## PART TWO - MATERIAL STANDARDS

### 2.1 GENERAL

All materials and equipment shall be new and undamaged. Where possible, the same manufacturer of each item shall be used throughout the job. In accordance with paragraph WS-20 "Material and Equipment List" of this Agreement, the Developer or Contractor shall file a material and equipment list with the District including the quantity, manufacturer, model number and technical specifications, if applicable, of material and equipment to be installed as part of the work. If requested by the District, five (5) copies of all information concerning the specifications, installation, operation and maintenance of material and equipment installed as part of the work shall be furnished to the District in five separate labeled binders.

A. Foundation Gravel

Foundation gravel used for backfill of over-excavated trenches shall conform to the requirements of WSDOT/APWA 9-03.17, "Foundation Material, Class B."

B. Controlled Density Fill (CDF)

Controlled Density Fill (CDF) shall be a mixture of Portland cement (Type I or II), fly ash (ASTM C618, Class F), fine aggregates (coarse sand with 100% passing 3/8-inch sieve, 60-100% passing No. 4 sieve, and 0-5% passing No. 200 sieve), and water, with a maximum 28-day compressive strength of 100 psi, conforming to following proportions:

| Material | Batch Weight/Cubic Yard |
|---|---|
| Mixing Water | 50 lb/cu yd |
| Portland Cement | 30 lb/cu yd |
| Fly Ash | 200 lb/cu yd |
| Fine Aggregate | 3200 lb/cu yd |

Submit CDF mix design for District review prior to use.

C. Pea Gravel

Bedding material for PVC or HDPE pipe shall be well graded, clean granular gravel material commonly known as pea gravel. Material slightly smaller than pea gravel may be used.

Bedding material shall meet the following requirements:

| U.S. STANDARD SIEVE SIZE | PERCENT PASSING |
|---|---|
| 3/8" Square Opening | 100% |
| No. 8 Sieve | 0 - 5% |

V. Sand Bedding Material

Bedding material for ductile iron pipe shall conform to the requirements of WSDOT/APWA 9-03.13, Backfill for Sand Drain".

W. Concrete Encasement

Concrete material for encasing water mains crossing over sewer pipes shall have a 30-day compressive strength of not less than 1,500 psi. The mix shall have a slump of between one (1) and five (5) inches.

X. Native Backfill Material

Native materials will be considered suitable for use in backfilling if the material is not sensitive to moisture (compactable if moisture content is greater than optimum). Native materials shall be a sand and gravel combination with no deleterious materials. All materials shall pass a 3-inch sieve.

Y. Imported Backfill Material

Durable crushed gravel or rock; or naturally occurring sands and gravels free from wood, bark, roots or other extraneous material, meeting the requirements of WSDOT/AWPA 9-03.19 for "Bank Run Gravel for Trench Backfill", with percent passing the No. 200 sieve limited to 5 percent max.

Z. Hot Mix Asphalt (HMA)

Hot Mix Asphalt (HMA) shall be CL ½" as specified in WSDOT/APWA Section 9-03.9(6) Aggregates for Hot Mix Asphalt, HMA Proportions of Materials, and Performance Graded PG 58-22. Aggregate for asphalt concrete shall conform to the requirements of WSDOT/APWA Sections 9-03.8(1) through 9-03.8(6) for Aggregates for Hot Mix Asphalt, inclusive.

AA. Crushed Surfacing

1. Top Course and Keystone Material (5/8" Minus): For use in the restoration of excavated areas. Top Course and Keystone material shall conform to the requirements of WSDOT/APWA 9-03.9(3), "Crushed Surfacing" for Top Course and Keystone.
2. Base Course Material (1 ¼" Minus): Base Course Material shall conform to the requirements of WSDOT/APWA 9-03.9(3), "Crushed Surfacing" for Base Course.

J. Not Used

K. 7/8-inch Drain Rock

Material for drains around facilities such as hydrants, blowoffs, and hill holders shall conform to the requirements of WSDOT/APWA 9-03.12(5), "Gravel Backfill for Drywells", except that the material shall be washed to remove fines.

