

Chapter ILHR 82

DESIGN, CONSTRUCTION, INSTALLATION
SUPERVISION AND INSPECTION OF PLUMBING

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Note: Sections ILHR 82.01 to 82.12, 82.15 and 82.17 to 25 as they existed on February 28, 1985 were repealed and new sections ILHR 82.01 to 82.36 and 82.51 and 82.60 were created effective March 1, 1985.

ILHR 82.01 Scope. The provisions of this chapter apply to the design, construction and installation of plumbing, including but not limited to sanitary and storm drainage, water supplies, storm water and sewage disposal for buildings.

Note: Chapter ILHR 83 contains provisions for the siting, design, installation, inspection and maintenance of private sewage systems. Chapter ILHR 84 contains provisions and standards for plumbing materials, plumbing fixtures and plumbing appliances.

History: Cr. Register, February, 1985, No. 350, eff. 3-1-85.

ILHR 82.03 Application. The provisions of this chapter are not retroactive, unless specifically stated otherwise in the rule.

History: Cr. Register, February, 1985, No. 350, eff. 3-1-85.

Subchapter I
Plumbing Principles and Definitions

ILHR 82.10 Basic plumbing principles. This chapter is founded upon certain basic principles of environmental sanitation and safety through properly designed, installed, and maintained plumbing systems. Some of the details of plumbing construction may vary, but the basic sanitary and safety principles desirable and necessary to protect the health of people are the same everywhere. As interpretations may be required, and as unforeseen situations arise which are not specifically addressed, the following principles shall be used to define the intent of this chapter.

(1) Plumbing in all buildings, public and private, intended for human occupancy, shall be installed and maintained in such a manner so as to protect the health, safety and welfare of the public or occupants.

(2) Every building intended for human occupancy shall be provided with an adequate, safe and potable water supply. A potable water supply shall not be connected to an unsafe water supply or a drain pipe, nor shall it be subject to the hazards of backflow or back siphonage. A building located adjacent to a street in which there is a public water supply, shall be connected to the public water supply by means of individual connections or private mains.

(3) In accordance with chs. Ind 20 to 25, each dwelling unit connected to a private sewage system or public sewer shall have at least one water closet, one wash basin, one kitchen sink and one bathtub or shower to meet the basic requirements of sanitation and personal hygiene. All other structures for human occupancy shall be equipped with sanitary facilities in sufficient numbers as specified in chs. ILHR 50 to 64.

(4) Plumbing fixtures, appliances and appurtenances, whether existing or to be installed, shall be supplied with water in sufficient volume and at pressures adequate to enable them to function properly and efficiently at all times and without undue noise under normal conditions of use. Plumbing systems shall be designed and adjusted to use the minimum quantity of water consistent with proper performance and cleaning.

(5) Hot or tempered water shall be supplied to all plumbing fixtures which normally require hot or tempered water for proper use and function.

(6) Devices for heating water and storing it in pressure vessels or tanks shall be so designed and installed as to prevent dangers of explosion or overheating.

(7) Every building with installed plumbing fixtures and intended for human occupancy, located adjacent to a street in which there is public sewer service, shall be connected to the public sewer by means of individual connections or private interceptor mains.

(8) Where plumbing fixtures exist in a building which is not connected to a public sewer system, suitable provision shall be made for disposing of the building sewage by a method of sewage treatment or disposal satisfactory to the department and the governmental unit responsible for the regulation of private sewage systems.

(9) Drain systems shall be designed, constructed, and maintained to conduct the waste water or sewage quickly from the fixture to the place of disposal, with velocities which will prevent clogging, fouling and the depositing of solids, and shall have adequate cleanouts so arranged that the drain pipes may be readily cleaned.

(10) The drain systems shall be designed so that there is an adequate circulation of air in all pipes and no danger of siphonage, aspiration or forcing of trap seals under conditions of ordinary use.

(11) The piping of a plumbing system shall be of durable material, free from defective workmanship, and designed and constructed to give satisfactory service for its reasonable expected life.

(12) Plumbing fixtures shall be made of durable, smooth, nonabsorbent and corrosion resistant material, and shall be free from concealed fouling surfaces.

(13) Proper protection shall be provided to prevent contamination of food, water, sterile goods and similar materials by backflow of sewage.

(14) All plumbing fixtures shall be installed to provide adequate spacing and accessibility for the intended use and for cleaning.

(15) All rooms in which water closets, urinals or similar fixtures are installed shall be provided with adequate lighting and proper ventilation.

Note: See ss. ILHR 52.53 to 52.55 for toilet rooms located in commercial and public buildings.

History: Cr. Register, February, 1985, No. 350, eff. 3-1-85.

ILHR 82.11 Definitions. In chs. ILHR 82 and 84:

(1) "Accepted engineering practice" means a specification, standard, guideline or procedure in the field of construction or related thereto, generally recognized and accepted as authoritative.

(2) "Accessible" when applied to a fixture, appliance, pipe, fitting, valve or equipment, means having access thereto, but which first may require the removal of an access panel or similar obstruction.

(3) "Air-break" means a piping arrangement for a drain system where the wastes from a fixture, appliance, appurtenance or device discharge by means of indirect or local waste piping terminating in a receptor at a point below the flood level rim of the receptor and above the inlet of the trap serving the receptor.

(4) "Air-gap, drain system" means the unobstructed vertical distance through free atmosphere between the outlet of indirect or local waste piping and the flood level rim of the receptor into which it discharges.

(5) "Air-gap, water supply system" means the unobstructed vertical distance through the free atmosphere between the lowest opening from any pipe or faucet supplying water to a tank, vat, plumbing fixture or other device and the flood level rim of the fixture, device or receptor.

(6) "Alignment" means installed in a straight line, either horizontal, vertical or at a given angle.

(7) "Anti-siphon" means a term applied to valves or mechanical devices which eliminate siphonage.

(8) "Anti-siphon ballcock" means an anti-siphon device in the form of an approved air gap or vacuum breaker which is an integral part of the ballcock unit and which is positioned on the discharge side of the water supply control valve.

(9) "Approved" means acceptable to the department.

(10) "Area drain" means a receptor designed to collect surface or storm waters from an open area.

(11) "Areawide water quality management plan" means those plans prepared by the department of natural resources, including those plans

prepared by agencies designated by the governor under the authority of ss. 144.025 (1) and (2), and 147.25, Stats., for the purpose of managing, protecting and enhancing groundwater and surface water of the state.

Note: See Appendix for further explanatory material.

(12) "Aspirator" means a fitting or device supplied with water or other fluid under positive pressure which passes through an integral orifice or constriction causing a vacuum.

(13) "Autopsy table" means a fixture or table used for post-mortem examination.

(14) "Backflow" means the unwanted reverse flow of liquids in a piping system.

(15) "Backflow connection" means any arrangement whereby backflow can occur.

(16) "Back-pressure" means a pressure higher than the water supply pressure which may cause backflow.

(17) "Backflow preventer" means a device or means to prevent backflow.

(18) "Back-siphonage" means backflow caused by the formation of a vacuum or partial vacuum in a water supply pipe.

(19) "Backwater valve" means a device designed to prevent the reverse flow of storm water or sewage into the drain system.

Note: Back vent, see "individual vent".

(20) "Ballcock" means a water supply valve opened or closed by means of a float or similar device used to supply water to a tank.

(21) "Bathroom group" means a water closet, lavatory and a bathtub or shower located together on the same floor level.

(22) "Battery of fixtures" means any group of 2 or more fixtures which discharge into the same horizontal branch drain.

(23) "Bedpan sterilizer" means a fixture used for sterilizing bedpans or urinals by direct application of steam, boiling water or chemicals.

(24) "Bedpan washer and sanitizer" means a fixture designed to wash bedpans and to flush the contents into the sanitary drain system and which may also provide for disinfecting utensils by scalding with steam or hot water.

(25) "Bedpan washer hose" means a device supplied with hot or cold water, or both, and located adjacent to a water closet or clinical sink to be used for cleansing bedpans.

(26) "Bell" means the portion of a pipe which is enlarged to receive the end of another pipe of the same diameter for the purpose of making a joint.

(27) "Boiler blow-off basin" means a vessel designed to receive the discharge from a boiler blow-off outlet and to cool the discharge to a temperature which permits safe entry into the drain system.

(28) "Branch" means a part of a piping system other than a riser, main or stack.

(29) "Branch interval" means the vertical distance along a drain stack measured from immediately below a branch drain connection to immediately below the first lower branch drain connection which is 8 feet or more below.

Note: See Appendix for further explanatory material.

(30) "Branch vent" means a vent serving more than one fixture drain.

(31) "B.T.U." means British Thermal Units.

(32) "Building" means a structure for support, shelter or enclosure of persons or property.

(33) "Building, public" means any structure, including exterior parts of such building, such as a porch, exterior platform or steps providing means of ingress or egress, used in whole or in part as a place of resort, assemblage, lodging, trade, traffic, occupancy or use by the public, or by 3 or more tenants.

(34) "Building drain" means horizontal piping within or under a building, installed below the lowest fixture or the lowest floor level from which fixtures can drain by gravity to the building sewer.

(35) "Building drain branch" means a fixture drain which is individually connected to a building drain and is vented by means of a combination drain and vent system.

(36) "Building drain, sanitary" means a building drain which conveys sewage only.

(37) "Building drain, storm" means a building drain which conveys storm water wastes or clear water wastes, or both.

(38) "Building sewer" means that part of the drain system not within or under a building which conveys its discharge to a public sewer, private interceptor main sewer, private sewage system or other point of disposal.

(39) "Building sewer, sanitary" means a building sewer which conveys sewage only.

(40) "Building sewer, storm" means a building sewer which conveys storm water wastes or clear water wastes, or both.

(41) "Building subdrain" means the horizontal portion of a drain system which does not flow by gravity to the building sewer.

(42) "Burr" means a roughness or metal protruding from the walls of a pipe usually as the result of cutting the pipe.

(43) "Bypass" means an installation of control valves and piping so installed as to isolate or go around a specific fixture, appliance, equipment or area of piping.

(44) "Catch basin" means a watertight receptacle built to arrest sediment of surface, subsoil or other waste drainage, and to retain oily or greasy wastes, so as to prevent their entrance into the building drain or building sewer.

(45) "Circuit vent" means a branch vent that serves 2 or more fixture traps which discharge to a horizontal branch drain and connects to the horizontal drain at a point between the 2 most upstream, floor outlet fixtures.

(46) "Cleanout" means an accessible opening in a drain system used for the removal of obstructions.

(47) "Clear water wastes" means liquids other than storm water, having no impurities or where impurities are below a minimum concentration considered harmful by the department, including, but not limited to noncontact cooling water and condensate drainage from refrigeration compressors and air conditioning equipment, drainage of water used for equipment chilling purposes and cooled condensate from steam heating systems or other equipment.

(48) "Combination fixture" means a fixture combining one sink and laundry tray or a 2 or 3 compartment sink or laundry tray in one unit.

(49) "Combination drain and vent system" means a specially designed system of drain piping embodying the wet venting of one or more fixtures by means of a common drain and vent pipe adequately sized to provide free movement of air in the piping.

(50) "Common vent" means a branch vent connecting at or downstream from the junction of 2 fixture drains and serving as a vent for those fixture drains.

(51) "Conductor" means a drain pipe inside the building which conveys storm water from a roof to a leader, storm drain or storm sewer.

(52) "Contamination" means a general term meaning the introduction into the potable water supply of chemicals, wastes or sewage which will render the water unfit for its intended purpose.

(53) "Corporation cock" means a valve installed in the side of a water main to which a water service pipe is connected or a valve installed in the side of a forced main sewer to which a forced building sewer is connected.

(54) "Critical level" means the reference point on a vacuum breaker which must be submerged before backflow can occur. When the critical level is not indicated on the vacuum breaker, the bottom of the vacuum breaker shall be considered the critical level.

(55) "Cross-connection" means a physical connection or arrangement between two otherwise separate piping systems, one of which contains potable water and the other either water of unknown or questionable safety, steam, gas or chemicals whereby there may be a flow from one system to the other, the direction of flow depending on the pressure differential between the two systems.

(56) "Curb stop" means a valve placed in a water service pipe.

(57) "Dead end" means a branch leading from a drain pipe, vent pipe, building drain or building sewer and terminating at a developed length of 2 feet or more by means of a plug, cap or other closed fitting.

(58) "Department" means the department of industry, labor and human relations.

(59) "Developed length" means the length of pipe line measured along the center line of the pipe and fittings.

(60) "Diameter" means in reference to a pipe the nominal inside diameter of the pipe.

Note: Downspout, see "leader".

(61) "Drain" means any pipe which carries waste water or water borne wastes.

(62) "Drain system" includes all the piping or any portion of the piping within public or private premises which conveys sewage, storm water or other liquid wastes to a legal point of disposal, but does not include the mains of public sewer systems or a private or public sewage treatment or disposal plant.

(63) "Dwelling unit" means a structure, or that part of a structure, which is used or intended to be used as a home, residence or sleeping place by one person or by 2 or more persons maintaining a common household, to the exclusion of all others.

(64) "Ejector" means an automatically operated device to elevate liquid wastes and sewage by the use of air under higher than atmospheric pressure.

(65) "Faucet" means a valve end of a water pipe by means of which water can be drawn from or held within the pipe.

(66) "Ferrule" means a rigid sleeve used to connect dissimilar plumbing materials.

(67) "Fixture drain" means the drain from fixture to a junction with another drain pipe.

(68) "Fixture supply connections" means that part of the piping system within 18 inches from the fixture supply branch to the fixture.

(69) "Fixture unit, drainage, dfu" means a measure of the probable discharge into the drain system by various types of plumbing fixtures. The drainage fixture unit value for a particular fixture depends on its volume rate of drainage discharge, on the time duration of a single drainage operation, and on the average time between successive operations.

(70) "Fixture unit, supply, sfu" means a measure of the probable hydraulic demand on the water supply by various types of plumbing fixtures. The supply fixture unit value for a particular fixture depends on its volume rate of supply, on the time duration of a single supply operation, and on the average time between successive operations.

(71) "Flexible joint" means any joint between two pipes that permits one of the pipes to be deflected or moved without disturbing the other pipe.

(72) "Flood level rim" means the edge of the receptacle from which water overflows.

(73) "Floor sink" means a receptor for the discharge from indirect or local waste piping installed with its flood level rim even with the surrounding floor.

(74) "Flow pressure" means the pressure in the water supply pipe near the faucet or water outlet while the faucet or water outlet is wide open and flowing.

(75) "Flush valve" means a device located at the bottom of a tank for flushing water closets and similar fixtures.

(76) "Flushometer valve" means a device which discharges a predetermined quantity of water to fixtures for flushing purposes and is closed by direct water pressure.

(77) "Garage, private" means a building or part of a building used for the storage of vehicles or other purposes, by a family or less than 3 persons not of the same family and which is not available for public use.

(78) "Garage, public" means a building or part of a building which accommodates or houses self-propelled land, air or water vehicles for 3 or more persons not of the same family.

(79) "Grease interceptor" means a receptacle designed to intercept and retain grease or fatty substances.

(80) "Health care facility" means any building or part of a building used for purposes such as hospitals, nursing or rest homes, homes for the aged, infirmaries, residential care facilities, sanitariums, mortuaries, medical laboratories, and offices and clinics with operatories for dentists and doctors.

(81) "Horizontal pipe" means any pipe or fitting which makes an angle of less than 45° with the horizontal.

(82) "Hot water" means water at a temperature of 110° F. or more.

(83) "Hot water storage tank" means a tank used to store water that is heated indirectly by a circulating water heater or by steam or hot water circulating through coils or by other heat exchange methods internal or external to the tank.

(84) "Hydrostatic test" means a test performed on a plumbing system or portion thereof in which the system is filled with a liquid, normally water, and raised to a designated pressure.

(85) "Indirect waste piping" means drain piping which does not connect directly with the drain system, but which discharges into the drain system by means of an air break or air gap into a receptor.

(86) "Individual vent" means a pipe installed to vent a fixture trap.

(87) "Industrial wastes" means the liquid wastes which result from the processes employed in industrial establishments and which are free from fecal matter.

(88) "Interceptor" or "separator" means a device designed and installed so as to separate and retain deleterious, hazardous or undesirable matter from wastes flowing through it.

(89) "Journeyman plumber" means a person as defined in s. 145.01 (3), Stats.

