

to be conducted away from residences, industrial establishments and public buildings. See domestic wastes.

(87) SEWERAGE SYSTEM (PUBLIC). All structures, conduits and pipe lines by which sewage is collected and disposed of, except plumbing inside and in connection with buildings and properties served, and service pipes from building to street main. See chapter 144, Wis. Stats.

(88) SEWAGE SYSTEM (PRIVATE). (a) A system comprised of a septic tank and effluent absorption area designed for the purpose of processing sewage wherever public sewer facilities are not available.

1. Annular space. The area between the seepage pit chamber wall exterior and the unexcavated earth wall.

2. Bedrock. Any solid exposed rock or overlain by unconsolidated material.

3. Detailed soil map. A map prepared by a state or federal agency showing soil series, type and phases at a scale of not more than 2,000 feet to the inch.

4. Distribution pipe. A conduit of perforated clay tile, bituminous fiber, concrete, cement asbestos or plastic.

5. Effluent. Liquid flowing from a septic or treatment tank.

6. Flood plain. That portion of the land flooded by the highest known flood water elevation or that portion of the land that would be flooded by the regional flood elevation established by a state or federal agency.

7. High ground water. The upper limit of the portion of soil or underlying material that is saturated with water. (In some instances an upper or perched water table may be separated from a lower one by an impervious zone.)

8. High water level. The highest known flood water elevation of any lake, stream, pond or flowage or the regional flood elevation established by a state or federal agency.

9. Holding tank. An approved watertight receptacle for the retention of sewage.

10. Legal description. An accurate Metes and Bounds description or a lot and block number in a recorded subdivision or recorded assessor's plat or a public land survey description to the nearest 40 acres.

11. Percolation test. A method of testing absorption qualities of the soils.

12. Reservoir. A watertight receptacle basin or vault constructed above ground surface or underground for the storage or water intended for domestic use.

13. Seepage pit. An underground receptacle so constructed as to permit disposal of effluent or clear wastes by soil absorption through its walls.

14. Seepage bed. An excavated area similar to a seepage trench but larger than 3 feet in width and containing more than one distribution line.

15. Seepage trench. An area excavated 3 feet or less in width which contains a bedding of aggregate and a single distribution line.

16. Septic tank. A water tight tank which receives sewage.

17. Soil boring. A method of augering, boring or excavating through the ground surface to obtain samples of various stratum of earth to determine the characteristics and absorptive qualities of the soil, bedrock and ground water elevations.

18. Vent cap. An appurtenance of approved type used for covering the vent terminal of an effluent disposal system so as to avoid closure by mischief or debris and still permit circulation of air within the system.

(89) SEWERS & DRAINS. (a) *Sanitary*. 1. Building sewer. That part of the plumbing system beginning at the immediate outside foundation or proposed foundation wall to its connection with the main of a public sewer, private sewer, private sewage disposal system or other point of disposal.

2. Building drain. The lowest horizontal piping of a drainage system which receives the discharge of soil, waste and other drainage pipes inside any building and conveys same to the building sewer by gravity flow. See Wis. Adm. Code section H 62.08 (2) (c), sketch.

3. Building drain branch. That part of any drainage system which extends laterally at a slight grade, with or without horizontal change of direction from the building drain or subdrain. In this definition, horizontally means an angle less than 45 degrees with a horizontal plane and a rise not to exceed the inside diameter of the branch. See Wis. Adm. Code section H 62.08 (2) (c), sketch.

4. Building subdrain. The horizontal portion of a drainage system within a building which cannot flow by gravity to the building drain.

(b) *Storm*. 1. Building sewer. That part of the storm water system which receives the discharge from building storm drains and sub-drains, parking lots, yard fountains and other permissive sources, and conveys such waters to a public storm water system, private storm water system or other approved point of disposal.

2. Building drain. The lowest horizontal piping which receives storm waters or other permissive water from roofs, area ways, court yards, canopies, enclosed parking ramps and other sources inside any building or structure and conveys same to the building storm sewer by gravity flow.

3. Building subdrain. Same as sanitary subdrain.

(90) SEWER. (a) *Private*. A privately owned building sewer serving a single building.

(b) *Private interceptor main sewer*. A privately owned building sewer not directly controlled by public authority. Privately owned

means single ownership by an individual, firm or corporation, and approved by local authority and the department.

(91) **SEWER (PUBLIC)**. A publicly owned sewer.

(92) **SUBSOIL DRAIN**. That part of a drainage system which conveys the ground or seepage water from the footings of walls or below the basement floor under buildings to the storm sewer or other point of disposal.

(93) **SHALL**. The word "shall" when used in this code is a mandatory requirement.

(94) **SHOULD**. "Should" is not mandatory but expresses the recommendation of the department.

(95) **SIPHONAGE**. A suction created by the flow of liquids in pipes.

(96) **SLIP-JOINT**. A connection in which one pipe slips into another, the joint of which is made tight with a compression type fitting.

(97) **SPECIAL WASTES**. Wastes which require special treatment before entry into the normal plumbing system.

(98) **SPECIAL WASTE PIPE**. Piping which conveys special wastes.

(99) **SPIGOT**. The end of a pipe which fits into a bell or hub.

(100) **STACKS & BRANCHES**. (a) *Stacks*. 1. Soil stack. Any pipe extending vertically which conveys the discharge of water closets, bedpan washers or like fixtures with or without other fixtures to a horizontal branch, building drain or building subdrain.

2. Waste stack. Any pipe extending vertically which receives only liquid wastes free from fecal matter and conveys same to a horizontal branch, the building drain or building subdrain.

(b) *Branches*. 1. Branch. A horizontal drain pipe extending from a soil or waste stack to which vertical sections or extensions may be connected which receive the discharge from one or more fixture drains.

2. Branch interval. A distance along a soil or waste stack corresponding in general to a story height but in no case less than 8 feet within which the horizontal branches from one story of a building are connected to the stack.

(101) **STERILIZERS**. (a) *Boiling type*. A non-pressure type device used for boiling instruments, utensils, and/or other equipment for disinfection purposes.

(b) *Pressure instrument washer-sterilizer*. A pressure vessel fixture designed to both wash and sterilize instruments during the operating cycle of the unit.

(c) *Pressure (autoclave)*. A pressure vessel designed to use steam under pressure for sterilizing. Also called an autoclave.

(d) *Water*. A device used for sterilizing water and storing sterile water.

(102) **STILL**. A device used in distilling liquids.

(103) **SUMP.** A tank or pit which receives sewage or liquid wastes located below the normal grade of the gravity system and which must be emptied by mechanical means.

(104) **SUMP PUMP.** A mechanical device other than an ejector for removing liquid waste from a sump.

(105) **SUPPORTS.** Supports, hangers, anchors and other devices for supporting and securing pipes, or fixtures to walls, ceilings, floors or structural members of a building.

(106) **SWIMMING POOL.** Any structure, basin chamber or tank containing an artificial body of water for swimming, diving or recreational bathing having a depth of 2 feet or more at any point.

(107) **TERMINAL.** That part of a drainage or vent piping system which projects above the roof of the building or at the end of the building effluent disposal system.

(108) **TRAP.** A fitting or device so designed and constructed as to provide, when properly vented, a liquid seal which will prevent the back passage of sewer air without materially affecting the flow of sewage or waste through it.

(a) *Trap crown.* Where the trap connects to or becomes a part of the horizontal arm of the trap which is intergral with the trap.

(b) *Trap seal.* Trap seal is indicated by the height of the water column measured between the overflow and the dip separating the inlet and outlet arms of the trap.

(109) **TURF SPRINKLER UNIT.** A system of piping, appurtenances and devices so installed as to distribute water for lawn or other similar irrigation purposes without plumbing fixtures or means of use for human consumption.

(110) **VACUUM BREAKER.** An atmospheric device, pipe installed and designed to protect a water supply against back-siphonage by entry of air to relieve vacuums in the water distribution system. (A vacuum breaker is not designed to protect the water supply under conditions of backflow or back-pressures.)

(111) **VENT PIPE.** Any pipe provided to ventilate a plumbing system.

(a) *Back vent.* A pipe that connects to a soil or waste pipe to vent a single fixture trap and connects to the vent system above the fixture served with no part of it below the fixture trap.

(b) *Branch vent.* That part of the vent piping which extends horizontally with or without lateral or vertical extensions and to which other vent pipes connect.

(c) *Circuit vent.* A vent pipe which serves 2 or more fixture traps which discharge to a nearly horizontal soil or waste branch and extends from the downstream side of the furthestmost upstream fixture trap to the main soil or waste vent or main vent so that a circuit is formed.

(d) *Continuous vent.* A vertical vent pipe that is a continuation of the vertical waste pipe to which it connects.

(e) *Loop vent.* Similar to a back vent except that part of it extends below the trap it serves before reconnecting to the vent piping system.

(f) *Main soil or waste vent.* That part of the stack above the highest installed fixture opening or branch connection. (Commonly referred to as a stack vent.)

(g) *Main vent.* A vent pipe connected to the base of a soil or waste stack below the lowest fixture branch extending vertically with or without change of direction and which serves as a terminal for other vent pipe connections and terminates through the roof or connects with the main soil or waste pipe at a point 2 feet or more above the highest soil or waste opening, but in no case less than 38 inches above the highest floor on which soil or waste openings are installed.

(h) *Relief vent.* The vent pipe connected to a soil or waste pipe close to the stack in a manner to equalize minus and plus pressures in the stack.

(i) *Stack venting.* A method of venting a fixture or group of fixtures through the soil or waste stack.

(j) *Sterilizer vent.* A separate pipe or stack connected indirectly to the building drainage system at the lowest terminal, which receives the vapors from non-pressure sterilizers or the exhaust vapors from pressure sterilizers and conducts the vapors directly to the outer air. (Commonly referred to as vapor, steam, atmospheric or exhaust vent.)

