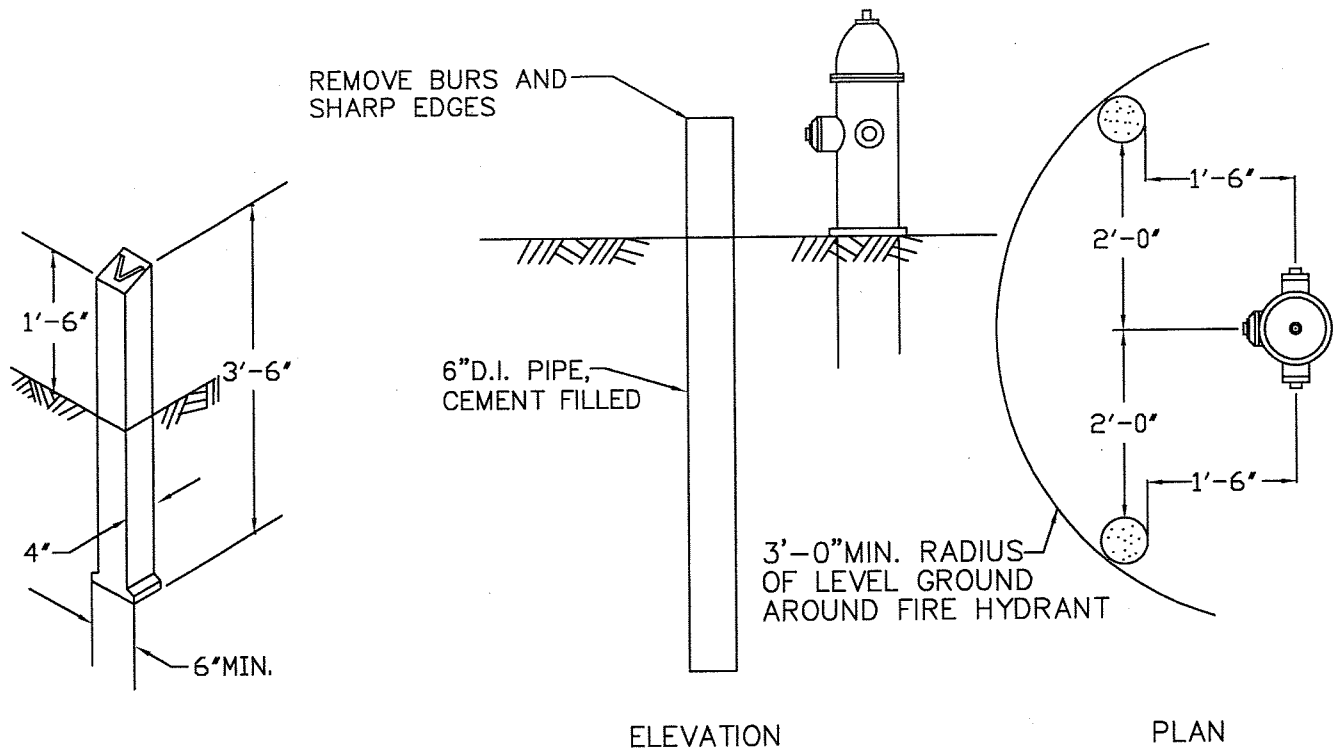
STANDARD DWG W-19

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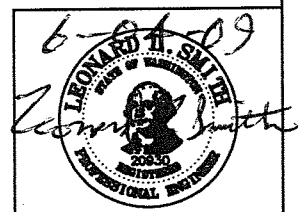


VALVE MARKER POST

FIRE HYDRANT GUARD POST

NOTES:

1. GUARD POST SHALL BE 6" CL.52 D.I. PIPE, 6' LONG, FILLED WITH CEMENT. PAINT WITH TWO COATS OF RUSTOLEUM HIGH GLOSS WHITE PAINT.
2. VALVE MARKER POST SHALL BE EQUAL TO FOG TITE METER SEAL COMPANY. PAINT WITH TWO COATS OF PRESERVATIVE BRAND CATERPILLAR OR INTERNATIONAL YELLOW PAINT. PAINT DISTANCE FROM THE VALVE MARKER TO THE VALVE ON THE POST WITH BLACK ENAMEL PAINT.
3. VALVE MARKER POST TO BE USED FOR ALL MAINLINE VALVES OUTSIDE PAVED AREAS.
4. HYDRANT VALVES SHALL BE LOCATED IN PLANTER STRIP AREA IF POSSIBLE.



**CITY OF
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FIRE HYDRANT GUARD POST & VALVE MARKER POST

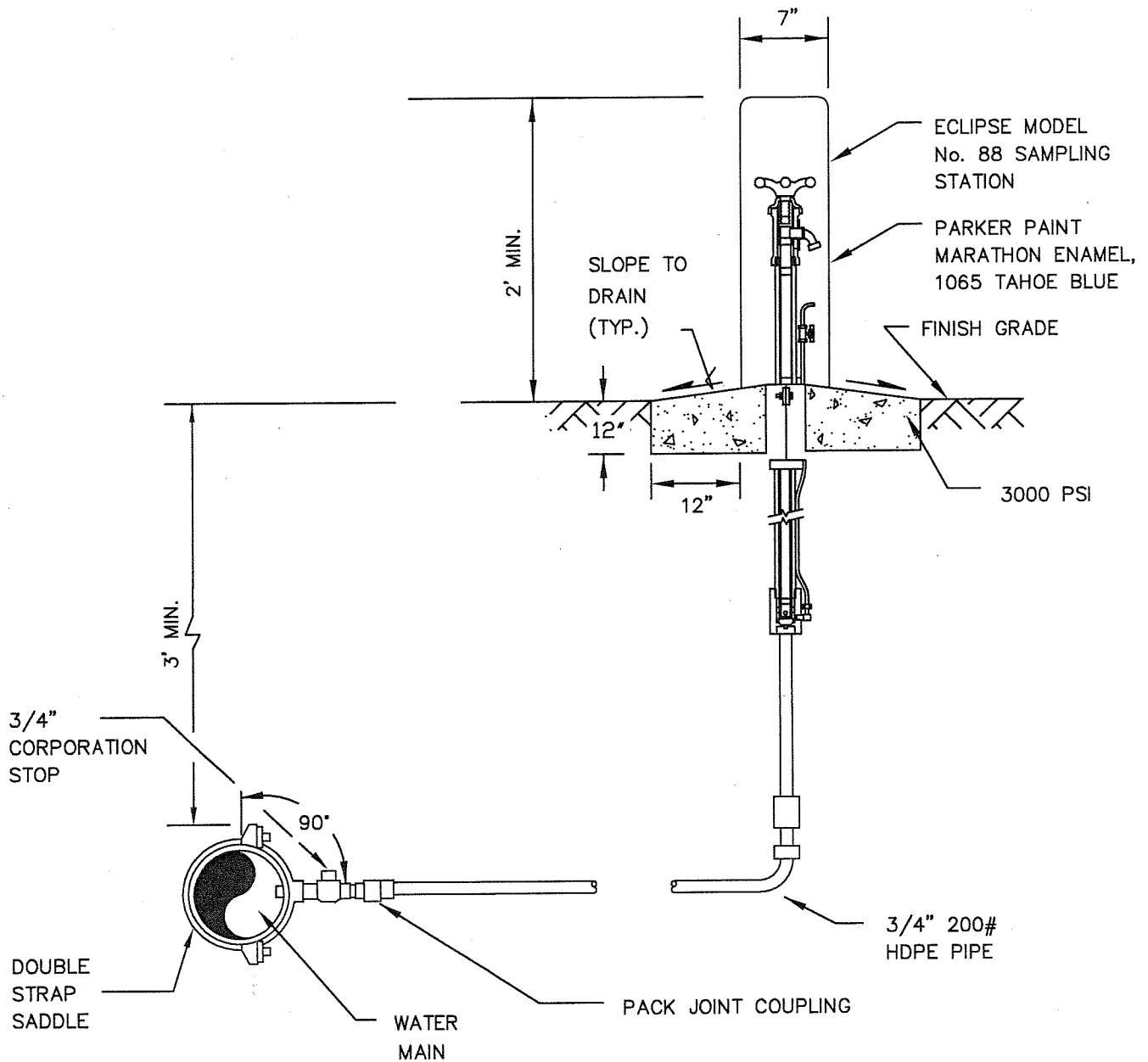
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NOT TO SCALE