(90) "Leader" means a pipe or channel outside a building which conveys storm water from the roof or gutter drains to a storm drain, storm sewer or to grade.

(91) "Load factor" means the percentage of the total connected fixture unit flow rate which is likely to occur at any point in the drain system.

(92) "Local waste piping" means a portion of drain piping which receives the wastes discharged from indirect waste piping and which discharges those wastes by means of an air break or air gap into a receptor.

(93) "Local vent" means a pipe connecting to a fixture and extending to outside air through which vapor or foul air is removed from the fixture.

(94) "Main" means the principal pipe artery to which branches may be connected.

(95) "Manhole" means an opening constructed to permit access to a sewer or any underground portion of a plumbing system.

(96) "Master plumber" means a person as defined in s. 145.01 (2), Stats.

(97) "Mechanical joint" means a connection between pipes, fittings or pipes and fittings by means of a device, coupling, fitting or adapter where compression is applied around the center line of the pieces being joined, but which is neither caulked, threaded, soldered, solvent cemented, brazed nor welded.

(98) "Mobile home" means a vehicle as defined in s. 101.91, Stats.

(99) "Mobile home drain connector" means the pipe which joins the drain piping for a mobile or manufactured home to the building sewer.

(100) "Mobile home park" means any plot or plots of ground as defined in s. 66.058, Stats.

(101) "Multiple dwelling" means a building containing more than 2 dwelling units.

(102) "Nonpotable water" means water not safe for drinking, personal or culinary use.

(103) "Nonpublic" means, in the classification of plumbing fixtures, those fixtures in residences, apartments, living units of hotels and motels, and other places where the fixtures are intended for the use by a family or an individual to the exclusion of all others.

(104) "Nuisance" means any source of filth or probable cause of sickness pursuant to the provisions of s. 146.14, Stats.

(105) "Oil interceptor" means a device designed to intercept and retain oil, lubricating grease or other similar materials.

(106) "Offset" means a combination of fittings or bends which brings one section of the pipe out of line but into a line parallel with the other section.

(107) "One or 2-family dwelling" means a building containing not more than 2 dwelling units.

(108) "Open air" means outside the building.

(109) "Pitch" means the gradient or slope of a line of pipe in reference to a horizontal plane.

(110) "Place of employment" means a place as defined in s. 101.01 (2) (a), Stats.

(111) "Plumbing" means piping, fixtures, appliances, appurtenances, devices and systems as defined in s. 145.01 (1), Stats.

(112) "Plumbing appliance" means any one of a special class of plumbing devices which is intended to perform a special function. The operation or control of the appliance may be dependent upon one or more energized components, such as motors, controls, heating elements, or pressure or temperature sensing elements. The devices may be manually adjusted or controlled by the user or operator, or may operate automatically through one or more of the following actions: a time cycle, a temperature range, a pressure range, a measured volume or weight.

(113) "Plumbing appurtenance" means a manufactured device or pre-fabricated assembly of component parts which is an adjunct to the basic piping system and plumbing fixtures. An appurtenance does not demand additional water supply, nor does it add any discharge load to a fixture or the drain system. It is presumed that the appurtenance performs some useful function in the operation, maintenance, servicing, economy, or safety of the plumbing system.

(114) "Plumbing fixture" means a receptacle or device which:

(a) Is either permanently or temporarily connected to the water distribution system of the premises, and demands a supply of water from the system;

(b) Discharges used water, waste materials, or sewage either directly or indirectly to the drain system of the premises; or

(c) Requires both a water supply connection and a discharge to the drain system of the premises.

(115) "Plumbing system" includes all water supply, water services and water distribution piping, plumbing fixtures and traps; drain and vent pipes; building drains, building sewers and private domestic sewage disposal systems including the respective connections, equipment, devices, appliances and appurtenances within the property line of the premises; and water-treating or water-using equipment in connection with the water and drain systems and the installation thereof.

(116) "Potable water" means water which is:

(a) Safe for drinking, personal or culinary use; and

(b) Free from impurities present in amounts sufficient to cause disease or harmful physiological effects and conforming in its bacteriological and chemical quality to the requirements specified in ch. NR 109.

(117) "Pressure relief valve" means a pressure actuated valve held closed by a spring or other means and designed to automatically relieve pressure at a designated pressure.

(118) "Private interceptor main sewer" means a privately owned sewer serving 2 or more buildings and not directly controlled by a public authority.

(119) "Private water main" means a privately owned water main serving 2 or more buildings and not directly controlled by a public authority.

(120) "Process piping" means piping which is separated from the water distribution or drain system by approved methods or means and used exclusively for refining, manufacturing, industrial or shipping purposes of every character and description.

(121) "Public" means, in the classification of plumbing fixtures, those fixtures which are available for use by the public or employees.

(122) "Public sewer" means a sewer owned and controlled by a public authority.

(123) "Public water main" means a water supply pipe for public use owned and controlled by a public authority.

(124) "Quick closing valve" means a valve or faucet that closes automatically when released manually or controlled by mechanical means for fast action closing.

(125) "Receptor" means a fixture or device which receives the discharge from indirect or local waste piping.

(126) "Reduced pressure principle type backflow preventer" means a device consisting of two independently acting check valves, spring loaded to a closed position and separated by an intermediate chamber in which there is an automatic relief vented to atmosphere, spring loaded to the open position.

(127) "Relief vent" means a vent which permits additional circulation of air in or between drain and vent systems.

(128) "Riser" means a water supply pipe which extends vertically one full story or more.

(129) "Roof drain" means a drain installed to receive water collecting on the surface of a roof and to discharge it into a conductor.

(130) "Roughing in" means the installation of all parts of the plumbing system which can be completed prior to the installation of fixtures including drain, water supply and vent piping and the necessary fixture supports.

(131) "Row house" means a place of abode not more than 3 stories in height, arranged to accommodate 3 or more attached row living units in which each living unit is separated from the adjoining unit by a vertical occupancy separation of not less than one-hour fire-resistive construction, extending from the basement or lowest floor to the under side of the roof deck.

(132) "Safing" means a pan or other collector placed beneath a pipe or fixture to prevent leakage from escaping to the floor, ceiling or walls.

(133) "Sand interceptor" means a receptacle designed to intercept and retain sand, grit, earth and other similar solids.

(134) "Sanitary sewer" means a pipe which carries sewage excluding storm water, surface water, ground water and clear water wastes.

(135) "Sewage" means any liquid waste containing animal or vegetable matter in suspension or solution, and may include liquids containing chemicals in solution.

(136) "Sewage grinder pump" means a type of sewage pump which macerates sewage.

(137) "Sewage pump" means an automatic pump for the removal of sewage from a sanitary sump.

(138) "Slip-joint" means a connection in which one pipe slips into another, the joint of which is made tight with a compression type fitting.

(139) "Spigot" means the end of a pipe which fits into a bell or hub.

(140) "Spring line, pipe" means the line or place from which the arch of a pipe or conduit rises.

Note: See Appendix for further explanatory material.

(141) "Stack" means a drain or vent pipe which extends vertically one full story or more.

(142) "Stack vent" means a vent extending from the top of a drain stack.

(143) "Standpipe" means a drain pipe serving as a receptor for the discharge wastes from indirect or local waste piping.

(144) "Sterilizer, boiling type" means a device of nonpressure type, used for boiling instruments, utensils, or other equipment for disinfection.

(145) "Sterilizer, instrument" means a device for the sterilization of various instruments.

(146) "Sterilizer, pressure instrument washer" means a pressure vessel designed to both wash and sterilize instruments during the operating cycle of the device.

(147) "Sterilizer, pressure" means a pressure vessel fixture designed to use steam under pressure for sterilizing.

Note: A pressure sterilizer is also referred to as an autoclave.

(148) "Sterilizer, utensil" means a device for the sterilization of utensils.

(149) "Sterilizer vent" means a separate pipe or stack, indirectly connected to the drain system at the lower terminal, which receives the vapors from nonpressure sterilizers, or the exhaust vapors from pressure sterilizers, and conducts the vapors directly to the outer air.

(150) "Sterilizer, water" means a device for sterilizing water and storing sterile water.

(151) "Storm sewer" means a pipe which carries storm water, surface water, ground water and clear water wastes.

(152) "Subsoil drain" means that part of a drain 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.

(153) "Sump" means a tank or pit which receives sewage or liquid wastes, usually located below the normal grade of the gravity system and which must be emptied by mechanical means.

(154) "Sump pump" means an automatic water pump for the removal of drainage, other than raw sewage, from a sump, pit or low point.

(155) "Sump vent" means a vent pipe from a nonpressurized sump.

(156) "Supports" means hangers, anchors and other devices for supporting and securing pipes, or fixtures to structural members of a building.

(157) "Swimming pool" means a 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.

(158) "Temperature and pressure relief valve" means a combination relief valve designed to function as both a temperature relief and pressure relief valve.

(159) "Temperature relief valve" means a temperature actuated valve designed to automatically discharge at a designated temperature.

(160) "Trap" means a fitting, device or arrangement of piping so designed and constructed as to provide, when properly vented, a liquid seal which prevents emission of sewer gases without materially affecting the flow of sewage or waste through it.

(161) "Trap seal" means the vertical distance between the top of the trap weir and the top of the dip separating the inlet and outlet of the trap.

(162) "Trap weir" means that part of a trap which forms a dam over which wastes must flow to enter the drain piping.

(163) "Turf sprinkler system" means a system of piping, appurtenances and devices so installed as to distribute water for lawn or other similar irrigation purposes.

(164) "Vacuum" means any pressure less than that exerted by the atmosphere.

(165) "Vacuum breaker" means an atmospheric device installed and designed to protect a water supply against back-siphonage by allowing the entry of air to relieve vacuums in the water distribution systems.

(166) "Vacuum relief valve" means a device which admits air into the water distribution system to prevent excessive vacuum in a water storage tank or heater.

(167) "Vent" means a part of the plumbing system used to equalize pressures and ventilate the system.

(168) "Vent header" means a branch vent which connects 2 or more stack vents or vent stacks or both and extends to the outside air.

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(169) "Vent stack" means a vertical vent pipe which extends one or more stories.

(170) "Vent system" means a pipe or pipes installed to provide a flow of air to or from a drain system, or to provide a circulation of air within the system to protect trap seals from siphonage and back pressure.

(171) "Vertical pipe" means any pipe or fitting which makes an angle of 45 degrees or less with the vertical.

(172) "Wall mounted water closet" means a water closet attached to a wall in such a way that it does not touch the floor.

(173) "Waste" means the discharge from any fixture, appliance, area or appurtenance.

(174) "Waste sink" means a receptor for the discharge from indirect or local waste piping installed with its flood level rim above the surrounding floor.

(175) "Water closet" means a water flushed plumbing fixture designed to receive human excrement directly from the user of the fixture.

(176) "Water conditioner" means an appliance, appurtenance or device used for the purpose of ion exchange, demineralizing water or other methods of water treatment.

(177) "Water distribution branch" means a part of the water distribution piping system other than a main, riser or branch main to within 18 inches of one or more fixtures.

(178) "Water distribution branch main" means a water distribution pipe to convey water to a riser, a pipe serving 2 or more branches with or without other branch mains.

(179) "Water distribution main" means the principal water distribution pipe to which risers, branch mains or branches are connected.

(180) "Water distribution riser" means a water distribution pipe which extends vertically one full story or more to convey water to mains, branch mains, branches or a group of fixtures.

(181) "Water distribution system" means piping which conveys water from the service to the plumbing fixtures, appliances, appurtenances, equipment, devices or other systems served including fittings and control valves.

(182) "Water heater" means any heating device with piping connections to the potable water supply system which is intended to supply hot water for domestic or commercial purposes other than space heating.

(183) "Water service" means the pipe from the water main or other source of potable water supply to a point for connection with a water distribution system or other system to be served.

(184) "Water supply system" means the water service pipe, water distribution pipes and necessary connecting pipes, fittings, control valves and all appurtenances in or adjacent to the building or premises.

(185) "Wet vent" means that portion of a vent pipe which receives the discharge of wastes from other than water closets, urinals or other fixtures which discharge like sewage or fecal matter.

(186) "Yoke vent" means a vent connected to a drain stack for the purpose of preventing pressure changes in the drain stack.

History: Cr. Register, February, 1985, No. 350, eff. 3-1-85.

Subchapter II Administration & Enforcement

ILHR 82.20 Plan review and approval. (1) **GENERAL.** Plumbing plans and specifications shall be submitted to the department or to an approved agent municipality for review in accordance with pars. (a) and (b). Prior to July 1, 1985, the department shall review and make a determination on an application for plan review within 20 business days of receiving the required information and fees. Beginning on July 1, 1985, and thereafter, the department shall review and make a determination on an application for plan review within 15 business days of receiving the required information and fees.

(a) *Department review.* Plumbing plans and specifications for the types of plumbing installations listed in Table 82.20-1 shall be submitted to the department for review, regardless of where the installation is to be located. Written approval for the plumbing plans shall be obtained prior to installation of the plumbing.

**Table 82.20-1
 SUBMITTALS TO DEPARTMENT**

Type of Plumbing Installation
1. All plumbing, new installations, additions and alterations, regardless of the number of plumbing fixtures involved, to be installed in health care facilities.
2. Plumbing, new installations, additions and alterations involving 6 or more plumbing fixtures, to be installed in buildings owned by a metropolitan or sanitary sewer district. ^a
3. Plumbing, new installations, additions and alterations involving 6 or more plumbing fixtures, to be installed in buildings owned by the state. ^a
4. Engineered plumbing systems.
5. Controlled roof drainage systems.
6. Reduced pressure zone principle backflow preventers.

Note a: A water heater is to be counted as a plumbing fixture.

(b) *Department or agent municipality review.* Plumbing plans and specifications for the types of plumbing installations listed in Table 82.20-2 shall be submitted for review to an agent municipality, if the installation is to be located within the agent municipality or to the department, if the installation is not to be located within an agent municipality. A municipality shall be designated as an agent municipality in accordance with sub. (2). Written approval for the plumbing plans shall be obtained prior to installation of the plumbing.

**Table 82.20-2
SUBMITTALS TO DEPARTMENT OR AGENT MUNICIPALITY**

Type of Plumbing Installation
1. New installations, additions and alterations to drain systems, vent systems, water service systems, and water distribution systems involving 6 or more plumbing fixtures to be installed in public buildings. ^{a,b}
2. Grease interceptors to be installed for public buildings.
3. Garage catch basins and oil interceptors to be installed for public buildings.
4. Car wash interceptors.
5. Sanitary dump stations.
6. Turf sprinkler systems connected to a potable water system.
7. Private water mains.
8. Water supply systems and drain systems to be installed for mobile home parks. ^c
9. Private interceptor main sewers. ^c
10. Chemical waste systems regardless of the number of plumbing fixtures involved. ^c

Note a: A water heater is to be counted as a plumbing fixture.

Note b: For the purpose of plan submittal, public buildings do not include zero-lot-line row houses where each living unit is served by an individual water service and an individual building sewer.

Note c: Only agent municipalities which are cities of the first class may review these types of installations.

1. Plan review and approval of one- and 2-family dwellings. Review and approval of plumbing plans for one- and 2-family dwellings shall be in accordance with the provisions specified in s. Ind. 20.09.

2. Local review. An agent municipality may require by local ordinance the submittal and review of plumbing plans for those installations involving 5 or less plumbing fixtures.

(2) **AGENT MUNICIPALITIES.** The department may designate to an approved municipality the authority to review and approve plumbing plans and specifications for those plumbing installations to be located within the municipality's boundary limits and which require approval under sub. (1) (b).

(a) An agent municipality shall employ at least 2 full time plumbing inspectors who have been qualified by the department.

1. The primary duties of the plumbing inspectors shall include plumbing plan review.

2. The plumbing inspectors shall be Wisconsin licensed master or journeyman plumbers.

Note: See Appendix for listing of agent municipalities.

(b) An agent municipality may waive its jurisdiction for plan review and approval for any project, in which case plans shall be submitted to the department for review and approval.

(c) Agent municipalities may set by ordinance the fees for plan review services.

(3) **PRIORITY PLAN REVIEW.** An appointment may be made with the department to facilitate the examination of plumbing plans in less than the normal processing time. Complete plumbing plans along with the fee specified in s. Ind 69.23 (1) (d), shall be submitted to the department in person by appointment. The plans shall comply with all of the provisions of this section.