(k) *Unit vent.* One which denotes an installation so arranged that one pipe will serve traps from two identical fixtures at the same point when connected to a vertical soil or waste pipe.

(l) *Wet vent.* That portion of a vent pipe which receives the discharge from wastes other than water closets, kitchen fixtures or other sources containing like sewage or fecal matter.

(m) *Yoke vent.* A pipe connecting upward from a soil or waste stack into a main vent pipe in a manner to equalize pressures within the stacks.

(112) **WATER SOFTENER.** An appliance, appurtenance or device used for the purpose of ion exchange or demineralizing water.

(113) **WATER SUPPLY (PRIVATE).** Private water supply means one or more sources of ground water, including facilities for conveyance thereof, such as wells, springs and pumps, on one property, other than those serving a municipality or a group of 10 or more premises of mixed ownership.

(114) **WATER SERVICE.** A pipe extended from the water main or private pumping system or other supply source with or without lateral extensions to the building, structure or other system to be served.

(115) **WATER DISTRIBUTION SYSTEM.** Those pipes which convey water from the service pipe to the plumbing fixtures, appliances, appurtenances, equipment, devices or other systems which are to be served.

(116) **WIPED JOINT.** The fusion of metal with solder, smoothly finished with a wiping cloth and having a thickness of at least one-fourth inch at the point where the pipes are joined.

(117) **WORKMANSHIP.** Work of such character that will fully secure the results sought in all the sections of this code as intended for the safety, welfare and health protection of all individuals.

(118) **YARD DRAIN.** The horizontal piping and its branches which convey the surface drainage from areas, courts or yards outside the walls of a building to the storm water sewer.

(119) **MISCELLANEOUS.** Standards or Specifications Abbreviations.

- A.G.A. ----- American Gas Association, Inc.
420 Lexington Ave., New York, New York 10017
- A.N.S.I. ----- American National Standards Institute, Inc.
1430 Broadway, New York, New York 10018
- A.S.M.E. ----- American Society of Mechanical Engineers
29 W. 39th St., New York, New York 10018
- A.S.S.E. ----- American Society of Sanitary Engineering
960 Illuminating Building, Cleveland, Ohio 44113
- A.S.T.M. ----- American Society for Testing and Material
1916 Race St., Philadelphia, Pa. 19103
- A.W.W.A. ----- American Water Works Association
2 Park Avenue, New York, New York 10016
- C.S. ----- Commercial Standards, Supt. of Documents
Governmental Printing Office, Washington, D.C.
20401
- F.S. ----- Federal Specifications
General Services Administration, Regional Office 3,
Washington, D.C. 20407
- M.S.S. ----- Manufacturers Standardization Society
of the Value and Fittings Industry
420 Lexington Ave., New York, New York 10017
- N.S.F. ----- National Sanitation Foundation
Testing Laboratory, Inc., P.O. Box 1468,
Ann Arbor, Michigan 48106
- U.L. ----- Underwriters' Laboratories, Inc.
207 E. Ohio Street, Chicago, Illinois 60611
- W.C.F. ----- Water Conditioning Foundation
1201 Waukegan Road, Glenview, Illinois 60025

History: 1—2—56; am. (8), (42) (b) and (c); (46) and (49), Register, February, 1957, No. 14, eff. 3—1—57; r. and recr. Register, October, 1970, No. 178, eff. 11-1-70; cr. (119), Register, October, 1971, No. 190, eff. 11-1-71; r. and recr. (70); (79) through (118) are renum. to be (80) through (119); (119) is renum. to be (79); am. (89) (a) 2. and 3. as renum., r. and recr. (90) as renum. Register, November, 1972, No. 203, eff. 12—1—72; r. and recr. (88) (a) 4, Register, July, 1976, No. 247, eff. 8—1—76.

Register, July, 1976, No. 247
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Table 32 (Continued)

Materials	See Limitations to Subsection H 62.19 (2) (a) Below	Standards and Specifications		
		ANSI	ASTM	Other
Malleable iron fittings -----		B16.3-1963		
Steel pipe flanges and fittings -----		B16.5-1968		
Nipples threaded -----				See section H 62.19 (1) (a) and (c), Wis. Adm. Code
Wrought seamless copper and copper alloy pipe and tube—general requirements-----	7		B251-68a	
Copper pipe—seamless -----	7		B42-66	
Copper pipe—threadless (TP) -----			B302-66a	
Copper tube—seamless—types K-L-M -----	7		B88-66a	
Copper drainage tube—type DWV -----	7		B306-66a	
Copper tube—seamless -----	7		B75-68	
Cast bronze screwed fittings 125 & 250 lbs. -----		B16.15-1964		
Cast bronze solder joint pressure fittings -----		B16.18-1963		
Cast bronze solder joint drainage fittings -----	8	B16.23-1969		
Bronze flanges & flanged fittings -----		B16.24-1962		
Wrought copper and bronze solder joint pressure fittings -----		B16.22-1963		
Wrought copper and bronze solder joint drainage fittings -----	8	B16.29-1966		
Seamless red brass pipe -----			B43-66	
Seamless brass tube -----			B135-67	
Brass fittings for flared copper tube -----		B16.26-1958		
Acrylonitrile-butadiene-styrene (ABS) Type 1, Schedule 40, DWV and building sewer -----	9		D1788-68	NSF 14
			D2661-68	
Acrylonitrile-butadiene-styrene (ABS) (water service) -----	10		D1527-68	NSF 14
			D2282-68	
Polybutylene (water service) -----	10		D2662-68	NSF 14
			D2666-68T	
Polyethylene (PE) (water service) -----	10		D2104-68	NSF 14
			D2239-68	
Polyvinyl chloride (PVC) (water service) -----	10		D2241-69	NSF 14
			D1785-68	
Polyvinyl chloride (PVC) -----	9		D2665-68	NSF 14
Schedule 40 unthreaded -----				
Schedule 80 can be threaded -----				
DWV and building sewer -----				
Solvent cement for acrylonitrile-butadiene-styrene (ABS) plastic pipe and fittings -----	9		D2235-67	
Solvent cement for polyvinyl chloride (PVC) plastic pipe and fittings -----	9		D2564-67	
Atmospheric vacuum breakers -----				ASSE 1001

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Table 32 (Continued)

Materials	See Limitations to Subsection H 62.19 (2) (a) Below	Standards and Specifications		
		ANSI	ASTM	Other
Caulking materials (water) -----				AWWA C600-64
Cement lining for cast iron pipe -----				AWWA C104-64
Coal tar enamel (protective coating) -----				AWWA C203-66
Ferrous plugs, bushings and locknuts with pipe threads -----		B16.4-1963		
Galvanized iron and steel sheets -----			A525-71	
Gel-coated glass-fiber reinforced polyester resin bath units -----	11	Z124.1		
Gel-coated glass-fiber reinforced polyester resin shower units -----	11	Z124.2		
Plumbing fixtures—land use -----	15			F.S. WW-P-541b and interim amendments 4 and 6
Precast jointing material for clay pipe -----				See section H 62.19 (1) (a) and (c), Wis. Adm. Code
Rubber gasket for cast iron soil pipe and fittings -----	12		C564-68	
Sheet brass -----			B36-67	
Sheet copper -----			B152-66	
			B248-71	
Sheet lead -----				Min. weight—4 lb. per sq. ft.
Soft solder -----			B32-66T	
Valves -----			A181-65	See section H 62.19 (1) (a) and (c), Wis. Adm. Code
Water hammer arrestors -----				ASSE 1003
Water heaters -----		C72.1-1949 Z21.10.1-1966 Z21.10.2a-1963		ASSE 1010
Manhole frames and covers -----				See section H 62.19 (1) (a) and (c), Wis. Adm. Code
Septic tanks - general design and accessories -----				See section H 62.20 (4), Wis. Adm. Code
Precast concrete arched pipe constructed -----	16			Wis. Adm. Code
Steel septic tanks -----	17			Wis. Adm. Code
Glass-fiber reinforced polyester tanks -----	18			Wis. Adm. Code

3. The wall thickness of fittings and hubs shall correspond with that of the pipe of the same size and kind. Change of direction. 45° elbows, 45° Y and 1/8 bend or fittings producing a like radius may be used in lieu of the elbows listed.

4. Cast iron soil pipe fittings. Change in direction. When direction of flow changes from horizontal to vertical, the radius of bends shall be as follows: (All dimensions are given as inches.)

Size of pipe -----	2	3	4	5	6
Minimum radius -----	3	3½	4	4½	5

When direction of flow changes from vertical to horizontal or when it is at right angles and changes in the same horizontal plane, the radii of bends shall be as follows: (All dimensions are given as inches.)

Size of pipe -----	2	3	4	5	6
Minimum radius -----	8	8½	9	9½	10

5. Building sewer and drain application prohibited. See Wis. Adm. Code section H 62.24.

6. Cast iron threaded drainage fittings. The face to center measurements for screw thread drainage fittings shall be as follows:

PIPE SIZE

1¼"	1½"	2"	2½"	3"	4"
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When change of direction is from horizontal to vertical:

2¼"	2½"	3 1/16"	3 11/16"	4¼"	5 3/16"
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When change of direction is from vertical to horizontal or horizontal to horizontal:

3"	3½"	4"	4½"	5¼"	6¼"
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Change of direction. 45° elbows, 45° Y and 1/8 bend or fittings producing a like radius may be used in lieu of the elbows listed.

7. Copper water tube used for underground water lines may be soft or hard temper. Copper water tube used for interior aboveground water lines shall be hard temper, except concealed vertical tube may be soft temper for repair of replacement lines. Copper tube used for soil, waste and vent piping shall be hard temper. See Wis. Adm. Code sections H 62.05 (2), H 62.06 (4), H 62.07 (18), H 62.13 (2) (b) and H 62.13 (4) (b).

8. Copper, brass and bronze drainage fittings. Change of direction. 45° elbows, 45° Y and 1/8 bend or fittings producing a like radius may be used in lieu of the elbows listed.