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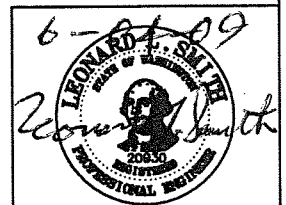


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NOTE:

INSTALL 14 GAUGE TRACER WIRE FROM CORP STOP TO SAMPLING STATION.



**CITY OF
BLACK DIAMOND**

WATER SAMPLING STATION

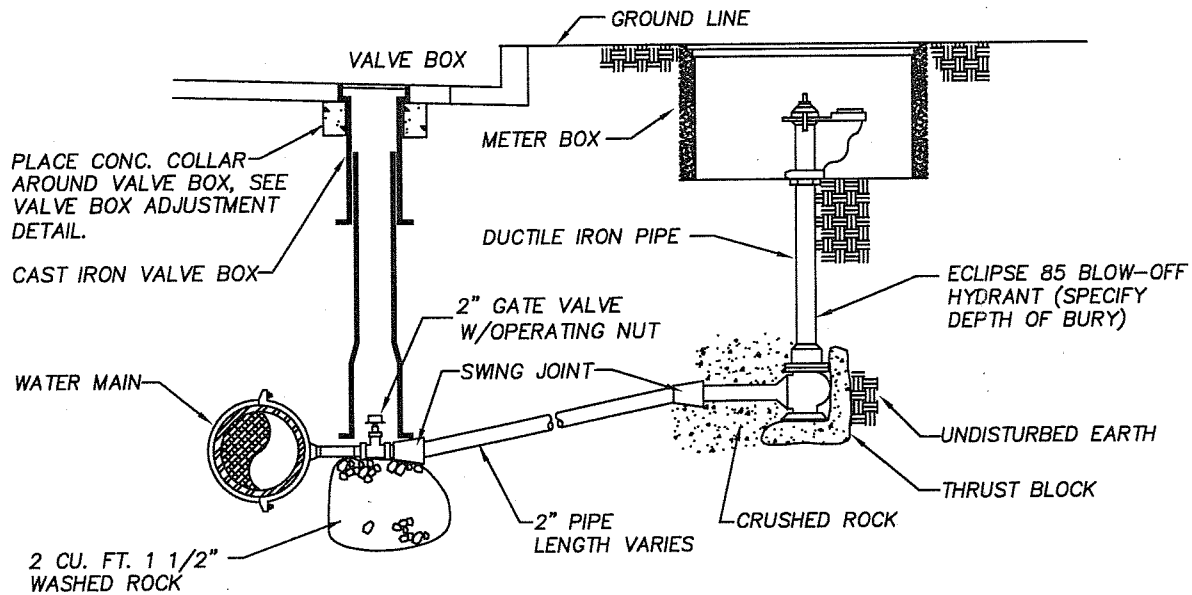
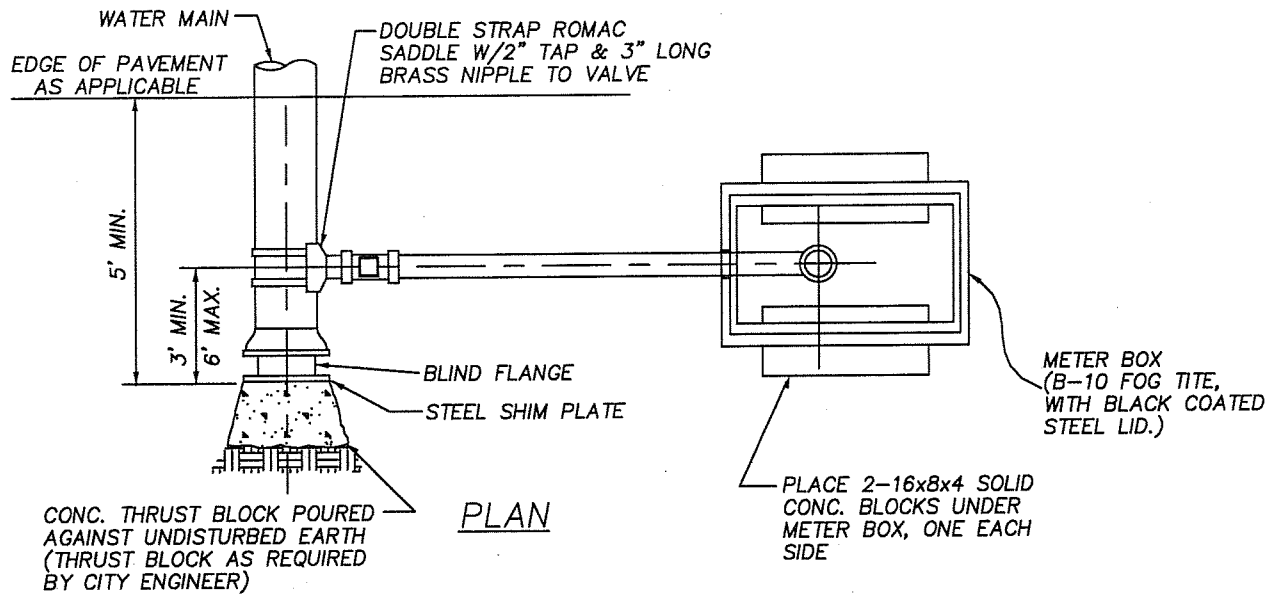
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NOT TO SCALE

04/01/09



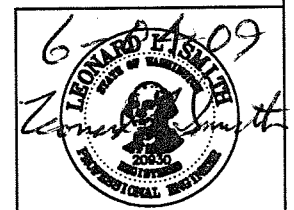
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BLOW-OFF HYDRANTS SHALL BE NON-FREEZING, SELF-DRAINING TYPE.

