

WISCONSIN CONSTRUCTION SPECIFICATION

634. Waste Transfer Pipe

1. SCOPE

The work shall consist of furnishing and installing waste transfer pipes, necessary fittings, and appurtenances as shown on the drawings.

2. MATERIALS

The pipe shall be homogeneous throughout and free from visible cracks, holes, foreign matter, or other defects. The pipe shall be as uniform in color, opacity, density, and other physical properties as is commercially practicable.

PVC pipe material shall be Type 1 (1120/1220) for pressure transfer systems. ABS pipe material shall be virgin plastic resin and meet ASTM D 3965. PE pipe material shall meet ASTM D 3350.

Pipes shall meet the criteria in Table 1. Pipes of equivalent strength, durability, and liquid tightness are acceptable. All pipe and fittings proposed for use shall be submitted for approval prior to installation.

Fittings and couplers shall meet or exceed the same strength requirements as those of the pipe. Standard manufactured pieces shall be used for angles required to make direction changes.

3. HANDLING AND STORAGE

Pipe shall be delivered to the job site and handled by means which provide adequate support to the pipe and does not subject it to undue stresses or damage. When handling and placing plastic pipe, care shall be taken to prevent impact blows, abrasion damage, and gouging or cutting. All special handling requirements of the manufacturer shall be strictly observed. Special care shall be taken to avoid impact when plastic pipe must be handled at temperatures of 40°F or less.

Pipe shall be stored on a relatively flat surface so that the barrels are evenly supported. Unless the pipe is specifically coated to withstand exposure to ultraviolet radiation, it shall be covered with an opaque material when stored outdoors for a period of 15 days or longer.

4. LAYING THE PIPE

The pipe shall be laid to the lines and grades as shown on the drawings. The pipe shall be laid so that there is no reversal of grade between joints, unless otherwise shown on the drawings. The pipe shall not be dropped or dumped on the bedding or into the pipe trench. The ground surface near the pipe trench shall be free of loose rocks and stones greater than 1 inch in diameter.

The pipe shall be laid starting from one end proceeding continuously upstream or downstream.

The pipe shall not be laid at both ends and proceeding towards the middle.

Standard manufactured pieces shall be used for angles required to make direction changes. Directional pipe deflection shall be allowed in PVC and solid wall PE pipe per the manufacturer's allowable bend radius.

Just before placement, each pipe section shall be inspected to ensure that all foreign material is removed from inside the pipe. The pipe ends and the couplings shall be free of foreign material when assembled. At the completion of a work shift, all open ends of the pipeline shall be temporarily closed off using a suitable cover or plug.

Care shall be taken to prevent distortion and damage to plastic pipe during unusually hot (over 90°F) or cold weather (under 40°F). After the pipe has been assembled in the trench, it shall be allowed to come within a few degrees of the ground temperature before backfilling to prevent pull out of joints due to thermal contraction.

Bell and spigot pipe should be laid with the bell pointed upstream. The pipe ends and couplings shall be free of foreign material when assembled.

The pipe shall be uniformly and continuously supported over its entire length on firm stable material. Blocking or mounding shall not be used to bring the pipe to final grade.

For pipe with bell joints, bell holes shall be excavated in the bedding material, as needed, to allow for unobstructed assembly of the joint and to permit the body of the pipe to be in contact with the bedding material throughout its length.

5. PIPE EMBEDMENT

Earth bedding – The pipe shall be firmly and uniformly placed on compacted earthfill bedding or an in-place earth material bedding of ample bearing strength to support the pipe without noticeable settlement. The earth material on which the pipe is placed shall be of uniform density to prevent differential settlement.

Unless otherwise specified, a groove that closely conforms to the outside surface of the pipe shall be formed in the bedding. The depth of the groove shall be equal to or greater than 0.3 of the pipe diameter.