L. Not Used

M. Grout

Grout shall consist of one part Portland Cement, three parts fine sand, and sufficient water to allow proper workability. "Jet-Set" is not allowed.

N. Trench Plug

Low permeable fill material, a non-dispersible clay material having a minimum plasticity index of 10.

O. Unsuitable Materials

1. Unsuitable materials include the materials listed below:

(a) Soils which, when classified under ASTM D 2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System), fall in the classifications of Pt (Peat), OH (organic clays of medium to high plasticity, organic silts), CH (inorganic clays of high plasticity, fat clays), MH (inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts), or OL ( organic silts and organic silty clays of low plasticity). OH, CH, MH with liquid limits of greater than 50 and OL liquid limit less than 50.

(b) Soils which cannot be compacted sufficiently to achieve the density specified for the intended use or as determined by the District. Soil additives for drying or stabilization will not be allowed, including but not limited to fly ash, Portland cement, or kiln dust.

(c) Materials that contain organic material, hazardous or designated waste materials including petroleum hydrocarbons, pesticides, heavy metals, and any material which may be classified as hazardous or toxic according to applicable regulations.

(d) Soils that contain greater concentrations of chloride or sulfate ions, or have a soil resistively or pH less than the existing on-site soils.

P. Ductile Iron Pipe

Ductile Iron pipe shall be cement mortar-lined and zinc coating as specified herein unless otherwise indicated on the plans. Any pipe found to have dimensional tolerances in excess of those prescribed by the manufacturer or having defects which prevent adequate joint seal or any other damage shall be rejected. If requested by the District, not less than three nor more than five pipe lengths of pipe for each size, selected from stock by the District, shall be tested as specified for maximum dimensional tolerance of the respective pipe.

Ductile Iron pipe shall conform to AWWA Standard C151, Thickness Class 52 or as indicated on the Drawings. Pipe with cement mortar lining shall conform to AWWA C104. The exterior of Ductile Iron pipe shall be coated with a layer of arc-sprayed zinc per ISO 8179. The mass of the zinc applied shall be 200b/m². A finishing layer topcoat shall be applie to the zinc. The mean dry film thickness of the finishing layer shall not be less than 3 mils with a local minimum not less than 2 mils. The coating system shall conform in every respect to ISO 8179-1 "Ductile iron pipes- External zinc-based coating - Part 1: Metallic zinc with finishing layer" Second edition 2004-06-01 Ductile Iron pipe and fittings for sewer shall be lined with PROTECTO 401 ceramic epoxy coating (Manufacturer - Induron, Birmingham, Alabama (888) 773-2401). Joints shall be mechanical joint or push-on joint and shall conform to AWWA C111.

1. Ductile Iron and Cast Iron fittings shall conform to AWWA Standard C110. Mechanical or push-on joints shall conform to AWWA Standard C111. Flanged joints shall conform to ASA Standard B-16.1, Class 125 with ductile iron followers. All fittings shall be cement mortar lined in conformance with AWWA Standard C104.
2. Where required on the Drawings, restrained push-on joint pipe and fittings shall be provided. Restrained joint pipe shall conform to AWWA Standard C151, Thickness Class 52 or as indicated on the Drawings. Pipe shall have cement mortar lining conforming to AWWA C104. Push-on restrained joints shall conform to AWWA C111. Restrained joints shall be designed for a water working pressure of 350 psi for sizes 4_inch through 24_inch, 250 psi for sizes 30-inch through 48-inch, and 150 psi for sizes 54-inch through 64-inch. Submit type of restrained joint pipe to the District for approval.
3. Where fittings are called for on restrained joint pipes, mechanical joints with megalugs or Alpha fittings shall be used.
4. Ductile Iron pipe shall be polywrapped.
5. Ductile Iron pipe shall be furnished with factory-installed plugs in each end of each stick of pipe. Such plugs shall remain installed until the pipe is ready to be installed in the trench.

