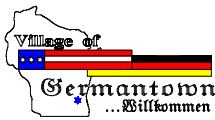


**DESIGN, DRAFTING & CONSTRUCTION STANDARDS & SPECIFICATIONS
SECTION 5.0: SANITARY SEWER SYSTEM REQUIREMENTS**

TABLE 1.0: GOVERNING AGENCIES AND APPLICABLE CODES/GUIDELINES/REGULATIONS (Most stringent shall apply)	
Wisconsin State Statutes & Administrative Code	<ul style="list-style-type: none"> • Chapter NR 110 • Chapter DSPS 382 (formerly Comm 82)
Milwaukee Metropolitan Sewerage District (MMSD)	<ul style="list-style-type: none"> • MMSD Rules, including Chapter 2
State of Wisconsin Department of Transportation (WisDOT)	<ul style="list-style-type: none"> • WisDOT Standard Specifications for Highway and Structure Construction • WisDOT Facility Development Manual (FDM)
Village of Germantown	<ul style="list-style-type: none"> • Municipal Code • Stormwater Management Requirements • Design, Drafting & Construction Standards & Specifications (Sec. 1-9) • Village Board and Committee actions • DPW Director, Village Engineer, Utility Superintendent discretion
Other	<ul style="list-style-type: none"> • Standard Specifications for Sewer & Water Construction in Wisconsin (Standard Specifications) • Southeast Wisconsin Regional Planning Commission (SEWRPC) • Manufacturer specifications

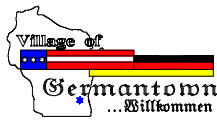
TABLE 2.0: DESIGN CRITERIA															
General	<ul style="list-style-type: none"> • Min. mainline dia. = 8" DIPS; Min. lateral dia. = 6" DIPS • Situate manholes along centerline of roadway with a max. 5' offset • Min. slopes for mainlines shall conform to NR 110.13, Table 1 as follows: <table border="0" style="margin-left: 40px;"> <tr><td>8-inch</td><td>0.40 (ft/100 ft)</td></tr> <tr><td>10-inch</td><td>0.28 (ft/100 ft)</td></tr> <tr><td>12-inch</td><td>0.22 (ft/100 ft)</td></tr> <tr><td>15-inch</td><td>0.15 (ft/100 ft)</td></tr> <tr><td>18-inch</td><td>0.12 (ft/100 ft)</td></tr> <tr><td>21-inch</td><td>0.10 (ft/100 ft)</td></tr> <tr><td>24-inch</td><td>0.08 (ft/100 ft)</td></tr> </table> • Min. cover above mainlines and risers = 7' depth; depths < 7' require polystyrene board insulation conforming to Standard Specifications Ch. 4.17.0 and 8.50.2 • Sewer depths shall provide gravity flow for basement floor drains and plumbing fixtures. "Hung" services are prohibited. Grinder pumps may be considered by Village Engineer. • Max. manhole spacing for 15" dia. or less DIPS mainline = 400' • Max. manhole spacing for > 15" dia. DIPS mainline shall conform to NR 110.13(3)(b) • Manholes shall connect 2 pipes having differing dia. • Min. elevation difference between influent and effluent pipes in manholes = 0.1' • Max. elevation difference between influent and effluent pipes without outside drop in manholes = 2.0' • Pipe with cover depths > 20' shall have the pipe material approved by the Engineer and shall be designed conforming to Standard Specifications Ch. 5.3.12 and Table 12 	8-inch	0.40 (ft/100 ft)	10-inch	0.28 (ft/100 ft)	12-inch	0.22 (ft/100 ft)	15-inch	0.15 (ft/100 ft)	18-inch	0.12 (ft/100 ft)	21-inch	0.10 (ft/100 ft)	24-inch	0.08 (ft/100 ft)
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DESIGN, DRAFTING & CONSTRUCTION STANDARDS & SPECIFICATIONS
SECTION 5.0: SANITARY SEWER SYSTEM REQUIREMENTS