1. SET UNDERGROUND IN CITY APPROVED METER BOX, THESE HYDRANTS WILL BE FURNISHED WITH A 2" FIP INLET, A NON-TURNING OPERATING ROD, AND SHALL OPEN TO THE DESIGN, AND BE SERVICEABLE FROM ABOVE GRADE WITH NO DIGGING.
2. THE OUTLET SHALL ALSO BE BRONZE AND BE 2-1/2" NST.
3. HYDRANTS SHALL BE LOCKABLE TO PREVENT UNAUTHORIZED USE.
4. HYDRANTS SHALL BE LOCKABLE TO PREVENT UNAUTHORIZED USE.

(SPECIFY OVERALL LENGTH 6" SHORTER THAN NORMAL DEPTH OF BURY. MINIMUM OPENING IN METER BOX SHALL BE 10".)



**CITY OF
BLACK DIAMOND**

**PERMANENT IN-LINE
BLOW-OFF ASSEMBLY**

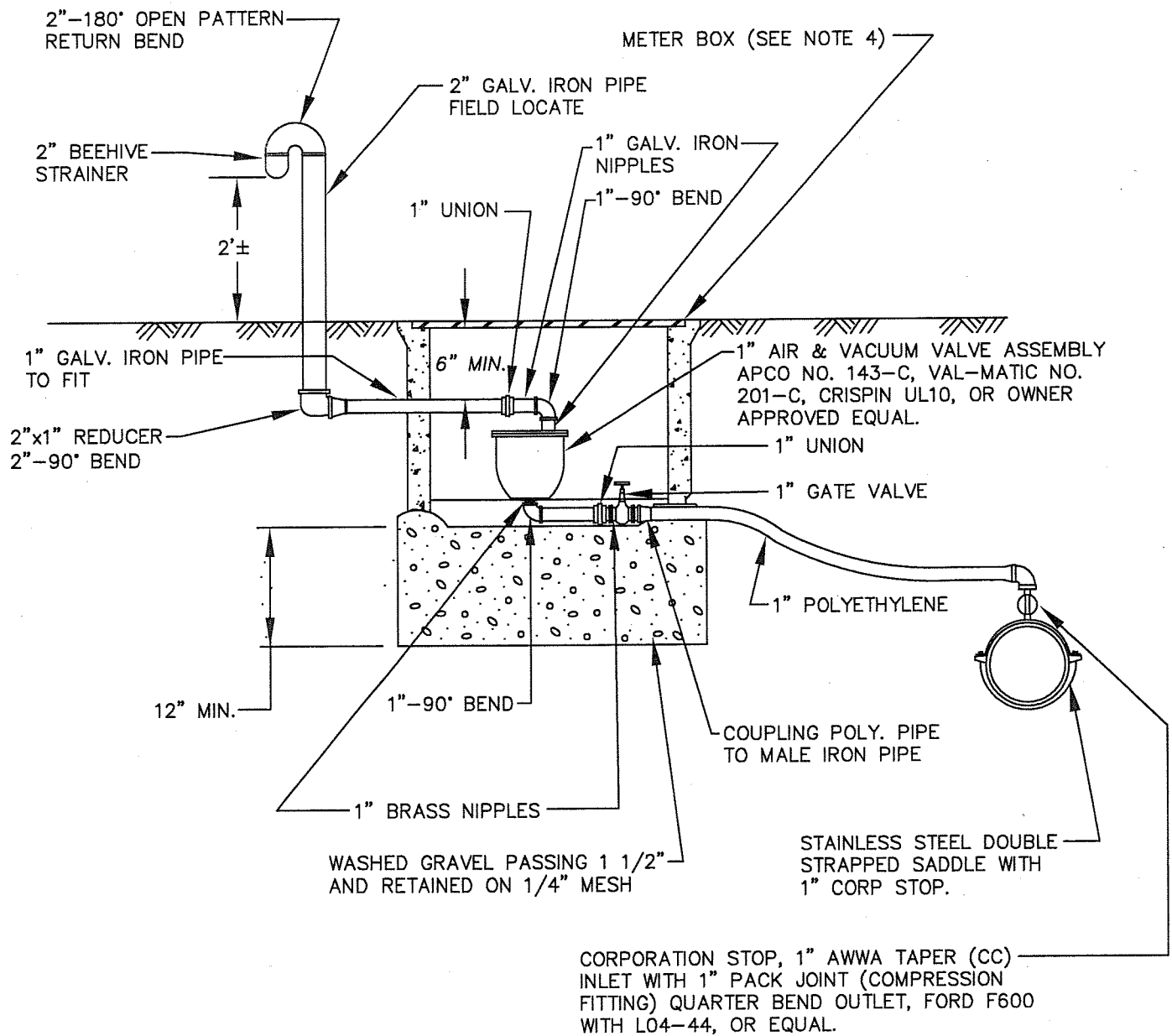
STANDARD DWG W-22

NOT TO SCALE

01/01/08

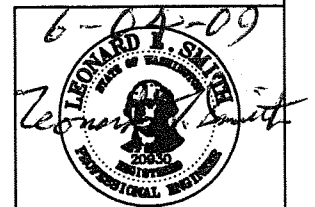


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NOTES:

1. ALL FITTINGS TO BE BRASS OR COPPER FROM WATER MAIN TO 1" AIR & VACUUM ASSEMBLY.
2. 2" GALVANIZED PIPE ABOVE GRADE TO BE PAINTED WITH 2 COATS PRESERVATIVE BRAND CATERPILLAR OR INTERNATIONAL YELLOW PAINT.
3. AIR & VACUUM RELEASE VALVE ASSEMBLY MUST BE INSTALLED AT HIGHEST POINT OF LINE. IF HIGH POINT FALLS IN A LOCATION WHERE ASSEMBLY CANNOT BE INSTALLED, PROVIDE ADDITIONAL DEPTH OF LINE TO CREATE HIGH POINT AT A LOCATION WHERE ASSEMBLY CAN BE INSTALLED.
4. LOCATE AIR & VACUUM METER BOX OUTSIDE OF TRAFFIC AREAS, BEHIND CURB OR SIDEWALK.