The radii of wrought copper or cast brass or bronze waste fittings shall be as follows:

PIPE SIZE

1¼"	1½"	2"	2½"	3"	4"
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When change of direction is from horizontal to vertical:

1⅝"	1⅞"	2 7/16"	3 5/16"	4⅞"
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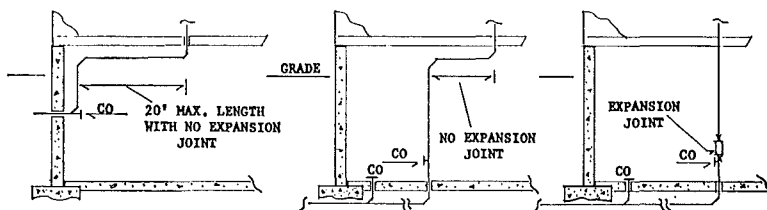
When change of direction is from vertical to horizontal or horizontal to horizontal:

2 $\frac{3}{8}$ " 2 $\frac{7}{8}$ " 3 $\frac{3}{8}$ " 4 $\frac{5}{16}$ " 5 $\frac{3}{16}$ "

9. Plastic pipe and fittings—DWV. a. Plastic pipe and fittings shall not be embedded in masonry or concrete and shall be installed exposed or in frame partitions or in accessible tunnels, shafts or crawl spaces. For installations in excess of 3 stories or 35 feet, detailed plans and specifications shall be submitted to the department for approval prior to installation.

b. Schedule 40 plastic pipe and fittings shall not be threaded. When threaded construction is necessary, adapter fittings shall be used to make the transition. Only ABS-DWV socket type fittings shall be used with ABS pipe, and PVC-DWV socket type fittings with PVC pipe. The intermixing of the two type of plastic pipe and fittings is prohibited. The solvent cement for jointing shall meet the requirements of ASTM D-2235-67 for ABS plastic pipe and fittings, and ASTM D 2564-67 for PVC plastic pipe and fittings.

c. An approved plastic expansion joint shall be installed immediately above the cleanout in all vertical soil and waste stacks extending one or more floors in height. When the horizontal offset precedes the vertical rise, an expansion joint shall not be required. See following sketch.



All stacks or piping extending through the roof of the structure shall terminate with an approved expandable type roof terminal flashing or an approved no-caulk neoprene ring roof flashing.

d. All pipe and fitting materials are to be identified as set forth in ASTM Standards D 2661-68 and D 2265-68.

10. Plastic water service piping. a. Plastic water service piping may be installed for cold water only. The use of plastic water service piping from the water main in the street to the curb stop is subject to water department ordinances or local governmental acceptance. Plastic water service piping entering the building shall terminate within 5 feet inside the point of entering the building.

b. The plastic pipe, fittings and solvent cements shall be approved by the National Sanitation Foundation for potable water supply and bear the NSF seal of approval. They also shall comply with the applicable ASTM standards.

c. The plastic pipe and fittings shall have a pressure rating or no less than 160 pounds per square inch; pipe 2 inches and larger shall have a safety factor ratio of 4 to 1 and shall require approval by the

department prior to installation. The pressure rating shall be marked on the pipe.

d. Electric grounding to water distribution systems which have utilized plastic water service piping is prohibited.

e. Plastic materials shall be installed according to manufacturer's recommendation or applicable ASTM Standards.

11. Gel-coated fiberglass bath and shower units. All units shall be approved by the department. All nonexposed areas, those not gel-coated, shall have an outer coating of self-extinguishing resin at least 3/32 of an inch in thickness or shall be constructed entirely of self-extinguishing resin. The resin shall be rated self-extinguishing according to ASTM D 635-68. Domes or ceilings shall meet the same specifications. If wood or other materials are used for structure stability or sound deadening, the material used shall be completely enclosed with self-extinguishing resin. When urethane foam is used, it shall meet ASTM D 1692-68 rating as self-extinguishing.

12. See Wis. Adm. Code section H 62.18 (2) (e) 2.

13. Corrugated steel pipe may be used for storm building sewers subject to the following conditions:

a. The pipe is sized according to tables 11, 11a, 11b and 12, Wis. Adm. Code, section H 62.12, with adjustments considered to allow for flow characteristics and configuration of the pipe.

b. The connection from a building storm drain to a corrugated steel building storm sewer shall be made at least 10 feet outside the building wall or foundation.

14. Asbestos cement storm drainage pipe conforming to ASTM C663-70 may be installed for storm sewers from a point at least 10 feet outside the building wall or foundation.

15. Brass tubing. All brass tubing used for fixtures, traps and overflows between wall or floor and fixtures shall be made of seamless brass tube with a thickness of at least 0.0453 inch (No. 17 Brown and Sharpe gauge) and shall conform to A.S.T.M. "Standard Specifications for Seamless Brass Tubes," serial number B-135-67.

16. Precast concrete and site constructed tanks. Precast concrete tanks shall have a minimum wall thickness of 2 inches.

b. Materials and joints. a. The concrete used in constructing a precast or site-constructed tank shall be a mix to withstand a compressive load of at least 3,000 pounds per square inch. All concrete tanks shall be designed to withstand the pressures to which they are subjected.

c. The floor and sidewalls of a site-constructed concrete tank shall be monolithic except a construction joint will be permitted in the lower 12 inches of the sidewall of the tank. The construction joint shall have a keyway in the lower section of the joint. The width of the keyway shall be approximately 30% of the thickness of the sidewall with a depth equal to the width. A continuous water stop or baffle at least 6 inches in width shall be set vertically in the joint, embedded 1/2 its width in the concrete below the joint with the remaining width

in the concrete above the joint. The water stop or baffle shall be copper, neoprene, rubber or polyvinylchloride designed for this specific purpose.

d. Joints between the concrete septic tank and its cover and between the septic tank cover and manhole riser shall be tongue and groove or shiplap type and sealed watertight using neat cement, mortar or bituminous compound.

17. Steel septic tanks. For general tank design see section H 62.20 (4) (a) and (b). Steel tanks shall be fabricated of new, hot rolled commercial steel. The tanks, including cover with rim, inlet and outlet collars and manhole extension collars shall be fabricated with welded joints in such manner as to provide structural stability and watertightness. Steel tanks shall be coated, inside and outside, in compliance with the U.S. department of commerce Commercial Standard 177. Any damage to the bituminous coating shall be repaired by recoating. The gauge of the steel shall be as follows:

<i>Septic Tank Capacity</i>	<i>Tank Component</i>	<i>Gauge of Steel</i>
500 to 1,000 gallons -----	Bottom and sidewalls	10
	Cover	12
	Baffles	12
1,000 to 4,000 gallons -----	Complete tank	7
4,001 to 12,000 gallons -----	Complete tank	1/4"
12,001 or more gallons -----	Complete tank	5/16"

18. Glass-fibre reinforced polyester septic tanks. a. General. The following paragraphs apply to septic tanks made of glass-fiber reinforced polyester and intended for use in nonindustrial private domestic sewage treatment and disposal systems. For general septic tank design see section H 62.20 (4) (a) and (b). Unless otherwise indicated, the plastic terminology used in this section is in accordance with the definitions given in ASTM Standard D 883.

b. Materials. Septic tanks, covers, baffles, flanges, manholes, etc., shall be made from polyester resins with glass-fiber reinforcement and meet the general design criteria as prescribed in (4) (a) of this section.

c. Resin. The resin shall be a commercial grade of polyester resin and shall be evaluated as a laminate by tests conducted in accordance with ASTM Standard C 581. Unless otherwise approved by the department the same resin shall be used throughout the laminate.

d. Reinforcing material. The reinforcing material shall be of a suitable commercial grade of glass-fiber (E Glass) treated with a coupling agent, approved by the glass-fiber manufacturer, that will provide a compatible bond between the resin and the glass. Glass-fiber surfacing materials, if used, shall be of a chemical-resistant glass (C glass) bonded with a suitable binder.

e. Fillers and pigments. The resins used shall not contain fillers except as required for viscosity control. Up to 5% by weight of the total resin content of thixotropic agent that will not interfere with visual inspection may be added to the resin for viscosity control. Resins may contain pigments and dyes recognizing that such additions may interfere with visual inspection of laminate quality.

f. Laminate. The laminate shall consist of the following. See following sketch.

- 1) Primary chemical-resistant surface.
- 2) Internal anti-wicking barrier.
- 3) Additional structural reinforcing section if required to meet the properties described in subsection n. below and the following table.
- 4) Exterior surface.

1) Primary Chemical-Resistant Surface	
2) Internal Anti-Wicking Barrier	

1)	2)	2)	3)	3)	3)	To Desired Thickness For Strength	3)	3)	3)	3)	4)
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- 3) Additional Structural Reinforcing Section
 - 4) Exterior Surface
-

g. Primary chemical-resistant surface. This surface shall be between 0.005 and 0.012 inch thick. It shall be a reinforced resin-rich surface. It shall be free from cracks and crazing and have a smooth finish.

h. Internal anti-wicking barrier. Not less than 0.100 inch of chemical-resistant laminate next to the inner surface shall be reinforced with not less than 20% nor more than 30% by weight of mat or chopped strand.

i. Additional structural reinforcing section. This layer or body or the laminate shall be of chemically resistant construction suitable for the intended use and providing the additional strength necessary to meet the tensile and flexural requirements. Where separate layers such as mat, cloth or woven roving are used, all layers shall be lapped at least one inch. Laps shall be staggered as much as possible. If woven roving or cloth is used, layers of chopped strand glass shall be placed as alternate layers.

j. Exterior surface. This surface shall consist of a chopped strand glass over which shall be applied a resin-rich coating. This resin-rich surface layer shall contain less than 20% of reinforcing material.

k. Cut edges. All cut edges shall be coated with resin so that no glass fibers are exposed and all voids are filled. Structural elements having edges exposed to the chemical environment shall be made with chopped strand glass reinforcement only.

l. Wall thickness. The minimum wall thickness shall be as recommended by the manufacturer but in no case shall it be less than 3/16 inch regardless of operating conditions. Isolated small areas may be as thin as 80 percent of the specified minimum wall thickness.

m. Mechanical properties. To establish proper wall thickness and other design characteristics, the minimum physical properties for any

laminate shall be as shown in the following table and subdivision n. below.