TABLE 3.0: MAINLINE PIPE, APPURTENANCES, AND OTHER MATERIALS

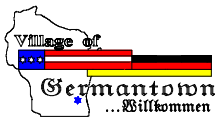
Polyvinyl Chloride (PVC)	<ul style="list-style-type: none"> • 15” dia. or less DIPS = PSM SDR-35 PVC. Conform to Standard Specifications Ch. 8.10.0 and ASTM D-3034. • 18” dia. or greater DIPS = pipe stiffness of 46 psi. Conform to ASTM F-679. • Pipe joints = Rubber gaskets. Conform to Standard Specification Ch. 8.10.6(a) and ASTM D-3212. • Force main = PVC water class pipe. 4” thru 12” dia. = Class 150-DR18 conforming to AWWA C-900, conforming to Standard Specification Ch. 4.6.0 and 8.20.01. <ol style="list-style-type: none"> 1. Fittings = ductile iron conforming to Standard Specifications Ch. 8.22.0. <ol style="list-style-type: none"> a. 4” thru 12” dia. = Class 250 mechanical joints. 2. Nuts & Bolts = Cor-Blue™ 3. Mechanical joint retainer glands = Mega-Lug™; Buttresses also required. 4. Tees, crosses, bends, offsets, and other fittings shall conform to Standard Specification Ch. 8.22.0. Acceptable supplier shall be Tyler or equal. 5. Triple wrap all ductile iron fittings with polyethylene. Conform to Standard Specifications Ch. 4.4.4 and 8.21.0.
High Density Polyethylene (HDPE)	<ul style="list-style-type: none"> • Force main = HDPE pressure pipe and fittings conforming to AWWA C-900 and ASTM F-714 for DIPS with SDR-11. DIPS pipe shall have equally spaced green longitudinal stripes co-extruded into outside surface. • Connections and fittings: Joined by heated butt fusion. Conform to ASTM D2657 and manufacturer specifications. Internal/external beads shall not be removed. • Main and branch joints: Joined by electrofusion conforming to manufacturer specifications. Internal/external beads shall not be removed. • HDPE MJ adaptors: Connections to mechanical joint pipe, fittings, valves, and other appurtenances that conform to AWWA C111/ANSI A21.11. MJ adapters shall be installed incorporating extended Cor-Blue™ nuts and bolts and standard gland and gasket.
Fusible PVC C-900	<ul style="list-style-type: none"> • Conform to Standard Specifications Ch. 4.6.0 and 8.20.0, Class 150-DR18 and to AWWA C-900 • Connections: Restrained or non-restrained retainer gland product for PVC pipe, as well as for MJ or flanged fittings • PVC Gasketed, Push-On Fittings: Gasketed PVC, push-on type couplings and fittings, including bends, tees, and couplings as shown in the drawings • Sweeps or Bends: Not > 22.5 degrees, and shall be used in nominal diameters ranging from 4 inch through 16 inch. • Connection Hardware: Bolts and nuts for buried service shall be made of non-corrosive, high-strength, low-alloy steel having the characteristics specified in ANSI/AWWA C111/A21.11
Tracer Wire	<ul style="list-style-type: none"> • Force main = Insulated solid copper #8 wire, placed parallel to and above the sanitary sewer • Laterals = Insulated solid copper #8 wire, placed parallel to and above the lateral. GPS survey of lateral locations can substitute for the tracer wire. • Directionally drilled pipe = Min. 7/16” PVC-coated stainless steel aviation cable • Spacing of tape = 10’ intervals • Splicing = spliced, soldered, and wrapped with Plyflex low voltage splice kit, manufactured by Plymouth Rubber Co. (or Engineer approved equal) • Splicing between marker posts is prohibited. • Location box spacing = 300 ft max. • Continuity testing: Provide a temporary above-ground wire between adjacent location boxes. Connect ohm meter in a series loop with detector wire and above-ground wire. Circuit resistance shall not exceed 5 ohms.
Warning Tape	<ul style="list-style-type: none"> • Terra Tape Standard 250 manufactured by Reef Industries, Inc., Shieldtec manufactured by Empire Level Manufacturing Corp., Milwaukee, WI, (or ENGINEER approved equal). Tape shall read “Caution – Sanitary Line Buried Below”. Tape shall be green and 3” wide. Install over the cover material.