**CITY OF
BLACK DIAMOND**

1" AIR & VACUUM RELEASE VALVE ASSEMBLY

STANDARD DWG W-23

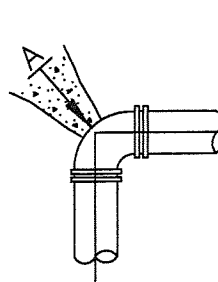
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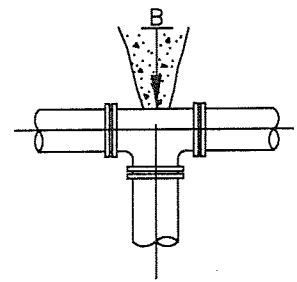


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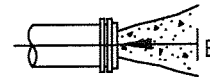
THRUST BLOCK - TABLE							
		MINIMUM BEARING AREA AGAINST UNDISTURBED SOIL SQUARE FEET					
PIPE SIZE	PRESSURE PSI	A	B	C	D	E	X (100 PSI)
4"	200	2/(1)	1/(NONE)	1/(NONE)	NONE	NONE	NONE
	300	3/(2)	2/(2)	2/(1)	1/(1)	NONE	NONE
6"	200	4/(3)	3/(2)	3/(1)	1/(1)	1/(NONE)	NONE
	300	6/(4)	4/(3)	3/(2)	2/(1)	1/(NONE)	NONE
8"	200	7/(5)	5/(3)	4/(3)	2/(2)	1/(1)	3/(2)
	300	11/(8)	8/(5)	6/(4)	3/(2)	2/(1)	
10"	200	11/(8)	8/(6)	6/(4)	3/(2)	2/(1)	4/(3)
	275	16/(11)	11/(7)	9/(6)	5/(3)	3/(2)	
12"	200	16/(11)	11/(8)	9/(6)	5/(3)	3/(2)	5/(4)
	250	24/(16)	17/(11)	13/(9)	7/(5)	4/(3)	
14"	200	22/(13)	16/(11)	12/(8)	6/(4)	3/(2)	7/(6)
	250	33/(22)	23/(16)	18/(12)	9/(6)	5/(3)	
16"	200	29/(19)	21/(14)	16/(11)	8/(6)	5/(3)	10/(7)
	225	32/(21)	23/(16)	17/(12)	9/(6)	5/(3)	
18"	200	36/(24)	26/(17)	20/(13)	10/(7)	5/(4)	13/(9)
20"	200	45/(29)	32/(21)	24/(16)	13/(8)	7/(4)	16/(11)
24"	200	64/(43)	46/(30)	35/(23)	18/(12)	9/(6)	23/(16)



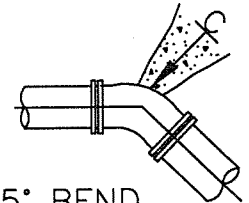
90° BEND



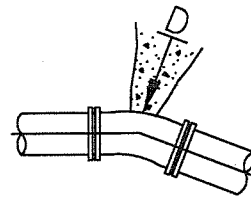
TEE



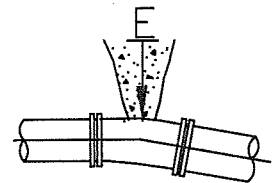
CAP



45° BEND

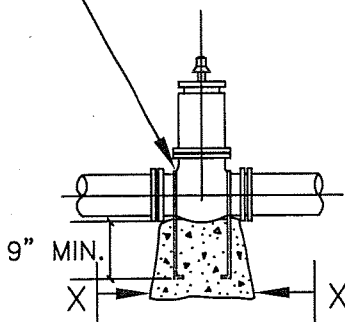


22 1/2° BEND



11 1/4° BEND

2 - 3/4" DIA. RODS FOR 10" SIZE & SMALLER
2 - 1" DIA. RODS LARGER THAN 10" SIZE



GATE VALVE

NOTE: ADDITIONAL BLOCKING MUST BE PROVIDED IF GATE VALVE IS AT END OF LINE DURING TESTING.

SAFE BEARING LOADS IN LB./SQ. FT.
THE SAFE BEARING LOADS GIVEN IN THE FOLLOWING TABLE ARE FOR HORIZONTAL THRUSTS WHEN THE DEPTH OF COVER OVER THE PIPE EXCEEDS 2 FEET.

SOIL	SAFE BEARING LOAD LB. PER SQ. FT.
* MUCK, PEAT, ETC.	0
SOFT CLAY	1,000
SAND	2,000
SAND & GRAVEL	3,000
SAND & GRAVEL CEMENTED WITH CLAY	4,000
HARD SHALE	10,000

* IN MUCK OR PEAT, ALL THRUSTS SHALL BE RESTRAINED BY PILES OR TIE RODS TO SOLID FOUNDATIONS OR BY REMOVAL OF MUCK OR PEAT AND REPLACEMENT WITH BALLAST OF SUFFICIENT STABILITY TO RESIST THRUST.

NOTES:

1. SQUARE FEET OF CONCRETE THRUSTS - BLOCK AREA BASED ON SAFE BEARING LOAD OF 2000/(3000) LBS. PER SQ. FT.
2. AREAS MUST BE ADJUSTED FOR OTHER SIZE PIPE, PRESSURES & SOIL CONDITIONS.
3. CONCRETE BLOCKING SHALL BE CAST IN PLACE & HAVE MIN. OF 1/4 SQUARE FOOT BEARING AGAINST THE FITTING.
4. BLOCK SHALL BEAR AGAINST FITTINGS ONLY & SHALL BE CLEAR OF JOINTS TO PERMIT TAKING UP OR DISMANTLING JOINT. FITTING SHALL BE ISOLATED FROM CONCRETE THRUST BLOCK WITH 20 LB. TAR PAPER, PLASTIC OR SIMILAR MATERIAL.
5. CONTRACTOR SHALL INSTALL BLOCKING ADEQUATE TO WITHSTAND FULL TEST PRESSURE AS WELL AS TO CONTINUOUSLY WITHSTAND OPERATING PRESSURE UNDER ALL CONDITIONS OF SERVICE.



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CONCRETE BLOCKING

STANDARD DWG W-24

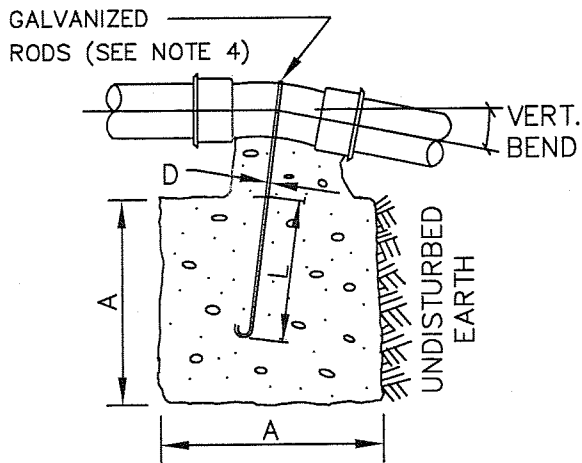
NOT TO SCALE

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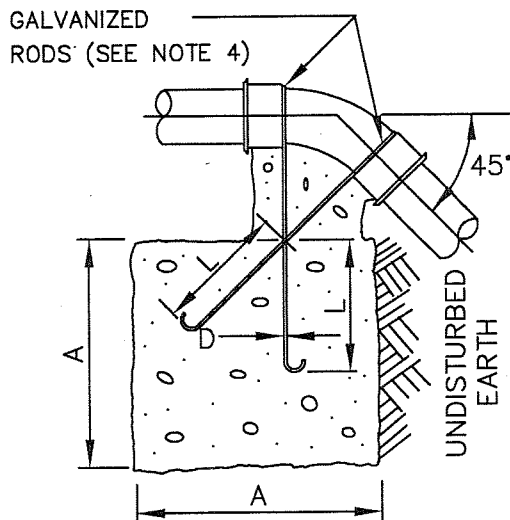