Earth bedding shall be compacted to a density not less than adjacent undisturbed in-place earth material or be compacted earth backfill. Earthfill material used for compacted earth bedding shall be free of rocks or stones greater than 1 inch in diameter and earth clods greater than 2 inches in diameter. The pipe shall be loaded sufficiently during the compaction of bedding under the haunches and around the sides of the pipe to prevent displacement from its planned alignment. Pipe shall not be deformed to the extent that joint integrity is adversely impacted.

Sand, gravel, or crushed rock bedding – When sand, gravel, or crushed rock bedding is specified, the pipe shall be firmly and uniformly placed on the bedding material. Material for bedding shall not exceed 1 inch in diameter. Unless otherwise shown on the drawings, the coarse-grained bedding material shall be carefully placed and compacted to a depth equal to or greater than 0.3 of the diameter of the pipe above the bottom of the pipe. The pipe shall be loaded sufficiently during backfilling and compaction around the sides to prevent displacement of the pipe from its final approved placement.

Pipe encased in drainfill – The pipe shall be firmly and uniformly placed on bedding of specified drainfill. Drainfill shall be placed and compacted as specified in NRCS FOTG Section IV, Wisconsin Construction Specification 8, or as shown on the drawings. The pipe shall be loaded sufficiently during backfilling around the sides and during compaction to prevent displacement of the pipe.

Pipe encased in concrete – Concrete encasement shall be carefully placed to form a continuous uniform support around the entire circumference of the pipe or as shown on the drawings. Pipes encased in concrete shall be securely anchored to prevent movement of the pipe during concrete placement. A clear distance of 1.5 inches shall be maintained between the pipe and any reinforcing steel.

6. LIQUID TIGHT PIPE PENETRATIONS

- Hydrophilic sealants (swell in contact with water) shall be non-bentonite.
- Sealant, grout, flexible connections, fitting, etc. used to seal pipe penetration joints between wall and pipe shall be liquid tight.
- Pipes shall be continuous through walls. (i.e. no pressure from pumps shall be exerted on penetration joints between wall and pipe.)
- Pipes at penetration joints shall be properly supported to prevent undue stress on the seal.
- Grouted joints shall be pinned, keyed, or otherwise attached to structure to prevent joint separation.
- Flexible connection systems shall be installed according to manufacturer's recommendations for the specific application.

7. BACKFILL

Initial backfill – Unless otherwise specified or shown on the drawings, initial backfill to 6 inches above the top of the conduit is required. Earth haunching and initial backfill material shall consist of soil material that is free of rocks, stones, or hard clods more than 1 inch in diameter. Coarse backfill material shall be the specified sand, gravel, crushed rock, or drainfill material.

Initial backfill shall be placed in two stages. In the first stage (haunching), backfill is placed to the center of the pipe. In the second stage, it is placed to 6 inches above the top of the pipe.

The first stage material shall be worked carefully under the haunches of the pipe to provide continuous support throughout the entire pipe length. The haunching backfill material shall be placed in layers that have a maximum thickness of about 6 inches and are compacted as shown on the drawings or as stated in the NRCS Wisconsin Construction Specification appropriate for the backfill material. During compaction operations, care shall be taken to ensure that the tamping or vibratory equipment does not come in contact with the pipe and the pipe is not deformed or displaced.

Final backfill – Final backfill shall consist of placing the remaining material required to complete the backfill from the top of the initial backfill to the ground surface, including mounding at the top of the trench. Final backfill material within 2 feet of the top of the pipe shall be free of debris or rocks larger than 3 inches nominal diameter. Coarse backfill material shall be the specified sand, gravel, crushed rock, or drainfill. Final backfill shall be placed in approximately uniform, compacted layers. Final backfill compaction and layer thickness requirements shall be as shown on the drawings or as stated in the NRCS Wisconsin Construction Specification appropriate for the backfill material.

8. PRESSURE TESTING

This pressure test procedure consists of filling, an initial expansion phase, a test phase, and depressurizing. Severe service transfer pipe shall be pressure tested in the following manner prior to being placed into service.

