



**DESIGN, DRAFTING & CONSTRUCTION STANDARDS & SPECIFICATIONS
SECTION 6.0: WATER DISTRIBUTION 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 811 • Chapter SPS 382 (formerly Comm 82)
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 • 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"> • Residual Pressure = 20 psi min.; Static Pressure = 35 psi min. at proposed final ground surface • Main Dia. = 8" min.; Lateral Dia. = 1½" min. • Cover above Mainlines/Laterals = 6' min. depth from proposed final ground surface to pipe crown (or Engineer-approved depth); depths < 5' require polystyrene board insulation conforming to Standard Specifications Ch. 4.17.0 and 8.50.2 • Live Taps required • Insulation: Polystyrene board. Required when cover < 5' or within 2' of an underground structure. Required over hydrant leads beneath roadside ditches. • Hydrant Locations: Intersections; Far end of cul-de-sac at lot line extended; Mid-block at lot line extended • Hydrant Spacing: Residential = 350' max.; Commercial/Industrial = 500' max. • Valve Locations: Intersections; Mid-block at lot line extended; Hydrant branches; 4 valves per Cross; 3 valves per Tee • Air Vent Locations: Temporary ends; High points where there is no hydrant • Connections shall be made under pressure. • Buttresses: Concrete required. Conform to Standard Specifications 4.3.13 and File No. 43 thru 46.
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TABLE 3.0: PIPE MATERIAL, FITTINGS AND APPURTENANCES

<p>High Density Polyethylene (HDPE)</p>	<ul style="list-style-type: none"> • Required for new construction. • USA-manufactured products preferred. • Material = PE 3408 conforming to ASTM D 3350 cell classification 345464C. List material in PPI TR-4. Standard grade HDB rating = 1600 psi at 73°F. Conform to cell classification 345464E. Approved for potable water per NSF Standard 61. Conform to ASTM F714 for DIPS and AWWA C906 with a SDR of 11. • Stripes = Equally-spaced blue longitudinal stripes co-extruded into pipe's outside surface • Molded Fittings: Manufactured & tested conforming to ASTM D3261 and AWWA C906, and fully pressure rated to same internal rating as mating pipe. • Fabricated fittings: Manufactured by heat fusion joining specially machined shapes cut from pipe, polyethylene sheet stock, or molded fittings. Prohibited: Non-pressure or low-pressure rated fabricated fittings. • HDPE MJ Adapters = International Piping Products. Required for connections to mechanical joint pipe, fittings, valves, and other appurtenances. Conform to AWWA C111/ANSI A21.11. • HDPE Flange Adapters: Possess sufficient bore length to be clamped in butt fusion-joining machine w/o stub-end holder. Serrate sealing surface to promote gasketless sealing. Fit w/ back-up rings having pressure-rating equal to pipe's. Chamfer or radius adapters. Flange bolts and nuts = Grade 3 or higher stainless steel. • Nuts and Bolts = Cor-Blue™ • HDPE Connection to Existing Gasketed-joint Water Main: Use anchoring fitting and concrete cast-in-place thrust anchor (or Engineer-approved method). • Ductile Iron Fittings: Class 250 w/ MJ conforming to AWWA C153. Conform to Standard Specifications Ch. 8.22.0 • PE Wrap: Triple wrap and securely tape DI fittings, valves and valve boxes. Conform to Standard Specifications Ch. 4.4.4 and 8.21.0. • Water Services: Dia. = ½" Min. Branch tap connections by electrofusion welded for corporation saddle. • Joints: Plain pipe ends and fittings = Butt fusion. Main and branch fittings = Butt fusion or electrofusion. Internal and external beads shall not be removed. • First Fusion: Each day, perform trial fusion and bent strap test. Conform to ASTM D2657. Allow trial fusion to completely cool before cutting test straps. Test strap length = 12" or 30 times wall thickness. Test strap width = 1" or 1.5 times wall thickness.
<p>Polyvinyl Chloride (PVC)</p>	<ul style="list-style-type: none"> • Allowable for relays. • USA-manufactured products preferred. • Pipe = AWWA C-900, Class 150-DR18, push-on joints. Conform to Standard Specifications Ch. 4.6.0 and 8.20.0. • Fittings = Ductile Iron, Class 250-Mechanical Joint Manufactured by Tyler (or Engineer approved equal). Conform to Standard Specifications Ch. 8.22.0 • Mechanical Joints = Mega-Lug retainer glands w/ buttresses. Conform to Standard Specifications Ch. 4.3.13 and File No. 43-46. • Nuts and Bolts = Cor-Blue™ • PE Wrap: Triple wrap and securely tape DI fittings, valves and valve boxes. Conform to Standard Specifications Ch. 4.4.4 and 8.21.0. • Cleaning of Pipe: Keep interior pipe and structures clean. Conform to Standard Specifications Ch. 4.3.11