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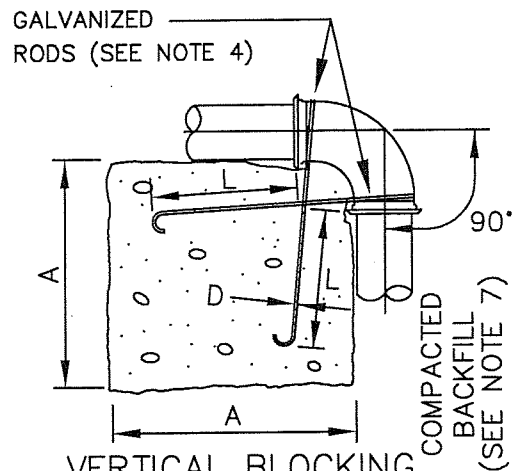




VERTICAL BLOCKING
11 1/4° & 22 1/2° BENDS



VERTICAL BLOCKING
FOR 45° BENDS



VERTICAL BLOCKING
FOR 90° BENDS
(SEE NOTE 6)

VERTICAL BLOCKING SIZE W/RESTRAINED JOINTS SOIL TYPE = COHESIVE GRANULAR [GC+SC] SAND, GRAVEL, CLAY MIXTURE					
PIPE SIZE	V B	CU FT	A	D	L
4"	11 1/4°	*			
	22 1/2°	*			
	45°	*			
	90°	16	2.5'	3/4"	2.0'
6"	11 1/4°	*			
	22 1/2°	*			
	45°	13	2.3'	3/4"	2.0'
	90°	43	3.5'	3/4"	2.0'
8"	11 1/4°	*			
	22 1/2°	*			
	45°	33	3.2'	3/4"	2.0'
	90°	86	4.4'	3/4"	2.0'
10"	11 1/4°	*			
	22 1/2°	13	2.3'	3/4"	2.0'
	45°	64	4.0'	3/4"	2.0'
	90°	141	5.2'	1"	3.5'
12"	11 1/4°	*			
	22 1/2°	20	2.7'	3/4"	2.0'
	45°	111	4.8'	3/4"	2.0'
	90°	206	5.9'	1 1/8"	4.0'

* BLOCKING NOT REQUIRED IF 36 FEET
OF PIPE IS RESTRAINED ON EACH SIDE
OF BEND.



NOTES:

- NO CHANGE IN PIPE DIRECTION OR DIAMETER SHALL OCCUR WITHIN 36 FEET OF THE VERTICAL BEND. BENDS, TEES, REDUCERS, ETC. BEYOND THE 36 FOOT LIMIT SHALL BE RESTRAINED BY STANDARD CONCRETE BLOCKING PER STD. DTL. W-1 & W-3.
- CONCRETE BLOCKING SIZES BASED ON:
 - 36 FEET OF PIPE RESTRAINED EACH SIDE OF BEND.
 - THRUST BLOCK AREAS BASED ON SAFE BEARING LOAD OF 1,000 PSF.
 - 2,500 PSI CONCRETE.
 - MINIMUM 3 FEET OF COVER.
 - PIPE THRUST BASED ON 200 PSI PRESSURE.
 - VERTICAL BLOCK SIZE BASED ON CONCRETE WEIGHT OF 150 POUNDS PER CUBIC FOOT.
 - TRENCH CONDITIONS BASED ON TYPE 2, FLAT BOTTOM TRENCH WITH LIGHTLY CONSOLIDATED BACKFILL, PER ANSI/AWWA C150/A21.50.
 - FACTOR OF SAFETY IS 1.5.
 - SOIL FRICTIONAL RESISTANCE BASED ON COHESIVE GRANULAR SOIL TYPE (GC+SC). SAND, GRAVEL, CLAY MIXTURE.
- BLOCKING DESIGN MUST BE ADJUSTED FOR OTHER SIZE PIPE, PRESSURES & SOIL CONDITIONS.
- DEFORMED REINFORCEMENT BARS SHALL BE IN ACCORDANCE WITH ASTM A 615. BARS SHALL BE GALVANIZED IN ACCORDANCE WITH ASTM A 767.
- LINE SHALL NOT BE PRESSURIZED UNTIL ALL TRENCHING WITHIN 100 FT. OF VERTICAL BEND IS BACKFILLED AND COMPACTED TO MINIMUM COVER OF 3 FT. OVER PIPE.
- 90° VERTICAL BENDS SHALL ONLY BE INSTALLED WHERE GIVEN PRIOR APPROVAL BY THE CITY.
- BACKFILL TRENCH BEYOND 90° VERTICAL BLOCK WITH CRUSHED SURFACING TOP COURSE MATERIAL COMPACTED TO 95% MINIMUM DENSITY. CRUSHED BACKFILL SHALL EXTEND 20 FEET BEYOND BLOCK OR TO FIRM BEARING TRENCH WALL, WHICHEVER IS LESS.



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VERTICAL BLOCKING WITH
RESTRAINED JOINTS FOR NEW LINES

STANDARD DWG W-25

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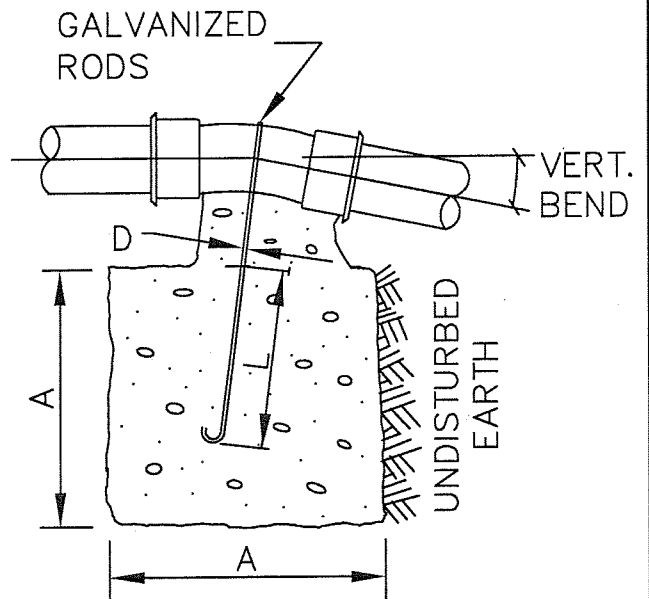
**VERTICAL BLOCKING
FOR 11 1/4°-22 1/2°-30° BENDS**

PIPE SIZE	V B	CU FT	A	D	L
4"	11 1/4°	8	2.0'	3/4"	1.5'
	22 1/2°	11	2.2'		2.0'
	30°	17	2.6'		
6"	11 1/4°	11	2.2'	3/4"	2.0'
	22 1/2°	25	2.9'		
	30°	41	3.5'		
8"	11 1/4°	16	2.5'	3/4"	2.0'
	22 1/2°	47	3.6'		
	30°	70	4.1'		
12"	11 1/4°	32	3.2'	3/4"	2.0'
	22 1/2°	88	4.5'		
	30°	132	5.1'		
16"	11 1/4°	70	4.1'	7/8"	3.0'
	22 1/2°	184	5.7'		
	30°	275	6.5'		
20"	11 1/4°	91	4.5'	7/8"	3.0'
	22 1/2°	225	6.1'		
	30°	330	6.9'		
24"	11 1/4°	128	5.0'	1"	3.5'
	22 1/2°	320	6.8'		
	30°	480	7.9'		