Requirements for Properties of Newly Fabricated
Reinforced Polyester Laminates

Property at 73.4° F. in psi (MPa)*	Thickness in inches				Test Method
	3/16	1/4	5/16	3/8 & up	
Ultimate tensile strength, min.	9,000 (62)	12,000 (83)	13,500 (93)	15,000 (103)	ASTM D 638
Flexural strength, min.	16,000 (110)	19,000 (131)	20,000 (137)	22,000 (152)	ASTM D 790
Flexural modulus of elasticity (tangent), min.	700,000 (4823)	800,000 (5512)	900,000 (6201)	1,000,000 (6895)	ASTM D 790

* (MPa) = mega pascals

n. Surface hardness. The laminate shall have a Barcol hardness of at least 90% of the manufacturer's minimum specified hardness for the cured resins when tested in accordance with ASTM D 2583. This requirement applies to both interior and exterior surfaces.

o. Appearance. The finished laminate shall be as free as commercially practicable from visual defects such as foreign inclusions, dry spots, air bubbles, pinholes, pimples and delamination. The inner surface shall be free from cracks and crazing and have a smooth finish and an average of not more than 2 pits per square foot providing the pits are less than 1/8 inch diameter and not more than 1/32 inch deep and are covered with sufficient resin to avoid exposure of inner surface fabric. Some waviness is permissible provided the surface is smooth and free from pits. Unless otherwise specified, ASTM D 2563 visual acceptance level 3 shall be the minimum standard for acceptance.

p. Tank design. All tanks shall meet the general design criteria as outlined in section H 62.20 (4) (a) and (b). Horizontal cylindrical tanks standard end enclosed shall be convexed heads with a maximum radius of curvature equal to the tank diameter. Rectangular tanks shall have external ribs to prevent sidewall deflection exceeding 1/2% of span at any location when tested by filling with water.

q. Shell joints. Where tanks are manufactured in sections and joined by use of a laminate bond, the joint shall be glass-fiber reinforced resin at least the thickness of the heaviest section being joined. The reinforcement shall extend on each side of the joint a sufficient distance to make the joint at least as strong as the tank wall, and shall be not less than the minimum joint widths specified in the following table. The reinforcement shall be applied both inside and out, with the inner reinforcement considered as a corrosion resistant barrier only and not structural material.

Minimum Total Widths of Overlays for
Reinforced-Polyester Tank Shell Joints

Tank wall thickness in inches	3/16	1/4	5/16	3/8	7/16	1/2	9/16	5/8	11/16	3/4
Minimum outside overlay width in inches	4	4	5	6	7	8	9	10	11	12
Minimum inside overlay width in inches	4	4	5	5	6	6	6	6	6	6

r. Resistance to static load. There shall be not more than 0.25 percent difference in dimensions before and after the tanks are statically loaded. For the static load test bed an empty tank in dry sand to a depth not exceeding 4 inches and oriented as in service. Load top segment of empty tank with evenly distributed load to a total weight in pounds equal to:

$$L = 140 \times A \times b \quad \text{where } L = \text{total load}$$

A , = horizontal cross-sectional area
of tank
 b = depth of overburden expected

Rotate tank through 90° on its major axis. Bed tank in dry sand to a depth not exceeding 4 inches. Load sides of empty tank with evenly distributed load to total weight in pounds equal to:

$$L = 70 \times A \times b \quad \text{where } L = \text{total load}$$

A , = vertical cross-sectional area of tank
 b = depth of overburden expected

s. Siphoning or pumping. There shall be no permanent deflection or change in length of any internal or external component of the tank during the pumping or siphoning when the tank is filled to its working level. There shall be no signs of leaking, weeping or other failure.

t. Weight. No tank shall differ in gross weight by more than +10 or - 5 percent from the weight of tanks that have been subjected to the tests for siphoning and static pressure.

u. Tests. Tensile strength test shall be in accordance with ASTM D 638, except that the specimens shall be the actual thickness of the fabricated article and the width of the reduced section shall be one inch. Other dimensions of specimens shall be as designated by the ASTM standard for type one specimens for materials over 1/2 inch to one inch inclusive. Specimens shall not be machined on the surface. Test 5 specimens at 0.20 to 0.25 inch/minute crosshead speed, and average the results. Flexural strength shall be determined in accordance with Procedure A and Table 1 of ASTM D 790, except that the specimens shall be actual thickness of the fabricated article and the width shall be one inch. Other dimensions of specimens shall be as designated by the ASTM standard. Specimens shall not be machined on the surface. Test 5 specimens, with the resin-rich side in compression. Determine the tangent modulus of elasticity in flexure by ASTM D 790.

(b) *Miscellaneous materials.* 1. Backwater valves. Backwater valves shall have cast iron or brass bodies, noncorrosive bearings, seats and self-aligning disks, and shall be so constructed as to insure a positive

mechanical seal and to remain closed, except when discharging wastes. Such valves shall remain sufficiently open during periods of low flows to avoid screening of solids and shall not restrict capacities or cause excessive turbulence during peak loads. Valve access covers shall be bolted type with gasket and each valve shall bear the manufacturers name cast into the body.

2. Caulking ferrules. a. Caulking ferrules for lead pipe or copper tube to cast iron shall be of red brass, free from sand holes, flaws or other defects, uniform in thickness, and at least 4 1/4 inches long, of a size and weight as shown in table 33.

Table 33

Inside diameter, inches	Weight
1 1/2	1 lb. 1 oz.
2	1 lb. 4 oz.
3	1 lb. 14 oz.
4	2 lb. 8 oz.
5	3 lb. 0 oz.
6	3 lb. 8 oz.

b. Caulking ferrules for connection between national taper pipe thread and cast iron pipe shall be brass or cast iron. Brass ferrules shall conform to section H 62.19 (2) (b) 2. a. as to materials. Cast iron ferrules shall conform to Wis. Adm. Code section H 62.10 (5), table 7.

3. Cleanout ferrules and plugs. See Wis. Adm. Code section H 62.10 (5) (a) and (7).

4. Closet bolts, nuts and screws for floor outlet fixtures connecting to a floor flange shall be brass or copper. Bolts and nuts for wall outlet fixtures shall be brass or corrosive resistant plated steel.

5. Dishwasher air-gaps as approved by the department.

6. Floor flanges for water closets and similar fixtures shall be brass not less than 1/8 inch thick, cast iron not less than 1/4 inch thick or galvanized malleable iron, hard lead or other material approved by the department. Caulked-on flanges shall have a caulking depth of at least 2 inches.

7. Footing, foundation and groundwater collecting piping within a building shall be asbestos cement, bituminous fiber, cast iron, concrete, vitrified tile or other material approved by the department.

8. Lead soil, waste and vent piping shall be the best quality drawn lead pipe, having a minimum weight per foot as follows:

Inside diameter, inches	1 1/4	1 1/2	2	3	4
Weight per foot, pounds	2 1/2	3 1/2	4 3/4	6	8

Lead traps and lead bends shall have a minimum wall thickness of 1/8 inch. Lead water piping shall have minimum weights as indicated in table 34.

Table 34

Inside diameter, inches	Weight lbs. per foot	Wall thickness inches
$\frac{1}{8}$	2
$\frac{1}{4}$	2
$\frac{3}{8}$	3
$\frac{1}{2}$	3½	.231
1	4½	.246
1½	7¼	.320
2	11¼	.386
2	19½	.504

Sheet lead for safin pans shall weigh not less than 4 pounds per square foot. Sheet lead for flashings and roof terminals shall weigh not less than 3 pounds per square foot.

9. Solder bushings shall be red brass with minimum weights as follows:

<i>Pipe size inches</i>	<i>Minimum weight each</i>
$\frac{1}{4}$	6 oz.
$\frac{1}{2}$	8 oz.
2	14 oz.
$2\frac{1}{2}$	1 lb. 6 oz.
3	2 lb. 0 oz.
4	3 lb. 8 oz.

10. Sheet copper for the following uses: a. General use including safe pans—minimum 12 ounces per square foot.

b. Flashings for vent terminals—minimum 8 ounces per square foot.

11. Galvanized sheet iron or steel for vent terminal flashings shall not be lighter than number 28 Brown and Sharpe gauge.

Note: Copies of standards promulgated by the following technical societies, referred to above are on file in the offices of secretary of state, health and social services and revisor of statutes and may be obtained for personal use from the following addresses:

American National Standards Institute, Inc.
1430 Broadway, New York, New York 10018

American Society for Testing and Material
1916 Race St., Philadelphia, Pa. 19103

American Water Works Association
2 Park Avenue, New York, New York 10016

Cast Iron Soil Pipe Institute
2029 K Street, NW
Washington, D. C. 20006

National Sanitation Foundation
Testing Laboratory, Inc.
P.O. Box 1468
Ann Arbor, Michigan 48106

American Society of Sanitary Engineering
960 Illuminating Building
Cleveland, Ohio 44113

History: 1-2-56; r. and recr. Register, November, 1972, No. 203, eff. 12-1-72; cr. (2) (a) 16, 17 and 18, Register, July, 1976, No. 247, eff. 8-1-76.

Register, July, 1976, No. 247
Health

H 62.20 Private domestic sewage treatment and disposal systems.

(1) APPROVALS AND LIMITATIONS. (a) *Allowable use.* Septic tank and effluent absorption systems or other treatment tank and effluent disposal systems as may be approved by the department may be constructed when no public sewerage system is available to the property to be served or likely to become available within a reasonable time. All domestic wastes shall enter the septic or treatment tank unless otherwise specifically exempted by the department or this chapter. The private domestic sewage treatment and disposal system of each building shall be entirely separate from and independent of that of any other building. Mobile home parks, campgrounds, sanitary districts, school districts, resorts and so forth with limited area or other limitations may with departmental approval use a common system.