Before Pressure Testing

- a. Solvent welded or heat fused joints of the assembled severe service transfer pipe shall be allowed to cure. Solvent-welded joints should be allowed to cure for a minimum of 24 hours, or more time if recommended by the glue manufacturer.
- b. Severe service transfer pipe shall be flushed and cleaned.
- c. All thrust control structures shall be in place, and all cast-in-place thrust blocks shall be allowed to cure according to one of the following options:
 - i. 3 days for early strength concrete (5,000 psi);
 - ii. 7 days for normal strength concrete (3,500 psi); or
 - iii. A strength of 500 psi is reached, with data that's field- or lab-verified to support.
- d. Pipes shall be backfilled or otherwise restrained sufficiently along its length to anchor the pipe against movement during the pressure testing. The pipe shall also be braced and/or anchored at each end to prevent movement.
- e. The ends of the pipe shall be plugged, and a pressure gauge shall be attached to the upstream and downstream ends. All high points along the severe service transfer pipe shall be vented to permit the complete removal of all air within the pipe.

Filling

Slowly fill the restrained test section completely with clear water. **WARNING – Ensure that there is no air trapped in the test section. Failure to remove entrapped air can cause explosive release resulting in death or serious bodily injury. Use equipment vents at high points to remove air.**

Initial Expansion Phase

Gradually pressurize the test section with water to the working pressure (as specified in the construction plans) plus 10 psi and maintain that pressure for three hours. During the initial expansion phase, pipe may expand slightly, requiring additional water to maintain pressure.

Test Phase

Immediately following the initial expansion phase, reduce test pressure back to working pressure, stop adding water and isolate test section. If test pressure remains steady (within 5% of the target value) for one hour, no leakage is indicated and the test section passes.

Depressurizing

Following the test phase, and prior to putting the pipe into service, gradually reduce pressure on the test section, drain out and properly dispose of all test water.