(4) **PLANS AND SPECIFICATIONS.** (a) At least 2 sets of plumbing plans and one copy of specifications which are clear, legible and permanent copies shall be submitted for examination and approval.

(b) If a submitter wants more than 2 sets of approved plans returned, the fees specified in Ind 69.23 shall accompany the plan submittal.

(c) All plans submitted for approval shall be accompanied by sufficient data and information for the department to judge if the plumbing and its performance will meet the requirements of this chapter and ch. ILHR 84.

1. Information to accompany the plans shall include the location or address of the plumbing installation and the name of the owner.

Note: See Appendix for further explanatory material.

2. Plans proposing the installation of a private interceptor main sewer which is to discharge to a municipal treatment facility shall:

a. Be accompanied by a letter from the appropriate designated planning or management agency indicating conformance with an approved areawide water quality management plan under ch. NR 121; and

b. Not be approved, if the municipality is ineligible for sanitary sewer extension approvals under s. NR 110.05.

3. Except as provided in subd. 4., plans proposing the installation of a building sewer for new construction which is to discharge to a municipal treatment facility shall:

a. Be accompanied by a letter from either the appropriate designated management agency or sanitary district indicating conformance with an approved areawide quality management plan; and

b. Not be approved, if the municipality is ineligible for sanitary sewer extension approvals under s. NR 110.05.

4. Plans proposing the installation of a building sewer for new construction which is to discharge to a municipal treatment facility shall not be required to comply with subd. 3., if:

a. The proposed installation is served by an existing building sewer which extends from the lot line to the public sewer; and

b. The proposed installation does not exceed the capacity of the existing building sewer or sewers.

Note: See Appendix for further explanatory material.

(d) Except as provided in par. (e), all plumbing plans and specifications shall be sealed or stamped and shall be signed by a Wisconsin registered architect, engineer or plumbing designer in accordance with ch. A-E 1.

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(e) A master plumber may design and submit for approval plumbing plans and specifications for a plumbing system which the master plumber is to install. Each sheet of plans and specifications the master plumber submits shall be signed and dated and shall include the Wisconsin license number of the master plumber. Where more than one sheet is bound together into one volume, only the title sheet or index sheet need to be signed and dated by the master plumber responsible for their preparation, if the signed sheet clearly identifies all of the other sheets in the volume.

(5) **PERMIT TO START.** If the department review of the plumbing plans has not been completed within 30 days after complete plans, specifications, data and the appropriate fee have been received by the department, the department may issue, upon request, a permit to commence installation of the plumbing.

(a) The holders of the permit may proceed at their own risk without assurance that a conditional approval for the plumbing plans will be granted.

(b) The issuance of a permit shall not be construed as plan approval or approval for designs and installations which do not comply with chs. ILHR 82 to 84.

(c) All noncomplying portions of the plumbing installed under the permit prior to department approval shall be removed or replaced.

(6) **REVIEW FOR APPROVAL.** (a) *Conditional approval.* If, upon review, the department determines that the plumbing plans substantially conform to the provisions of chs. ILHR 82 to 84, a conditional approval, in writing, shall be granted. All noncode complying conditions stated in the conditional approval shall be corrected before or during installation.

(b) *Denial of approval.* If, upon review, the department determines that the plumbing plans do not substantially conform to the provisions of chs. ILHR 82 to 84, the request of conditional approval shall be denied in writing.

(7) **EVIDENCE OF APPROVAL.** The plumber responsible for the installation of the plumbing shall keep at the construction site at least one set of plans bearing the department's or the agent municipality's stamp of approval and at least one copy of specifications. The plans and specifications shall be open to inspection by an authorized representative of the department.

(8) **FEES.** Fees for plumbing plan review and petition for variance shall be submitted in accordance with s. Ind 69.23.

Note: See Appendix for further explanatory material.

(9) **REVISIONS.** All changes or modifications, which involve the provisions of chs. ILHR 82 to 84, made to plumbing plans and specifications, which have been granted approval under sub. (1), shall be submitted to the department or agent municipality for examination. All changes and modifications shall be approved in writing by the department or agent municipality prior to installation of the plumbing.

(10) **REVOCAION OF APPROVAL.** The department may revoke any approval, issued under the provisions of this chapter, for any false statements or misrepresentation of facts on which the approval was based.

(11) **DEPARTMENT LIMITATION AND EXPIRATION OF APPROVAL.** (a) A conditional approval of a plan by the department shall not be construed as an assumption by the department of any responsibility for the design; and the department does not hold itself liable for any defects in construction, nor for any damages that may result from the specific installation.

(b) Plan approval by the department or its authorized representative shall expire 2 years after the date indicated on the approval letter, if construction has not commenced within that 2 year period.

(12) **PETITION FOR VARIANCE.** (a) **Procedure.** The department will consider and may grant a variance to an administrative rule upon receipt of a fee and a completed petition for variance form from the owner, provided an equivalency is established in the petition for variance which meets the intent of the rule being petitioned. The department may impose specific conditions in granting a variance to promote the protection of the health, safety or welfare of the public. Violation of those conditions under which the variance is granted constitutes a violation of this chapter.

(b) *Petition processing time.* Except for priority petitions, the department shall review and make a determination on a petition for variance within 30 business days of receipt of all calculations, documents and fees required to complete the review. The department shall process priority petitions within 10 business days.

(13) **PENALTIES.** Penalties for violations of this chapter shall be assessed in accordance with ss. 145.12 and 145.25 (4), Stats.

History: Cr. Register, February, 1985, No. 350, eff. 3-1-85.

(4)(c) 2 b + 3
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ILHR 82.21 Testing and maintenance. (1) **TESTING OF PLUMBING SYSTEMS.** Except as provided in par. (a), all new plumbing and all parts of existing systems which have been altered, extended or repaired shall be tested as specified in par. (d) to disclose leaks and defects before the plumbing is put into operation.

(a) *Waiver of testing.* The testing of the plumbing shall not be required where the installation does not include the addition, replacement, alteration or relocation of any water distribution, drain or vent piping.

(b) *Local inspection.* Where the plumbing is installed in a municipality having a local inspector, the testing of the plumbing shall be done in the presence of a plumbing inspector, except as provided in subd. 1. b.

1. **Notice of inspection.** a. The plumber responsible for the installation shall notify the plumbing inspector in person, by telephone or in writing when the work is ready for inspection.

b. If the inspection is not made by the end of the normal business day following the day of notification, not including Saturday, Sunday or legal holidays, the plumber may proceed with the testing and the installation.

2. **Preparations for inspection.** When the installation is ready for inspection, the plumber shall make such arrangements as will enable the plumbing inspector to inspect all parts of the plumbing system. The plumber shall have present the proper apparatus and appliances for making the tests, and shall furnish such assistance as may be necessary in making the inspection.

3. Rough-in inspection. A rough-in inspection shall be made when the plumbing system is roughed-in and before fixtures are set. Except as provided in subd. 1., plumbing work shall not be closed in, concealed, or covered until it has been inspected and approved by the plumbing inspector and permission is granted to do so.

4. Final inspection. a. Upon completion of the plumbing installation and before final approval is given, the plumbing inspector shall inspect the work.

b. When required by a municipality, the plumbing installation shall be subject to a final test conducted in accordance with par. (d) 7. The final test shall be observed by the plumbing inspector.

5. Reinspections. Whenever the plumbing official finds that the work or installation does not pass any initial test or inspection, the necessary corrections shall be made to comply with this chapter. The work or installation shall then be resubmitted for inspection to the plumbing inspector.

(c) *Inspection of one-and 2-family dwellings.* The inspection of plumbing installations for one- and 2-family dwellings shall be in accordance with ss. Ind 20.08 to 20.11.

(d) *Testing provisions.* 1. General. All plumbing shall be tested in accordance with provisions of this paragraph before being put into use.

a. Equipment, material and labor for tests. All equipment, material and labor required for testing a plumbing system or part thereof shall be furnished by the plumber responsible for the installation.

b. Exposure of work. Except as provided in subds. 2. and 5., all new, altered, extended or replaced plumbing shall be left uncovered and unconcealed until it has been tested. Where the work has been covered or concealed before it is tested, it shall be exposed for testing.

2. Building sewer and private interceptor main sewer. A building sewer and a private interceptor main sewer shall be inspected before being covered and shall be tested for leaks and defects with water or air before or after being covered in accordance with either subpar. a. or b. The test for leaks and defects may be applied to the entire building sewer or private interceptor main sewer or in sections.

a. Water test. The building sewer or private interceptor main sewer shall be tested by insertion of a test plug at the point of connection with the public sewer. The sewer shall then be filled with water under a head of not less than 10 feet. The water level at the top of the test head of water shall not drop for at least 15 minutes.

b. Air test. The air test shall be made by attaching an air compressor testing apparatus to any suitable opening, and, after closing all other inlets and outlets to the system, forcing air into the system until there is a uniform gauge pressure of 3 pounds per square inch. This pressure shall be held without introduction of additional air for a period of at least 15 minutes.

3. Building drain. The entire building drain with all its branches, receptacles and connections shall be brought so far as practical to the sur-

face or grade of the basement floor and shall be tested with water or air in accordance with subd. 7.

4. Drain and vent systems. The piping of a drain and vent systems, including conductors, shall be tested upon completion of the rough piping installation with water or air in accordance with subd. 7.

5. Water service piping. Water service piping shall be inspected before being covered. The piping shall be tested and proved water tight under a water pressure not less than the working pressure under which it is to be used. The piping shall be tested before or after being covered or concealed. The water used for tests shall be obtained from a potable source of supply.

6. Water distribution system. The piping of a water distribution system shall be tested and proved water tight under a water pressure not less than the working pressure under which it is to be used. The water used for tests shall be obtained from a potable source of supply.

7. Test methods for drain and vent systems. A test for watertightness may be applied to an entire piping system or in sections after the rough piping has been installed.

a. Water test. If applied to the entire system, all openings in the piping shall be tightly closed, except the highest opening, and the system shall be filled with water to the point of overflow. If the system is tested in sections, each opening shall be tightly plugged except the highest opening of the section under test, and each section shall be filled with water, but a section shall not be tested with less than a 10 foot head of water. In testing successive sections, at least the upper 10 feet of the next preceding section shall be tested, so that no joint or pipe in the building, except the uppermost 10 feet of the system, is subjected to a test of less than a 10 foot head of water. The water shall be kept in the system or in the portion under test for at least 15 minutes before inspection starts. The system shall then be tight at all points.

b. Air test. The air test shall be made by attaching an air compressor testing apparatus to any suitable opening, and, after closing all other inlets and outlets to the system, forcing air into the system until there is a uniform gauge pressure of 5 pounds per square inch or sufficient to balance a column of mercury 10 inches in height. This pressure shall be held without introduction of additional air for a period of at least 15 minutes.

8. Final test. Where required by the local plumbing inspector, after the plumbing fixtures have been installed and the traps filled with water, the connections shall be tested and proved gas and watertight by either one of the methods specified in subpars. a. or b.

a. Smoke test. The smoke test shall be made by introducing a pungent, thick smoke, produced by one or more smoke machines, into the completed system. When the smoke appears at stack openings on the roof, the openings shall be closed and a pressure equivalent to a one inch water column shall be built and maintained for the period of the inspection.

b. Air test. The air test shall be made by attaching an air compressor testing apparatus to any suitable opening, and, after closing all other inlets and outlets to the completed system, forcing air into the system until a pressure equivalent to the gauge pressure of a one inch water column. This shall be accomplished by the use of "U" tube or manometer

inserted in the trap of a water closet. The pressure shall remain constant for the period of inspection without the introduction of additional air.

(2) **MAINTENANCE AND REPAIRS.** All plumbing systems, both existing and new, and all parts thereof, shall be maintained in a safe and sanitary condition. All devices or safeguards which are required by this chapter shall be maintained in good working order. The owner shall be responsible for the maintenance of plumbing systems.

(a) *Reduced pressure principle type backflow preventers.* Reduced pressure principle type backflow preventers shall be maintained and annually tested in accordance with ASSE 1013 and its appendix.

(b) *Existing systems.* Whenever it appears upon inspection that any part of an existing plumbing system is defective, or fails to conform to the requirements of this chapter and if failure tends to create a health hazard, it shall be repaired, renovated, replaced or removed.

(c) *Fixtures replaced.* When an old or defective fixture is removed, to be replaced by a new fixture, and no other fixture or piping is to be added or remodeled, it is not necessary to reconstruct the drain or vent piping to make it conform to the provisions of this chapter, unless the drain or vent piping is in a defective condition. Where the existing drain or vent piping does not conform to the provisions of this chapter, the department may require the new fixtures to be provided with deep seal traps.

(d) *Reconstruction.* When old or defective plumbing is to be remodeled, additional fixtures installed, or the whole plumbing system moved to another part of the building, the remodeled system shall be made to conform to this chapter.

(e) *Materials reused.* All plumbing fixtures, drain and vent pipes removed from a building, if found to be in good condition, may be reused, if the fixtures and pipes are approved by the department or local plumbing inspector and the owner of the building in which they are to be installed gives written consent.

(f) *Existing building sewers and drains.* Existing building sewers and drains may be used in connection with new buildings only when they are found on examination and test to conform to the requirements of this chapter governing building sewers and drains. If the existing work is found defective, the local or state inspector shall notify the owner of the changes necessary to make it conform to the requirements of this chapter.

(g) *Repairs.* All repairs to fixtures or piping shall be done in conformance with the provisions of this chapter, except repair clamps or bands may be used for emergency situations.

(h) *Demolition of structures.* When a structure is demolished or removed, all sanitary sewer, storm sewer and water supply connections shall be sealed and plugged in a safe manner.

(i) *Dead ends.* If a dead end is created in the removal of any part of a drain system, all openings in the drain system shall be properly sealed.

Subchapter III
Drain and Vent Systems

ILHR 82.30 Sanitary drain systems. (1) **SCOPE.** The provisions of this section set forth the requirements for the design and installation of sanitary drain systems, including building drains and building sewers.

Note: The provisions for storm and clear water drain systems are specified in s. ILHR 82.36.

(2) **MATERIALS.** All sanitary drain systems shall be constructed of approved materials in accordance with ch. ILHR 84.

(3) **LOAD ON DRAIN PIPING.** (a) *Intermittent flow fixtures.* The load factor on drain piping shall be computed in terms of drainage fixture unit values specified in Table 82.30-1 for the corresponding fixture listed. Drainage fixture unit values for intermittent flow fixtures not listed in Table 82.30-1 shall be computed on the basis of one fixture unit equalling 7.5 gallons per minute of flow.

(b) *Continuous flow devices.* Drainage fixture unit values for continuous or semicontinuous flow devices such as pumps, ejectors, air conditioning equipment or similar devices shall be computed on the basis of one fixture unit for each 2 gallons per minute of flow rate of discharge into the drain system.