(b) *Public sewer connection.* When public sewers approved by the department of natural resources become available to the premise served, the private domestic sewage treatment and disposal system shall be discontinued within that period of time required by local order but not to exceed one year. The building sewer shall be disconnected from the private system and be connected to the public sewer. All abandoned treatment tanks and seepage pits shall have the contents pumped and disposed of in accordance with NR 113, Wis. Adm. Code, the tank or entire top shall be removed and the remaining portion of the tank or excavation shall be immediately filled with suitable fill material.

(c) *Plans and specifications.* 1. One- and two-family residences. Unless required elsewhere in this chapter, the submission of plans and specifications and departmental approval of initial, modified, additional or replacement construction of private domestic sewage treatment and disposal systems serving one- and two-family residences is not required. All applicable approvals and permits required by local government shall be obtained prior to the commencing of construction. The local authority may require plans and specifications prior to issuing permits or approval.

2. Public buildings — departmental approval. Complete plans and specifications shall be submitted in accord with section H 62.20 (1) (c) 4. and 6. and section H 62.25 and written approval received before commencing work on the initial installation of a private domestic sewage treatment and disposal system or for the addition to, modification or replacement of the system, if the system serves or will serve any public building. The owner shall submit a copy of the approved plans to the local authority. Included as public buildings but not limited by enumeration are:

- a. Theaters and assembly halls
- b. Schools and other places of instruction
- c. Apartment buildings, hotels and places of detention
- d. Factories, office and mercantile buildings
- e. Mobile home parks, campgrounds and camping resorts
- f. Parks

3. Public buildings — local approval. The approval by the county or other local governmental agency having authority shall not eliminate the need for approval by the department for the installation of private

domestic sewage treatment and disposal systems serving public buildings. Departmental approval shall not eliminate the need for obtaining all required local permits and approvals.

4. Public buildings — submission of plans and specifications. All plans and specifications shall be submitted in triplicate and shall include the following:

a. Detailed plot plan dimensioned or drawn to scale showing the lot size; the location of all septic tanks, holding tanks or other treatment tanks, building sewers-sanitary and storm, wells, water mains or water service, streams and lakes, dosing chambers, distribution boxes, effluent disposal systems, dual disposal systems, and disposal replacement areas; and the location of the public building served by such systems. Adjoining properties shall be checked to determine if limiting distances are a factor. All distances and dimensions required in section H 62.20 (1) (d) 2. shall be shown on this detailed plot plan.

b. Legal description of the property on which the system is to be installed.

c. A permanent elevation reference point.

d. Soil boring and percolation test data. Soil test data shall relate to the undisturbed and finished grade elevations and permanent elevation reference point or bench mark. See section H 62.20 (2) (b).

e. Ground slope with 2-foot contours for the finished grade elevation of the entire area of the soil absorption system and the area on all sides for a distance of 25 feet.

f. Complete data relative to the maximum expected use and occupancy of the building to be served.

Note: All anticipated future growth plans should be considered.

g. Complete specifications of pumps and controls including a statement on volume of dosing and plans of dosing chambers and piping, including relative elevations of related units when dosing or dual system facilities are required or provided.

5. Public buildings — availability of plans. One set of plans bearing the department's stamp of approval shall be maintained at the project site during construction of any private sewage treatment and disposal system serving a public building.

6. Public buildings — revised plans. Approved plans and specifications shall not be revised except with the written approval of the department.

(d) *Local filing requirements.* 1. As-built plan. Every installer of an initial, modified, additional or replacement private domestic sewage treatment and disposal system shall submit a detailed as-built plan of the system to the local authority.

2. Dimension and scale of plan. The as-built plan shall be dimensioned or drawn to scale and shall show the location of the system and the dwelling served by such system. The recommended scale is one inch equals 40 feet, but in any case the scale used shall be sufficient to show clearly all the required dimensions and distances enumerated

below. The following dimensions and distances shall be shown on the plan: the dimensions of the lot or a sufficient portion such that all other required dimensions and distances may be shown; the dimensions of the dwelling to be served by the system; the location of the dwelling and all other buildings on the lot with distances from lot lines to said dwelling and buildings; the location of all septic tank and other treatment tank manholes and the distance and location of each manhole to the dwelling and to any other nearby reference points; the location and dimensions of all septic, holding or other treatment tanks, soil absorption systems and replacement disposal areas; and the location and distances from all buildings, wells, water services, water mains and other underground public utilities, reservoirs, swimming pools or high water marks of any lake, stream, pond or flowage located on the lot or on adjacent properties within 100 feet of the septic tanks, treatment tanks, sewage disposal systems or replacement disposal areas.

3. Plan examination. The local authority shall examine this plan to determine if it adequately shows the required locations, distances and dimensions. If it is determined that the plan meets the requirements of section H 62.20, then he shall accept and file the plan.

4. Acceptance. No private domestic sewage treatment and disposal system shall be used until an as-built plan for the system has been accepted and filed by the local authority.

5. File. The local authority shall establish a filing system which provides a system of retrieval of the as-built plans and may set by ordinances a filing fee. The local authority may require that additional information be included on the plan to aid in filing, indexing or retrieving plans.

(e) *Specific limitations.* 1. Cesspools. Cesspools are prohibited.

2. Industrial wastes. The department of natural resources shall be contacted in regard to the treatment and disposal of all industrial wastes, including such combined with domestic waste.

3. Clear water. The discharge of surface, rain and other clear water into a private domestic sewage disposal system is prohibited.

4. Water softener backwash. Water softener discharge may be directed to the sewage disposal system or to the ground surface if a nuisance is not created.

(2) SOIL TESTS AND SITE REQUIREMENTS. (a) *General.* Soil boring and percolation tests shall be made by a soil tester certified by the department. Test data shall be signed by the certified soil tester on forms furnished by the department.

(b) *Percolation and boring tests.* 1. Number and location. The size and design of each proposed soil absorption system shall be determined from the results of soil percolation tests and soil borings conducted in accordance with this section. At least 3 percolation tests shall be conducted with the holes located uniformly in the location and to the bottom depth of the proposed absorption system. At least 3 soil borings shall be dug to a depth at least 3 feet below the bottom of the proposed system. Percolation tests may not be required where a detailed soil map clearly indicates loamy sand or coarser material

conditions at the depth of the proposed system and soil permeability is limited to the maximum of the class used for design purposes and the soil condition is confirmed by the soil bore test data. The department reserves the right to require proof of the map findings or soil texture and resultant anticipated percolation rate. The exemption of percolation tests does not eliminate the required bore hole test data. The borings shall be distributed uniformly in the area of the proposed system. If soil pits are constructed they shall be located immediately adjacent to the area.

2. Soil maps. When a parcel of land consists entirely of soils having very severe or severe limitations for on-site liquid waste disposal as determined by use of a detailed soil map and interpretive data, that map and interpretive data may be used as a basis for denial for an on-site waste disposal system. Nevertheless, in all cases the property owner shall be permitted to present evidence consisting of soil percolation test data, bore hole data and topographic survey data to support the contention that a suitable site for an on-site liquid waste disposal system does exist.

(c) *Replacement system area.* On each parcel of land being initially developed sufficient area of suitable soils based on soil tests and separation and site requirements contained in paragraphs (b) and (e) for one replacement system shall exist. Where bore hole test data in the replacement system area are equivalent to that in the proposed system area the percolation test may be eliminated.

(d) *Septic tank location.* No tank shall be located within 5 feet of any building or its appendage, 2 feet of any lot line, 10 feet of any cistern, 25 feet of any well, reservoir, below ground swimming pool or the high water mark of any lake, stream, pond or flowage.

Note: Septic tanks should be located to provide accessibility for pumping and service vehicles.

(e) *Soil absorption site.* 1. Location. The surface grade of all soil absorption disposal systems shall be located at a point lower than the surface grade of any nearby water well or reservoir on the same or adjoining property, except that when this is not possible, the site shall be so located that surface water drainage from the site is not directly toward a well or reservoir and will bypass the well or reservoir site by several feet. The soil absorption system shall be located not less than 5 feet from any lot line; 10 feet from a water service, or an uninhabited slab constructed building; 15 feet from an aboveground swimming pool; 25 feet from any occupied or habitable building or dwelling, building with below grade foundation, public water main, below grade swimming pool or cistern; 50 feet from any water well or reservoir and 50 feet from the high water mark of any lake, stream or other watercourse. Effluent disposal systems in compacted areas such as parking lots and driveways are prohibited. Surface waters shall be diverted away from the soil absorption site.

2. Percolation rate—trench or bed. A subsurface soil absorption system of the trench or bed type shall not be installed where the percolation rate for any one of the 3 tests is slower than 60 minutes for water to fall one inch. The slowest percolation rate shall be used to determine the absorption area.

3. Percolation rate—seepage pit. For a seepage pit, percolation tests shall be made in each stratum penetrated below the inlet pipe. Soil strata in which the percolation rates are slower than 30 minutes per inch shall not be included in computing the absorption area. The slowest percolation rate shall be used to determine the absorption area.

4. Floodplain. A soil absorption system shall not be installed in a floodway. Soil absorption systems in areas considered floodplains excluding the floodway shall not be installed unless written approval is received from the department. The department shall receive written local government approval for construction in and filling of the floodplain area prior to reviewing plans.

5. Slope. The soil absorption system shall be constructed on that portion of the lot which does not exceed the slope here specified for the class. In addition, the soil absorption system shall be located at least 20 feet from the crown of any slope that is greater than the specified slope in its class.