Table 1
Pipe Specifications ^{Note 1,2}

Installation Type	Size	Material	Specification	Joint Performance Specs	Joint Fitting Spec. ^{Note 3}
GRAVITY PIPELINES (Including Abrasive Materials)	(4"-10")	HDPE Pipe	AASHTO M252, Type S	ASTM D 3212 (10.8 psi)	F2306/F477
	(12"-60")	HDPE Pipe	AASHTO M294, Type S or ASTM F2306	ASTM D 3212 (10.8 psi)	F2306/F477
	(18"-48")	PVC Pipe	ASTM F 679	ASTM D 3212, & D 3139 & D 2672	ASTM F 679
	(3"-15")	PVC Pipe	ASTM D 3034 (SDR 35)	ASTM D 3212, & D 3139 & D 2672	ASTM D 3034
	(1/8"-36")	PVC Pipe	ASTM D 2241 (SDR 32.5)	ASTM D 3212, & D 3139 & D 2672	ASTM D 2241
<i>Any pipe listed below is also acceptable.</i>					
PRESSURE PIPELINES • < 70 psi max. working pressure • Non-Abrasive Materials	(1/8"-24")	PVC Pipe	ASTM D 1785 (Sch. 40)	ASTM D 3212, & D 3139 & D 2672	ASTM D 2464 & D 2466
	(1/8"-36")	PVC Pipe	ASTM D 2241 (SDR 26)	ASTM D 3212, & D 3139 & D 2672	ASTM D 2467
	(4"-12")	PVC Pipe	AWWA C900 (DR 25)	ASTM D 3212, & D 3139 & D 2672	Per manufacturer recommendation
	(14"-48")	PVC Pipe	AWWA C905 (DR 25)	ASTM D 3212, & D 3139 & D 2672	Per manufacturer recommendation
	(3.5"-54")	PE Pipe	ASTM F 714 (DR 21)	Per manufacturer recommendation / ASTM D 3261 / ASTM F 2620	ASTM D 2683
	(1/8"-42")	Steel	ASTM A 53 / ANSI/ASME B36.10 (Sch. 40)	Flanged: to ANSI B16.5 Threaded: to ANSI B 16.11 Butt-Weld	Flanged: to ANSI B16.1 Thread to ANSI B16.11 Butt-Weld
<i>Any pipe listed below is also acceptable.</i>					
PRESSURE PIPELINES ^{Note 4} • ≥ 70 psi max. working pressure • Abrasive Materials • Recirculation Systems	(1/8"-24")	PVC Pipe	ASTM D 1785 (Sch. 80)	ASTM D 3212, & D 3139 & D 2672	ASTM D 2467
	(1/8"-36")	PVC Pipe	ASTM D 2241 (SDR 21)	ASTM D 3212, & D 3139 & D 2672	ASTM D 2467
	(1/8"-36")	PVC Pipe	ASTM D 2241 (SDR 17)	ASTM D 3212, & D 3139 & D 2672	ASTM D 2467
	(4"-12")	PVC Pipe	AWWA C900 (DR 18)	ASTM D 3212, & D 3139 & D 2672	Per manufacturer recommendation.
	(14"-48")	PVC Pipe	AWWA C905 (DR 18)	ASTM D 3212, & D 3139 & D 2672	Per manufacturer recommendation
	(3.5"-54")	PE Pipe	ASTM F 714 (DR 17)	Per manufacturer recommendation / ASTM D 3261 / ASTM F 2620	ASTM D 2683
	(1/8"-42")	Steel	ASTM A 53 / ANSI/ASME B36.10 / 19 (Sch. 80)	Flanged: to ANSI B16.5 Threaded: to ANSI B 16.11 Butt-Weld	Flanged: to ANSI B16.1 Thread to ANSI B16.11 Butt-Weld
	(3"-64")	Ductile Iron	ASTM A746 / AWWA C150 / C151	AWWA C111 / C115	AWWA C110 or AWWA C153

^{Note 1} Pipe, joints, and fittings must meet the designed maximum operating pressure (for both daily use and during cleanout.)

^{Note 2} PVC pipe material shall be Type 1 (1120/1220) for pressure pipelines. All glued PVC pipe joints shall meet ASTM D 2855 Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets

^{Note 3} Other joints and metal/cast fittings may be used if pressure rating of fitting is equal to, or greater than, pressure rating of pipe used.

^{Note 4} Use thicker walled pipes when waste contains abrasive material (i.e. sand) that may cause the pipe to wear (erode), or when pump operates at higher velocities.

Pipes and Fittings that Meet Wisconsin Construction Specification 634-Waste Transfer Pipe

ASTM/AWWA/ AASHTO	Description
ASTM A 53	Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM C 76	Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM C 478	Standard Specification for Reinforced Concrete Manhole Sections
ASTM C 1227	Standard Specification for Precast Concrete Septic Tanks
ASTM D 1785	Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
ASTM D 2241	Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
ASTM D 2321	Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
ASTM D 2412	Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading
ASTM D 2464	Standard Specification for Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D 2466	Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
ASTM D 2467	Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D 2564	Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems
ASTM D 2657	Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings
ASTM D 2661	Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings
ASTM D 2672	Standard Specification for Joints for IPS PVC Using Solvent Cement
ASTM D 2683	Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing
ASTM D 2729	Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D 2774	Standard Practice for Underground Installation of Thermoplastic Pressure Piping
ASTM D 2855	Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets.
ASTM D 3034	Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D 3139	Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM D 3212	Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM D 3261	Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
ASTM D 3350	Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
ASTM D 3965	Specification for Rigid Acrylonitrile-Butadiene-Styrene (ABS) Materials for Pipe and Fittings