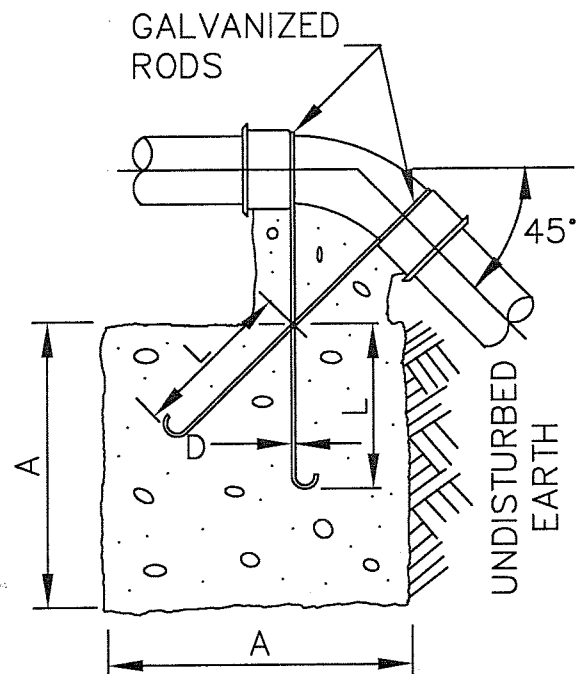
VERTICAL BLOCKING FOR 45° BENDS

4"	45°	30	3.1'	3/4"	2.0'
6"		68	4.1'		
8"		123	5.0'		
12"		232	6.1'	3/4"	2.5'
16"		478	7.8'		
20"		560	8.2'		
24"		820	9.4'		

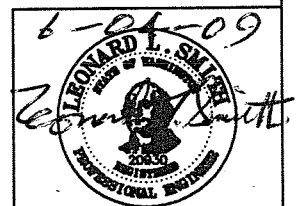
NOTES: CONCRETE BLOCKING BASED ON 200 PSI PRESSURE AND 2500 PSI CONCRETE.



VERTICAL BLOCKING
FOR 11 1/4°, 22 1/2°, & 30° BENDS



VERTICAL BLOCKING
FOR 45° BENDS



**CITY OF
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VERTICAL BLOCKING FOR
CONNECTING TO EXISTING MAIN

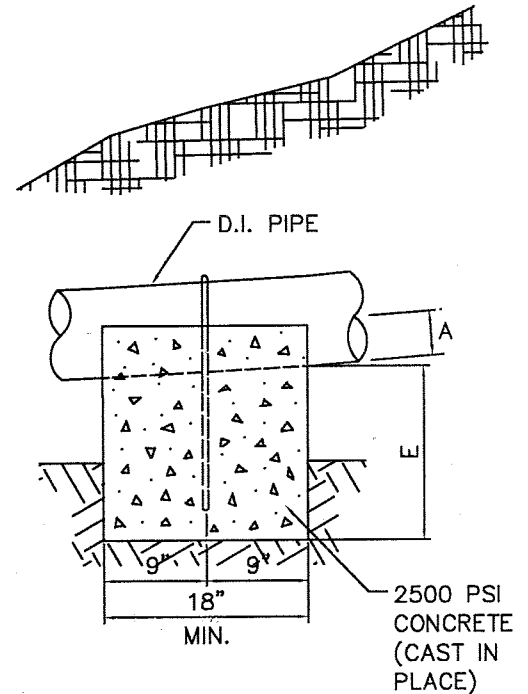
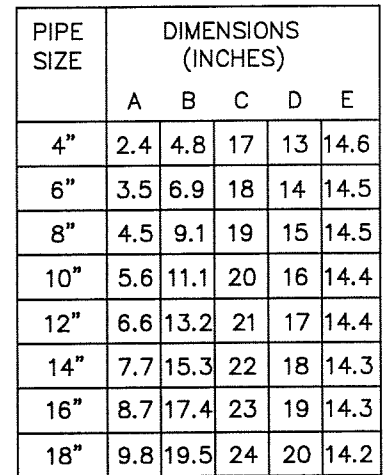
STANDARD DWG W-26

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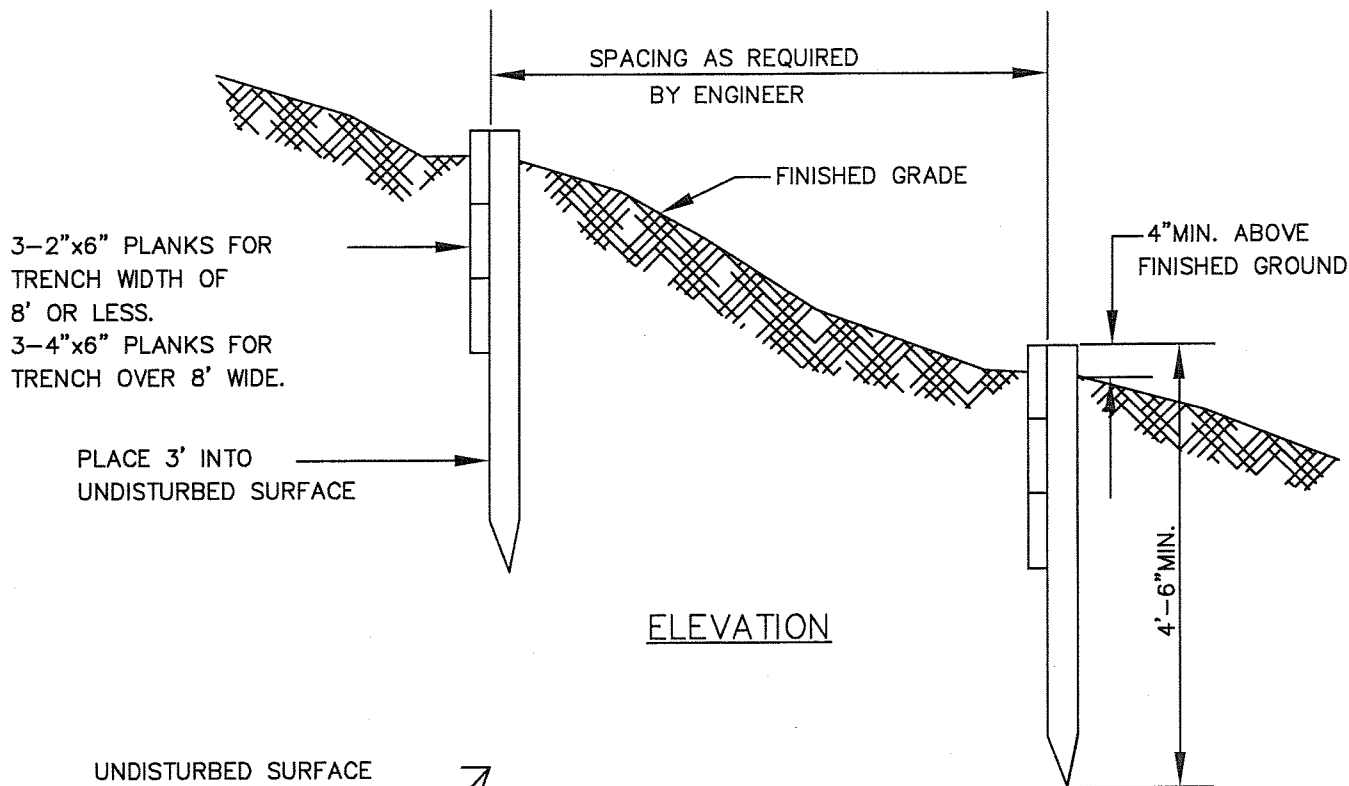