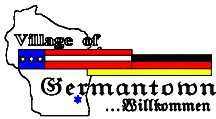


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Fusible PVC C-900	<ul style="list-style-type: none"> • May be allowable for new construction. Contact Village Engineer. • USA-manufactured products preferred. • Conform to Standard Specifications Ch. 4.6.0 and 8.20.0, Class 150-DR18 and to AWWA C-900. • 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"> • Insulated #10 solid copper tracer wire on all HDPE & PVC water main, fittings, hydrant leads, and building services. Tape Spacing = 10' intervals max. • Splicing: Spliced, soldered, and wrapped with "Plyflex" low voltage splice kit (or Engineer approved equal) • Daylighting: Wire shall be brought to grade in a 3" dia. vertical PVC conduit covered with a socket end cap. Pipe shall have a 4-ft min. bury depth, shall terminate no more than 3" above grade, and shall be located opposite the pumper nozzle attached to back of the hydrant base. Tracer wire shall not be brought to grade within valve boxes.
Chlorination	<ul style="list-style-type: none"> • Calcium hypochlorite tablets affixed to inside top of pipe w/ approved adhesive (Permatex No. 1) in the line at the time of installation. Conform to AWWA C651 and Standard Specifications Ch. 4.3.12

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, 1 1/2" 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 = 2 ft max.; Subsequent Lifts = 1 1/2 ft max. • 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.



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TABLE 5.0: VALVES

General

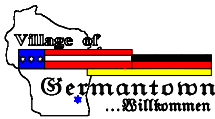
- USA-manufactured products preferred
- 6”-12” Dia. PVC Pipe = Mueller Model #2360, Kennedy “Kenseal II” (or Engineer approved equal) resilient seated gate valves. Conform to Standard Specifications Ch. 4.8.2 and 8.27.0 and AWWA-C509.
- 14”-24” Dia. PVC Pipe = Mueller Model #2361, Kennedy “Kenseal II” (or Engineer approved equal) resilient seated gate valves. Conform to Standard Specifications Ch. 4.8.2 and 8.27.0 and AWWA-C515.
- HDPE Pipe = Kennedy Model #7571DI resilient wedge gate valve with reduced wall
- Pressure Rating = 200 psi
- Stems shall be non-rising
- Valves shall open left
- Nuts & Bolts = Cor-Blue™
- All exposed valve hardware shall be T304 stainless steel.
- Corrosion protection: Conform to Standard Specifications Ch. 4.4.4
- Installation: Conform to Standard Specifications Ch. 4.8.2 and File No. 37
- Valve box adaptor: Adaptor #6 base by Adaptor, Inc. Milwaukee WI, w/ three-piece screw type. Conform to Standard Specifications Ch. 8.29.0. Incl. stationary rod if bury depth > 6½’
- Covers shall have word “WATER” cast on them.
- Elevations: Top of box = ¼-½” below binder grade; Raise to ¼” below final proposed surface grade when paving final pavement lift
- Prohibited: Manufactured rising rings
- Turning Valves & Hydrants: Only Village personnel are authorized to turn valves and hydrants. Contractors are prohibited from turning valves and hydrants.