Q. Polywrap for Ductile Iron Pipe

Polywrap shall conform to ANSI/AWWA A21.5/C105 (See AWWA C600) for linear low-density polyethylene film. The inside surface of the polyethylene wrap to be in contact with the pipe exterior shall be infused with a blend of anti-microbial biocide to mitigate microbiogically influenced corrosion and volatile corrosion inhibitor to control galvanic corrosion.

R. PVC Pipe for Watermains

PVC pipe 4 inches or larger in diameter shall conform to AWWA C900, Class 150. PVC pipe for water service shall only be used where crossing the gas pipeline easement. The pipe shall conform to WSDOT/APWA 9-30.1(5).

S. PVC Pipe for Non-Pressure (Gravity) Sewers

PVC pipe for depths up to twenty (20) feet, and less than 14 inches in diameter shall conform to ASTM D3034 and shall be defined as flexible conduit. Joints shall conform to ASTM D3212 using a restrained rubber gasket conforming to ASTM F477. Fittings shall be injection molded tees . Saddles fastened to pipe with external bands are not acceptable on any new system.

PVC pipe used for depths twenty (20) feet and greater and less than 14 inches in diameter shall conform to AWWA specification C900, Class 150 (DR 18). Joints shall conform to ASTM D3139 with rubber gaskets meeting ASTM F477. Fittings shall be Class 150 injection molded tees, meeting the requirements of AWWA C-907 and ASTM D1784.

T. HDPE Pipe for Water Mains and Pressure Sewers

HDPE pipe for water mains and pressure sewers may be used in specific situations where Ductile Iron pipe is not appropriate or feasible. The use of HDPE requires written District approval. The specifications and class of the HDPE will be determined on a project-specific basis including such factors as working pressure.

U. C-905 PVC Pipe for Non-Pressure (Gravity) Sewers

C-905 PVC pipe may be considered for lines that are fourteen (14) inches and greater in diameter. Pipe shall conform to the requirements of AWWA C905 and Uni-B-11.

All pipe joints shall be rubber gasketed. Rubber gaskets shall conform to ASTM F477.

V. Gate Valves

1. Gate valves shall conform to AWWA C-515, be epoxy coated, resilient seated, have a non-rising stem, a minimum of 200 PSI working pressure unless otherwise specified, shall have a standard 2-inch operating nut, and the standard opening rotation shall be counter_clockwise.
2. Gate valves shall be used for all water mains less than 12 inches in diameter. Gate valves are allowed for wet taps.
3. Butterfly valves shall be installed on all water mains 12 inches and larger. Butterfly valves may require plugging for testing purposes.
4. Where called for on the plans, gate valves shall be used for sewers four (4) inches and larger.
5. Special valves and fittings shall be as specified on the plans.
6. Gate Valves shall be one of the following types, with stainless steel bolts:
   a) Mueller
   b) Kennedy M & H
   c) Clow
   d) US Pipe
   e) American Flow Control Series 25002-17
   f) AVK

W. Valve Boxes

Valve boxes shall be Cast Iron, 2 piece, suitable for installation required, equal to Olympic Foundry Company/APWA Valve Box VB045. Valve box lids shall fit snugly in the casting. Valve Box Lid shall be marked "WATER" for water facilities. Valve boxes shall be equal to Olympic Foundry 940 and marked "SEWER" for sewer facilities.

X. Valve Marker Posts

Valve marker posts shall be reinforced concrete posts, 4"x4" on one end and 4"x6" on the other end, and 42" long. Posts shall be equipped with 1.5" raised Cole brand numbers referencing distance to the valve to the nearest foot. Cole brand numbers shall be installed using waterproof Liquid Nails brand glue suitable for metal surfaces.

Y. Concrete Blocking

Concrete blocking shall be a 1:3:6 mix with a six-inch (6") maximum slump.

Z. Bolts In Piping

All bolts shall be new and shall be of the same type and quality of the pipe or fittings as supplied by the manufacturer. Bolts shall be in conformance with AWWA Standard C110.

AA. Flange Gaskets

Flange gaskets shall be Ring-type cloth insert rubber gaskets 1/16-inch thick equal to Rainbow or Durable Garlock. Gaskets shall cover the full face of flanged fitting ends.