DESIGN, DRAFTING & CONSTRUCTION STANDARDS & SPECIFICATIONS
SECTION 5.0: SANITARY SEWER SYSTEM REQUIREMENTS

TABLE 4.0: BEDDING, COVER AND BACKFILL	
Bedding	<ul style="list-style-type: none"> • Class “B” conforming to Standard Specifications Ch. 3.2.6(b) and File No. 4, Part IX • 3/8” crushed stone chips. Conform to Standard Specifications Ch. 8.43.2, Table 32 • Conform to Standard Specifications Ch. 4.3.3 • Prohibited: Sand; gravel
Cover	<ul style="list-style-type: none"> • 3/8” crushed stone chips conforming to Standard Specifications Ch. 8.43.2, Table 32, File No. 4, and Ch. 8.43.3 • 12” above the top of pipe • Prohibited: Sand; gravel
Backfill	<ul style="list-style-type: none"> • Aggregate slurry under Village-owned pavements: Required at top 3’ depth. Conform to Standard Specification Ch. 8.43.8. • Granular where specified: Crushed gravel. Conform to Standard Specification Ch. 8.43.4, Table 39 Graded Aggregates, 1½” Graded Crushed Stone. • Spoil not under pavements: Spoil material. Conform to Standard Specifications Ch. 8.43.5 • Consolidation: Mechanical compaction. Conform to Standard Specification Ch. 2.6.14(b). Conform to 95% Standard Proctor Density tested at Contractor’s expense. • Initial Lift = Max. 2 ft; Subsequent Lifts = Max. 1½ ft • Prohibited: Debris; frozen material; large clods or stones; organic material; blast rock; stones larger than 6”; sand. Contractor shall haul away and dispose of these materials at Contractor’s expense.

TABLE 5.0: MANHOLES	
Characteristics	<ul style="list-style-type: none"> • Precast Required: Conform to Standard Specifications Ch. 8.39.0 and File No. 12 • Wall Thickness = Min. 5” • Min. MH Dia. <ul style="list-style-type: none"> ○ 48” for 8-24” dia. pipes ○ 60” for 30-42” dia. pipes ○ 72” for > 42” dia. pipes • Min. elevation difference between influent and effluent pipes in manholes = 0.1’ • Max. elevation difference between influent and effluent pipes without outside drop in manholes = 2.0’ • Cone sections = Eccentric (concentric cones are prohibited) • Lift holes: Exterior lift holes only (interior lift holes are prohibited) • Benches: Full benches are prohibited. Conform to Standard Specifications Ch. 3.5.4(c) and File No. 13. w/o full benches and w/ long radii.
Spray Epoxy Coating	<ul style="list-style-type: none"> • MH Exterior: 2 coats (black) of Ameron International, Amercoat 78 HB at 8-10 mils ea. • MH Interior: 2 coats (white) of Permite PCS-9043 Type II Permox pipe glaze at 20 mils ea. • Coatings shall be applied by suppliers at the plant
Outside Drop	<ul style="list-style-type: none"> • Conform to Standard Specifications Ch. 3.5.8 and File No. 19/20 • 1 full-length of pipe shall precede the tee connecting the manhole and the drop segment
Joint Seals	<ul style="list-style-type: none"> • Kentseal butyl rubber sealant (or Engineer approved equal) • External: MacWrap External Joint Sealers by MarMac Manufacturing (or Engineer approved equal). Conform to ASTM C877, Type II <ul style="list-style-type: none"> ○ 9” wide collar, outer layer of polyethylene, min. 4000 psi tensile strength, min. 1500 psi tear resistance, under layer of rubberized mastic reinforced with woven polypropylene fabric ○ 2 stainless steel straps within the collar 3/4” from edges confined with tube isolated from mastic and allowed to slip freely ○ Min. 6” overlap with closing flap to cover straps • External for MH w/ Precast Outside Drop: EZ-Wrap by Press Seal Gasket Corp primed with EZ-Stick No. 4 primer <ul style="list-style-type: none"> ○ Extruded butyl adhesive tape bonded to the concrete



DESIGN, DRAFTING & CONSTRUCTION STANDARDS & SPECIFICATIONS
SECTION 5.0: SANITARY SEWER SYSTEM REQUIREMENTS

TABLE 5.0: MANHOLES (Con't)

