

## CHAPTER 4 MATERIAL REQUIREMENTS

### SECTION 401 GENERAL

#### 401.1 Minimum Requirements

- A. The material requirements contained in this Chapter include the minimum requirements necessary for construction of wastewater facilities in the SBWRD.
- B. Contractor shall submit material cut sheets and specifications for proposed materials according to Section 501.2 to demonstrate compliance with SBWRD Standards.
- C. Materials proposed for incorporation into the work that do not conform to these specifications shall require written approval by SBWRD prior to delivery to the job site.
- D. Any material or equipment not conforming to the Approved Construction Drawings and/or these SBWRD Standards or has not received prior written approval by SBWRD shall be removed from the project site.

#### 401.2 Use of Materials

- A. All materials and equipment furnished for permanent installation in the work shall be new, unused, and undamaged when installed or otherwise incorporated in the work.
- B. No material or equipment shall be used by the contractor for any purpose other than that intended or specified.

### SECTION 402 GRAVITY PIPE

#### 402.1 Acrylonitrile Butadiene Styrene (ABS) Pipe:

- A. Pipe: ASTM D 2661, D 2751, or F 628.
- B. Fittings: ASTM D 3311, ASTM D 2661.
- C. Joints.
  - 1. Elastomeric Seal: ASTM C 1173 and D 3212.
  - 2. Solvent Cementing: ASTM D 2235.
- D. Permitted for 4" and 6" diameter gravity Private Lateral Wastewater Lines only. Shall not be used for ejector pump pressure lines or any public wastewater line.

#### 402.2 Ductile Iron Pipe

- A. Pipe: ASTM A-746
  - 1. Lining: High-build multi-component Amine cured Novolac Epoxy lining, Protecto 401 Ceramic Epoxy or approved equal, applied according to manufacture's recommendations.
  - 2. Standard asphaltic exterior coating.

- 3. Minimum wall thickness Class 50.
- B. Fittings: ANSI A21.10. Fittings shall be consistent with the specified pipe including the lining material.
- C. Joints: ANSI A21.11 and shall be mechanical joint, approved restrained joint, or push-on type as specified on Approved Construction Drawings.
- D. Additional Exterior Corrosion Protection: Polyethylene encasement conforming to ASTM A 674 shall be required on all Ductile Iron Pipe installations and shall be installed per ASTM A674 requirements.
- E. Sealing field cut ends and repairing field damaged lining areas shall be accomplished with Protecto Joint compound or approved equal, according to manufacturer's instructions.
- F. Pipe with excessive field damaged lining material, as determined by the SBWRD Inspector, shall not be used.
- G. Permitted for 4" thru 24" diameter wastewater lines.
- H. Permitted only in Source Protection Zones and for water line separation requirements

#### 402.3 High Density Polyethylene (HDPE) Pipe

- A. Materials: Virgin resins, Cell Classification meeting or exceeding PE 345464C as defined in ASTM D 3350, resins shall be listed by the Plastic Pipe Institute in its pipe-grade registry TR-4.
- B. Pipe and Fittings:
  - 1. ASTM Material Designation Code: PE 3408 high density, extra high molecular weight.
  - 2. SDR 17 in accordance with ASTM F 714.
  - 3. Outside diameter to be ductile iron pipe size (DIPS) or iron pipe size (IPS).
  - 4. Marked in accordance with ASTM F 714.
  - 5. Pipe shall be manufactured with an integral color coded stripe of HDPE, color green.
- C. Fittings for Private Lateral Lines:
  - 1. 45 degree bends shall be fusion welded molded HDPE fittings or fusion welded 3 segment fabricated HDPE fittings.
  - 2. Wyes for cleanouts shall be fabricated fusion welded fitting.
- D. Joints: Zero leak-rate heat-fusion joint conforming to ASTM D 3261.
- E. Minimum slope requirements in accordance with Section 303.7 shall apply.

#### 402.4 Polyvinyl Chloride (PVC) Pipe

- A. Material: PVC plastic having a cell classification of 12364 or 12454 as defined in ASTM D1784
- B. Pipe:
  - 1. 4" thru 15" diameter: ASTM D 3034, SDR-35.
  - 2. 18" thru 48": ASTM F 679 (Large diameter solid wall), SDR 35.

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3. Minimum pipe stiffness shall be 46 psi when tested in accordance with ASTM D 2412.
- C. Fittings:
4. Gasketed sewer fittings conforming to ASTM F-1336.
  5. Solvent weld PVC fittings meeting ASTM D3034 may be used on 4" and 6" private laterals as approved by SBWRD. Gasketed fittings shall not be used for solvent welding.
- D. Joints:
1. Integral-bell gasketed joints conforming to ASTM D3212. Rubber gaskets shall be factory installed and conform to ASTM F 477.
  2. Joints on 4" and 6" diameter pipe may be solvent weld joints conforming to ASTM D 2855. A purple primer conforming to ASTM D 656 and solvent cement not purple in color and conforming to ASTM 2564 shall be used.
- E. Pipe lengths shall not be greater than 20 feet.
- F. PVC pipe meeting requirements of ASTM D 1785, Schedule 40 or Schedule 80, with equivalent gasketed or solvent weld fittings, may be used for 4" and 6" Private Lateral Wastewater Lines.