Table 82.30-1
DRAINAGE FIXTURE UNIT VALUES

Type of Fixture	Drainage Fixture Unit Value (dfu)	Trap Size Minimum Diameter (in inches)
Automatic clothes washers,		
Commercial, individual.....	4	2
Commercial, large capacity.....	a	a
Self Service Laundry.....	3	1½
Residential.....	3	1½
Bathroom Group, includes: water closet, lavatory, bathtub or shower.....	6	
Bathtubs, all types ^b	2	1½
Bedpan Washer.....	6	2
Beer Tap.....	½	1¼
Bidet.....	2	1½
Bottle Cooler.....	½	1¼
Coffee Maker.....	½	1¼
Cuspidor, fountain or dental.....	1	1¼
Dipper Well.....	1	1¼
Dishwasher, commercial type.....	c	c
Dishwasher, residential type.....	2	1½
Drinking Fountain.....	½	1¼
Exhaust Hood Washer.....	4	2
Floor Drain,		
2 inch.....	2	2
3 inch.....	3	3
4 inch.....	4	4
Larger than 4 inch.....	4	d
Glass Filler.....	½	1¼
Glass Washer.....	2	1½
Ice Chest.....	½	1½
Laundry Tray, 1 or 2 compartment.....	2	1½
Lavatory.....	1	1¼
Refrigerated Food Display Case.....	1	1
Shower Stall		
Residential.....	2	2
Public, individual.....	2	2
Public, group.....	2 per shower head	2

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Sinks,		
Cup	½	1½
Factory, wash, per set of faucets.....	1	1½
Fountain wash up, per station	1	1½
Fountain or Bar, 4 compartments or less	3	1½
Food Waste Grinder, commercial 2 HP or less	2	1½ or 2 ^e
Food Waste Grinder, commercial 3 HP or more.....	3	3
Laboratory	2	1½
Laboratory, school.....	2	1½
Classroom.....	1	1½
Pack or plaster.....	3	2
Residential, with or without food waste grinder	2	1½
Restaurant,		
Scully, pots and pans - 4 compartments or less	4	2
Food, rinsing, cleaning or thawing	3	2
Service Sink, Flushing Rim	6	3
Service Sink, 2 inch diameter, wall outlet.....	2	2
Service Sink, 3 inch diameter, wall outlet.....	3	3
Service Sink, 2 inch diameter, floor outlet.....	2	2
Service Sink, 3 inch diameter, floor outlet.....	3	3
Shampoo Sink, barber or beauty parlor	2	1½
Surgeons, wash up	3	1½
Wash Fountain, circular and semi-circular	3	2
Receptors of Indirect Wastes, gravity flow discharge		
1½ inch receptor outlet diameter.....	2	1½
2 inch receptor outlet diameter	3	2
3 inch receptor outlet diameter	4	3
4 inch receptor outlet diameter	6	4
larger than 4 inch receptor outlet diameter	8	f
Soda Dispenser.....	½	1½
Sterilizers,		
Bedpan	4	2
Garbage can washer.....	3	3
Instrument or water	1	1½
Urinal.....	2	2
Water Closet, nonpublic.....	4	g
Water Closet, public.....	6	g

a Based on discharge rate of the fixture.

b Includes foot, sitz and infant baths and regular bathtubs with or without showers or whirlpool circulation piping.

c Based on discharge rates and number of outlets; a 4-inch diameter trap and drain pipe minimum recommended.

d Trap size corresponds to the size of the floor drain.

e Minimum trap size corresponds to size of the fixture's tail piece as provided by the manufacturer.

f Trap size corresponds to the size of the receptor drain outlet.

g Trap size specified in referenced standards of s. ILHR 84.20 (4) (a).

(4) **SIZE OF DRAIN PIPING.** (a) *Maximum loading.* 1. The total drainage load in any portion of drain piping shall not exceed the limits specified in Tables 82.30-2 and 82.30-3.

2. The drainage fixture unit values assigned to a receptor which is to receive only the indirect waste discharge from a relief valve on a domestic water heater may be disregarded when determining the minimum size of the building drain and building sewer. Any drain piping between the receptor and the building drain shall be sized by including the assigned fixture unit values for the type of receptor.

Note: See s. ILHR82.31 (17) for sizing requirements of combination drain and vent systems.

(b) *Minimum size of underground drain piping.* Any pipe of the drain system installed underground, other than the building sewer, shall not be less than 2 inches in diameter. Any portion of underground drain piping which is 2 inches in diameter shall not exceed a length of 20 feet.

(c) *Minimum size of building sewers.* 1. Gravity flow sewers. The minimum size of a gravity flow sanitary building sewer shall be 4 inches in diameter. A municipality or sanitary district by ordinance may require that portion of the building sewer between the lot line and the public sewer to be larger than 4 inches in diameter.

2. Pressurized sewers. a. Sewers pressurized through the use of sewage ejectors, sewage pumps or sewage grinder pumps shall be sized to maintain a minimum flow velocity of 2 feet per second and shall be in accordance with the ejector or pump manufacturer's recommendations.

b. Pressurized building sewers shall be sized not less than 2 inches in diameter for sewage ejectors and sewage pumps, and 1½ inches in diameter for all sewage grinder pumps.

(d) *Minimum size of private interceptor main sewers.* Private interceptor main sewers 6 inches or less in diameter shall not exceed the drainage fixture unit limits specified in Table 82.30-3. Private interceptor main sewers 8 inches or larger in diameter shall comply with the design flow criteria specified in ch. NR 110.

1. One- and 2-family dwellings. a. The portion of a private interceptor main sewer serving not more than 2 one-family dwellings and the attendant garages shall not be less than 4 inches in diameter.

b. The portion of a private interceptor main sewer serving more than 2 one-family dwellings and the attendant garages shall not be less than 6 inches in diameter.

c. The portion of a private interceptor main sewer serving one 2-family dwelling and its attendant garages shall not be less than 4 inches in diameter.

d. The portion of a private interceptor main sewer serving more than one 2-family dwelling and the attendant garages shall not be less than 6 inches in diameter.

2. Public buildings. A private interceptor main sewer serving public buildings shall be not less than 8 inches in diameter.

Note: See Appendix for further explanatory material.

(e) *Future fixtures.* Where provisions are made for the future installation of fixtures, the drainage fixture unit values of such fixtures shall be considered in determining the required sizes of drain and vent pipes. Construction to provide for future installations shall be terminated with a plugged fitting or fittings.

Table 82.30-2
HORIZONTAL AND VERTICAL DRAIN PIPING

Pipe Diameter (in inches)	Maximum Number of Drainage Fixture Units Which May Drain Through Any Portion of Horizontal and Vertical Drain Piping			
	Horizontal Drain Piping ^a	Vertical Drain Piping of 3 Branch Intervals or Less ^b	Vertical Piping in Drain Stacks of more than 3 Branch Intervals ^b	
			Total Discharge from Side Connections into One Branch Interval	Total Discharge through Any Portion
1½	1	2	1	2
1½	3	4	2	8
2	6	10	6	24
3	20 ^c	48 ^d	20 ^c	72 ^d
4	160	240	90	500
5	360	540	200	1,100
6	620	960	350	1,900
8	1,400	2,200	600	3,600
10	2,500	3,800	1,000	5,600
12	3,900	6,000	1,500	8,400

Note a: Does not include building drains and building sewers.

Note b: Drain stacks may be reduced in size as the drainage load decreases to a minimum diameter of one half of the diameter required at the base of the stack, but not smaller than that required for a stack vent under s. ILHR 82.31 (14) (a).

Note c: Not more than 2 water closets or similar flush action type fixtures of 4 or more drainage fixture units.

Note d: Not more than 2 water closets or similar flush action type fixtures of 4 or more drainage fixture units within each branch interval nor more than 6 flush action type fixtures on the stack.

Table 82.30-3
BUILDING DRAINS, BUILDINGS SEWERS AND PRIVATE INTERCEPTOR MAIN SEWERS^a

Pipe Diameter (in inches)	Maximum Number of Drainage Fixture Units Which May Drain Through Any Portion of a Building Drain, Building Sewer or Private Interceptor Main Sewer			
	Pitch (inch per foot)			
	1/16	1/8	1/4	1/2
2	NP ^b	NP	6	9
3	NP	36 ^c	42 ^c	50 ^c
4	NP	180	216	250
5	NP	390	480	575
6	NP	700	840	1,000
8	1,400	1,600	1,920	2,300
10	2,500	2,900	3,500	4,200
12	2,900	4,600	5,600	6,700
15	7,000	8,300	10,000	12,000

Note a: Private interceptor main serves 6 inches or less in diameter, see s. NR 110.13 for private interceptor main sewers 8 inches or larger in diameter.

Note b: NP means Not Permitted.

Note c: Not more than 2 water closets or similar flush action type fixtures of 4 or more drainage fixture units.

(5) **PITCH OF HORIZONTAL DRAIN PIPING.** All horizontal drain piping 4 inches or larger in diameter shall be installed at a pitch which produces a computed velocity of at least 2 feet per second when flowing half full.

(a) *Horizontal branch drains.* 1. The minimum pitch of horizontal branch drains 2 inches or less in diameter shall be ¼ inch per foot.

2. The minimum pitch of horizontal branch drains larger than 2 inches in diameter shall be $\frac{1}{8}$ inch per foot.

(b) *Building drains and building sewers.* 1. The minimum pitch of building drains shall be in accordance with Table 82.30-3.

2. a. The minimum pitch of building sewers 10 inches or less in diameter shall be in accordance with Table 82.30-3.

b. The minimum pitch of building sewers 12 inches or larger in diameter shall conform with the minimum pitches specified for municipal sewers in s. NR 110.13 (2) (c).

(c) *Private interceptor main sewers.* 1. The minimum pitch of private interceptor main sewers 6 inches or less in diameter shall be in accordance with Table 82.30-3.

2. The minimum pitch of private interceptor main sewers 8 inches or larger in diameter shall conform with the minimum pitches specified for municipal sewers in s. NR 110.13 (2) (c).

(6) **OFFSETS IN VERTICAL DRAINS.** Offsets in vertical drain piping shall be in accordance with this subsection.

(a) *Offsets of 45° or less.* 1. An offset in a vertical drain, with a change in direction of 45° or less from the vertical, shall be sized as a vertical drain piping in accordance with sub. (4).

2. Where a horizontal branch connects to a stack within 2 feet above or below an offset with a change of direction of 30 to 45° from the vertical and the offset is located below 2 or more branch intervals, a relief vent shall be installed in accordance with s. ILHR 82.31 (5).

(b) *Offsets of more than 45°.* A drain stack with an offset of more than 45° from the vertical shall be installed in accordance with subds. 1. to 5.

1. That portion of the stack above the highest offset fitting shall be sized as for vertical drain piping in accordance with sub. (4).

2. That portion of the offset between and including the offset fittings shall be sized as horizontal drain piping in accordance with sub. (4).

3. That portion of stack below the offset shall be not less than the size of the offset and not less than the size required for vertical drain piping in accordance with sub. (4).

4. No horizontal branch drain may connect to the stack offset downstream from the offset's highest fitting within the distance equal to 10 pipe diameters of the offset.

5. Where an offset is located below 2 or more branch intervals, a relief vent and a yoke vent shall be installed in accordance with s. ILHR 82.31 (5).

Note: See Appendix for further explanatory material.

(7) **HORIZONTAL BRANCH DRAIN CONNECTION AT BASE OF A STACK.** (a) A horizontal branch drain shall not connect to a building drain downstream from the base fitting of a drain stack 2 inches or larger in diameter within the distance equal to 10 pipe diameters of the building drain.

(b) A combination drain and vent branch shall not connect to a building drain downstream from the base fitting of a drain stack 2 inches or larger in diameter within the distance equal to 20 pipe diameters of the building drain.

Note: See Appendix for further explanatory material.

(8) **PIPING CHANGES IN DIRECTION.** Changes in the direction of drain piping shall be accomplished in accordance with the requirements of this subsection.

(a) *Fittings.* All changes in direction of flow in drain piping shall be made by the appropriate use of 45 degree wyes, long or short sweep quarter bends, sixth, eighth, or sixteenth bends, or by a combination of these or other equivalent fittings. Fittings which change the direction of flow for drain piping 8 inches or less in diameter shall conform to the minimum radii specified in Table 82.30-4.

Note: See Appendix for further explanatory material.

Table 82.30-4
MINIMUM RADII OF FITTINGS
(in inches)

Diameter of pipe (in inches)	Changes in Direction of Flow	
	Horizontal to Vertical	Vertical to Horizontal and Horizontal to Horizontal
1-1/4	1-1/8	2-1/4
1-1/2	1-3/8	2-3/4 ^a
2	1-7/8	3-1/4
3	2-7/8	4-1/16
4	3-3/4	4-7/8
5	4-1/2	6-1/2
6	5	7
8	6	8

Note a: The minimum radius may be reduced to 1 1/4 inches for the first 90° fitting downstream from a trap serving a lavatory or sink. This fitting may be a tee or quarter bend.

(b) *Blowout type fixtures.* Where blowout type fixtures are installed back to back, appropriate fittings shall be installed to prevent the passage of wastes from one fixture to the other.

(9) **DRAIN FITTINGS AND CONNECTIONS.** Drain fittings, connections, devices and methods of installation shall not obstruct or retard the flow of water, wastes, sewage or air in the drain system or venting system in an amount greater than the normal frictional resistance to flow, unless as otherwise permitted in this chapter or unless approved by the department.

(a) *Closet bend.* The reduction of a 4 × 3 inch closet bend or collar fitting from 4 inches to 3 inches shall not be considered an obstruction.

(b) *Side inlet tees or bends.* The side inlet of a low pattern or high pattern tee or bend shall not be used as a vent connection when the side inlet is placed in a horizontal position or when any arrangement of piping or fittings produces a similar effect.

Note: See Appendix for further explanatory material.

(c) *Prohibited fittings and connections.* The types of fittings and connections specified in subds. 1. to 5. shall not be used for drain piping:

1. A heel inlet bend when the heel inlet is in the horizontal position;
2. A fitting or connection which has an enlargement chamber or recess with a ledge or shoulder, or reduction in pipe area in the direction of flow;
3. A fitting which has running threads;
4. A fitting which has saddles, except as provided in sub. (11) (e) 1.; and
5. A connection by means of tapping or drilling of a drain or vent pipe, unless as otherwise approved by the department.

(10) **SUMPS, EJECTORS AND PUMPS.** (a) *Sumps.* 1. General. All sanitary building subdrains shall discharge into an approved, vented sump with an airtight cover. The sump shall be so located as to receive the sewage by gravity flow, and shall be located at least 25 feet from any water well.

2. Capacity. The minimum capacity of the sump shall be determined in accordance with the provisions of subpars. a. to e.

a. The water supply fixture unit method shall be used to determine peak input flow in gallons per minute; only the fixtures that drain to the sump shall be included.

Note: When converting water fixture units to gallons per minute it is permissible to calculate the load as a supply system with predominantly flush tanks.

b. The sump capacity between the lowest "pump on" switch level and the "pump off" switch level shall equal at least one minute of peak input, but in no case shall the pump that is actuated by the lowest "pump on" switch run less than 20 seconds.

c. Between the highest "pump on" switch level and the sump inlet, the sump shall hold the amount of input that exceeds the discharge of the pumping equipment in a 5 minute peak input period, but in no case shall the vertical distance between the switch and the inlet be less than 3 inches.

d. The low water level shall be maintained in accordance with the pump manufacturer's requirements, but shall not be less than 4 inches above the sump bottom.

e. Minimum sump diameter. Sumps containing one pump shall have an inside diameter of at least 24 inches. Sumps containing 2 pumps shall have an inside diameter of at least 30 inches.

Note: See Appendix for further explanatory material.

3. Vents. All sumps and all drains leading to a sump shall be vented in accordance with s. ILHR 82.31.

4. Materials. All sumps shall be constructed in a watertight manner of approved materials in accordance with ch. ILHR 84.

(b) *Ejectors and pumps.* 1. Where required. The liquid from all sanitary building sumps shall be lifted and discharged into the building sanitary drain system by automatic ejectors, pumps or any other equally efficient method approved by the department.

2. Duplex equipment. a. Public buildings. Duplex ejector or pumping equipment shall be installed in a public building where 3 or more water closets or more than 20 drainage fixture units discharge into a sump.

b. One- and 2-family dwellings. Duplex ejector or pumping equipment shall be installed where the sanitary wastes of 2 or more one- or 2-family dwellings discharge into a sump.

c. Operation. Where duplex ejector or pumping equipment is installed, appropriate devices shall be installed to automatically alternate operation of the pumps or ejectors and to operate both pumps or ejectors when one unit cannot handle the load.

3. Size. The size and design of an ejector or pump shall be determined by the capacity of the sump to be served, the discharge head and discharge frequency. All ejectors and pumps shall provide a minimum flow velocity of 2 feet per second in the forced discharge piping.

Note: Ejectors or pumps discharging to septic tanks may disturb the normal settling properties of the tank environment; contact the bureau of plumbing for more information.

a. Sewage grinder pumps. All sewage grinder pumps shall have a minimum 1¼ inch diameter discharge opening and discharge piping.

b. Nongrinder-type sewage pumps. All nongrinder-type sewage pumps serving water closets shall be capable of passing a 2 inch diameter solid ball and shall have a minimum 2 inch diameter discharge opening and discharge piping. All other pumps handling sanitary wastes shall be rated by the manufacturer as an effluent pump, shall be capable of passing a ½ inch diameter solid ball and shall have a minimum 1½ inch diameter discharge opening and discharge piping.

4. Discharge connections. a. The discharge pipe from the ejector or pump shall be connected to the gravity drain by means of a wye pattern fitting. Where the fitting connects to a horizontal drain, the bottom of the wye branch of the fitting shall be located above the horizontal center line.

b. A full flow check valve shall be installed in the discharge piping from each ejector or pump.

c. Where duplicate ejector or pumping equipment is installed, each discharge pipe from an ejector or pump shall be provided with a gate or ball type valve installed downstream of each full flow check valve.