<p>Chimneys</p>	<ul style="list-style-type: none"> • Depth: Min. = 2", Max. = 16" (measured bottom of frame to top of cone) • HDPE or EPP 5000 Series rings meeting ASTM D4976 or ASTM D3575 • HDPE Rings in Pavements: <ul style="list-style-type: none"> ○ Drill two ½" diameter holes 180° apart on mandatory 2" thick EPP ring (Cretex part number 40-27GF-200). Drill into corbelled section of the manhole, ring shall be drilled prior to placing on manhole. ○ Apply 2 beads of M-1 adhesive 1/2"x1/2" on corbal. Install drilled EPP ring and anchor with a 4" Rawl Power Bolt utilizing a 2" diameter fender washer. Tighten until bolt head is flush with the top of the 2" ring. ○ Install ¼" Ladtech topper ring set in M-1 Adhesive as described above. ○ Dry stack chimney to proper height, including solid HDPE topper ring. Pay special attention to slope and use appropriate slope rings. ○ Once desired height and slope are achieved, mark rings to align desired stacking order and placement. ○ Apply bead of caulk around lip of adjusting ring and re-stack rings. Apply 2 beads of caulk on topper ring, one towards the outside and one towards the inside. Topper ring does not have a locking lip so be cautious ring does not slip during seal installation. ○ Install seal per manufactures specifications. • Adhesives: M-1 (Chem-Link Corp.) used on EPP rings. Gun grade butyl rubber adhesive sealant on HDPE rings • Seals: Order-to-fit Adaptor internal/external w/ rubber sleeve sealing exterior from frame to corbel • PE Wrap: Install double 8-mil polyethylene wrap from top of frame to 84" min. depth. • Prohibited: Cracked rings; all forms of wedges; back-plastering • EPP Rings in Turf: <ul style="list-style-type: none"> ○ Drill two ½" diameter holes 180° apart on mandatory 2" thick EPP ring (Cretex part number 40-27G-200). Drill into corbelled section of the manhole, ring shall be drilled prior to placing on manhole. ○ Apply 2 beads of M-1 adhesive 1/2"x1/2" on corbal. Install drilled EPP ring and anchor with a 4" Rawl Power Bolt utilizing a 2" diameter fender washer. Tighten until bolt head is flush with the top of the 2" ring. ○ Dry stack chimney to proper height, including solid Grade Finish ring. Pay special attention to slope and use appropriate slope rings. ○ Once desired height and slope are achieved, mark rings to align desired stacking order and placement. ○ Apply 2 beads of M-1 in keyway area of adjusting rings and re-stack rings. ○ Adjusting rings will be lag bolted in 4" height increments with a ½" x 5" steel wood lag bolt and 2" fender washer with bolts alternating 180° apart with each 4" rise in height ○ Install seal per manufacturer's specifications.
<p>Frames & Covers</p>	<ul style="list-style-type: none"> • Frame in Pavement: Neenah R-1661 frame w/ solid gasketed lid and 2 concealed pick holes. Conform to Standard Specifications Ch. 3.5.0 • Frame in Turf: Neenah R-1661 bolt-down frame w/ solid gasketed lid and 2 concealed pick holes. Conform to Standard Specifications Ch. 3.5.0. Bolts coated with anti-seize compound. Frames to be anchored to chimney with 1/2" dia. steel wood lag bolts extending 6" into chimney or to a depth that is practical for the chimney height and sealed with Permatex Ultra Series black, blue or grey silicone adhesive • Pavement Ring: Neenah R-1979 Series Ref. #1661-7158 • Elevations: Top of frame = binder grade; Paving ring for surface lift adjustment
<p>Connections</p>	<ul style="list-style-type: none"> • Kor-N-Seal boots (or Engineer approved equal). Factory installed for new manholes. Conform to Standard Specifications Ch. 3.4.7(c) and ASTM C-425/C-443. • Connections shall be cored. Cutting or breaking is prohibited. • Bulkheads for future connections: Conform to Standard Specifications Ch. 3.2.25 and File #13A