### SECTION 403 PRESSURE PIPE

#### 403.1 Ductile Iron Pipe

- A. Pipe: ASTM A-746
1. Lining: High-build multi-component Amine cured Novolac Epoxy lining, Protecto 401 Ceramic Epoxy or approved equal, applied according to manufacture's recommendations.
  2. Standard asphaltic coating on the exterior.
  3. Pressure Class and minimum wall thickness shall be based on specific requirements of installation with minimum wall thickness Class 50.
- B. Fittings: ANSI A21.10. Fittings shall be consistent with the specified pipe including lining material.
- C. Joints: ANSI A21.11 and shall be mechanical joint, approved restrained joint, or push-on type as specified on Approved Construction Drawings.
- D. Additional Exterior Corrosion Protection: Polyethylene encasement conforming to ASTM A 674 shall be required on all Ductile Iron Pipe installations.
- E. Sealing field cut ends and repairing field damaged lining areas shall be accomplished with Protecto Joint compound or approved equal, according to manufacturer's instructions.
- F. Pipe with excessive field damaged lining material, as determined by the SBWRD Inspector, shall not be used.
- G. Thrust Blocking: Appropriate thrust blocking, designed specifically for the pressures and soil conditions encountered, shall be installed at all fitting.

#### 403.2 High Density Polyethylene (HDPE) Pipe

- A. Materials: Virgin resins, Cell Classification meeting or exceeding PE 345434C as defined in ASTM D 3350, resins shall be listed by the Plastic Pipe Institute in its pipe-grade registry TR-4.
- B. Pipe and Fittings:
1. ASTM Material Designation Code: PE 3408 high density, extra high molecular weight.
  2. 1 1/4" thru 12" diameters. SDR and Pressure Class shall be based on specific requirements of installation with minimum SDR 11 and Pressure Class 160 in accordance with ASTM F 714.
  3. Outside diameter to be ductile iron pipe size (DIPS) or iron pipe size (IPS).
  4. Marked in accordance with ASTM F 714.
  5. Pipe shall be manufactured with an integral color coded stripe of HDPE, color green.
- C. Joints: Zero leak-rate heat-fusion joint conforming to ASTM D 3261.
- D. Thrust Blocking: Appropriate thrust blocking, designed specifically for the pressures and soil conditions encountered, shall be installed at all fitting.

#### 403.3 Polyvinyl Chloride (PVC) Pipe

- A. Material: PVC plastic having a cell classification of 12454 as defined in ASTM D1784.
- B. Pipe and Fitting:
1. 1 1/4" thru 3" diameters: ASTM D 1785, Schedule 40 or Schedule 80 depending on anticipated pressures.
  2. 4" thru 12" diameters: AWWA C900 . DR and Pressure Class shall be based on specific requirements of installation with minimum DR 18 and Pressure Class 150.
- C. Joints:
1. 1 1/4" thru 3" diameters. Solvent cement joints conforming to ASTM D 2855. A purple primer conforming to ASTM D 656 and solvent cement not purple in color and conforming to ASTM 2564 shall be used.
  2. 4" thru 12" diameters. Integral-bell gasketed joints conforming to ASTM D31339. Rubber gaskets shall be factory installed and conform to ASTM F 477.
- D. Fittings: ANSI A21.10. Fittings shall be consistent with the specified pipe.
- E. Thrust Blocking: Appropriate thrust blocking, designed specifically for the pressures and soil conditions encountered, shall be installed at all fittings.

### SECTION 404 MANHOLES

#### 404.1 General

- A. Manholes shall be watertight and shall be constructed

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- with precast reinforced concrete bases, wall and cone sections, thermo-plastic riser form, and castings.
- B. Steps shall be installed in all manholes except approved shallow manholes.
  - C. Cast-in-place concrete bases will generally not be allowed, and if allowed only for connection of new main lines to existing main lines where the use of a precast concrete base is not practical, as specifically approved by SBWRD.
  - D. Concrete manhole products shall not be installed within 7 days of manufacture date. The date stamped on the concrete product will be used as the starting date in determining this time period. Any concrete product installed prior to the completion of this 7 day period will not be approved by SBWRD and shall be removed.

### 404.2 Precast Concrete Bases

- A. Shall conform to ASTM C 478 and standard detail "Precast Manhole With Precast Base" in Appendix C. Shall consist of a monolithically cast precast base section with invert and shall be supplied with a flexible pipe connector for each pipe entering the manhole.
- B. Invert:
  - 1. An invert shall be provided for each pipe, including private laterals, entering the manhole.
  - 2. Inverts shall be full depth. The cross-sectional shape of the invert shall be uniform for the entire length and shall match the lower halves of the inflow and outflow pipe up to the springline of the pipe and shall be vertical from the springline to the top of the pipe.
  - 3. In certain situations extra depth of the channel may be required to contain the wastewater flow in the channel.
  - 4. If a change in pipe diameter occurs at the manhole, a smooth transition from one size to the other shall be provided.
  - 5. The invert shall have a uniform grade from inflow to outflow pipe flow lines with no areas of flat or reverse grade.
  - 6. Changes in flow direction shall be smooth and uniform. Short radiuses or abrupt changes in direction will not be allowed.
  - 7. The junction where the pipe abuts the invert shall be manufactured specifically for the type of pipe connecting to the manhole such that the flowline of the pipe matches the flowline of the invert.
  - 8. The junction shall be constructed so that the distance from the inside of the manhole wall to the end of the pipe when installed is 5" for HDPE pipe and 3" for all other pipe material.
  - 9. Minimum drop through manhole as required by Section 303.8.
- C. Apron: Minimum 2% cross-slope.
- D. Private Lateral Wastewater Line connections to Precast Base:
  - 1. Private Lateral Wastewater Line connections to pre-cast bases shall meet the requirements for flexible pipe connector and inverts listed above.
  - 2. In addition, the elevation of the lateral line entering a manhole shall be at or above the springline of the main line.
  - 3. The number of Private Lateral Wastewater Lines connecting directly to each manhole shall be limited to two (2). Exceptions shall be as approved by SBWRD.
- E. Steps: Shall be located over the largest apron of the manhole base.