5. Discharge pipe air relief. Air relief valves shall be provided at all high points in the discharge piping of an ejector or pump where the piping arrangement creates an air trap.

6. Prohibited connections. No fixtures may be connected to the discharge pipe between the ejector or pump and the point where it enters the gravity drain.

7. Maintenance. All ejectors, pumps and like appliances shall receive care as needed to keep them in a satisfactory operating condition.

(11) BUILDING DRAINS AND BUILDING SEWERS. The interior plumbing of each building shall be entirely separated and independent of any other building's plumbing. All sanitary or special type drain systems shall be connected, by means of independent connections, with a public sewer,

approved private interceptor main sewer or private sewage system. No building sewer may pass under or through a building to serve another building.

(a) *Building drains.* 1. Elevation. a. All building drains shall be installed below the lowest floor levels on which fixtures may be installed if the public sewer, septic tank or private interceptor main sewer elevation permits.

b. A building drain serving only dwelling units may be located above ground in order to discharge to the building sewer by means of gravity flow. No above ground building drain may be located above the floor of the first story.

c. Where any portion of an above-ground building drain discharges to a vertical pipe, the building drain shall connect to the building sewer at an elevation at least 30 inches above the basement floor.

Note: See Appendix for further explanatory material.

2. Backwater protection. A building drain subject to backflow or backwater shall be protected with a backwater valve or with a sump with pumping equipment in accordance with sub. (10).

a. Backwater valves, when fully open, shall have a capacity not less than that of the pipes in which installed.

b. Backwater valves shall be so located as to be readily accessible for cleaning.

3. Floor drain required. Where a plumbing fixture or appliance is located on a floor which is entirely below grade, a floor drain shall be installed to serve that floor.

(b) *Building sewers.* 1. Minimum depth. a. The top of a building sewer shall be located at a depth of not less than 42 inches below finished grade, except as provided in subpar. b. or as approved by the department.

b. The top of a building sewer which discharges to a septic tank, holding tank or grease interceptor shall be located at a depth of not less than 18 inches below finished grade.

2. Protection from frost. a. Except as provided in subpars. c. and d., a building sewer shall be protected from frost in accordance with subd. 3. in areas where the top of the building sewer is located less than 60 inches below a surface area from which snow will be cleared.

b. Except as provided in subpars. c. and d., a building sewer shall be protected from frost in accordance with subd. 3. in areas where the top of the building sewer is located less than 42 inches below a surface which snow will not be cleared.

c. Where a building sewer discharges to a septic tank, holding tank, or grease interceptor, the portion of a building sewer which is within 30 feet from the connecting building drain and which is under a surface area from which snow will not be cleared shall not be required to be protected from frost.

d. Frost protection for a building sewer shall not be required where the predicted depth of frost as determined from Figure 82.30-1 and Table 82.30-6 does not extend below the top of the building sewer.

3. Insulations for building sewers. Where required by subd. 2. a. or 2. b., building sewer insulation for frost protection shall be provided in accordance with one of the methods specified in subpars. a. to c.

a. Extruded polystyrene. Extruded polystyrene foam insulation shall be installed at a depth of at least 18 inches below finished grade and at least 6 inches above the top of the sewer pipe. The minimum thickness and width of the foam insulation shall be determined from Figure 82.30-1 and Tables 82.30-5 to 82.30-7. If the insulation is to be installed more than 6 inches above the top of the sewer, the number of inches exceeding 6 inches shall be added to the width of insulation determined from Table 82.30-7.

b. Insulating concrete. Lightweight insulating concrete shall be installed to the depth of the spring line of the sewer and shall extend laterally at least 6 inches on both sides of the sewer. The minimum thickness of the insulating concrete shall be determined from Figure 82.30-1 and Table 82.30-5. The thickness shall be measured from the top of the sewer. The top of the insulation shall be installed at least 12 inches below finished grade.

c. Alternative methods. Alternative methods of frost protection shall be approved by the department.

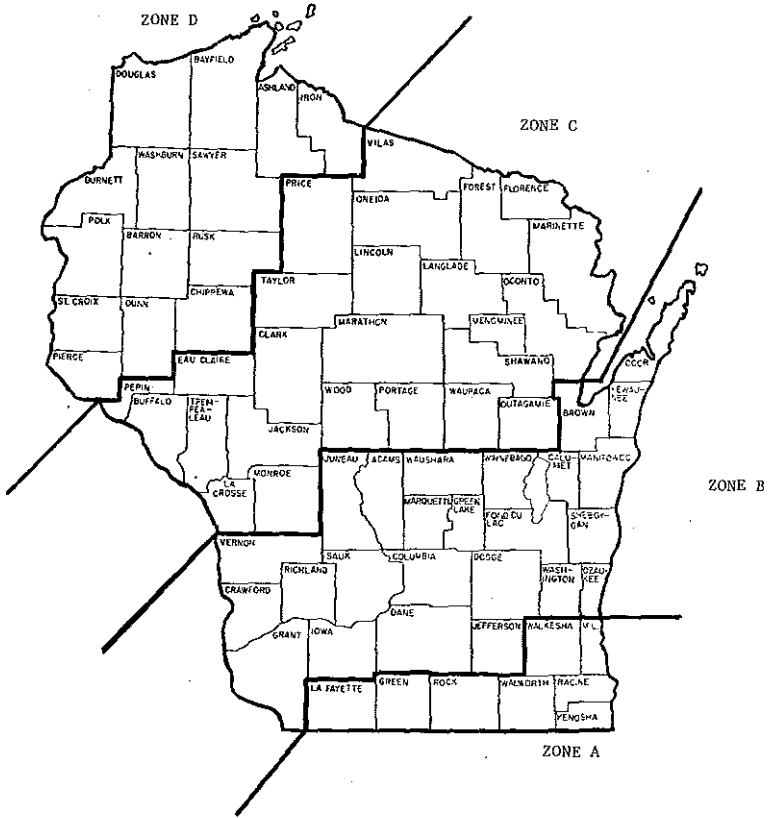


Figure 82.30-1
INSTALLATION SITE ZONES

Table 82.30-5
MINIMUM THICKNESS OF INSULATION

Installation Site Zone	Extruded Polystyrene Foam (in inches)	Insulating Concrete (in inches)
A	1.0	6
B	1.5	9
C	2.0	12
D	2.5	15

Table 82.30-6
PREDICTED DEPTH OF FROST IN VARIOUS TYPES OF BACKFILL SOIL
(in feet)

Soil Type	Installation Site Zone			
	A	B	C	D
Clay, Clay Loam	2.5	3.0	3.5	4.0
Silt Loam, Silty Clay Loam	3.5	4.0	4.5	5.5
Sandy Clay Loam	4.0	4.5	5.5	6.0
Sandy Loam, Loamy Sand	4.5	5.0	6.0	6.5
Sand	5.0	5.5	6.5	7.5
Gravelly Sand	6.0	7.5	9.0	10.0

Table 82.30-7
MINIMUM WIDTH OF EXTRUDED POLYSTYRENE FOAM INSULATION
(in feet)

Predicted Depth of of Frost (in feet)	Depth of Sewer (in feet)					
	2.0	2.5	3.0	3.5	4.0	4.5
2.5	2	NR				
3.0	3	2	NR			
3.5	4	3		NR		
4.0	5	4	3	2	NR	
4.5	6	5	4	3	2	NR
5.0	7	6	5	4	3	2
5.5	8	7	6	5	4	3
6.0	9	8	7	6	5	4
6.5	10	9	8	7	6	5
7.0	10	10	9	8	7	6
7.5	10	10	10	9	8	7
8.0	10	10	10	10	9	8
8.5	10	10	10	10	10	9
9.0	10	10	10	10	10	10
10.0	10	10	10	10	10	10

Note: NR means Not Required.

(c) *Location limitations.* Building drains and building sewers shall be separated from water wells by the following minimum distances:

1. Eight feet for building drains and building sewers of cast iron pipe;
2. Eight feet for building drains and building sewers of plastic pipe;
3. Twenty-five feet for building drains and building sewers of all other materials; and
4. Twenty-five feet for all pressurized building drains and building sewers.

Note: See s. ILHR 82.40 for provisions regarding the separation of water supply piping and building sewer piping.

(d) *Installation of building drains and building sewers.* 1. Trenching. All excavations for building drains and building sewers shall be open trench Register, February, 1985, No. 350

work, unless otherwise permitted by local ordinance or accepted by the local inspector.

2. Stable bottom. Where the bottom of the trench can be maintained in a stable condition and free of water during the time of installation the building drain and the building sewer shall be bedded and initially back-filled as specified in this subdivision. Grade, as used in this subdivision, shall mean the elevation of the bottom of the building drain or the building sewer.

a. Concrete, clay, plastic and asbestos-cement pipe. Except where sand is encountered, the trench bottom throughout its length shall be excavated to a depth at least 3 inches below the grade elevation and shall be brought back to grade with sand, pea gravel, or a graded stone bedding. The bedding material shall be of a size that all the material shall pass a $\frac{3}{4}$ inch sieve. When sand is used as a bedding material it shall not contain excessive moisture and the bedding in the entire trench width shall be hand or mechanically tamped to compact it to a minimum of 90% Standard Proctor Density. All bedding shall be shaped to accommodate pipe bells or couplings. Initial backfill on the sides of the pipe and to a depth of 12 inches over the pipe shall be sand, gravel, crushed stone or excavated material which is neither corrosive nor organic in nature. A concrete floor may be placed over a building drain having less than 12 inches of initial backfill. Initial backfill material shall be of a size that all the material shall pass a one inch sieve. Initial backfill material shall be placed in increments not exceeding 6 inches in depth and shall be well tamped for the full width of the trench and for the full length of the sewer.

b. Cast iron pipe. Where the trench bottom does not contain stone larger than one inch in size or where bedrock is not encountered, the trench may be excavated to grade. Where stone larger than one inch in size or when bedrock is encountered, the trench shall be excavated to a depth at least 3 inches below the grade elevation and shall be brought back to grade with a bedding of sand, gravel, or crushed stone which shall be of a size that all the material shall pass a $\frac{3}{4}$ inch sieve. The bedding material shall be shaped to accommodate the pipe bells or couplings. Initial backfill on the sides of the pipe and to a depth of 3 inches over the pipe for that part of the pipe laid on private property shall be well tamped sand, gravel, crushed stone or excavated material which is neither corrosive nor organic in nature. A concrete floor may be placed over a building drain having less than 3 inches of initial backfill. Initial backfill material shall be of a size that all the material shall pass a one inch sieve. For that portion of the sewer in the street right of way, the initial backfill material to a depth of 12 inches over the pipe shall be sand, gravel or crushed stone which shall be of a size that all the material shall pass a one inch sieve. Initial backfill material shall be placed in increments not exceeding 6 inches and shall be well tamped.

3. Unstable bottom. Where a mucky or unstable bottom is encountered in the trench, the required dry and stable foundation conditions shall be provided by sheathing driven and left in place to a depth of 48 inches below the trench bottom or to solid foundation at a lesser depth, the removal of wet and yielding material to a depth of 24 inches or to solid material, and replacement of the unstable material with limestone screenings, pea gravel or equivalent material for the bedding under the pipe. The trench bedding shall be shaped to accommodate pipe bells or

couplings. In lieu of the foregoing, the required dry and stable foundation conditions may be provided by installation of a longitudinally reinforced concrete cradle the width of the trench and at least 3 inches thick or by installation of a longitudinally reinforced concrete slab the width of the trench at least 3 inches thick and bedding material as provided for in subd. 2. Initial backfill material and its placement shall conform to that specified in subd. 2. All sheathing shall be cut off at a depth of 3 feet or more below the ground surface to prevent heaving due to frost action.

4. Backfill completion. Care shall be exercised in placing the balance of the backfill to prevent breakage of the pipe. Large boulders or rock, concrete slabs, or frozen masses shall not be used in the backfill. At least 36 inches of backfill cover shall be provided over the top of the pipe before the pipe trench is wheel-loaded.

5. Pipe openings protected. The ends of all pipes not immediately connected shall be closed so as to prevent the introduction of earth or drainage from an excavation.

(e) *Connection to public sewer.* The connections of building sewers to public sewers shall be in accordance with conditions of approval for the public sewer granted by the department of natural resources under s. 144.04, Stats.

1. Gravity public sewer. When a building sewer connection to the public sewer is not found within 3 feet of the point designated by the local governing body or its authorized representative, the connection shall be made in accordance with one of the provisions specified in subpars. a. to d.

a. A saddle fitting approved by the department and acceptable to the municipality or sanitary district shall be installed.

b. Where acceptable to the municipality or sanitary district a portion of the main sewer may be removed and a tee or wye fitting approved by the department may be inserted with compression joints in the public sewer acceptable to the municipality or the sanitary district. The insertion shall be made under the supervision of the authorized representative of the municipality or the sanitary district.

c. When the public sewer is concrete or clay, the end of the connecting sewer may be set upon or in an opening cut into the top half of the public sewer, but shall not protrude into the public sewer. The connection shall be secured by encasing the main sewer pipe and the connection in concrete at least 3 inches thick so as to assure permanency of the connection and adequate backing of the public sewer pipe.

d. In lieu of the use of a fitting and in the event that an opening cannot be located in the top half of the public sewer, a length of concrete or clay public sewer pipe may be removed and a section with a wye fitting shall be inserted in its place. The joints at the ends of the section shall be encased in concrete at least 3 inches thick. The connection or insertion shall be made under the supervision of the authorized representative of the municipality or the sanitary district.

2. Pressurized public sewer. Where a forced building sewer discharges to a pressurized public sewer, a full flow corporation cock, full flow curb stop, check valve and dresser type coupling shall be installed. The curb stop, check valve and dresser type coupling shall be installed on the

property as close as possible to the connection to the common forced main sewer. The check valve and dresser type coupling shall be accessible.

Note: See Appendix for further explanatory material.

(f) *Prohibited installations.* 1. Harmful discharge. No person may connect to a public sewer any building drain or building sewer through which is discharged any substance likely to cause undue corrosion, obstruction, nuisance, explosion or interference with sewage treatment processes.

2. Storm and clear water connections. Storm and clear water drains shall not discharge to a sanitary building drain or building sewer or to a private sewage disposal system. The building sanitary sewer and building storm sewer shall be installed as two separate piping systems and shall connect to the appropriate street or public sewer.

Note: See s. ILHR 82.36 for provisions relative to storm sewers.

(12) PRIVATE INTERCEPTOR MAIN SEWERS. (a) The connection of a private interceptor main sewer to a public sewer shall be in accordance with the conditions of approval for the public sewer granted by the department of natural resources under s. 144.04, Stats.

(b) Private interceptor main sewers which discharge to a municipal treatment facility shall be designed in accordance with the appropriate water quality management plan.

(c) All private interceptor main sewers shall be tested in accordance with s. ILHR 82.21.

(d) Private interceptor main sewers 6 inches or less in diameter shall be installed in accordance with the criteria for building sewers specified in sub. (11) (b) and (c) and (d) and (e).

(e) Private interceptor main sewers 8 inches or larger in diameter shall be:

1. Provided with frost protection in accordance with sub. (11) (b); and
2. Installed in accordance with the municipal sewer criteria specified in s. NR 110.13.

(13) LOCATION OF DRAIN PIPING. (a) Drain piping located below the ceilings of areas where food, ice or potable liquids are prepared, handled, stored or displayed shall be installed with the least number of joints and shall be installed in accordance with subs. 1. to 5.

1. All pipe openings through floors shall be provided with sleeves bonded to the floor construction and protruding not less than one inch above the top of the finish floor with the space between sleeve and the piping sealed.

2. Plumbing fixtures, except bathtubs and showers, shall be of the wall mounted type. Bathtubs shall have waste and overflow connections made above the floor and piped to a trap below the floor.

3. Floor and shower drains installed shall be equipped with integral seepage pans.

4. Cleanouts for piping shall be extended through the floor construction above.

5. Piping subject to operation at temperatures that will form condensation on the exterior of the pipe shall be thermally insulated.

(b) Where drain piping is located in ceilings of areas where food, ice or potable liquids are prepared, handled stored or displayed, the ceilings shall be of the removable type, or shall be provided with access panels in order to provide an access for inspection of the piping.