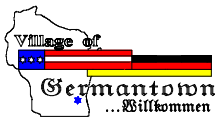


DESIGN, DRAFTING & CONSTRUCTION STANDARDS & SPECIFICATIONS
SECTION 5.0: SANITARY SEWER SYSTEM REQUIREMENTS

Steps	<ul style="list-style-type: none"> • Conform to Standard Specifications Ch. 2.5.4(g) and 8.40.0, and File #15 and #12 • Prohibited: Steps in chimneys
Sampling Manholes	<ul style="list-style-type: none"> • Required at all non-residential laterals • Conform to Germantown detail and Standard Specifications Ch. 3.5.8(f), File #23 • Min. dia. = 48"
Grout	<ul style="list-style-type: none"> • If approved by Village Engineer and Utility Superintendent, Contractor may use acrylamide or polyurethane grout for manhole repair/rehabilitation

TABLE 6.0: LATERALS

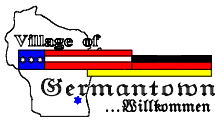
Pipe	<ul style="list-style-type: none"> • PVC SDR-35 conforming to Standard Specifications Ch. 5.3.10 and 8.10.0 w/ rubber gasketed joints conforming to Standard Specification Ch. 8.41.4 • Min. 6" dia.
Connections	<ul style="list-style-type: none"> • Wye for New Sewer = Prefabricated • 8"x6" Wye for Exist Sewer = 8"x6" factory wye with 2 repair couplings • > 8"x6" Wye for Exist Sewer = Inserta-Tee conforming to Standard Specifications Ch. 5.3.2 and Table 10 cored in the upper pipe quadrant (30°) with 45° bend • Bentonite dam = Construct bentonite dam at each lateral in areas of high seasonal groundwater • Existing Lateral: Use Fernco. If reducer needed, install at right-of-way boundary. Gaps shall be < 1/8". • Prohibited: Lateral connections to manholes; Ferncos on clay or concrete pipe.
General	<ul style="list-style-type: none"> • Installation: Conform to Standard Specifications Ch. 5.3.0, 5.3.5 and File No. 50 • Extend to right-of-way. • Cap at right-of-way. Water-proof, leak-proof. • Marker board = 2"x4". Length from bottom of pipe to 3' above proposed final ground surface. Top 1' painted green.



DESIGN, DRAFTING & CONSTRUCTION STANDARDS & SPECIFICATIONS
SECTION 5.0: SANITARY SEWER SYSTEM REQUIREMENTS

TABLE 7.0: INSPECTION AND TESTING

Scheduling	<ul style="list-style-type: none"> Contact Engineering Dept. (262) 250-4721 two business days before construction to schedule inspection(s) 																																																																	
Mainline Testing	<ul style="list-style-type: none"> Deflection, Alignment and Bore: Conform to Standard Specifications Ch. 3.2.6(i)(4) and File No. 30 for 5% deflection limit. Low Pressure Air Test: Conform to Standard Specifications Ch. 3.7.3, 5.4.3 and File No. 31. Utility Superintendent will conduct CCTV and if applicable dye flooding testing. Force Main Hydrostatic Test: Conform to Standard Specifications Ch. 4.15.0. Include appurtenances Contractor shall repair mainlines failing tests until acceptable to Village Engineer and Utility Superintendent at Contractor's expense 																																																																	
Manhole Vacuum Testing	<ul style="list-style-type: none"> Conform to Standard Specifications Ch. 3.7.6 Contractor shall perform testing after pavements are installed Min. Test Time in Seconds for Manhole Dia. <table border="1" data-bbox="568 661 1494 1029"> <thead> <tr> <th>Depth (ft)</th> <th>42" Dia. MH</th> <th>48" Dia. MH</th> <th>60" Dia. MH</th> <th>72" Dia. MH</th> </tr> </thead> <tbody> <tr><td>8</td><td>17</td><td>20</td><td>26</td><td>33</td></tr> <tr><td>10</td><td>21</td><td>25</td><td>33</td><td>41</td></tr> <tr><td>12</td><td>25</td><td>30</td><td>39</td><td>49</td></tr> <tr><td>14</td><td>30</td><td>35</td><td>45</td><td>57</td></tr> <tr><td>16</td><td>34</td><td>40</td><td>52</td><td>67</td></tr> <tr><td>18</td><td>38</td><td>45</td><td>59</td><td>73</td></tr> <tr><td>20</td><td>42</td><td>50</td><td>65</td><td>81</td></tr> <tr><td>22</td><td>46</td><td>55</td><td>72</td><td>89</td></tr> <tr><td>24</td><td>51</td><td>59</td><td>78</td><td>97</td></tr> <tr><td>26</td><td>55</td><td>64</td><td>85</td><td>105</td></tr> <tr><td>28</td><td>59</td><td>69</td><td>91</td><td>113</td></tr> <tr><td>30</td><td>63</td><td>74</td><td>98</td><td>121</td></tr> </tbody> </table> Contractor shall repair manholes failing tests until acceptable to Village Engineer and Utility Superintendent at Contractor's expense 	Depth (ft)	42" Dia. MH	48" Dia. MH	60" Dia. MH	72" Dia. MH	8	17	20	26	33	10	21	25	33	41	12	25	30	39	49	14	30	35	45	57	16	34	40	52	67	18	38	45	59	73	20	42	50	65	81	22	46	55	72	89	24	51	59	78	97	26	55	64	85	105	28	59	69	91	113	30	63	74	98	121
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DESIGN, DRAFTING & CONSTRUCTION STANDARDS & SPECIFICATIONS
SECTION 5.0: SANITARY SEWER SYSTEM REQUIREMENTS