<i>Class of Slope</i>	<i>Minutes Required for Water to Fall One Inch</i>	<i>Slope</i>
1 -----	Under 3 -----	20%
2 -----	3 to 45 -----	15%
3 -----	45 to 60 -----	10%

6. Filled area. A soil absorption system shall not be installed in a filled area unless written approval is received from the department except if filled prior to certification as a subdivision lot under chapter H 65, Wis. Adm. Code.

7. Groundwater, bedrock or slowly permeable soils. Soil having a percolation rate of 60 minutes per inch or faster shall exist for the depth of the proposed soil absorption system and for at least 3 feet below the proposed bottom of the soil absorption system. There shall be at least 5 feet of soil over bedrock and above the high groundwater level.

(3) PERCOLATION TEST PROCEDURE. (a) *Type of hole.* The hole shall be dug or bored. It shall have vertical sides and have a horizontal dimension of 4 to 12 inches.

(b) *Preparation of hole.* The bottom and sides of the hole shall be carefully scratched with a sharp pointed instrument to expose the natural soil interface. All loose material shall be removed from the hole and the bottom shall be covered with 2 inches of coarse sand or gravel.

(c) *Test procedure, sandy soils.* For tests in sandy soils containing little or no clay, the hole shall be carefully filled with clear water to a minimum depth of 12 inches over the gravel and the time for this amount of water to seep away shall be determined. The procedure shall be repeated and if the water from the second filling of the hole at least 12 inches above the gravel seeps away in 10 minutes or less, the test may proceed immediately as follows: Water shall be added to a point not more than 6 inches above the gravel. Thereupon, from a fixed reference point, water levels shall be measured at 10-minute intervals for a period of one hour. If 6 inches of water seeps away in

less than 10 minutes, a shorter interval between measurements shall be used, but in no case shall the water depth exceed 6 inches. The final water level drop shall be used to calculate the percolation rate. Soils not meeting the above requirements shall be tested as in paragraph (d) below.

(d) *Test procedure, other soils.* The hole shall be carefully filled with clear water and a minimum water depth of 12 inches shall be maintained above the gravel for a 4-hour period by refilling whenever necessary or by use of an automatic siphon. Water remaining in the hole after 4 hours shall not be removed. Thereafter the soil shall be allowed to swell not less than 16 hours nor more than 30 hours. Immediately following the soil swelling period, the percolation rate measurements shall be made as follows: Any soil which has sloughed into the hole shall be removed and water shall be adjusted to 6 inches over the gravel. Thereupon, from a fixed reference point, the water level shall be measured at 30-minute intervals for a period of 4 hours unless 2 successive water level drops do not vary by more than 1/16 of an inch. At least 3 water level drops must be observed and recorded. The hole shall be filled with clear water to a point not more than 6 inches above the gravel whenever it becomes nearly empty. Adjustment of the water level shall not be made during the last 3 measurement periods except to the limits of the last measured water level drop. When the first 6 inches of water seeps away in less than 30 minutes, the time interval between measurements shall be 10 minutes and the test run for one hour. The water depth shall not exceed 6 inches at any time during the measurement period. The drop that occurs during the final measurement period shall be used in calculating the percolation rate.

(e) *Verification.* 1. Physical characteristics. Depth to high groundwater and bedrock, ground slope and percolation test results shall be subject to verification. Verification of high groundwater may include, but not be limited to, a morphological study of soil conditions with particular reference to soil color and sequence of horizons.

2. Filling. Where the natural soil condition has been altered by filling or other attempts to improve wet areas, the department may require observation of high groundwater levels under saturated soil conditions.

Note: Detailed soil maps are of value for determining estimated percolation rates and other soil characteristics.

(4) **SEPTIC TANKS AND OTHER TREATMENT TANKS.** (a) *Design of septic tanks.* 1. Materials. Septic tanks shall be fabricated or constructed of welded steel, monolithic concrete, glass-fiber reinforced polyester or other materials approved by the department. All tanks shall be watertight and fabricated so as to constitute an individual structure.

2. Approval. a. The design of prefabricated septic tanks shall be approved by the department.

b. Plans for site-constructed concrete tanks shall be approved by the department prior to construction.

3. General. a. The liquid depth shall not be less than 3 feet nor more than an average of 6 feet. The total depth shall be at least 8 inches greater than the liquid depth.

b. Rectangular tanks shall have a minimum width of 36 inches and shall be constructed with the longest dimensions parallel to the direction of flow.

c. Cylindrical tanks shall have an inside diameter of not less than 48 inches.

d. Each prefabricated tank shall be clearly marked to show liquid capacity and the name and address or registered trade mark of the manufacturer. The markings shall be impressed into or embossed onto the outside wall of the tank immediately above the outlet opening. Each site-constructed concrete tank shall be clearly marked at the outlet opening to show the liquid capacity. The marking shall be impressed into or embossed onto the outside wall of the tank immediately above the outlet opening.

e. For septic tank material and construction specifications, see section H 62.19 (2) table 32, Wis. Adm. Code Limitations 16, 17 and 18. For general septic tank design criteria, see section H 62.20 (4) (a) and (b), Wis. Adm. Code.

4. Tank accessories. a. The inlet and outlet openings on all tanks shall contain a "boss" stop or other provision which will prevent the insertion of the sewer piping beyond the inside wall of the tank.

b. The inlet and outlet on all tanks or tank compartments shall be provided with open-end coated iron sanitary tees or baffles made of approved materials, so constructed as to distribute flow and retain scum in the tank or compartments. The tees or baffles shall extend at least 6 inches above and 9 inches below the liquid level, but not to exceed 1/3 the liquid depth. At least 2 inches of clear space shall be provided over the top of the baffles or tees. The bottom of the outlet opening shall be at least 2 inches lower than the bottom of the inlet.

c. Each single-compartment tank and each unit of a multi-compartment tank shall be provided with at least one manhole opening no less than 24 inches square or 24 inches in diameter. Manholes shall terminate no more than 6 inches below the ground surface, be of the same material as the tank and be provided with a substantial, fitted, watertight cover of concrete, steel, cast iron or other approved materials. Steel tanks shall have a minimum 2-inch collar for the manhole extensions permanently welded to the tank. The manhole extension on glass-fiber tanks shall be of the same material as the tank and an integral part of the tank. The collar shall have a minimum height of 2 inches.

d. An airtight inspection opening which may be either a manhole or a cast iron pipe at least 4 inches in diameter, shall be provided over the inlet baffle of all treatment tanks. The upper end of the inspection pipe shall terminate at or above ground surface. The manhole shall terminate not more than 6 inches below the ground surface.

(b) *Design of other treatment tanks.* 1. The design of other treatment tanks shall be considered on an individual basis. A complete description of the method of treatment to be performed in the treatment tank plus three complete sets of plans must be submitted to the department for each request for approval of the treatment tank. The installation of the tank shall be commenced only upon receipt of written approval by the department. The capacity, sizing

and installation of the tank shall be according to sections H 62.20 (4) (d) and H 62.20 (4) (e) unless the department specifies different sizing or installation requirements in its written approval of the treatment tank. The department may require such treatment tank to be preceded by a conventional septic tank. Credit will be given for the capacity of the septic tank in meeting the required capacity as listed in section H 62.20 (4) (c).

(c) *Capacity and sizing.* 1. Minimum capacity. The capacity of a septic tank or other treatment tank shall be based on the number of persons using the building to be served or upon the volume and type of waste. The minimum liquid capacity shall be 750 gallons except a 500 gallon septic tank may be used to serve a one bedroom residence.

2. Multiple tanks. When the required capacity is to be provided by more than one tank, the minimum capacity of any tank shall be 750 gallons. When 3 or 4 tanks are installed, approval of the design of the system shall be obtained from the department. The installation of more than 4 tanks in series is prohibited. Installation of septic tanks in parallel is prohibited.

3. Sizing of tank. a. The minimum liquid capacity for one- and two-family residences is as follows:

Septic Tank Capacity One- and Two-Family Residences

Number of Bedrooms	Septic Tank
1 -----	500
2 -----	750
3 -----	975
4 -----	1200
5 -----	1425
6 -----	1650
7 -----	1875
8 -----	2100

b. For buildings other than one- and two-family residences the liquid capacity shall be increased above the 750-gallon minimum as established in the following table. For such buildings having kitchen and/or laundry waste, the tank capacity shall be increased to receive the anticipated volume for a 24-hour period from the kitchen and/or laundry. The liquid capacities established in this table do not include employees.

Apartment buildings (per bedroom) -----	200 gals.
Assembly hall (per person - no kitchen) -----	2 "
Bars and cocktail lounges (per patron space) -----	9 "
Beauty salons (per station) -----	140 "
Bowling alley (per alley) -----	125 "
Bowling alley with bar (per alley) -----	225 "
Campgrounds and camping resorts (per camp space) -----	100 "
Campground sanitary dump stations (per camp space) (omit camp spaces with sewer connection) -----	15 "
Camps, day use only - no meals served (per person) -----	15 "
Camps, day and night (per person) -----	40 "
Car wash (automatic) - subject to state approval	
Car wash (per car handwash) -----	50 "
Catch basins - garages, service stations, etc. - (per basin floor clean up, etc.) -----	100 "
Catch basins - truck washing (per truck) -----	100 "
Churches - no kitchens (per person) -----	3 "