### 404.3 Cast-in-Place Concrete Bases

- A. If approved by SBWRD, shall conform to standard detail "Cast-in-Place Manhole Base" in Appendix C and applicable portions of ASTM C-478, and shall include a precast wall section with a cast-in-place invert.
- B. The cast-in-place concrete base shall be located at the approximate midpoint of an individual pipe section on the existing main line in order to avoid including a joint of the existing pipe line within the new manhole base.
- C. The material around the existing pipe shall be removed to a level that is a minimum 12" below the bottom of the pipe extending radially from the center of the new manhole a sufficient distance to allow for placement of bedding material and concrete as discussed below.
- D. The existing pipe shall be adequately supported to prevent settlement or damage.
- E. A minimum 6" depth of compacted bedding material shall be placed to provide a level subgrade for the cast-in-place base.
- F. The initial precast wall section shall be supported on concrete blocks and adjusted to proper alignment and grade prior to pouring the invert. The concrete blocks shall be positioned to not interfere with the coring of the base for placement of the new pipe and shall not be exposed in the finished manhole base.
- G. The precast wall section may have "doghouse" cutouts to span the existing pipe.
- H. The precast wall section shall not bear directly on the existing pipe.
- I. Adequate separation between any part of the precast wall section and the pipe shall be provided to allow for placement of the pipe to manhole adapters and to provide a minimum 3" thickness of concrete between the pipe and the wall section.
- J. Prior to placing the concrete, the outside of the existing pipe shall be cleaned and pipe to manhole adapters (2 per side), located at each outside manhole wall, shall be installed on the existing pipe.
- K. Prior to placing the concrete, a circular form

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- extending from the prepared subgrade to a minimum 6" above the top of the highest pipe entering the manhole shall be installed and anchored. The form shall be a minimum 12" greater in diameter than the outside of the manhole section wall and shall be located concentric with the manhole section.
- L. The cast-in-place invert shall be a continuous pour of Class 4000 concrete and shall meet the following requirements.
1. Concrete shall be a minimum 6" in thickness below the bottom of the existing pipe and the bottom of the precast manhole wall section and shall extend a minimum 6" radially, measured from the outside of the precast manhole wall section.
  2. The concrete on the outside of the manhole shall extend a minimum 6" above the top of the highest pipe that will connect to the manhole and shall be level for the full circumference of the manhole.
  3. The concrete on the inside of the manhole shall extend to the top of the highest pipe that will connect to the manhole.
  4. The concrete shall be formed around the existing pipe to provide an invert in the manhole. The bottom half of the existing pipe will remain in place to form the bottom of the invert. The concrete above the existing pipe shall be formed to provide a uniform channel with vertical sides that matches the diameter of the pipe from springline to the top of pipe.
  5. In certain situations extra depth of the channel may be required to contain the wastewater flow in the channel.
  6. After the cast-in-place base has been completed and cured for a minimum of 48 hours and after the wall section, cone and casting have been placed and tested, the top half of the existing pipe shall be removed to within 3" of the manhole wall in the length of the pipe and to the springline of the pipe in the width.
  7. Rough edges of the pipe and concrete thus exposed shall be ground smooth and, if necessary, grouted with epoxy grout in such a manner as to produce a smooth and acceptable finish.
  8. Any gaps at the interface of the precast wall section and the cast-in-place concrete due to concrete shrinkage shall be grouted or sealed as directed by SBWRD.
  9. Minimum drop through manhole as described in Section 303.8.
  10. Apron: Minimum 2% slope.
- M. Connections of new pipe to Cast-in-place manholes.
1. After invert has been poured and cured, the cast-in-place base shall be core drilled at the design elevation to accept a flexible pipe connector and to form a full depth invert for the new pipe.
  2. A flexible pipe connector shall be installed in the core drilled base to provide a watertight seal.
  3. Installation of pipe in flexible pipe connectors shall be per manufacturer's recommendation.
  4. Additional forming of the core drilled invert by chipping and grouting may be required to provide a smooth transition to the existing invert.
- N. Private Lateral Wastewater Line Connections to Cast-in-Place Base:
1. The connection of Private Laterals to cast-in-place bases shall meet the requirements listed in item L above.
  2. In addition, the elevation of the Private Lateral line entering a manhole shall be at or above the springline of the main line.
- O. Any portion of the existing line damaged shall be repaired or replaced by the contractor as approved by SBWRD.
- P. Debris and construction material shall not be allowed to enter the existing wastewater system.
- Q. If debris and construction material does enter the existing wastewater system the Contractor shall be responsible for removal of the material, as approved by SBWRD.
- ### 404.4 Manhole Sections
- A. Precast reinforced concrete conforming to ASTM C 478.
  - B. Joints: Tongue and groove type specifically designed for type of joint sealant material being used.
  - C. Lifting Insert: Designed to not extend completely through section wall with a minimum 3/4" cover from inside of wall.
  - D. Steps: Installed in all sections except sections in shallow manholes
  - E. Precast base sections shall be monolithically poured.
  - F. Cone sections shall be of the eccentric type.
- ### 404.5 Grade Rings
- A. Grade rings shall only be used for adjustment of frame and cover to final grade when specifically approved by SBWRD. Standard adjustment shall be accomplished with a Thermo-plastic Riser Form. If approved, grade rings shall meet the following requirements.
  - B. Precast reinforced concrete conforming to ASTM C 478.
  - C. Designed to meet H-20 live loading.
  - D. Sizes: 2", 4" or 6" height.
  - E. Grade rings with cracks or visible damage shall not be accepted.
- ### 404.6 Flat-Slab Lid
- A. Precast reinforced concrete conforming to ASTM C 478.