(c) Exposed drain piping shall not be located over a pool, surge tank or an open filter for a pool.

History: Cr. Register, February, 1985, No. 350, eff. 3-1-85.

ILHR 82.31 Vents and venting systems. (1) **SCOPE.** The provisions of this section set forth the requirements for the design and the installation of vents and venting systems.

(2) **MATERIALS.** All vents and venting systems shall be constructed of approved materials in accordance with ch. ILHR 84.

(3) **GENERAL.** (a) *Vents.* Every trap and trapped plumbing fixture shall be provided with an individual vent, except as otherwise permitted in this chapter. Vents and venting systems shall be designed and installed so that the water seal of a trap shall be subject to a maximum pneumatic pressure differential equal to one inch of water column.

(b) **MAIN STACK.** Each gravity-flow sanitary building sewer shall be served by at least one stack which extends from a building drain to a vent terminal or vent header. The stack shall be not less than 3 inches in diameter from the building drain to the vent terminal or vent header.

(4) **VENT STACKS AND STACK VENTS.** (a) *Where required.* Where individual vents, relief vents, or other branch vents are required, a vent stack and a stack vent shall be installed to serve all drain stacks of 2 or more branch intervals.

(b) *Installation.* 1. The connection of the vent stack to a drain stack shall be at or below the lowest branch drain connection to the drain stack. The connection to the drain stack shall be by means of a wye pattern fitting installed in a vertical portion of the stack.

2. A vent stack and a stack vent shall:

a. Extend to a vent terminal in accordance with sub. (16);

b. Connect to a vent stack which extends to a vent terminal; or

c. Connect to a stack vent at least 6 inches above the flood level rim of the highest fixture discharging into a drain stack.

3. Vent stacks and stack vents may connect into a common vent header and then shall extend to a vent terminal.

Note: See Appendix for further explanatory material.

(5) **RELIEF AND YOKE VENTS FOR STACK OFFSETS.** (a) *Offsets of 30 to 45°.* Where a horizontal branch drain connects to a drain stack within 2 feet above or below a stack offset with a change of direction of 30 to 45° from the vertical and the offset is located below 2 or more branch intervals, a

relief vent shall be installed in accordance with par. (c), except where an offset of more than 45° from the vertical is located in the drain stack within 12 feet above the offset of 30 to 45 degrees.

(b) *Offsets of more than 45°.* Except as provided in subds. 1. and 2., where a drain stack has an offset of more than 45° from the vertical located below 2 or more branch intervals, a relief vent and a yoke vent shall be installed in accordance with par. (c).

1. Where an offset of more than 45° from the vertical is located in the drain stack within 12 feet above the lower stack offset, the installation of a yoke vent shall not be required.

2. Where the offset of more than 45° is located below the lowest branch drain connection, the installation of the relief vent shall not be required.

(c) *Installation.* 1. Relief vent. a. A relief vent serving a drain stack offset shall be installed as a vertical continuation of the portion of the stack below the offset or as a side connection to the portion of the stack below the offset. No drain connection may be installed between the offset and the side connection of the relief vent.

b. The connection of the relief vent to the drain stack shall be by means of a wye pattern fitting.

c. The connection of the relief vent to another vent shall be not less than 42 inches above the next higher floor level where plumbing fixtures are installed that discharge into the drain stack.

2. Yoke vent. a. A yoke vent serving a drain stack offset shall connect to the drain stack at or below the lowest branch drain connection to the portion of the drain stack above the offset.

b. The connection of the yoke vent to the drain stack shall be by means of a wye pattern fitting.

c. The connection of the yoke vent to another vent shall be not less than 42 inches above the next higher floor level where plumbing fixtures are installed that discharge into the drain stack.

Note: See Appendix for further explanatory material.

(6) **YOKE VENTS FOR STACKS OF MORE THAN 10 BRANCH INTERVALS.** Drain stacks of more than 10 branch intervals shall be provided with yoke vents.

(a) Yoke vents shall be installed not more than 10 branch intervals apart nor more than 10 branch intervals from the top or bottom of the drain stack.

(b) The connection of the yoke vent to the drain stack shall be by means of a wye pattern fitting.

(c) The connection of the yoke vent to another vent shall be not less than 42 inches above the next higher floor level where plumbing fixtures are installed that discharge into the drain stack.

(7) **RELIEF VENTS FOR BUILDING DRAINS.** A building drain with a change in elevation of 12 feet or more and at an angle of 45° or more from the horizontal shall be provided with a relief vent.

(a) The connection of the relief vent to the building drain shall be by means of a wye pattern fitting installed within 2 feet upstream of the top of the change in elevation.

(b) The connection of the relief vent to another vent shall be not less than 42 inches above the next higher floor level where plumbing fixtures are installed that discharge through the building drain.

Note: See Appendix for further explanatory material.

(8) **VENTS FOR SANITARY SUMPS.** Sanitary sumps shall be provided with a vent connecting either to the sump above the drain inlet or to the drain inlet within 12 inches of the sump.

(9) **FIXTURE VENTS.** (a) *Developed length between vent and trap.* Each fixture trap shall be protected with a vent located in accordance with the provisions of subs. 1. and 2.

1. Each fixture trap which is not an integral part of the fixture shall be protected with a vent so located that the developed length of the fixture drain piping from the trap weir to the vent connection is within the limits set forth in Table 82.31-1.

2. Each fixture trap which is an integral part of the fixture shall be protected with a vent so located that the developed length of the fixture drain piping from fixture outlet to the vent connection is within the limits set forth in Table 82.31-1. For a floor outlet water closet or similar fixture, the point where the fixture drain piping turns horizontal shall be considered as the fixture outlet.

(b) *Minimum distance.* A vent shall not connect to a fixture drain within the distance equal to 2 diameters of the drain piping from the weir of a trap.

Note: See Appendix for further explanatory material.

Table 82.31-1
MAXIMUM DEVELOPED LENGTH BETWEEN VENT AND TRAP
(in feet)

Diameter of Fixture Drain ^a (in inches)	Vent Connecting to Horizontal Drain Piping		Vent Connecting to Vertical Drain Piping						
			by means of a Sanitary Tee Fitting			by means of a Wye Pattern Fitting ^b			
	Pitch of Fixture Drain (inch per foot)			Pitch of Fixture Drain (inch per foot)			Pitch of Fixture Drain (inch per foot)		
	½	¼	⅓	½	¼	⅓	½	¼	⅓
1¼	NP ^c	5.0	2.5	NP	3.5	2.0	NP	1.5	1.0
1½	NP	6.0	3.0	NP	5.0	3.0	NP	4.0	2.0
2	NP	8.0	4.0	NP	6.0	4.0	NP	4.5	4.0
3	24	12.0	6.0	10.0	8.0	6.0	8.0	6.0	6.0
4 ^d	32	16.0	8.0	12.0	10.0	8.0	10.0	8.0	8.0

Note a: Diameters to be selected on the basis of the smallest drain pipe installed downstream from the trap serving a particular fixture.

Note b: The wye pattern fitting refers to a tee-wye fitting, a combination wye and eighth bend fitting or a wye and eighth bend combination of fittings with no more than one inch between the wye fitting and eighth bend fitting.

Note c: NP means Not Permitted.

Note d: The maximum developed length for fixture drains larger than 4 inches in diameter shall be approved by the department.

(10) **CIRCUIT VENTING.** In lieu of providing individual vents, a horizontal drain to which at least 2 but not more than 8 similar floor outlet fixtures, other than blowout type water closets, are connected in battery, may be vented by a circuit vent in accordance with pars. (a) to (e). For the purposes of this subsection flush action type floor outlet fixtures of 4 or more drainage fixture units shall be considered as one group of similar fixtures; all other types of floor outlet fixtures shall be considered as another group of similar fixtures.

(a) The circuit vent shall connect to the horizontal drain at a point between the 2 most upstream, floor outlet fixtures.

(b) 1. A circuit vented horizontal drain into which 4 or more floor outlet fixtures discharge shall be provided with a relief vent, unless the horizontal drain connects to a drain stack with no other drain connections located above the circuit vented horizontal drain. The relief vent shall connect to the circuit vented horizontal drain downstream of the most downstream fixture drain which is vented by the circuit vent and upstream of any other drain connections.

2. Two circuit vented horizontal drains serving a total of 8 fixtures, 4 on each branch, shall be provided with at least one relief vent, unless the horizontal drains connect to a drain stack with no other drain connections located above the circuit vented horizontal drains. One relief vent may serve both horizontal drains, if installed downstream of the point where the 2 horizontal drains are joined.

Note: See Appendix for further explanatory material.

(c) A horizontal drain served by a circuit vent shall not diminish in size from the connection to the drain stack to the circuit vent connection. Where a relief vent is installed, the horizontal drain served by the circuit vent shall not diminish in size from the relief vent connection to the circuit vent connection.

(d) Fixture drains served by a circuit vent shall conform to the provisions of sub. (9). The connection of the fixture drain to the branch drain served by the circuit vent shall be considered as the vent connection.

(e) Only wall outlet fixtures with a drainage fixture unit value of one or less which are served by individual vents or common vents may discharge into a horizontal drain served by a circuit vent.

(11) **COMMON VENTS.** In lieu of providing individual vents, fixtures may be common vented in accordance with pars. (a) and (b).

(a) *Vertical drains.* A common vent may serve 2 fixture traps where both fixture drains connect to a vertical drain at the same elevation. The drain connection of a blowout type fixture or a kitchen sink served by a common vent shall not be by means of a double sanitary tee fitting.

(b) *Horizontal branches.* The fixture drains from 2 lavatories or 2 compartments of one residential kitchen sink may connect to a horizontal branch drain without individual venting provided a common vent connects to the branch drain downstream of both fixture drains. Both fixture drains shall be of the same diameter. The developed length of the drain from the vent to the farthest trap shall conform to sub. (9).

Note: See Appendix for further explanatory material.

(12) **ISLAND FIXTURE VENTING.** Island plumbing fixtures may be vented in accordance with pars. (a) to (d).

(a) Island plumbing fixtures may be vented by extending an individual vent or a common vent as high as possible under the fixture enclosure and returning the vent vertically downward and connecting it to the fixture drain by means of a wye pattern fitting.

(b) Horizontal vent piping shall connect to the vertical section of the fixture vent and extend to a point where it can extend vertically to a vent terminal in accordance with sub. (16) or connect to another vent in accordance with sub. (15).

(c) Drainage fittings shall be used on all sections of the vent pipe below the floor level and a minimum slope of $\frac{1}{4}$ inch per foot to the drainage point shall be provided.

(d) Cleanouts shall be provided on the vent piping in accordance with s. ILHR 82.35.

Note 1: See Appendix for further explanatory material.

Note 2: See sub. (17) for venting provisions relating to laboratory sinks.

(13) **WET VENTING.** In lieu of providing individual vents, fixtures may be wet vented in accordance with pars. (a) to (c).

(a) *Vertical wet vents.* 1. Where 2 wall outlet fixtures are located on the same floor level with their fixture drains connecting to the same vertical drain pipe at different elevations, the lower fixture drain may be wet vented in accordance with subpars. a. to e.

a. No other fixtures may discharge into the vertical drain pipe above or between the 2 wall outlet fixtures. Additional fixtures may discharge into the vertical drain pipe below the 2 wall outlet fixtures.

b. A branch vent shall connect to the vertical drain pipe immediately above the higher fixture drain connection.

c. The entire vertical drain shall be at least one pipe size larger than the upper fixture drain, but not smaller than the lower fixture drain.

d. Both fixture drains shall conform to sub. (9). The connection of the lower fixture drain to the vertical drain shall be considered as the vent connection.

e. The higher fixture drain may not serve a water closet or urinal.

Note: See Appendix for further explanatory material.

2. The fixtures of a nonpublic bathroom group may be wet vented in accordance with subpars. a. to e.

a. No other fixtures may discharge into the vertical drain pipe above or between the fixtures of the bathroom group. Additional fixtures may discharge into the vertical drain pipe below the fixtures of the bathroom group.

b. A branch vent at least 2 inches in diameter shall connect to the vertical drain pipe immediately above the highest fixture drain connection.

c. Each fixture drain of the fixtures to be wet vented shall connect individually to a vertical drain at least 3 inches in diameter.

d. Each fixture drain shall conform to sub. (9). The connection of the fixture drain to the vertical drain shall be considered as the vent connection.

e. The fixture drains of the water closet and bathtub or shower shall connect to the vertical drain at the same elevation. Where this connection is by means of a sanitary tee fitting with a side inlet, the centerline of the side inlet opening shall not be below the centerline of the larger opening.

(b) *Horizontal wet vents.* A drain from a lavatory or lavatories which are either provided with individual vents or a common vent may serve as the wet vent for not more than 2 bathtubs or showers and not more than 2 water closets in accordance with subds. 1. to 7. No other fixtures may discharge into or be served by the wet vent.

1. All of the fixtures shall be located in nonpublic bathroom groups.

2. The lavatories and bathtubs or showers shall have a common horizontal drain with the drain for the lavatories serving as a wet vent for the bathtubs or showers.

3. Where 2 bathtubs or showers are served by the same wet vent, their fixture drains shall connect independently to the common horizontal drain downstream of the vertical drain serving the lavatory or lavatories.

4. Where 2 bathtubs or showers and 2 water closets are served by the same wet vent a relief vent shall be provided, unless the wet vented horizontal drain connects to a drain stack with no other drain connections located above the wet-vented horizontal drain. The relief vent shall connect to the horizontal drain at a point downstream of the fixture drains for the water closets and upstream of any other fixture drain connections.

5. One or 2 water closets may connect to the common horizontal drain with the drain from the lavatories and bathtubs or showers also serving as a wet vent for the water closets. Where 2 water closets are served by the same wet vent, their fixture drains shall connect independently to the common horizontal drain at the same point.

6. The wet vent shall be at least 2 inches in diameter. No more than 4 drainage fixture units may discharge into a 2 inch diameter wet vent.

7. A branch vent shall connect immediately above the highest fixture drain connection and shall be sized in accordance with sub. (14).

(c) *Floor outlet fixtures.* An individual vent serving a floor outlet fixture, a common vent serving floor outlet fixtures, a circuit vent, a relief vent serving a circuit vented drain or a relief vent serving a wet vented horizontal drain may serve as a wet vent in accordance with subds. 1. to 4.

1. One or 2 wall outlet fixtures, each with a drainage fixture unit value of one or less may have their fixture drains connected individually into the individual vent, common vent, circuit vent or relief vent serving the floor outlet fixtures thereby forming a wet vent.

2. The wet vent shall be at least 2 inches in diameter.

3. The branch vent to which the wet vent connects shall be sized in accordance with sub. (14). The branch vent may serve the wall outlet fixtures in lieu of individual vents or a common vent.

4. The fixtures discharging into the wet vent shall be located on the same floor level as the floor outlet fixtures.

(14) **VENT SIZE.** (a) *Stack vents and vent stacks.* Stack vent and vent stack pipe sizes shall be determined in accordance with Table 82.31-2 on the basis of developed length and the diameter of the drain stack at its base.

1. The developed length of the stack vent shall be measured along the vent pipe, from the highest drain branch connection to the vent terminal or to the connection to a vent header.

2. The developed length of the vent stack shall be measured along the vent pipe from the vent stack base connection to the vent terminal or to the connection to a vent header.

Note: See Appendix for further explanatory material.

(b) *Vent headers.* 1. Vent header pipe sizes shall be determined in accordance with Table 82.31-3 with the number of drainage fixture units being the sum of the fixture unit loads of the stacks vented through that portion of the header. The diameter of a vent header shall not be less than any vent connecting to it.

2. The developed length of the vent header shall be measured along the pipe from the most distant vent stack or stack vent base connection to the vent terminal.

Note: See Appendix for further explanatory material.

(c) *Branch vents.* Branch vent pipe sizes shall be determined in accordance with Table 82.31-3. The developed length of the branch vent shall be measured along the pipe from the furthest fixture drain served by the branch vent to the point where it connects to a vent pipe of a larger diameter or to a vent terminal.

Note: See Appendix for further explanatory material.

(d) *Individual vents.* Individual vent pipe sizes shall be determined in accordance with Table 82.31-3. The developed length of an individual vent shall be measured along the vent pipe from the fixture drain served by the vent to the point where it connects to a vent pipe of a larger diameter or to a vent terminal.