TABLE 8.0: SUBMITTAL REQUIREMENTS	
Construction Drawings & As-Builts	<ul style="list-style-type: none"> Plan and Profile on D-sized paper prepared, sealed and signed by Wisconsin P.E. Datum: Local NVGD 1929 datum required Submit both paper and electronic copies to Village Engineer Preparation and submittal of construction drawings and as-builts shall be at the Engineering Consultant's expense.
Plan Review	<ul style="list-style-type: none"> Engineering Consultant shall prepare the entire MMSD Sewer Plan Review Tool Kit If applicable, Engineering Consultant shall prepare the entire Dept. of Safety & Professional Services (formerly Commerce) Plumbing Plan Review package for "private" sanitary services Submit 1 original paper and 1 electronic copy of all documents to the Village Engineer for review Village Engineer will provide Engineering Consultant an Owner Letter once the documents are accepted by the Village Engineering Consultant shall submit the entire package to the MMSD with the Owner Letter If applicable, Engineering Consultant shall submit the entire Dept. of Safety & Professional Services (formerly Commerce) Plumbing Plan Review package for "private" sanitary services with the Owner Letter Preparation and submittal of plan review packages shall be at the Engineering Consultant's expense.
Street Excavation in ROW Permit	<ul style="list-style-type: none"> Contractor to prepare and submit with fee to Village Engineering Dept.
Erosion Control Permit	<ul style="list-style-type: none"> Contractor to prepare and submit with fee to Village Inspection Services (Building Inspection) Dept.
Building Permit	<ul style="list-style-type: none"> Plans, reports and permits shall be reviewed and accepted by the MMSD, Dept. of Safety & Professional Services (formerly Commerce), and Village Engineer before the Village will issue a building permit
Occupancy Permit	<ul style="list-style-type: none"> As-Builts shall be reviewed and accepted by the Village Engineer before the Village will issue an occupancy permit

TABLE 9.0: LIST OF VILLAGE STANDARD DETAILS	
	<ul style="list-style-type: none"> Outside Drop Sanitary Manhole Sanitary Manhole Chimney Rebuild Sanitary & Sampling Manhole Sanitary Sewer Lateral Trench

TABLE 10.0: OTHER REQUIREMENTS	
	<ul style="list-style-type: none"> Contractor shall be responsible for Digger's Hotline locates, site safety, resident access, traffic control, erosion & sediment control, and protection of existing facilities, features and structures at all times At the beginning of construction, Contractor shall install a mechanical plug at the new connection to existing manhole(s). The Utility Superintendent will remove and return the plug(s) after the constructed system has been accepted. At end of each day and during breaks, Contractor shall install water-proof, leak-proof plugs At end of each day, open excavations shall not exceed 25 ft. in length. All lateral trenches shall be backfilled at end of day. At end of each day, contractor shall erect barricades with flashers and snow fencing surrounding excavations. Mainline Installation: Conform to Standard Specifications Ch. 3.2.0 Sawcut Exist Pavements: Wheel mounting saw required. Sawcut full-depth.