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- B. Designed to meet H20 live loading.
- C. Joints: Tongue and groove type compatible with manhole sections and specifically designed for type of joint sealant being used.
- D. Allowed only on 6 foot diameter or larger manholes or on manholes meeting the requirements of standard detail "Shallow Manhole" in Appendix C.
- E. Opening for casting on 6 foot or larger diameter manholes shall be offset to align with steps in the manhole sections.
- F. Opening for casting on "Shallow Manholes" shall be centered in lid.

### 404.7 Frame and Cover

- A. Standard Frame and Cover.
  - 1. Cast iron conforming to ASTM A48 Class 35B.
  - 2. Combined minimum weight of 400 pounds with the cover approximately 150 pounds and the frame approximately 250 pounds.
  - 3. Frame.
    - a. Shall be of the cone construction, D&L Supply A 1180 series, Olympic Foundry, or approved equal.
    - b. Shall not have slots for dust pans.
    - c. Frames with flat slab construction are not allowed.
  - 4. Cover.
    - a. 24 3/4" in diameter, non-vented with pick hole for removal.
    - b. Low profile waffle pattern, D & L Supply A 1181-WP, Olympic Foundry, or approved equal.
    - c. Marked "SEWER."
- B. Oversized Frame and Cover.
  - 1. Shall be used on manholes connecting to pipelines 27" diameter and greater.
  - 2. Cast iron conforming to ASTM A48 Class 35B.
  - 3. Combined minimum weight of 450 pounds.
  - 4. Frame.
    - a. Shall be of the cone construction, D&L Supply A-1350, Olympic Foundry, or approved equal.
    - b. Shall not have slots for dust pans.
    - c. Frames with flat slab construction are not allowed.
  - 5. Cover.
    - a. 30" in diameter, non-vented with pick hole for removal.
    - b. Low profile waffle pattern, D & L Supply A-1350, Olympic Foundry, or approved equal.
    - c. Marked "SEWER."
- C. Frost Proof Frame and Cover
  - 1. Cast iron conforming to ASTM A48 Class 35B.
  - 2. Combined minimum weight of 445 pounds.
  - 3. Frame.
    - a. Shall be of the cone construction, D&L

- Supply A 1019, Olympic Foundry, or approved equal.
  - b. Shall not have slots for dust pans.
  - c. Frames with flat slab construction are not allowed.
- 4. Cover.
    - a. 27 3/4" in diameter, non-vented with pick hole for removal.
    - b. Low profile waffle pattern, D & L Supply A 1019, Olympic Foundry, or approved equal.
    - c. Marked "SEWER."
  - 5. Inner Cover:
    - a. 1/4" Aluminum with handle, D & L Supply A 1019 or approved equal.
- D. Water-tight seal-down frame and cover.
    - 1. Cast iron conforming to ASTM A48 Class 35B.
    - 2. Combined minimum weight of 400 pounds.
    - 3. Shall be of the gasket and bolt-down type.
    - 4. Frame.
      - a. Shall be of the cone construction, D&L Supply E-1926, Olympic Foundry, or approved equal.
      - b. Shall not have slots for dust pans.
      - c. Frames with flat slab construction are not allowed.
    - 5. Cover.
      - a. 24 3/4" in diameter, non-vented with pick hole for removal.
      - b. Low profile waffle pattern, D & L Supply E-1926, Olympic Foundry, or approved equal.
      - c. Marked "SEWER."
    - 6. Countersunk, hexagonal stainless steel bolts.
  - E. Cover for Manholes with Odor Control Units.
    - 1. 24 3/4" in diameter, vented, thickness of cover reduced to allow placement of Odor Control Unit.
    - 2. Low profile waffle pattern, D & L Supply A-1180-82 or approved equal.
    - 3. Marked "SEWER SUPPORT STRUCTURE."
    - 4. These manhole covers shall be installed on all manholes with a Manhole Odor Control Unit installed.
  - F. Metal Adapter Rings (Risers).
    - 1. Shall only be allowed for adjusting the top of frame elevation on existing manholes for pavement overlays as approved by SBWRD.
    - 2. Shall not be allowed on manholes constructed as part of a new development project.
    - 3. The maximum depth of adapter rings shall be 4".
    - 4. The maximum number of adapter rings shall be 2.
    - 5. D&L Supply G-2088 thru G-2093, Olympic Foundry or approved equal.
    - 6. Shall not have slots for dust pans.
    - 7. Shall include 4 set-screws to anchor ring to existing frame.

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8. Shall be compatible with the existing frame being adjusted.

### 404.8 Manhole Steps

- A. Shall conform to ASTM C 478 with ½" deformed grade 60 steel reinforcing rod encased in polypropylene conforming to ASTM 2146, Type II, Grade 16906.
- B. See Section 509.4 for spacing and alignment requirements.

### 404.9 Flexible Pipe Connector (Boot)

- A. Shall conform to ASTM C-923,
- B. Manufactured and sized specifically for the type and size of pipe connecting to the manhole.

### 404.10 Pipe to Manhole Adapter

- A. "Romac Style 'LCT' Manhole Adapter Gasket" as manufactured by Romac Industries, Inc., Fernco Large Diameter Waterstop or Manhole Adapter as manufactured by Fernco, Inc., or approved equal.

### 404.11 Joint Sealant Material

- A. Shall meet the following requirements.
  1. Preformed flexible joint sealant (mastic) meeting requirements of ASTM C 990. Ram-Nek as manufactured by Henry Company Sealants Division, Kent Seal as manufactured by Hamilton Kent, Polysealant as manufactured by J-K Polysource, Inc., or approved equal.