Note: See Appendix for further explanatory material.

(e) *Common vents.* Common vent pipe sizes shall be determined in accordance with Table 82.31-3. The developed length of a common vent shall be measured along the vent pipe from the drain served by the vent to the point where it connects to a vent pipe of a larger diameter or to the vent terminal.

(f) *Circuit vents.* Circuit vent pipe sizes shall be determined in accordance with Table 82.31-3. The developed length of the circuit vent shall be measured along the vent from the connection with the branch drain

served by the vent to the point where it connects to a vent pipe of a larger diameter or to a vent terminal.

Note: See Appendix for further explanatory material.

(g) *Relief vents.* Relief vents shall be sized in accordance with the provisions of subs. 1. to 4. The developed length of a relief vent shall be measured along the vent from the connection with the branch drain served by the vent to the point where it connects to a vent pipe of a larger diameter or to a vent terminal.

1. Circuit vented branch drain. The diameter of a relief vent for a branch drain served by a circuit vent shall be at least one half the diameter of the branch drain. The maximum developed length shall be determined from Table 82.31-3 based on the number of drainage fixture units served by the vent.

2. Drain stacks. A relief vent serving a drain stack shall be sized as a stack vent in accordance with par. (a).

3. Building drain. The diameter of a relief vent serving a building drain, as required in sub. (7), shall be at least one half the diameter of the building drain. The maximum developed length shall be determined from Table 82.31-3 based on the number of drainage fixture units served by the vent.

4. Horizontal wet vent. The diameter of a relief vent serving a horizontal wet vent shall be at least 1½ inches. The maximum developed length shall be determined from Table 82.31-3 based on the number of drainage fixture units served by the vent.

(h) *Yoke vents.* A yoke vent serving a drain stack shall be sized as a vent stack in accordance with par. (a).

(i) *Vents for sumps.* 1. a. Except as provided in subpar. b., the size of a vent for a sanitary pump with other than a pneumatic ejector, shall be determined in accordance with Table 82.31-4.

b. The size of a vent for a sanitary sump located outside with other than a pneumatic ejector shall be determined in accordance with Table 82.31-4, but shall not be less than 2 inches in diameter.

2. The air pressure relief pipe from a pneumatic ejector shall not be connected to vent or vent system serving a sanitary drain system, storm drain system or chemical waste system.

a. The relief pipe shall be of a size to relieve the air pressure inside the ejector to atmospheric pressure, but shall not be less than 2 inches in diameter where the ejector is located outside and 1¼ inches in diameter for all other ejector locations.

b. The vent shall terminate in accordance with the provisions of sub. (16).

Table 82.31-2

SIZE AND LENGTH OF VENT STACKS AND STACK VENTS										
Diameter of Drain Stack at Base (inches)	Maximum Developed Length of Vent (feet)									
	Diameter of Vent (inches)									
	1½	1½ ^a	2	3	4	5	6	8	10	12
1½	50	150	NL ^b							
2	NP ^c	50	150	NL						
3		NP	50	400	NL					
4		NP	20	180	700	NL				
5			NP	50	200	700	NL			
6			NP	20	70	200	700	NL		
8				NP	25	60	250	800	NL	
10					NP	25	60	250	800	NL
12						NP	25	100	300	900

Note a: Not more than 2 water closets or similar flush action type fixtures of 4 or more drainage fixture units.

Note b: NL means No Limit.

Note c: NP means Not Permitted.

Table 82.31-3

MINIMUM DIAMETERS AND MAXIMUM LENGTH OF INDIVIDUAL, COMMON,
BRANCH AND CIRCUIT VENTS AND VENT HEADERS

Drainage Fixture Units (dfu)	Maximum Developed Length of Vent (feet)									
	Diameter of Vent (inches)									
	1½ ^a	1½ ^b	2	3	4	5	6	8	10	12
2	50	NL ^c								
4	40	200	NL							
8	NP ^d	150	250	NL						
10	NP	100	200	NL						
24	NP	50	150	NL						
42	NP	30	100	500	NL					
72		NP	50	400	NL					
240		NP	40	250	NL					
500		NP	20	180	700	NL				
1100			NP	50	200	700	NL			
1900			NP	20	70	200	700	NL		
3600				NP	25	60	250	800	NL	
5600					NP	25	60	250	800	

Note a: No water closets permitted.

Note b: Not more than 2 water closets or similar flush action type fixtures of 4 or more drainage fixture units.

Note c: NL means No Limit.

Note d: NP means Not Permitted.

Table 82.31-4
SIZE AND LENGTH OF VENTS FOR SANITARY SUMPS

Discharge Capacity of Ejector (gpm)	Maximum Developed Length of Vent ^a (feet)				
	Diameter of Vent (inches)				
	1¼	1½	2	3	4
10	NL ^b				
20	270	NL			
40	72	160	NL		
60	31	75	270	NL	
80	16	41	150	NL	
100	10	25	97	NL	
150	NP ^c	10	44	370	NL
200		NP	20	210	NL
250		NP	10	132	NL
300		NP	10	88	380
400			NP	44	210
500			NP	24	130

Note a: The developed length of the vent is measured along the pipe from the connection to the sump, to the point where it connects to a vent pipe of a larger diameter.

Note b: NL means No Limit.

Note c: NP means Not Permitted.

(15) **VENT GRADES AND CONNECTIONS.** (a) *Vent grade.* All vent and branch vent pipes shall be graded and connected so as to drain back to a drain pipe by means of gravity.

(b) *Installation.* Vents shall be installed in accordance with subs. 1. to 3.

1. Except for wet vent piping, the connection of a vent to horizontal drain piping shall be at a point above the horizontal center line of the drain piping.

2. Except as provided in subs. (12) and (17), vent piping serving a wall-outlet fixture may not offset horizontally less than 36 inches above the floor, but in no case lower than the elevation of the highest flood level rim of any fixture served by the vent.

3. Vent piping may not connect to a branch vent less than 38 inches above the floor, but in no case lower than 2 inches above the elevation of the highest flood level rim of any fixture served by the vent.

Note: See Appendix for further explanatory material.

(16) **VENT TERMINALS.** All vents and vent systems shall terminate in the open air in accordance with this subsection.

(a) *Extension above roofs.* Extensions of vents through a roof shall terminate at least 8 inches above the roof. Where the roof is to be used for any purpose other than weather protection, the vents shall extend at least 7 feet above the roof.

(b) *Waterproof flashings.* The penetration of a roof system by a vent shall be made watertight with an approved flashing.

(c) *Prohibited uses.* Vent terminals shall not be used as flag poles, support for antennas or other similar purposes.

(d) *Location of vent terminals.* 1. A vent shall not terminate under the overhang of a building.

2. All vent terminals shall be located:

- a. At least 10 feet from an air intake;
- b. At least 5 feet from a power exhaust vent;
- c. At least 10 feet horizontally from or 2 feet above roof scuttles, doors and openable windows; and
- d. At least 5 feet from or 2 inches above parapet walls.

3. Where a structure has an earth covered roof extending from surrounding grade, the vent extension shall run at least 7 feet above grade and terminate with an approved vent cap. The portion of vent pipe outside the structure shall be without joints, except one fitting may be installed where the pipe leaves the top or side of the structure.

(e) *Extension through wall.* Where approved by the department, a vent may terminate through an exterior wall. Such a vent shall terminate at least 10 feet horizontally from any lot line and shall terminate downward. The vent shall be screened and shall comply with par. (d).

(f) *Extensions outside buildings.* Drain or vent pipe extensions shall not be located or placed on the outside of an exterior wall of any new building, but shall be located inside the building.

(g) *Frost closure.* For protection against frost closure, each vent terminal shall be at least 2 inches in diameter. Where it is necessary to increase the diameter of the vent, the change in diameter shall be made at least 6 inches inside the building.

(h) *Vents penetrating grade.* Vents penetrating grade shall be of cast iron above the point one foot below grade.

Note: See Appendix for further explanatory material.

(17) COMBINATION DRAIN AND VENT SYSTEMS. In lieu of providing individual vents, fixtures may be vented in accordance with pars. (a) to (c).

(a) *Stacks.* 1. A drain stack may serve as a combination drain and vent system for identical fixtures in accordance with subpars. a. to e.

a. The drain stack shall not serve more than 3 identical fixtures. Each fixture shall be located on a separate floor level.

b. The drain stack shall be limited to serving kitchen sinks with or without food waste grinders or dishwasher connections within dwelling units, drinking fountains and lavatories.

c. The drain stack shall not be offset horizontally above the lowest fixture drain connection.

d. The developed length of any fixture drain from the trap weir to the drain stack shall not exceed the limits specified in Table 82.31-1.

e. The drain stack shall be sized in accordance with Table 82.31-5 and shall extend undiminished in diameter from the connection to the building drain to a vent terminal in accordance with sub. (16).

Note: See Appendix for further explanatory material.

Table 82.31-5

Fixtures Connected	Size of stack (inches)
Drinking Fountains	1½
Lavatories	2
Kitchen Sinks	3

2. A drain stack may serve as a combination drain and vent system for a kitchen sink and a laundry tray in accordance with subpars. a. to d.

a. One kitchen sink within a dwelling unit, with or without a food waste grinder or dishwasher connection shall connect to the drain stack above the laundry tray. No other fixtures may connect to the drain stack.

b. The drain stack shall be at least 2 inches in diameter below the kitchen sink connection and it shall be at least 4 inches in diameter below the laundry tray connection.

c. In lieu of the minimum sizes as required in subpar. b.; the entire stack below the kitchen sink connection may be 3 inches in diameter.

d. The drain stack shall not offset horizontally above the fixture drain connection for the laundry tray.

Note: See Appendix for further explanatory material.

(b) BUILDING DRAINS. A building drain may serve as a combination drain and vent system for floor drains and floor outlet fixtures in accordance with subds. 1. to 6.

1. A vent stack or a drain stack at least 2 inches in diameter shall be connected upstream of any building drain branch.

2. No more than 2 water closets may connect to the building drain by means of building drain branches.

3. a. That portion of the building drain between the connection of the building drain branch and the vent stack or drain stack required in subd. 1. shall be at least one pipe size larger than the minimum size permitted in Table 82.30-3 based on the total drainage fixture unit load.

b. The vent stack or drain stack required in subd. 1. shall be at least one-half the diameter of that portion of the building drain which is vented by the stack, but shall not be less than 2 inches in diameter. The stack shall not diminish in size from the building drain to its termination at a vent terminal.

4. The trap of a floor drain or a floor outlet fixture, except a water closet, connected to a building drain branch shall be at least 3 inches in diameter.

5. A building drain branch shall not connect to a building drain downstream from the base fitting of a drain stack 2 inches or larger in diameter within the distance equal to 20 pipe diameters of the building drain.

6. The pitch and the developed length of the building drain branch shall not exceed the limits specified in Table 82.31-1.

Note: See Appendix for further explanatory material.

(c) *Laboratory sink venting.* A horizontal drain may serve as a combination drain and vent system for island laboratory sinks in accordance with subds. 1. to 7.

1. A vent stack or a drain stack at least 2 inches in diameter shall be connected upstream of any fixture drain vented by the combination drain and vent system.

2. a. That portion of the horizontal drain between the connection of fixture drain and the vent stack or drain stack required in subd. 1. shall be at least one pipe size larger than the minimum size permitted in Table 82.30-2 based on total drainage fixture unit load.

b. The vent stack or drain stack required in subd. 1. shall be at least one-half the diameter of that portion of the horizontal drain which is vented by the stack, but shall not be less than 2 inches in diameter. The stack shall not diminish in size from the building drain to its termination at a vent terminal.

3. All fixture drains vented by the horizontal drain shall be at least 3 inches in diameter.

4. Fixture drains vented by the horizontal drain shall be at least 3 inches in diameter.

5. An individual vent or common vent shall be extended as high as possible under the sink enclosure and then returned vertically downward and connected to the horizontal drain. A cleanout shall be provided on the vent piping.

6. In lieu of connecting the vent to the horizontal drain which forms the combination drain and vent system, the vent may connect to a horizontal fixture drain vented by the combination drain and vent system. The pitch and developed length of the horizontal fixture drain shall not exceed the limits specified in Table 82.31-1.

7. Fixture drains to be vented by the horizontal drain shall not connect to a horizontal drain downstream from the base fitting of a drain stack 2 inches or larger in diameter within the distance equal to 20 pipe diameters of the horizontal drain serving the stack.

Note: See Appendix for further explanatory material.

(18) PROHIBITED USES. A vent or vent system shall not be used for purposes other than the venting of the plumbing system.

(a) *Boiler blowoff basin vents.* Vent piping from boiler blowoff basins shall not be connected to a vent or vent system serving a sanitary drain system, storm drain system or chemical waste system.

(b) *Chemical waste vents.* Vent piping for chemical waste systems shall not be connected to a vent system serving a sanitary drain system or storm drain system.

(c) *Steam vents.* Vents serving steam operated sterilizers, cleansing or degreasing equipment, pressing machines or any other apparatus which Register, February, 1985, No. 350

normally discharges steam into the vent shall not be connected to a vent or a vent system serving a sanitary drain system, storm drain system or chemical waste system.

History: Cr. Register, February, 1985, No. 350, eff. 3-1-85.

ILHR 82.32 Traps and direct fixture connections. (1) **SCOPE.** The provisions of this section set forth the requirements for the types and installation of traps and direct fixture connections.

(2) **MATERIALS.** All traps and fixture connections shall be of approved materials in accordance with ch. ILHR 84.

(3) **GENERAL.** Each plumbing fixture, each compartment of a plumbing fixture and each floor drain shall be separately trapped by a water seal trap, except as provided in par. (a). A fixture shall not be double trapped.

(a) *Trap exceptions.* The plumbing fixtures listed in subs. 1. to 3. shall not be required to be separately trapped:

1. Fixtures having integral traps;
2. Compartments of a combination plumbing fixture installed on one trap, provided:
 - a. No compartment is more than 6 inches deeper than any other;
 - b. The distance between the compartments' waste outlets farthest apart does not exceed 30 inches; and
 - c. No compartment waste outlet is equipped with a food waste grinder.
3. Storm drains as provided in s. ILHR 82.36 (14) (b).

(b) *Trap seals.* Each trap shall provide a liquid seal depth of not less than 2 inches and not more than 4 inches, except as otherwise specified in this chapter.

(c) *Loss of trap seal.* A trap seal primer valve may be installed on a trap subject to high rates of evaporation.

1. A trap seal primer valve shall be installed on a receptor of indirect wastes not subject to year round use.

2. Trap seal primer valves shall conform to ASSE 1018.

Note: A list of referenced standards is contained in ch. ILHR 84.

(d) *Design.* Traps shall be self-scouring and shall not have interior partitions, except where such traps are integral with the fixture. Uniform diameter P-traps shall be considered self-scouring.

(e) *Size.* Traps shall be of diameters not less than those specified in Table 82.30-1 of s. ILHR 82.30.

(f) *Prohibited traps.* The installation of the types of traps listed in subs. 1. to 6. shall be prohibited:

1. Bell traps;
2. Drum traps, except where specifically approved by the department;
3. S-traps which are not integral parts of fixtures;

4. Separate fixture traps which depend on interior partitions for the trap seal;

5. Traps which depend upon moving parts to maintain the trap seal; and

6. Traps which in case of defect would allow the passage of sewer air.

(4) **INSTALLATION.** (a) *Setting of traps.* All traps shall be so located as to be accessible, rigidly supported and set true with respect to the water level and so located as to protect the water seals, and shall be protected from freezing and evaporation.

(b) *Distance from fixture drain outlets.* 1. Vertical distance. Except as provided in subpars. a. to c., the vertical distance between the top of the fixture drain outlet and the horizontal center line of the trap outlet shall not exceed 15 inches.

a. The vertical distance between the top of the strainer of a floor drain or the opening of a standpipe receptor and the horizontal center line of the trap outlet shall not exceed 36 inches.

b. The vertical distance between the top of the fixture drain outlet of a pedestal drinking fountain and the horizontal center line of the trap outlet shall not exceed 60 inches.

c. The vertical distance between the water level in the bowl of a floor outlet water closet and the center line of the horizontal portion of the fixture drain shall not exceed 36 inches.

2. Horizontal distance. The horizontal distance between the vertical center line of a fixture drain outlet and the vertical center line of the trap inlet shall not exceed 15 inches, except the horizontal distance for a pedestal drinking fountain shall not exceed 24 inches.