Churches - with kitchen (per person)-----	7.5	gals.
Condominiums (per bedroom)-----	200	"
Country clubs - subject to state approval-----		
Dance halls (10 sq. ft. per person)-----	3	"
Dining hall - kitchen and toilet waste (per meal served)-----	10	"
Dining hall - kitchen waste only (per meal served)-----	3	"
Dog kennels (per animal enclosure)-----	20	"
Drive-in restaurants - all paper service (per car space)-----	15	"
Drive-in restaurants - all paper service inside seating (per seat)-----	15	"
Drive-in theaters (per car space)-----	5	"
Employees - in all buildings, per employe - total all shifts-----	20	"
Hospitals (per bed space)-----	200	"
Hotels or motels and tourist rooming houses (per room - 2 persons per room)-----	100	"
Medical office buildings, clinics and dental offices		
Doctors, nurses, medical staff (per person)-----	75	"
Office personnel (per person)-----	20	"
Patients (per person)-----	10	"
Migrant labor camp, central bathhouse (per employee)-----	30	"
Mobile home parks, homes with bathroom groups (per site)-----	300	"
Nursing and rest homes (per bed space)-----	100	"
Parks, toilet wastes (per person - 75 persons per acre)-----	5	"
Parks, with showers and toilet wastes (per person - 75 persons per acre)---	10	"
Restaurant - kitchen and toilet wastes (per seating space)-----	30	"
Restaurant (24-hr) - kitchen and toilet wastes (per seating space)-----	60	"
Restaurant - dishwasher and/or food waste disposer (per seat)-----	3	"
Restaurant (24-hr) - dishwasher and/or food waste disposer (per seat)---	6	"
Retail store - customers (10 sq. ft. per person)-----	1.5	"
Schools (per classroom - 25 pupils per classroom)-----	450	"
Schools with meals served (per classroom - 25 pupils per classroom)-----	600	"
Schools with meals served and showers provided (per classroom)-----	750	"
Self-service laundries (toilet waste only, per machine)-----	50	"
Auto. washer, (apartments, service buildings, etc. - per machine)-----	300	"
Service stations (per car)-----	10	"
Swimming pool bathhouses (per person)-----	10	"

(d) *Installation of septic and other treatment tanks.* 1. Location. Septic and other treatment tanks shall not be installed within the interior foundation walls of a building nor shall a new building or addition to an existing building be constructed or located over, or within 5 feet of a tank.

2. Groundwater. If the tank is installed in groundwater adequate anchoring provisions shall be made.

3. Bedding. A 3-inch thick compacted bedding shall be provided for all septic and other treatment tank installations. The bedding material shall be sand, gravel, granite, limerock or other noncorrosive materials of such size that 100 percent will pass a 1/2-inch screen.

4. Backfill. a. The backfill material for steel and glass fiber tanks shall be as specified for bedding and shall be tamped into place, care being taken to prevent damage to the coating.

b. The backfill for concrete tanks shall be soil material, 100 percent of which shall pass a 4-inch screen and shall be tamped into place.

5. Piping. The inlet and outlet piping between a septic or other treatment tank and points 3 feet beyond the undisturbed ground surrounding the excavation made to install each tank and all piping connecting tanks shall be cast iron pipe or other pipe approved by the department for the specific purpose. The piping 3 feet beyond the undisturbed ground on the outlet side of the septic tank shall comply with the materials specified in section H 62.04 (2), Wis. Adm. Code.

The joints between pipe and tank openings shall be made with lead and oakum or other methods approved by the department.

6. Manhole riser joints. a. Concrete. All joints on concrete risers and manhole covers shall be tongue and groove or shiplap type and sealed watertight using neat cement, mortar or bituminous compound.

b. Steel. All joints on steel risers shall be welded or flanged and bolted and be watertight. All steel manhole extensions shall be bituminous coated inside and outside.

c. Glass-fiber. All methods of attaching glass-fiber risers shall be watertight and approved by the department.

(5) SOIL ABSORPTION SYSTEM - INITIAL INSTALLATION. (a) *Disposal of tank effluent.* The effluent from septic tanks and other approved treatment tanks shall be disposed of by soil absorption systems or by such other manner approved by the department and with the concurrence of the department of natural resources for the specific installation.

(b) *Method of discharge.* For 6-bedroom one- or two-family residences or facilities having a daily effluent application of 1500 gallons or less, flow from the septic or treatment tank to the soil absorption system may be gravity or pressure. For all other systems the tank effluent must be discharged by pumping or by use of an automatic siphon.

Note: The dosing of effluents is recommended for all systems.

(c) *Dosing or pumping chamber - sizing and construction and pumping equipment.* The working capacity of the dosing or pumping chamber shall be sized to permit automatic discharge of the total daily sewage flow with discharge occurring no more than 4 times per 24 hours. Dosing or pumping chamber construction shall meet the same general criteria as specified for septic tanks in relationship to materials and fabrication. Dosing or pumping chambers shall be provided with a minimum 4-inch vent extended at least 12 inches above final grade and terminate with an approved vent cap and be a minimum of 25 feet from a door, window or fresh air intake. The automatic siphons and pumping equipment shall be department approved.

(d) *Sizing - general.* For systems having a daily effluent application of 5000 gallons or less, sizing shall be in accord with subsections H 62.20 (5) (e) and (f) below. For systems receiving effluents in excess of 5000 gallons per day, subsections H 62.20 (5) (e) and (f) below shall apply except that 2 systems of equal size shall be required. Each system shall have a capacity of no less than 75 percent of the required area. A suitable means of alternating waste application shall be provided. The dual system shall be considered as one system.

(e) *Sizing - residential.* The bottom area for seepage trenches or beds or the side wall area for seepage pits required for a soil absorption system serving residential property shall be determined from the following table using soil percolation test data and type of construction:

Percolation Class	Percolation Rate Minutes Required for Water to Fall One Inch	Minimum Absorption Area in Square Feet			
		Public Buildings		Residential Property per bedroom	
		Seepage Trenches or Pits	Seepage Beds	Seepage Trenches or Pits	Seepage Beds
Class 1	0 to 10	110	140	165	205
" 2	10 to 30	165	205	250	315
" 3	30 to 45	200	250	300	375
" 4	45 to 60	220	280	330	415

(f) *Sizing - other.* The required bottom area for seepage trenches or beds or the side wall area for seepage pits for a soil absorption system serving public buildings shall equal the absorption area specified in section H 62.20 (5) (e) for public buildings according to the percolation test results and type of construction multiplied by the applicable unit specified in column 2, multiplied by the applicable factor in column 3 of the following table. The effluent disposal factor established in this table does not include employees.

Column 1 Building Classification	Column 2 Units	Column 3 Factor
Apartment building	1 per bedroom	1.0
Assembly hall - no kitchen	1 per person	0.02
Bar and cocktail lounge	1 per patron space	0.2
Beauty salon	1 per station	2.4
Bowling alley	1 per bowling lane	2.5
Bowling alley with bar	1 per bowling lane	4.5
Camp, day use only	1 per person	0.2
Camp, day and night	1 per person	0.45
Campground and camping resort	1 per camping space	0.9
Campground and sanitary dump station	1 per camping space	0.2
Car wash (automatic)	Subject to state approval	
Car wash (per car handwash)	1 per car	1.0
Catch basin - garages, service stations, etc. (floor cleanup)	1 per basin	2.0
Catch basin - truck wash	1 per truck	5.0
Church - no kitchen	1 per person	0.04
Church - with kitchen	1 per person	0.09
Condominium	1 per bedroom	1.0
Dance hall	1 per person	0.06
Dining hall - kitchen and toilet	1 per meal served	0.3
Dining hall - kitchen only	1 per meal served	0.15
Dog kennel	1 per animal enclosure	0.4
Drive-in restaurant (all paper service)	1 per car space	0.3
Drive-in restaurant (inside seating)	1 per seat	0.3
Drive-in theater	1 per car space	0.1
Employees - in all buildings	1 per person	0.4
Hotel or motel and tourist rooming house	1 per room	0.9
Hospital	1 per bed space	2.0
Medical office buildings, clinics and dental offices		
Doctors, nurses and medical staff	1 per person	0.8
Office personnel	1 per person	0.25
Patients	1 per person	0.15
Migrant labor camp - central bathhouse	1 per employee	0.25
Mobile home park	1 per mobile home site	3.0
Nursing or rest homes	1 per bed space	1.0
Park - toilet waste only	1 per acre	4.0
Park - showers and toilets	1 per acre	8.0
Restaurant - kitchen and toilet	1 per seating space	0.6
Restaurant - (24-hr) kitchen and toilet	1 per seating space	1.2

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Restaurant with dishwasher and/or food waste disposer	1 per seating space	0.75
Restaurant - (24-hr) with dishwasher/disposer	1 per seating space	1.5
Retail store	1 per customer	0.03
Self-service laundry - toilet wastes only	1 per machine	1.0
Auto washer (apartments, service bldgs., etc.)	1 per machine	6.0
Service station	1 per car served	0.15
Swimming pool bathhouse	1 per person	0.2
School - no meals, no showers	1 per classroom	5.0
School - meals served or showers	1 per classroom	6.7
School - meals and showers	1 per classroom	8.0

(g) *Installation - seepage trench or bed systems.* 1. A seepage trench or a seepage bed shall have a depth to the top of the distribution pipe of 12 to 42 inches measured from the finished grade.

Note: A shallow seepage trench system is preferred in all cases.

2. The bottom of the seepage trench shall be level with seepage trench excavations from one to 5 feet in width. The absorption area of a seepage trench shall be computed by using the bottom area only. Trench excavations shall be spaced at least 6 feet apart. The distribution header shall be constructed of approved solid wall pipe and the bottom area of the header excavation shall not be computed as absorption area. The individual seepage trenches should preferably not be over 100 feet long. Equal distribution of effluents shall be made to all seepage trenches.

3. Seepage beds shall be level and meet the requirements of a seepage trench except that the excavation is more than 5 feet wide and has more than one distribution pipe line. Distribution piping in a seepage bed shall be uniformly spaced no more than 6 feet and no less than 3 feet apart and no more than 3 feet or less than one foot from the sidewall. The distribution header shall be constructed of approved solid wall pipe.

4. Seepage trenches or beds shall not be excavated when the soil has a plastic consistency at moist or wet conditions.

5. All smeared or compacted surfaces in the seepage trench or bed shall be scarified to the depth of the compaction and the loose material removed.

6. Distribution piping for gravity systems shall be a minimum of 4-inch I.D. approved perforated cement asbestos, concrete, clay tile, bituminous fiber or plastic. The top of the distribution piping shall be laid 12 to 42 inches below the surface in continuous straight or curved lines at a slope of 2 to 4 inches per 100 feet.