### 404.12 Concrete

- A. Pre-cast : Shall meet the requirements of ASTM C-478.
- B. Cast-in-place: Class 4000: 28-day minimum compressive strength of 4000 psi and contain not less than 6 ½ bags of low alkali, Type II or Type V Portland Cement per cubic yard and air entrainment per ASTM C-150.

### 404.13 Non-Shrink Cementitious Grout

- A. High strength, non-shrink, non-metallic, cement based grout.
- B. Surfaces shall be prepared and grout shall be prepared and placed according to manufacturer's directions.

### 404.14 Non-Shrink Epoxy Grout

- A. High strength, non-shrink, 100% solids, 3 component epoxy grout system.
- B. Surfaces shall be prepared and grout shall be prepared and placed according to manufacturer's directions.

### 404.15 Brick for Manhole Adjustment

- A. Brick shall only be used for adjustment of frame and cover to final grade when specifically approval by SBWRD. Standard adjustment shall be accomplished with a Thermo-plastic Riser Form. If approved for use,

brick shall meet the following requirements.

- B. Cut sections of fired-clay units cut to appropriate sizes.
- C. Sections of cinder or cement based masonry units shall not be used.

### 404.16 Thermoplastic Riser Form

- A. Thermoplastic riser form: As manufactured by Whirlygig® or approved equal.
- B. Riser form shall not be cut vertically to allow for adjustment to manhole frame.
- C. Sealant for Thermoplastic riser: One-compound, all purpose, polyurethane sealant. Sikaflex® Construction Sealant as manufactured by Sika Chemical; Dynatrol®I-XL as manufactured by Pecora Corporation or approved equal.

### 404.17 Manhole Interior Coating

- A. Two component, 100% solids, high build epoxy based coating system. Sikagard® 62 as manufactured by Sika Chemical; Devcon Epoxy Concrete Sealer as manufactured by Devcon; Duralkote® High Build Epoxy Coating as manufactured by Tamms Ind., or approved equal.
- B. Surfaces shall be prepared and coating material shall be prepared and applied according to manufacturers directions.
- C. Manholes with interior coating applied at manufacturing plant where the coating is chipped or damaged during installation shall have the damaged area repaired with the same coating material.

### 404.18 Manhole Odor Control Units

- A. Thermo-plastic manhole insert with removable carbon filled canister designed to remove hydrogen sulfide and other odorous components in the exhaust air from the wastewater system.
- B. "Sweet Street Odor Control Unit" as manufactured by Calgon Carbon Corporation, "Manhole Odor Control Unit" as manufactured by Bay Products, Inc., or approved equal.
- C. The unit shall be supplied with high-activity, chemically treated activated carbon specifically designed for use in odor control applications.
- D. The manhole cover supplied for manholes with these Manhole Odor Control Units shall meet the requirements of Section 404.7.E.

## SECTION 405 LOW PRESSURE SEWER SYSTEMS

### 405.1 General

- A. The design of the Low Pressure Sewer System shall meet the requirements of Section 303.9.
- B. The proposed Low Pressure Sewer System and appurtenances shall be consistent within each

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development.

### 405.2 Main Line Materials

- A. Low Pressure Sewer System pipe: HDPE pressure pipe meeting the requirements of Section 403.2.
- B. Flushing Connections.
  - 1. Manhole: Minimum 5' diameter meeting the requirements of Section 404.
  - 2. Ball Valve: Nickel-plated bronze body with Type 316 stainless steel ball and stem, full port, vinyl coated stainless steel lever-style handle, threaded, minimum 150 psi working pressure. Size of in-line valve shall match main line size. Flushing connection valve shall be 1 1/2".
  - 3. Universal Coupling: Brass, 110 psi working pressure, 1". Air King Universal Coupling as manufactured by Dixon Valve and Coupling Co. or approved equal.
  - 4. Pressure Hose: Type P(EDPM) tube with synthetic, high tensile textile cord reinforcement and Type P(EDPM) cover. 1" inside diameter, minimum 250 psi working pressure. Gates Adapta Flex™ as manufactured by Gates Corporation or approved equal. Connectors shall be brass with minimum 250 psi working pressure.
  - 5. Pipe Supports.
    - a. Adjustable Pipe Saddle Support w/ Strap: Two piece, full circle pipe saddle with strap and neoprene liner to isolate and protect pipe; threaded pipe w/ adjuster; and threaded stand pipe, cross bolted to prevent up-lift. All metal items shall be stainless steel. TolCo Figures 311, 319 and 316T as manufactured by TolCo a brand of NIBCO, Inc. or approved equal.
    - b. Adjustable Pipe Saddle Support: One piece, saddle support with neoprene liner to isolate and protect pipe; threaded pipe w/ adjuster, and threaded stand pipe, cross bolted to prevent up-lift. All metal items shall be stainless steel. TolCo Figures 317A and 316T as manufactured by TolCo a brand of NIBCO, Inc or approved equal.
    - c. Pipe supports for smaller diameter pipe (2" and 3") may consist of Unistrut, or approved equal, channel, brackets and clamps. All metal parts shall be stainless steel. Neoprene liner required on all pipe to support contact areas to isolate and protect pipe.
  - 6. HDPE to Brass Adapter: SDR 11 HDPE X aluminum bronze or red brass MPT with Full length HDPE. Aluminum Bronze MPT Adapter, as manufactured by High Country Fusion Company, Inc., Red Brass Transition Fitting as manufactured by Industrial Pipe Fittings, LLC,

or approved equal.