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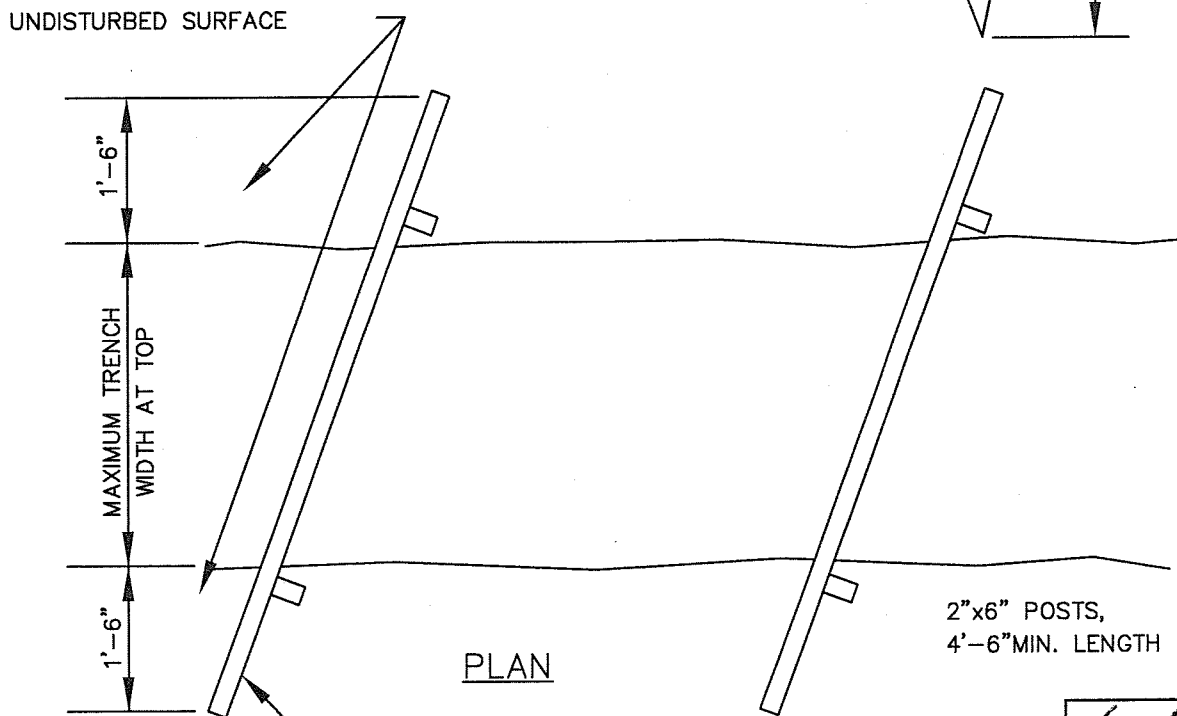


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ELEVATION



PLAN

TOP PLANK ONLY TO EXTEND FULL DISTANCE AS SHOWN



**CITY OF
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TIMBER BAFFLE/HILL HOLDER

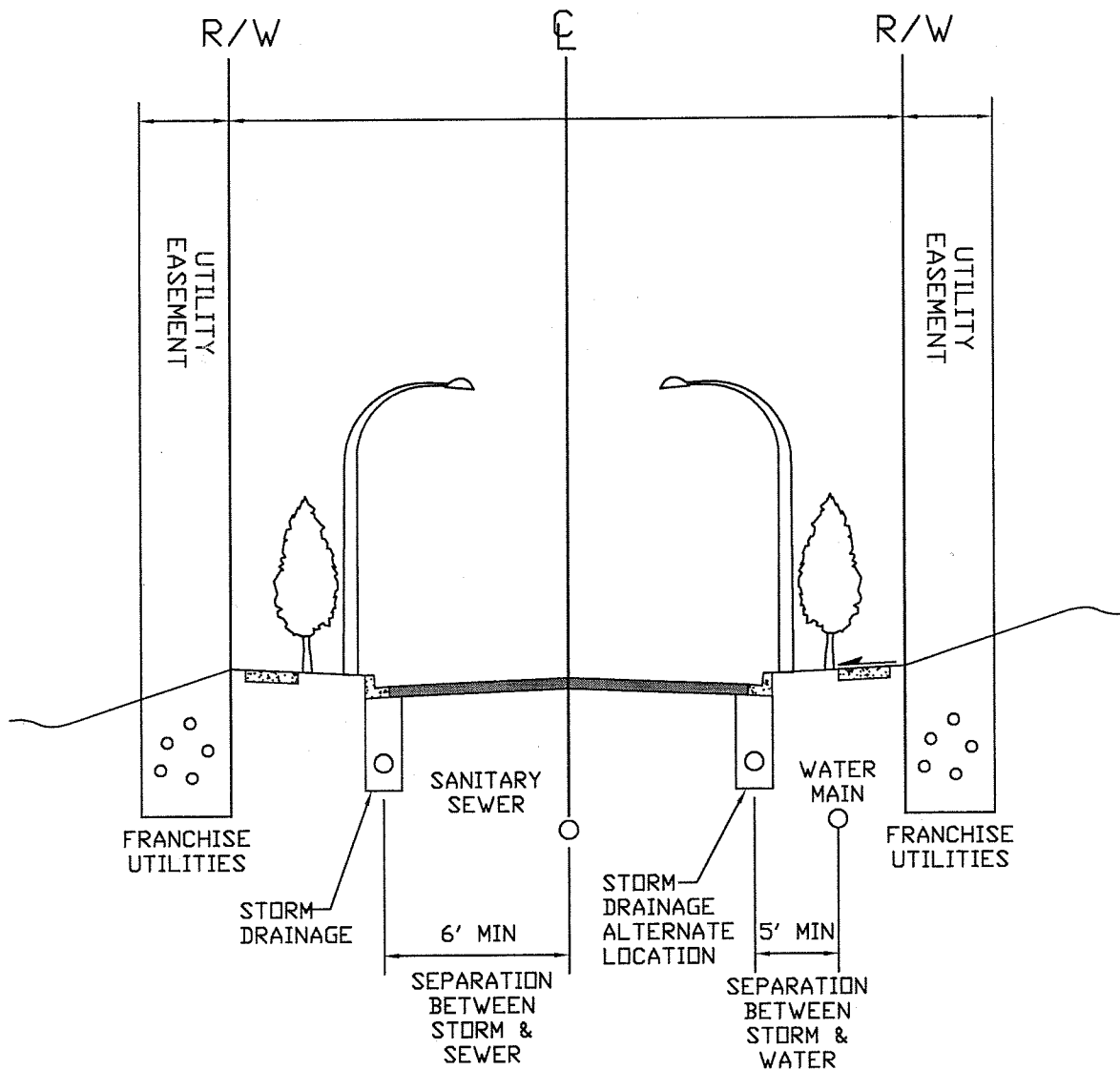
STANDARD DWG W-28

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FACING NORTH OR WEST

NOTES:

1. MAINTAIN HORIZONTAL & VERTICAL UTILITY SEPARATIONS PER WASHINGTON STATE DEPARTMENT OF ECOLOGY & DEPARTMENT OF HEALTH MINIMUM REQUIREMENTS.