ASTM F 412	Standard Terminology Relating to Plastic Piping Systems
ASTM F 477	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F 480	Standard Specification for Thermoplastic Well Casing Pipe and Couplings Made in Standard Dimension Ratios (SDR), SCH 40 and SCH 80
ASTM F 679	Standard Specification for Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings
ASTM F 714	Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter
ASTM F 1417	Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air
ASTM F 1760	Standard Specification for Coextruded Poly(Vinyl Chloride) (PVC) Non-Pressure Plastic Pipe Having Reprocessed-Recycled Content
ASTM F 1668	Standard Guide for Construction Procedures for Buried Plastic Pipe
ASTM F 2306	Standard Specification for 12 to 60 in. [300 to 1500 mm] Annular Corrugated Profile-Wall Polyethylene (PE) Pipe and Fittings for Gravity-Flow Storm Sewer and Subsurface Drainage Applications
ASTM F 2487	Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Corrugated High Density Polyethylene Pipelines
ASTM F 2620	Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings.
ASTM F 2736	Standard Specification for 6 to 30 in. (152 To 762 mm) Polypropylene (PP) Corrugated Single Wall Pipe and Double Wall Pipe
ASTM F 2764	Standard Specification for 30 to 60 in. [750 to 1500 mm] Polypropylene (PP) Triple Wall Pipe and Fittings for Non-Pressure Sanitary Sewer Applications
AASHTO M252	Standard Specification for Corrugated Polyethylene Drainage Pipe
AASHTO M294	Standard Specification for Corrugated Polyethylene Pipe, 300- to 1500-mm Diameter
AASHTO M306	Standard Specification for Drainage, Sewer, Utility, and Related Castings
AWWA C110	AWWA Standard for Ductile-Iron and Gray-Iron Fittings
AWWA C111	Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C115	Standard for Flanged Ductile-Iron Pipe With Threaded Flanges
AWWA C150	American National Standard for Thickness Design of Ductile-Iron Pipe
AWWA C151	AWWA Standard for Ductile-Iron Pipe, Centrifugally Cast
AWWA C153	American National Standard for Ductile-Iron Compact Fittings for Water Service
AWWA C200	Steel Water pipe - 6 Inch and Larger
AWWA C605	Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water
AWWA C900	AWWA Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Transmission and Distribution
AWWA C905	AWWA Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 In. Through 48 In. (350 mm Through 1,200 mm), for Water Transmission and Distribution
AWWA C909	AWWA Standard for Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe, 4 In. Through 24 In. (100 mm Through 600 mm), for Water, Wastewater, and Reclaimed Water Service

Pipes and Fittings that DO NOT meet Wisconsin Construction Specification 634-Waste Transfer Pipe

Note-Some of the ASTMs listed below allow a dual marking of the pipe. The second marking may include an ASTM that is included on the list of pipes that will meet this specification. This will make the dual marked pipe acceptable.

ASTM/AWWA/ AASHTO	Description
ASTM C 425	Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings
ASTM C 700	Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated
ASTM C 877	Standard Specification for External Sealing Bands for Concrete Pipe, Manholes, and Precast Box Sections
ASTM C 1244	Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill
ASTM D 2665	Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings
ASTM D 2680	Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer
ASTM F 628	Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe With a Cellular Core
ASTM F 667	Standard Specification for Large Diameter Corrugated Polyethylene Pipe and Fittings
ASTM F 891	Standard Specification for Coextruded Poly(Vinyl Chloride) (PVC) Plastic Pipe With a Cellular Core
ASTM F 949	Standard Specification for Poly(Vinyl Chloride) (PVC) Corrugated Sewer Pipe With a Smooth Interior and Fittings
ASTM F 1803	Standard Specification for Poly (Vinyl Chloride) (PVC) Closed Profile Gravity Pipe and Fittings Based on Controlled Inside Diameter
ASTM F 1866	Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Schedule 40 Drainage and DWV Fabricated Fittings
ASTM F 2648	Standard Specification for 2 to 60 inch [50 to 1500 mm] Annular Corrugated Profile Wall Polyethylene (PE) Pipe and Fittings for Land Drainage Applications