- 7. Miscellaneous Pipe and Fittings: Threaded, schedule 40 brass.
- C. Combination Air Valve.
  - 1. Manhole: Minimum 5' diameter meeting the requirements of Section 404.
  - 2. Sewage Combination Air Release and Air/Vacuum Valve with Accessories. ValMatic Series 800 as manufactured by ValMatic Valve and Manufacturing Company or approved equal. Size of valve shall be determined by Engineer and approved by SBWRD.
  - 3. Valves: Meeting requirements of Section 405.2.B.2,
  - 4. Dielectric Fitting: Shall be used at the connection of any brass pipe, valve or fitting to the cast iron air release valve.
  - 5. Miscellaneous Pipe and Fittings: Threaded, schedule 40 brass.

### 405.3 Private Lateral Wastewater Line Materials

- A. Individual low pressure grinder pump station: Environment One D-Series as manufactured by Environment One Corporation.
- B. Low Pressure Sewer System pipe: HDPE pressure pipe meeting the requirements of Section 403.2.
- C. Private Lateral Components:
  - 1. Combination curb stop valve/check valve assembly with valve box: Engineered Thermoplastic Service Lateral Components for SDR 11 HDPE pipe as supplied by Environment One Corporation or approved equal.
  - 2. Valve box shall be arch pattern.
  - 3. Valve boxes shall include valve operator extension rod.
  - 4. Valve boxes located in traffic areas shall be traffic rated iron or shall have a traffic rated frame and cover installed over the valve box.

## SECTION 406 WASTEWATER PUMP STATIONS

### 406.1 General

- A. Equipment and materials proposed for wastewater pump stations shall be reviewed and approved by SBWRD during the design review process.
- B. As a minimum the pump station construction shall incorporate the following features.
  - 1. Wet Well Structure
    - a. Concrete structure with integrally cast PVC lining system, T-Lock PVC Lining as manufactured by Ameron International or approved equal.
    - b. All exposed concrete surfaces that cannot be manufactured with PVC lining system shall be coated with an approved coating system

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- designed specifically for wastewater environments.
- c. All pipe and conduit penetrations shall be sealed to the lining system according to the lining system manufacturer’s recommendations.
- 2. Wet Well Metal Items.
  - a. All metal items within the wet well including guide rails, lifting cable or chain, anchor bolts, fasteners, clips, etc., shall be stainless steel.

- joint with gasketed cap, transition gaskets sized for outside pipe diameters. Lining shall be High-build multi-component Amine cured Novolac Epoxy lining, Protecto 401 Ceramic Epoxy or approved equal, applied according to manufacture’s recommendations.
- G. Coupling bolts shall be greased with non-oxidizing grease and the coupling shall be wrapped with polyethylene sheeting and taped.

**SECTION 407  
PIPE COUPLINGS**

**407.1 Main Line Pipe Couplings**

- A. Concrete Pipe, Asbestos Cement Pipe, Clay Pipe and connection of dissimilar pipe material not covered below.
  - 1. Flexible PVC or rubber pipe connector with stainless steel shear ring , Strong Back - RC Series Repair Coupling as manufactured by Fernco, Inc., Flex-Seal ARC Series as manufactured by Mission Rubber Co., or approved equal. Transition couplings or bushings required for pipe material of differing outside diameter.
- B. Ductile Iron Pipe: Ductile iron pipe coupling sleeve, mechanical joint, minimum 12" length. Lining shall be High-build multi-component Amine cured Novolac Epoxy lining, Protecto 401 Ceramic Epoxy or approved equal, applied according to manufacture’s recommendations.
- C. HDPE Pipe: HDPE Electro fusion coupling as manufactured by Central Plastics Company, or approved equal.
- D. PVC Pipe.
  - 1. PVC double bell repair coupling, ASTM D 3034, SDR 35, with gasketed joints conforming to ASTM 3212.
  - 2. If approved by SBWRD, Flexible PVC or rubber pipe connector with stainless steel shear ring , Strong Back - RC Series Repair Coupling as manufactured by Fernco, Inc., Flex-Seal ARC Series as manufactured by Mission Rubber Co., or approved equal.
- E. Ductile Iron Pipe to PVC or HDPE Pipe.
  - 1. Ductile iron pipe short body tee, mechanical joint with gasketed cap, transition gaskets sized for outside pipe diameters. Lining shall be High-build multi-component Amine cured Novolac Epoxy lining, Protecto 401 Ceramic Epoxy or approved equal, applied according to manufacture’s recommendations.
- F. HDPE Pipe to PVC Pipe:
  - 1. Ductile iron pipe short body tee, mechanical

**407.2 Private Lateral Wastewater Line Pipe Couplings**

- A. Shall meet the requirements of Section 407.1 for the type of pipe being used.
- B. Connection of the exterior lateral pipe to the waste pipe exiting the building.
  - 1. Flexible PVC or rubber pipe connector with stainless steel shear ring , Strong Back - RC Series Repair Coupling as manufactured by Fernco, Inc., Flex-Seal ARC Series as manufactured by Mission Rubber Co., or approved equal.
  - 2. Transition couplings or bushings required for pipe material of differing outside diameter.
- C. “No-hub” type couplings shall not be used.