7. Fresh air inlets of cast iron shall be provided and connected to the perforated distribution pipe with an approved fitting or junction box and be placed so as to assure a free flow of air throughout the entire installation. The vent pipes shall be at least 4 inches in diameter and extend at least 12 inches above the final grade and terminate with an approved vent cap. Fresh air inlets shall be located at least 25 feet from any window, door or air intake of any building used for human habitation. A maximum of 4 distribution pipe lines may be served by one common 4-inch vent when interconnected by a common header pipe.

8. A minimum of 12 inches of washed, graded, hard rock or similar aggregate ranging in size from 3/4 to 2-1/2 inches shall be laid into

the trench or bed below the distribution pipe elevation and such aggregate shall be evenly distributed a minimum of 2 inches over the top of the distribution pipe. The aggregate shall be covered with untreated building paper or 2 inches of marsh hay or equal. The first 4 to 6 inches of soil backfill shall be hand filled.

9. Where dosing is required the siphon or pump shall discharge a minimum capacity equal to 75% of the combined volume of the distribution piping in the absorption system. See section H 62.20 (5) (d).

(h) A seepage pit shall have a minimum inside diameter of 5 feet and shall consist of a chamber walled-up with material such as a perforated precast concrete ring, concrete block, brick or other material approved by the department which allows effluent to percolate into the surrounding soil. Seepage pits shall be located 6 feet or more apart. The pit bottom shall be left open to the soil. Washed graded hard rock or similar aggregate 3/4 to 2-1/2 inches in size shall be placed into a 6-inch minimum annular space separating the outside wall of the chamber and sidewall excavation. Depth of the annular space shall be measured from the inlet pipe to the bottom of the walled-up chamber. Each seepage pit shall be provided with a 24-inch manhole extending within 6 inches of the ground surface and a 4-inch fresh air inlet which shall meet the requirements of section H 62.20 (5) (g) 7. Excavation and scarifying shall be in accord with section H 62.20 (5) (g) 5. The effective area of a seepage pit shall be the vertical wall area of the walled-up chamber for the depth below the inlet for all strata for which the percolation rates are less than 30 minutes per inch. Six inches of annular opening outside the vertical wall area may be included for determination of effective area. The following table may be used for determining the effective sidewall area of circular seepage pits:

Effective Absorption Area Seepage Pit *

Inside diameter of walled-up chamber in feet *	Depth of Permeable Strata Below Inlet					
	3	4	5	6	7	8
7-----	75	101	126	151	176	201
8-----	85	113	142	170	198	226
9-----	94	126	157	188	220	251
10-----	104	138	173	208	242	277
12-----	123	163	204	245	286	327

* The 6-inch annular opening credit is included.

(6) SOIL ABSORPTION SYSTEM—REPLACEMENT. (a) *Approval*. The department shall be contacted for approval of replacement systems for all public buildings and all buildings where site conditions do not permit systems in accord with this section.

(b) *Effluent disposal*. Alternates for the disposal of effluents emanating from existing structures may be accomplished by means other than outlined in this section provided written local approval is obtained and submitted along with detailed plans and specifications to the department for review and consideration. Written approval shall be received from the department prior to commencing the improvements or work on these systems.

(7) MAINTENANCE AND SLUDGE DISPOSAL. (a) *Maintenance.* Septic tanks shall be cleaned whenever the sludge and scum occupies 1/3 of the tank volume. All sludge, scum, liquid and any other material removed from a private domestic sewage treatment and disposal system is hereafter referred to as sludge.

(b) *Sludge disposal.* See Wis. Adm. Code chapter NR 113.

(8) CHEMICAL RESTORATION. The chemical restoration of effluent disposal systems shall be approved by the department.

(9) HOLDING TANKS. (a) *Approval.* 1. Holding tanks shall be considered on an individual basis. Three complete sets of plans, as required in section H 62.20 (1) (c) 4., shall be submitted to the department for each request to install a holding tank.

2. Sizing. a. The minimum liquid capacity of a holding tank for one- and two-family residences is as follows:

Number of Bedrooms	Holding Tank
1 -----	1000
2 -----	1500
3 -----	2000
4 -----	2500
5 -----	3000
6 -----	3500
7 -----	4000
8 -----	4500

b. Public buildings shall have a minimum 5-day holding capacity but not less than 1000 gallons. Sizing shall be based in accord with section H 62.20 (4) (c) 3. b.

Note: The 750 gallon minimum referred to in section H 62.20 (4) (c) 3. b. does not apply to holding tanks.

3. Agreement. A signed agreement between local government and owner to guarantee the pumping and transport of the holding tank contents to a disposal site meeting the requirements of Wis. Adm. Code chapter NR 113, provided it becomes necessary to prevent or abate a nuisance as described in sections 146.13 and 146.14, Wis. Stats., or if the owner does not pump and transport in response to orders from local government, shall be submitted to the department for review and approval. The agreement shall be binding on the owners, their heirs and assignees. The installation of the holding tank shall be made in accord with the following criteria.

(b) *Installation.* 1. Materials. The tank shall be constructed of material approved by the department.

2. Location. Tanks shall be located in accord with section H 62.20 (2) (d) except the tanks shall be 20 feet from a building or its appendage.

3. Warning device. A high water warning device shall be installed. This device shall be either an audible or an indoor illuminated alarm. If the latter, it shall be conspicuously mounted.

4. Manhole. Each tank shall be provided with a manhole opening no less than 24 inches square or 24 inches in diameter extending to

ground surface. Each manhole cover shall have an effective locking device.

5. Septic tank. If an approved septic tank is installed to serve as a holding tank, the inlet and outlet baffles shall be removed and the outlet sealed.

6. Vent. Each tank shall be provided with a minimum 2-inch fresh air inlet extending 12 inches above final grade terminating with a return bend fitting and a minimum of 25 feet from a door, window or fresh air inlet.

7. Servicing. Holding tanks shall be serviced in accord with chapter 146, Wis. Stats., and Wis. Adm. Code chapters H 62 and NR 113.

8. Before any holding tank is purchased or installed a state septic tank permit shall be obtained in accord with section 144.03, Wis. Stats.

(10) SEVERABILITY. Should any section, paragraph, phrase, sentence, clause or word of this chapter be declared invalid or unconstitutional for any reason, the remainder of this chapter shall not be affected thereby.

History: 1-2-56; am. (1) (f), Register, June, 1956, No. 6, eff. 7-1-56; am. (2) (a), (2) (b), (2) (c) 2, Register, February, 1957, No. 14, eff. 3-1-57; am. (1) (b), (d) and (e), Register, April, 1962, No. 76, eff. 10-1-62; r. and recr. Register, November, 1969, No. 167, eff. 12-1-69; am. (5) (d) 2. e., Register, October, 1971, No. 190, eff. 11-1-71; r. and recr. (2) (b), Register, November, 1972, No. 203, eff. 12-1-72; r. and recr. Register, July, 1976, No. 247, eff. 8-1-76.

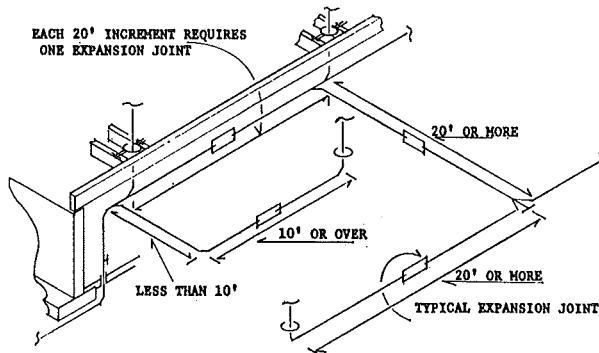
H 62.21 Hangers and supports. (1) **GENERAL.** All piping in a plumbing system shall be installed without undue strains and stresses and provisions shall be made for expansion, contraction and structural settlement and backgrounds where necessary.

(2) **PIPE SUPPORTS.** (a) *Stacks.* All pipes shall be supported so that alignment is retained and the weight of the pipes shall not bear upon a caulked joint, except where the spigot end of one vertical pipe rests in the hub end of the next lower vertical pipe. All vertical stacks extending 3 floors or more in height shall be supported on concrete or masonry piers. All vertical piping shall be provided with an approved support at each floor or approximately every 10 feet.

(b) *Pipe supports—water distribution.* All piping shall be supported to prevent undue strains upon connections or fixtures and shall be so aligned and graded that the entire system or parts thereof can be controlled and drained. The formation of traps and/or sags in water piping shall be avoided where possible. When unavoidable, such sags, traps or inverts shall have provisions for properly draining same.

(3) **HANGERS.** (a) All horizontal piping above the floor shall be supported or anchored by approved wall brackets, copper, iron or steel hangers, concrete or masonry piers set at intervals not to exceed 10 feet. Cast iron pipe shall be supported at the joint and intervals not to exceed 5 feet. Copper tubing shall be supported at approximately 6 feet for piping 1¼ inches inside diameter and less, and at intervals not to exceed 10 feet for piping 1½ inches inside diameter and larger. Lead pipe shall be supported in its entirety. Bracket, hanger and support materials in contact with the pipe or tubing shall be compatible. Plastic DWV piping shall be supported at intervals of not

more than 4 feet, at the end of branches and change of direction or elevation. Supports shall allow free movement. Vertical piping shall be maintained in a straight alignment. Support trap arms in excess of 3 feet in length as close as possible to the trap. Closet rings shall be securely fastened with corrosive resistant fasteners to the floor. Closet bends or stubs shall be stabilized against all horizontal or vertical movement. Pipe exposed to damage by sharp surfaces shall be protected with grommets or sleeves of rubber or plastic. Hangers and straps shall not compress, distort, cut or abrade the piping and shall allow free movement of pipe. All horizontal piping exceeding 20 feet in length shall have an approved ABS or PVC expansion joint installed. See following sketch.



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