**CITY OF
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STANDARD UTILITY LOCATIONS

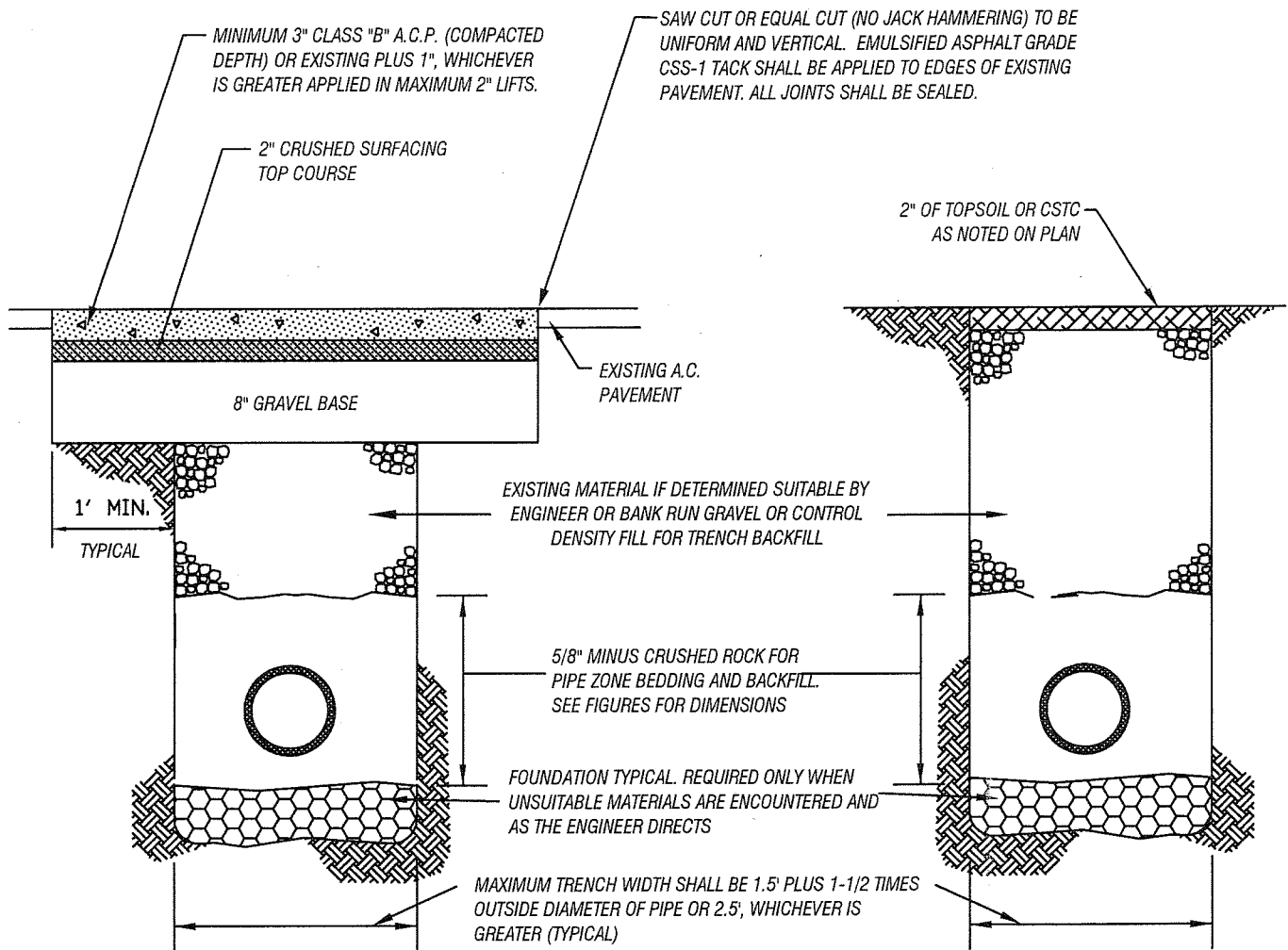
STANDARD DWG W-29

NOT TO SCALE

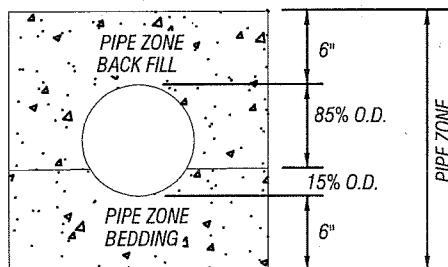
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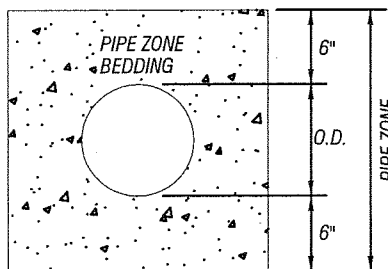
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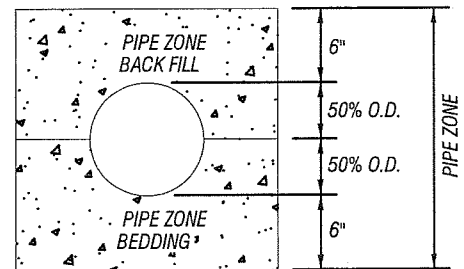
CONCRETE AND DUCTILE IRON PIPE



THERMOPLASTIC PIPE

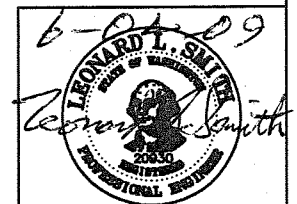


METAL PIPE



NOTES:

1. ALL MATERIALS EXCEPT A.C.P. AND BEDDING MATERIAL SHALL BE COMPACTED IN 6-INCH MAXIMUM LIFTS TO 95% DENSITY.
2. COMPACTION: BEDDING AND BACKFILL WITHIN THE PIPE ZONE SHALL BE COMPACTED TO 95% MAX. AS DETERMINED BY ASTM D1557. BACKFILL ABOVE THE PIPE ZONE SHALL BE COMPACTED TO 90% IN UNPAVED AREA, AND 95% IN PAVED OR SHOULDER AREAS AS DETERMINED BY ASTM D1557.



**CITY OF
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TRENCH RESTORATION

STANDARD DWG W-30

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