**SECTION 408  
BEDDING AND BACKFILL MATERIAL**

**408.1 Bedding and Initial Backfill Material**

- A. Manufactured, angular, crushed stone or rock, or crushed stone/sand mixtures free from organic matter meeting one of the following gradations when tested in accordance with ASTM D 2487.
  - 1. For pipe diameters 4" and larger:

	Open Graded	Dense Graded
US Stand. Sieve	Percent Passing	
1 1/2"	100	100
3/4"	95-100	95-100
#4	0-10	10-50
#200	0-5	0-5

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2. For pipe diameters less than 4":

	Open Graded	Dense Graded
US Stand. Sieve	Percent Passing	
3/4"	100	100
1/2"	95-100	95-100
#4	0-10	10-50
#200	0-5	0-5

	1 1/2 Inch	1 Inch	3/4 Inch
US Stand. Sieve	Percent Passing		
1 1/2"	100	-	-
1"	-	100	-
3/4"	81 - 91	-	100
1/2"	67 - 77	79 - 91	-
3/8"	-	-	78 - 92
#4	43 - 53	49 - 61	55 - 67
#16	23 - 29	27 - 35	28 - 38
#200	6 - 10	7 - 11	7 - 11

**408.2 Final Backfill Material**

- A. Final backfill material in Public or Private roads, streets and rights-of-way shall meet the requirements of applicable City, County or State standards and permits.
- B. Final backfill material in areas of Off-Road Wastewater Lines, as defined in Section 101.6, shall be acceptable material free of hard clods, frozen material or excessive amounts of large rocks. If existing material cannot meet compaction requirements, acceptable import material will be required.

**408.3 Cement Treated Fill Material (Flowable Fill)**

- A. Cement treated fill shall consist of low alkali Type II Portland cement, water, non-plastic sand or concrete aggregate, and other additives to meet the performance requirements.
- B. Performance Requirements: Unconfined compressive strength per ASTM D4832.
  - 1. 10 psi minimum in 24 hours.
  - 2. 100 psi maximum in 28 days.

**408.4 Untreated Base Course Material**

- A. Untreated base course material shall consist of clean, hard, tough, durable and sound mineral aggregates that consist of crushed stone, crushed gravel or crushed slag; free of detrimental and organic matter.
- B. Gradation. Shall conform to Utah Department of Transportation specification for Untreated Base Course as follows:

**408.5 Trench Dike Material**

- A. Cement Treated Fill Material: Shall meet the requirements of Section 408.3.

**SECTION 409 CASINGS**

**409.1 Casings Under Roadways**

- A. Casings shall meet the requirements of the applicable City, County or State standards.
- B. As a minimum, casings shall be steel pipe conforming to ASTM A 139, Grade A. Alternate casing pipe material may be allowable, as approved by SBWRD and the roadway owner.
- C. Joints between sections of casing pipe shall be welded around the full circumference to provide a water-tight joint.
- D. Minimum casing diameter shall be 24" to allow for future upsizing of carrier pipe. In situations where upsizing of the carrier pipe is not likely, a smaller diameter casing may be allowable, as approved by SBWRD.
- E. Minimum wall thickness shall be in accordance with the following:

Casing Diameter (inches)	Nominal Wall Thickness (inches)
24	0.312
30	0.438
36	0.462

- F. Casing Spacers meeting requirements of Section 409.3 shall be installed on carrier pipe inside all casings..

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### 409.2 Other Main Line Casings

- A. Casings required on main lines outside of roadways shall, as a minimum, be steel pipe conforming to ASTM A 139, Grade A. Alternate casing pipe material may be allowable, as approved by SBWRD
- B. Joints between sections of casing pipe shall be welded around the full circumference to provide a water-tight joint.
- C. Minimum casing diameter shall be 18" to allow for future upsizing of the carrier pipe. In situations where upsizing of the carrier pipe is not likely, a smaller diameter casing may be allowable, as approved by SBWRD.
- D. Minimum wall thickness shall be in accordance with the following:

Casing Diameter (inches)	Nominal Wall Thickness (inches)
18	0.312
24	0.312
30	0.438
36	0.462

- E. Casing Spacers meeting requirements of Section 409.3 shall be installed on carrier pipe inside all casings

### 409.3 Casing Spacers

- A. Maximum of 5' separation between spacers.
- B. Band shall be 14 gauge heat fused PVC coated steel.
- C. Risers shall be 10 gauge heat fused PVC coated steel welded to the band.
- D. Liner shall be PVC.
- E. Runners shall be reinforced plastic.
- F. Hardware shall be cadmium plated.
- G. Spacer configuration shall be restrained with spacer intervals and locations per manufacturer's recommendations.
- H. Spacers shall be concentric.

### 409.4 Casing End Seals

- A. Casing end seal shall be a pull-on type or approved wrap-around type comprised of 1/8" thick synthetic rubber compound sized to fit the carrier pipe and casing.
- B. Stainless steel bands shall be used to secure the end seal to the pipe.

### 409.5 Private Lateral Wastewater Line Casings

- A. Casings on private laterals 6" diameter and smaller shall be 8" diameter Ductile Iron Pipe meeting the requirements of Section 402.2 with cement mortar lining instead of Protecto 401 Epoxy Coating.
- B. Casing end seals, meeting the requirements of Section

409.4, shall be installed on the ends of casings.

## SECTION 410 MISCELLANEOUS MATERIAL

### 410.1 Marking Tape

- A. Marking tape shall be a type specifically manufactured for marking underground utilities and shall meet the following requirements.
  - 1. Tape shall be of an acid and alkali-resistant polyethylene film.
  - 2. Tape width shall be 2" minimum on laterals and 3" minimum on main lines. Minimum thickness shall be 0.004".
  - 3. Tape color shall be GREEN and shall bear a continuous printed inscription "SEWER."