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TABLE 6.0: HYDRANTS

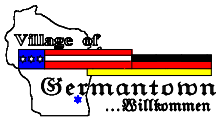
<p>General</p>	<ul style="list-style-type: none"> • USA-manufactured products preferred • Manufacturer for Hydrants: Kennedy Guardian, traffic model with breakaway flanges, two 2-½” hose nozzles (7-½ NST) and one 5-¼” pumper or steamer nozzle (4 NST), a 1-½” pentagon operating nut and CCW opening, 6” mechanical joint inlet connection. • Nozzle: Harrington Integral Hydrant Storz™ (or equal) • Bury Depth = 6.5’ min. to pipe crown • Conform to Standard Specifications Ch. 4.8.5 and 8.26.0 • Marker flag = 60” Hydro Finder. • Pumper Nozzle Elevation = 18-24” above top of curb or grade • Location = 3” behind back of curb • Access Ramp: Where a hydrant lead crosses a road-side ditch, an access ramp with the appropriate size culvert will be installed. Width = 6’ min. Extend 2’ beyond the hydrant. Materials = 6” crushed stone base and 3” of asphalt surface course • Turning Valves & Hydrants: Only Village personnel are authorized to turn valves and hydrants. Contractors are prohibited from turning valves and hydrants.
<p>Connections</p>	<ul style="list-style-type: none"> • USA-manufactured products preferred • PVC pipe: Connect using flanged anchor tee with MJ w/ built-in restraint. • HDPE pipe: Connect using HDPE branch saddle reducing tee or a flanged anchor tee. • Nuts & Bolts = Cor-Blue™
<p>Easements</p>	<ul style="list-style-type: none"> • Required for public hydrants/hydrant leads.
<p>Painting</p>	<ul style="list-style-type: none"> • Color = Safety Red • Preparation: Sandblast to 100% clean white metal from ground level up to top of hydrant. Dispose of spent materials. Fully enclose hydrant during blasting, priming, and painting. Air dryer must be used to prevent moisture in the air supply. • Primer = Devoe 224 high build epoxy primer (or Engineer-approved equal) to a thickness of 4-8 mils (1 mil=25.4 millimeters). • Topcoat = Devoe 379UVA urethane epoxy (or Engineer-approved equal) with a minimum thickness of 4 mils All hydrants must be fully enclosed during blasting, priming, and painting. Air dryer must be used to prevent moisture in the air supply. • Weather conditions shall be as follows for hydrant priming and painting: <ol style="list-style-type: none"> 1. Shall not be applied in the rain, wind, snow, mist, and fog or when hydrant temperatures are less than 5°F above the dew point 2. Shall not be applied when the relative humidity is above 85% or the temperature is above 90°F. 3. Shall not be applied if air or surface temperature is above 120°F. 4. Shall not be applied if air or surface temperature is below 60°F or is expected to drop below 60°F within 24 hours.



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TABLE 7.0: WATER SERVICES

Pipe	<ul style="list-style-type: none"> • USA-manufactured products preferred • Material: HDPE, AWWA C901, SDR-9. PE 3408 conforming to ASTM D 3350 cell classification 345464C. Standard grade HDB rating = 1600 psi at 73°F. Color material = Also conform to cell classification 345464E. Approved for potable water per NSF Standard 61. • Conform to AWWA C901 with a SDR of 9 • Size, Single Family Home = 1½” Dia. min. (Copper Tub Size (CTS)) outside dia. • Size, Commercial/Multifamily = 2” Dia. min. CTS outside dia. • Joints: Electrofusion
Connections	<ul style="list-style-type: none"> • USA-manufactured products preferred • Service Taps for HDPE Pipe: Electro-fusion welded corporation saddle. Outlet size shall be 1½” or 2” CTS w/ brass CC threads. Conform to AWWA C800. Butt weld outlet. Saddles shall include an integral bar code for processor scanning. Manuf. = Central Plastics Company (or Engineer-approved equal). Metal saddles are prohibited. • Service Taps for PVC Pipe: Corporation stops w/ pack joint. Conform to Standard Specifications Chapter 8.30.0. Manuf. = Ford (FB1001-6-IDR7 for 1½” or FB1001-7-IDR7 for 2”), A.Y. McDonald (or Engineer approved equal) • Pipe Saddles: Required for all taps in water main that is not HDPE pipe (i.e. PVC and ductile iron). Supplier = Smith-Blair, all stainless steel, double bolt, 1½”, Number 372. Couplings = Ford, C44-55Q, 1½” for copper or plastic tubing. • PVC 4” or Greater: Install under pressure. Tapping sleeves = Romac STS420 or Smith-Blair 665. Resilient seated gate valve w/ pressure rating = 200 psi. MJ connections. Nuts & Bolts = Cor-Blue™. Gate valve: Mueller No. 2360, Kennedy “Kenseal II”, (or ENGINEER approved equal) w/ non-rising stems and corrosion protection. • Curb Stop: Minneapolis pattern ball valve curb stop w/ pack joints. Placement: Right-of-way. Conform to Standard Specifications Ch. 8.30.0. Stiffeners at ea. compression type connection. Manuf. = Ford (B66-666M-IDR7 for 1½” or B66-777M-IDR7 for 2”), A.Y. McDonald (or Engineer approved equal) • Curb Stop Box: Minneapolis pattern curb stop valve boxes (Cast Iron Service Boxes) for each curb stop valve. Conform to Standard Specifications Ch. 8.25.0. Bury depth = 6½± ft. Lid = Two-piece w/ standard brass pentagon bolt plug, Type PL. Upper section shall be 1¼”. Manuf. = Ford (EM2-65-56), A.Y. McDonald (or Engineer approved equal). Must be visible at grade at all times. • Couplings & Fittings: Compression type w/ insert stiffeners for plastic tubing conforming with AISI Type 304 (stainless steel) • Nuts & Bolts = Cor-Blue™
Abandonments	<ul style="list-style-type: none"> • At Curb Stop: Permitted only when all existing pipe and appurtenances are defect-free, and authorized by Water Utility Superintendent. • At Main: Remove corporation stop & saddle, then replace w/ stainless steel repair sleeve wrapped w/ polyethylene sheeting. Conform to Standard Specifications Ch. 4.4.4 and 8.21.0
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” x 4”. Length from bottom of pipe to 3’ above proposed final ground surface. Top 1’ painted blue. • Tracer Wire: Insulated #10 solid copper tracer wire to be wrapped around outside of curb stop box for future connection to copper piping inside building.