BB. Flexible Coupling

Flexible couplings shall be cement-lined, Mechanical Joint, Ductile Iron long-pattern sleeves unless otherwise approved by the District.

CC. Galvanized Steel, Pipe And Fittings For Blowoffs And Air Vacuum Relief Valves

Galvanized steel pipe shall conform to ASTM A120-65, Schedule 40. Galvanized steel fittings shall be malleable galvanized.

### 2.2 WATER SYSTEMS

All water mains shall be cement-lined Ductile Iron as specified herein unless otherwise indicated on the Plans.

A. Butterfly Valves

Butterfly valves shall conform to AWWA C-504. Unless otherwise specified the valves shall be class 150, ductile iron, epoxy coated, stainless steel bolts, shaft seals shall be "O" ring type, the standard opening rotation shall be counter-clockwise and shall have a standard 2" operating nut.

1. Butterfly Valves shall be one of the following types:
   a) Mueller/ Pratt
   b) Kennedy M & H

B. Fire Hydrants

1. Fire hydrants shall be a dry-barrel, compression-type traffic model with a 5-1/4 inch main valve opening (MVO) with brass on brass or brass on stainless steel seating as specified for 36-inch trench, unless otherwise designated, flanged at ground line, 6 inch MJ connection with lugs suitable for rods; two 2-1/2 inch hose connections, National Standard Thread; pumper connection shall be a 4_inch Seattle Standard Thread 4.875 x 6 equipped with a five (5) inch, 125-5 Storz quick connect fitting, unless otherwise noted on the drawings or as required by the local fire department jurisdiction. Operating nut shall be 1-1/4 inch pentagon and shall open counter-clockwise. Hydrant shall be so constructed that the direction facing of pumper connection may be rotated to face the roadway. Hydrants shall comply with AWWA C502. Unless otherwise specified, hydrant shall be of dry barrel traffic type with break flange construction.
2. Hydrants shall be one of the following types:
   a) Dresser M&H 129-S
   b) Mueller A423 (Super Centurion 250)
   c) Clow Medallion
   d) American Darling B-62-B
   e) AVK Series 2780
   f) U.S. Pipe Sentinel 250

C. Tapping Sleeve And Valve Assembly

Where required by the District, tapping sleeves shall be Romac FTS 420 or JCM 412 , with fusion_bonded epoxy coating and Type 304 stainless steel fasteners. The gate valve shall conform to the requirements herein.

D. Corporation Stop

See Standard Details - Service Connections.

E. Service Saddle

See Standard Details - Service Connections.

F. Water Service Pipe

Water service pipe shall be DRISCOPLEX 5100 ULTRA-LINE or equal manufactured from a high density, extra high molecular weight pipe resin polyethylene defined by ASTM D3350 having a cell classification of 345564C as polyethylene type III, grade, PE4710. Pipe shall be Iron Pipe Size - ID ASTM D2239 - SIDR 7 and have a working pressure of 200 PSI at 73.4 degrees F. The polyethylene extrusion compound from which the PE pipe and tubing are extruded shall be made of virgin quality material. The polyethylene pipe or tubing shall be marked in accordance with ASTM D-2239 for IPS pipe sizes and carry the National Sanitation Foundation (NSF) seal of approval. See Standard Details for installation procedures.

G. Air and Vacuum Relief Valve Assemblies

Air and Vacuum Relief Valve assemblies shall be APCO No. 143-C, Crispin UL10 or District approved equal for one (1) inch assemblies and APCO No. 145-C, Crispin UL20 or District approved equal for two (2) inch assemblies, or approved equal, equipped with a brass plug on top service port, and shall conform to WSDOT/APWA 9-30.3(7).

H. Hydrant Guard Posts

Hydrant guard posts shall be reinforced concrete posts, 8"x8"x6' long, 8" diameter x 6' long, or 9" diameter x 6' long. The same size and type of guard posts shall be used around each hydrant.