### 410.2 Tracer Wire

- A. Tracer wire shall be a type specifically manufactured for the purpose of detecting buried utilities and shall meet the following requirements.
  - 1. Minimum 12 AWG copper wire coated with a minimum 30 mil High Molecular Weight Polyethylene (HMWPE) jacket designed specifically for buried use.
  - 2. Jacket color shall be green.
  - 3. Tracer Wire Connectors.
    - a. Silicon filled direct bury wire nuts: Dryconn Direct Bury Wire Nut (10600), as manufactured by King Innovation or approved equal.
    - b. Direct bury splice kit: 3M™ Direct Bury Splice Kit as manufactured by 3M Company, or approved equal.

### 410.3 Caps for Main Line and Private Lateral Stubs

- A. Glued, fused or gasketed cap.
- B. Expansion type (Brandt™) plugs shall not be used.

### 410.4 Off-road Manhole Marker

- A. 2" inside diameter by 10' long, Schedule 40, galvanized steel pipe.
- B. Bury Depth: 3'.
- C. The exposed portion of the marker shall be painted green.

### 410.5 Private Lateral Wastewater Line Stub Marker

- A. Redwood or pressure treated wood 2"x4" or larger wrapped with marking tape.
- B. The marker shall extend from the top of the stub end to a minimum 2' above final grade.
- C. The exposed portion of the marker shall be painted green.
- D. The length of the lateral pipe from the main line and

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the length of the marker shall be clearly labeled with permanent ink at the top of the marker.

### 410.6 Cleanout Cap

- A. In paved areas: Threaded brass cap in threaded x solvent weld PVC adapter. Cleanout Ring and Cover per Section 410.7 shall be placed over the cleanout assembly.
- B. In unpaved areas: Threaded brass cap in cast iron body or cast iron blind cap. Cast iron body shall be connected to cleanout riser pipe with flexible-type neoprene coupling as manufactured by FERNCO or approved equal or no-hub type connector to provide a water-tight connection. Sprinkler irrigation box per Section 410.7 shall be placed over the cleanout assembly.

### 410.7 Cleanout Ring and Cover

- A. Paved Areas: Cleanout Ring and Cover shall be separate from the cleanout stand pipe and cleanout cap to prevent transfer of loads to the standpipe from wheel loads or if settling of the pavement occurs.
  - 1. 4" and 6" cleanouts:
    - a. Cast iron Frame and Cover conforming to ASTM A48 Class 35B similar to D&L Supply H-8030, or approved equal. Ring and cover shall be cleaned and painted with an asphalt coating prior to delivery to site.
    - b. Heavy Duty Cleanout Housing with cast iron, bronze or other approved cover similar to Zurn Z1474 or Jay R. Smith 4880.
    - c. If a more decorative cover is required in pedestrian traffic areas, an access cover similar to Zurn Z1456 Deck Cleanout or Jay R. Smith 4890 Round Deck Plug may be used.
    - d. In all cases the Ring and Cover must be large enough in diameter to provide separation from the cleanout standpipe and cleanout cap and allow access for removal of the Cleanout Cap.
  - 2. Larger than 6" cleanout: 4' diameter manhole cone section properly supported with Standard Manhole Frame and Cover per Section 404.
- B. Landscaped Areas: Sprinkler irrigation box and cover or other appropriate enclosure.

### 410.8 Private Lateral Wastewater Line Saddles

- A. Private lateral saddles on all gravity main line pipe material except HDPE shall be "Romac 'CB' Sewer Saddle" as manufactured by Romac Industries Inc., or approved equal.
- B. Private lateral saddles on gravity flow HDPE main line pipe shall be electro fusion HDPE branch saddles.
- C. Private Lateral saddles on Low Pressure Sewer System main lines shall be electro fusion HDPE high volume tapping tees.

D.

### 410.9 Grease Interceptors, Oil Separators and Sand Interceptors

- A. Precast reinforced concrete structure consisting of a vault with integral floor, vault riser sections, baffle wall, lid, grade rings, frames and covers, and piping.
- B. Size as approved by SBWRD.
- C. Precast vault, vault riser sections, and lid.
  - 1. Shall be designed by a Registered Professional Engineer licensed in the State of Utah.
  - 2. Loading condition:
    - a. Walls designed for a saturated equivalent fluid at rest.
    - b. Design surcharge loading: AASHTO H-20 truck load.
  - 3. Concrete: Minimum 28-day compressive strength of 4000 psi.
  - 4. Reinforcing steel: ASTM A615 Grade 60.
  - 5. Concrete cover over reinforcing steel: Minimum 1 ½".
- D. Manhole Adjustment Materials: meeting requirements of Section 404.
- E. Frame and cover: meeting requirements of Sections 404.7.
- F. Piping: PVC with solvent weld joints meeting the requirements of Section 402.4.
- G. Piping connection to precast vault: Flexible Pipe Connector (Boot) meeting the requirements of Section 404.9.
- H. Joints between vault, vault riser sections, lid, grade rings and frame and cover shall be sealed with flexible butyl blend sealant (mastic) meeting the requirements of Section 404.11.

### 410.10 Private Residence Sand/Oil Interceptor

- A. Fabricated coated steel or pre-cast concrete structure consisting of a water-tight vault, heavy duty grate, outlet trap seal and pipe connections.
- B. Minimum capacity below outlet pipe shall be 60 gallons.
- C. Fabricated Steel structure with integral outlet trap seal: Sand Trap as manufactured by Jay R. Smith Mfg Co. or approved equal.
- D. Precast Concrete structure.
  - 1. Designed for AASHTO H-20 loading.
  - 2. Outlet Trap Seal: The Snout® Oil and Debris Stop as manufactured by Best Management Products, Inc. or approved equal.
- E. Pipe connections to structure shall be water tight as demonstrated by water test of structure.
- F. Private Residence Sand/oil Interceptors shall pass manhole acceptance test standards.

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