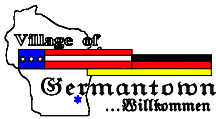
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TABLE 8.0: SAMPLING STATION

General	<ul style="list-style-type: none"> • Locations Required: All Commercial/Industrial sites • USA-manufactured products preferred • Manufacturer: Kupferle Foundry Company, Eclipse Model No. 88 (freeze-proof). • Situate so easily accessible • Station shall be provided with an aluminum cover that locks. • The station shall have an unthreaded nozzle, 3/4" FIP inlet, an o-ring valve design, and all brass waterway
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TABLE 9.0: 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).
General	<ul style="list-style-type: none"> • Keep trenches dry during pipe installation. • Temporary Plugs: Required at end-of-day, during breaks, and any other time pipe is unattended. • Defect Inspection: Inspect each pipe length and all appurtenances for defects. Remove or discard defective materials. • Turning Valves & Hydrants: Only Village personnel are authorized to turn valves and hydrants. Contractors are prohibited from turning valves and hydrants. • Meters for Filling & Flushing: Obtain meter from Water Utility and install for all filling & flushing. Contractor shall pay for water use. • Flushing: Conform to Standard Specifications Ch. 4.16.2. In areas serviced by sanitary sewer, obtain authorization from Wastewater Utility to direct flushed water into the nearest sanitary sewer manhole. • Hydrant Painting: A Village representative shall be present to witness blasting, priming and painting.
Testing	<ul style="list-style-type: none"> • A Village representative shall be present to witness all forms of testing. • Contractor shall perform all testing, sampling and analyses. • Hydrostatic Testing: Test all new water main and appurtenances under the supervision of Village personnel. A successful test is requisite to acceptance by the Village Public Works & Highway Committee. <ul style="list-style-type: none"> ○ HDPE Pipe: Fill w/ water, increase to test pressure, and allow stabilization. The test pressure shall be 1.5 times the operating pressure at the lowest point in the system. The pipe shall pass if the final pressure is within 5% of the test pressure for 1 hour. Conform to ASTM Sec. 9.8. For safety reasons, only hydrostatic pressure will be used. Conform to ASTM F2164. ○ Test Duration for HDPE Pipe: Less than 8 hrs. If testing is not completed for any reason, de-pressurize and allow to "relax" for 8 hours before resuming test. ○ PVC Pipe: Conform to Standard Specifications Ch. 4.15.0. ○ Water service may be tested as part of the water main hydrostatic test or they may be tested individually as a live tap to the pressurized main. All fittings and connections shall be carefully inspected for any visible water leakage in accordance with Standard Specifications Ch. 5.5.18. • Bacteriological Testing: Conform to Standard Specifications Ch. 4.16.0 and NR 811.07. Contractor shall provide analysis results to Village Engineering Dept. If the bacteriological test fails, conform to Standard Specifications Ch. 4.16.3 to re-chlorinate the main. • Tracer Wire Connectivity: Signal Detection Distance = 1,000 ft min.



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TABLE 10.0: 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 WDNR Water Main Extension Plan Review Package If applicable, Engineering Consultant shall prepare the entire Dept. of Safety & Professional Services (formerly Commerce) Plumbing Plan Review package for "private" water 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 WDNR 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" water 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 WDNR, 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 11.0: LIST OF VILLAGE STANDARD DETAILS

	<ul style="list-style-type: none"> HDPE Hydrant Branch Standard Hydrant Bollard Relocate Water Main HDPE Pipe Relocated Existing Water Main PVC Pipe Only HDPE Joint Restraint Water Main Reconnection Water Main Service Lateral Schematic
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TABLE 12.0: 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 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. 4.3.0 Sawcut Exist Pavements: Wheel-mounting saw required. Sawcut full-depth.
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