### 2.3 SEWER SYSTEMS

A. Sewer Pipe and Appurtenances, Non-Pressure

Gravity sewer pipe shall be either PVC Pipe for Non-Pressure (Gravity) Sewer Service or PROTECTO 401 ceramic epoxy lined Ductile Iron pipe as specified herein. Pipes with slopes greater than or equal to twenty (20) percent shall be PROTECTO 401 ceramic epoxy lined Ductile Iron pipe or C-900 PVC. C-905 PVC pipe may be considered for lines which are fourteen (14) inches in diameter or greater.

B. Sewer Pipe and Appurtenances, Pressure

High pressure sewer pipe and appurtenances shall be Ductile Iron or HDPE pipe as specified herein.

C. Side Sewer Pipe, Non-Pressure

1. Gravity side sewer pipe shall conform to the requirements of the Sammamish Plateau Water and Sewer District "Side Sewer Regulations", latest edition.
2. New side sewer connections on an existing sewer main for a single connection (not in conjunction with a new development) shall conform to the requirements listed below.
   a. For existing D3034 PVC Sewer Main (less than 20 feet in depth), the side sewer connection shall be one of the following:
      - Cut-in PVC side sewer tee
      - Romac "SST" Stainless Steel Tapping Sleeve (w/ stainless steel flange), with FLxMJ adapter with PROTECTO 401 ceramic epoxy lining and gasket sized for D3034 PVC side sewer. Romac side sewer saddle, Model CB, is NOT allowed.
   b. For existing C900 PVC Sewer Main (20 feet or greater in depth), the side sewer connection shall be a cut-in tee of one of the following materials:
      - C900 PVC side sewer tee with a C900 side sewer up to the transition point to D3034 PVC
      - Epoxy-lined ductile iron tee with a C900 side sewer up to the transition point to 4-inch D3034 PVC
   c. For existing ductile iron Sewer Main (20 feet or greater in depth), the side sewer connection shall be a cut-in tee of epoxy-lined ductile iron, with a C900 side sewer up to the transition to 4-inch D3034 PVC or Romac "SST" Stainless Steel Tapping Sleeve (w/ stainless steel flange), with FLxMJ adapter with PROTECTO 401 ceramic epoxy lining.

D. Side Sewer Pipe, Pressure

Grinder pump side sewer pipe shall conform to the requirements of the Sammamish Plateau Water and Sewer District "Side Sewer Regulations", latest edition.

E. Low Pressure Mainline Sewer Pipe and Appurtenances

Low pressure mainline sewer pipe shall be either two (2) inch or three (3) inch diameter high-density polyethylene plastic pipe (HDPE SDR 11), conforming to the materials requirements in the Sammamish Plateau Water and Sewer District "Side Sewer Regulations", latest edition.

F. Manholes

Galvanized steel shall not be used in manholes. See Standard Details for material requirements for standard manholes and for deep manholes.

1. Cast Iron Frames and Covers

Cast Iron frames and covers shall conform to the Olympic Foundry Company No. MH 30A Traffic Type or equivalent marked "SEWER" in two (2) inch raised letters. Castings shall conform to the requirements of ASTM A 48, Class 30 and shall be free of porosity, shrink cavities, cold shuts, or cracks or any surface defects which would impair service ability. Repair or defects by welding, or by the use of "smooth-on" or similar material will not be permitted. Cover shall have a maximum of one hole, and a rubber plug per the Standard District Detail shall be installed in the hole.

Manholes located outside of public rights-of-way shall be equipped with a 3-bolt, lockdown cover. All movable parts shall be made of noncorrosive metals otherwise arranged to avoid possible binding. The locking frame and cover shall be Olympic Foundry Company No. MH 30 D/T Traffic Type or equivalent marked "SEWER" in two (2) inch raised letters.

Manhole covers in pedestrian or bike lane areas shall have low embossment lids.

All manholes rings and covers shall be machine finished or ground on seating surfaces so as to assure nonrocking fit in any position, and interchangeability. At the request of the District, there shall be made available at the foundry standard rings and standard covers for use by inspectors in testing fit and seating.

At the request of the District, 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 a 20-foot head.

All manhole frames and covers shall be identified by the name or symbol of the manufacturer. This identification shall be in a plainly visible location when the frame and cover is installed. In addition to the manufacturer's identification, the material shall be identified by the following "NOD" or "DUC" for nodular or ductile iron respectively. The manufacturer's identification and the material identification shall be adjacent to each other and shall be minimum 1/2 inch letters recessed to be flush with the adjacent surfaces.

2. Precast Manhole Components

Precast manhole components shall conform to ASTM C478 except as modified herein. Base section openings to receive pipe shall be circular and held to the minimum size practical to accommodate the pipe to be inserted to effectively seal the joint. Kor_n-Seal boots shall be used for all pipe penetrations. Connections shall conform to WSDOT/APWA 7-05.3. All manholes shall be channeled in the field. Pre_channeled manholes are not permitted.

Where the direction of future extensions from the manhole are known, a 2-foot stub and cap shall be installed in a Kor-n-Seal boot at that location and the manhole shall be channeled to receive the future flow. The 2-foot stub shall be removed and replaced when the future extension is installed.

Precast manhole elements shall be provided with steps and/or ladders such that the completed manhole will contain a continuous vertical ladder with rungs equally spaced at twelve (12) inches plus or minus 3/4 inch. The lowest rung shall be not more than sixteen (16) inches above the shelf, and the uppermost rung shall be not more than eighteen (18) inches below the street surface. Ladder rungs or handholds in the manhole neck area must be recessed 2 inches for improved clearance.

Joints between precast manhole elements shall be rubber gasketed with O-rings or approved equal conforming to AASHTO M198 and shall be grouted on the inside. Shop drawings of the joint design shall be submitted to the District for approval, prior to manufacture or purchase. Completed joints shall show no visible leakage and shall conform to the dimensional requirements of ASTM C478.

Drop manholes, wherever shown on the plans, shall conform in all respects to the requirements for standard manholes as specified above. Pipe and fitting materials shall be ductile iron and shall conform to the specifications for ductile iron pressure sewer main.

Standard precast cones shall provide an eccentric reduction from forty-eight (48) inches to twenty-four (24) inches and shall not be less than seventeen (17) inches in height. Precast cones shall conform to WSDOT/APWA 9-12.4.

3. Manhole Steps

Polypropylene plastic steps shall be a polypropylene plastic step injection molded around a 1/2 inch diameter ASTM A-615, Grade 60, steel reinforcing bar. Step dimensions and pattern shall conform to the WSDOT/APWA 7-03.5.

4. Ladders

Precast manhole base sections shall be provided with a ladder as shown in the Standard Details. Ladders shall be made of the same material as the steps installed in the manhole sections. All ladders shall be subject to approval by the District.

Ladders shall be installed so they are centered on the largest shelf of the manhole or as otherwise directed by the District.

5. Manhole Lining

The manhole into which a force main or low pressure mainline discharges shall be lined 5-9 mils of Tnemec Series 141 Epoxoline or Wasser Aeroshield. In addition, the two manholes downstream of that manhole shall be lined with Tnemec Series 141 Epoxoline or Wasser Aeroshield if installed as part of the same project.

Existing manholes downstream of the force main discharge shall be lined with a material resistant to hydrogen sulfide corrosion, such as Wasser Aerohield or Tnemec Series 141 Epoxoline. Submit product information for District review.

G. Air And Vacuum Relief Valve Assemblies

Air and Vacuum Relief Valve assemblies, size 2-inch, shall be stainless steel ARI D-020 with flanged connection.

H. Cleanout Assemblies

Cleanout assemblies for private side sewers shall not be allowed in the right-of-way or in private access tracts. Cleanout assemblies shall be brought up to finished grade with a locking cleanout cover (Olympic Foundry No. M-1025, marked "SEWER"). See District Standard Detail.

REVISIONS | BY | DATE

Sammamish Plateau Water
1510 228th Avenue SE, Sammamish, WA 98075
425.392.6256 • spwater.org

STANDARD MATERIALS AND CONSTRUCTION NOTES

DATE: 10/30/2017
DRAWN: JTF
CHECKED: KAW
JOB NO.

SHEET 1 OF 3