Note: See Appendix for further explanatory material.

(5) **DIRECT FIXTURE DRAIN CONNECTIONS.** (a) *Floor drains.* 1. Floor drains shall be so located as to be accessible for cleaning purposes.

2. A floor drain receiving the wash from garbage cans shall be at least 3 inches in diameter.

(b) *Kitchen sinks.* Horizontal drain piping serving a kitchen sink trap shall not connect to vertical drain piping by means of a double sanitary tee.

(c) *Water closets.* A water closet shall discharge through a drain pipe or fitting with a minimum diameter of 3 inches.

1. A floor mounted wall outlet water closet shall connect to a 4 inch or 4 × 3 inch closet collar fitting or to a horizontal or vertical carrier type fitting.

2. A floor outlet water closet shall connect to a 4 inch or 4 × 3 inch closet collar fitting. A 4 × 3 inch closet bend fitting may be installed where a 4 inch closet collar fitting is used.

3. A wall mounted wall outlet water closet shall connect to a horizontal or vertical carrier type fitting.

4. Two water closets discharging to a vertical drain from opposite sides by means of the same fitting shall be installed in accordance with subpars. a. and b.

a. Where the vertical drain is 3 inches in diameter, the fitting for floor outlet water closets shall be a 3 inch double wye pattern fitting.

b. Where the water closets are wall outlet types the fitting shall be a double wye pattern fitting or a carrier-type fitting.

History: Cr. Register, February, 1985, No. 350, eff. 3-1-85.

ILHR 82.33 Indirect and local waste piping. (1) **SCOPE.** (a) The provisions of this section set forth the requirements for the installation of indirect waste piping and local waste piping.

(b) Indirect waste piping and local waste piping draining the fixtures, appliances and devices having a public health concern, including but not limited to those listed in Table 82.33-1, shall be considered as plumbing and shall comply with the provisions of this section.

Table 82.33-1
TYPES OF FIXTURES, APPLIANCES AND DEVICES UTILIZING INDIRECT WASTE PIPING AND LOCAL WASTE PIPING

Refrigerated Food Storage	Coffee Makers and Urns
Rooms and Compartments	Food Processing Equipment
Refrigerated Food Display Cases	Baptismal Founts
Ice Compartments	Clothes Washers and Extractors
Vending Machines	Dishwashers
Steam Tables	Stills
Steam Kettles	Sterilizers
Potato Peelers	Bar and Soda Fountains
Egg Boilers	Boiler Blowoff Basin Outlet Drains

(2) **MATERIALS.** Indirect waste piping more than 30 inches in length and all local waste piping shall be of approved materials in accordance with ch. ILHR 84.

(3) **SIZE.** Indirect waste piping more than 30 inches in length and all local waste piping shall be sized in accordance with s. ILHR 82.30, except indirect or local waste piping not exceeding 20 feet in length for refrigerated food display cases may be one inch in diameter.

(4) **INSTALLATION.** Indirect waste piping and local waste piping shall be so installed as to permit access for flushing and cleaning.

(5) **TRAPS.** (a) *Indirect waste piping.* 1. Gravity flow indirect waste piping more than 30 inches in length shall be provided with a trap in accordance with s. ILHR 82.32 (4), except indirect waste piping draining a sterilizer shall not be trapped.

2. All indirect waste piping draining a refrigerated compartment shall be provided with a trap in accordance with s. ILHR 82.32 (4).

(b) *Local waste piping.* Local waste piping handling sanitary wastes and more than 30 inches in length shall be provided with a trap in accordance with s. ILHR 82.32 (4).

(6) **MAXIMUM LENGTH.** Indirect waste piping and local waste piping handling sanitary wastes shall not exceed 30 feet in length horizontally nor 15 feet in length vertically.

(7) **AIR-GAPS AND AIR-BREAKS.** All indirect waste piping and all local waste piping shall discharge by means of an air-gap or air-break into a receptor.

(a) *Air-gap installation.* 1. The distance of an air-gap between indirect waste piping one inch or less in diameter and the receptor shall be at least twice the diameter of the indirect waste piping.

2. The distance of an air-gap between indirect waste piping larger than one inch in diameter and the receptor shall be not less than 2 inches.

(b) *Air-break installation.* The air-break between indirect waste piping or local waste piping and the receptor shall be accomplished by extending the indirect waste piping or local waste piping below the flood level rim of the receptor.

Note: See Appendix for further explanatory material.

(8) **RECEPTORS.** A receptor receiving the discharge from indirect waste piping or local waste piping shall be of a shape and capacity as to prevent splashing or flooding. Receptors shall be installed in accordance with this subsection and shall be accessible.

(a) *Waste sinks and standpipes.* 1. A waste sink or a standpipe serving as a receptor shall have its rim at least one inch above the floor.

2. A waste sink or a standpipe serving as a receptor shall be individually trapped in accordance with s. ILHR 82.32.

(b) *Floor sinks.* A floor sink serving as a receptor shall be equipped with a removable metal basket over which the indirect waste piping or local waste piping is to discharge, or the floor sink shall be equipped with a dome strainer. Indirect waste piping or local waste piping shall not discharge through a traffic grate, but shall terminate over an ungrated portion of the floor sink.

(c) *Local waste piping.* 1. Local waste piping serving as a receptor shall discharge to a waste sink, standpipe or floor sink, except as provided in subd. 2.

2. Local waste piping serving as a receptor for a water heater safety relief valve may discharge to a floor drain.

(d) *Prohibited receptors.* Except as provided in subds. 1. and 2., a plumbing fixture which is used for domestic or culinary purposes shall not be used as a receptor for indirect waste piping or local waste piping.

1. The indirect waste piping of a portable dishwasher may discharge into a kitchen sink of a dwelling unit.

2. The indirect waste piping of an automatic clothes washer may discharge into a laundry tray.

Note: See Appendix for further explanatory material.

(9) **INDIRECT WASTE PIPING REQUIRED.** (a) *Boilers, pressure tanks and relief valves.* Boilers, pressure tanks, relief valves and similar equipment discharging to a drain system shall be by means of an air-gap.

1. Steam pipes shall not connect or discharge to any part of a plumbing system.

2. Waste water more than 160° F. in temperature shall not discharge into any part of a plumbing system.

(b) *Clear water wastes.* 1. Clear water wastes, except those from a drinking fountain, discharging to a drain system shall be by means of an air-gap.

2. The clear water wastes from a drinking fountain discharging to a drain system shall be by means of a direct connection.

(c) *Clothes washers.* 1. Residential types. Residential-type clothes washers shall discharge into the sanitary drain system by means of an air-break.

a. A standpipe receptor shall not extend more than 36 inches nor less than 18 inches above the top of the trap inlet.

b. The top of a standpipe receptor shall terminate at least 32 inches but not more than 42 inches above the floor on which the washer is located.

2. Self-service laundries. Pumped-discharge automatic clothes washing equipment in launderettes, laundromats and self-service laundry establishments shall have the wastes discharge to a drain system by means of standpipes. The standpipes shall be installed in accordance with subd. 1.

a. The maximum number of washers which may be connected to a trap shall be in accordance with Table 82.33-2.

b. Washer wastes shall not be discharged to gutters, troughs, local waste piping, indirect waste manifold or other similar connections.

Table 82.33-2
WASHER CONNECTIONS

Trap Diameter	Maximum Number of Washers
2 inches	2 machines
3 inches	3 machines
4 inches	4 machines

3. Commercial. Gravity discharge-type clothes washing equipment shall discharge by means of an air-break or by other approved methods into a floor receptor, trench or trough.

a. The receptor shall be sized to hold one full simultaneous discharge load from every machine draining into the receptor.

b. The size of the receptor drain shall be determined by the manufacturer's discharge flow rate and the frequency of discharge.

Note: See Appendix for further explanatory material.

c. All wastes from the washers shall flow through a commercial laundry interceptor as specified in s. ILHR 82.34.

(d) *Dishwashing machines.* 1. Residential-type. A residential-type dishwashing machine shall discharge to the sanitary drain system by means of a fixed air-gap or air-break located above the high water level of the dishwashing machine. The indirect waste piping or hose from the dishwashing machine shall not exceed a developed length of 10 feet. The indirect waste piping shall be installed in accordance with one of the methods specified in subpars. a. and b.

a. An air-gap or air-break may be located below a countertop. Where the air-gap or air-break is located below a countertop, the indirect waste piping from the dishwashing machine shall discharge into a standpipe. The standpipe shall be at least 1½ inches in diameter and shall extend at least 12 inches above the trap inlet.

b. An air-gap may be located above a countertop. Where the air-gap is located above a countertop, the indirect waste piping from a dishwashing machine shall discharge into either a standpipe or local waste piping. The standpipe shall be at least 1½ inches in diameter and shall extend at least 12 inches above the trap inlet. The local waste piping shall connect to the fixture drain of a kitchen sink above the trap inlet. Where a hose is used for local waste piping, the developed length shall not exceed 18 inches.

2. Commercial. Commercial dishwashing machines shall discharge into a sanitary drain system by means of a fixed air-gap into a trapped and vented receptor. The indirect waste piping shall not be more than 30 inches in length.

3. Prohibited installations. No dishwashing machine may discharge into or through a food waste grinder.

Note: See Appendix for further explanatory material.

(e) *Drips and drain outlets.* Appliances, devices and apparatus not defined as plumbing fixtures which have drip or drain outlets shall be drained through indirect waste piping into an open receptor by means of an approved air-gap or air-break.

(f) *Elevator pit subsoil and floor drains.* A subsoil or floor drain installed in an elevator pit shall discharge through indirect waste piping for disposal in accordance with s. ILHR 82.36 (3).

1. A sump pump shall not be located in an elevator pit.

2. The sump containing the pump for an elevator pit shall have a submerged inlet constructed to maintain a minimum 6 inch trap seal.

Note: See Appendix for further explanatory material.

(g) *Food handling establishments.* Plumbing fixtures, devices and appurtenances installed in food handling establishments engaged in the storage, preparation, selling, serving or processing of food shall be installed in accordance with this paragraph.

1. Bar and soda fountain sinks. Where a bar or soda fountain sink is so located that the trap for the sink cannot be vented as specified in s. ILHR 82.31, the sink drain shall discharge to the sanitary drain system through indirect waste piping.

a. Where the indirect waste piping is not trapped, the wastes shall be discharged by means of an air-gap.

b. Where the indirect waste piping is trapped, the wastes shall be discharged by means of an air-gap or air-break.

2. Beer taps, coffee makers, glass fillers and soda dispensers. The drip pan from a beer tap, coffee maker, glass filler, soda dispenser or similar equipment shall discharge to the sanitary drain system through indirect waste piping by means of an air-break or air-gap.

3. Novelty boxes, ice compartments and ice cream dipper wells. Novelty boxes, ice compartments and ice cream dipper wells shall discharge to the sanitary drain system through indirect waste piping by means of an air-gap.

a. The indirect waste piping shall not exceed 30 inches in length.

b. The indirect waste piping draining a novelty box or ice compartment shall not discharge or connect to the indirect waste piping or local waste piping of any other fixture, appliance or device other than a novelty box or ice compartment.

4. Refrigerated food storage rooms, compartments and display cases. Drains serving refrigerated food storage rooms, compartments or display cases shall discharge to the sanitary drain system through indirect waste piping. The indirect waste piping shall drain by gravity to a receptor by means of an air-gap or air-break. Where an air-break is installed, the flood level rim of the receptor shall be at least 2 inches below the top of fixture strainer or drain opening in the refrigerated room, compartment or display case.

5. Other equipment. Coffee urns, egg boilers, potato peelers, steam kettles, steam tables, vending machines and similar types of enclosed equipment shall discharge to the sanitary drain system through indirect waste piping by means of an air-gap.

Note: See Appendix for further explanatory material.

(h) *Sterilizers*. Appliances, devices or apparatus, such as stills, sterilizers and similar equipment requiring waste connections and used for sterile materials, shall discharge through indirect waste piping to the sanitary drain system by means of an air-gap.

Note: See s. ILHR 82.50 regarding sterilizer wastes.

(i) *Swimming pools*. 1. Waste water from swimming or wading pools, including pool drainage and backwash from sand filters, shall be discharged to the storm sewer through indirect waste piping.

2. Waste water from floor drains which serve interior walks around pools and backwash from diatomaceous earth filters shall be discharged to the sanitary sewer through indirect waste piping.

3. Where a recirculation pump is used to discharge waste pool water to the drain system, the pump shall discharge to the drain system through indirect waste piping.

4. All indirect waste piping serving pools and pool areas shall discharge by means of an air-gap.

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5. The requirements for sewer connections as specified in ch. HSS 171 shall apply to all swimming pools.

(j) *Vacuum systems — central units.* Central vacuum units shall discharge by means of an air-gap or air break.

Note: For appliances, devices and equipment not included in this section or other sections contact the department for information and proposed installation review.

History: Cr. Register, February, 1985, No. 350, eff. 3-1-85.

ILHR 82.34 Interceptors and catch basins for special and industrial wastes. (1) **SCOPE.** The provisions of this section set forth the requirements for design and installation of interceptors and catch basins to handle special and industrial wastes.

(2) **MATERIALS.** All piping, interceptors and catch basins for special and industrial wastes shall be of approved materials in accordance with ch. ILHR 84.

(3) **GENERAL.** Any deleterious waste material which is discharged into a plumbing system shall be directed to an interceptor, catch basin or other approved device. The interceptor, catch basin or approved device shall be capable of separating the deleterious waste material from the normal sewage and retaining the deleterious waste material to facilitate its periodic removal or treatment or both.

(a) *Deleterious waste materials.* For the purpose of this subsection, deleterious waste materials include any waste material, other than that from dwelling units, which may:

1. Congeal, coagulate or accumulate in drains and sewers, thereby, creating stoppages or retarding the discharge flow;
2. Retard or interfere with municipal sewage treatment processes;
3. Pass through a treatment process and pollute the watercourse receiving the treatment effluent;
4. Create explosive, flammable, noxious, toxic or other hazardous mixtures of materials; or
5. Damage, destroy or deteriorate sewers or piping materials or structures.

Note: See Chapter Ind 8 as to flammable and combustible liquids.

(b) *Private disposal systems.* The special or industrial wastes from any plumbing system which are not discharged into a public sewer system shall be treated or disposed in compliance with the rules of the state agency having jurisdiction. The treatment or disposal system shall be installed so as not to endanger any water supply which is or may be used for drinking, culinary or bathing purposes, or which may create a nuisance, unsanitary conditions or water pollution.

(c) *Velocity control.* Interceptors, catch basins and other similar devices shall be designed, sized and installed so that flow rates shall be developed and maintained in a manner that solid and floating materials of a harmful, hazardous or deleterious nature will be collected in the interceptor for disposal.

- a. Cleanouts are located not more than 100 feet apart;
- b. Manholes are located not more than 400 feet apart;
- c. The distance from a cleanout to a manhole located upstream is not more than 200 feet; or
- d. The distance from a manhole to a cleanout located upstream is not more than 300 feet.

2. Sanitary building sewers 8 inches or larger in diameter shall be provided with manholes at:

- a. Every change in direction of 45 degrees or more;
- b. Every change in pipe diameter; and
- c. Intervals of not more than 400 feet.

(c) *Storm building sewers.* 1. Storm building sewers 10 inches or less in diameter shall be provided with cleanouts or manholes such that:

- a. Cleanouts are located not more than 100 feet apart;
- b. Manholes are located not more than 400 feet apart;
- c. The distance from a cleanout to a manhole located upstream is not more than 200 feet; or
- d. The distance from a manhole to a cleanout located upstream is not more than 300 feet.

2. Storm building sewers 12 inches or larger in diameter shall be provided with manholes or storm drain inlets with an inside diameter of at least 36 inches at:

- a. Every change in direction of 45 degrees or more;
- b. Every change in pipe diameter; and
- c. Intervals of not more than 400 feet.

(d) *Private interceptor main sewers.* 1. Private interceptor main sewers 5 inches or less in diameter shall be provided with a cleanout or manhole at the most upstream point of the private interceptor main sewer and such that:

- a. Cleanouts are located not more than 100 feet apart;
- b. Manholes are located not more than 400 feet apart;
- c. The distance from a cleanout to a manhole located upstream is not more than 200 feet; or
- d. The distance from a manhole to a cleanout located upstream is not more than 300 feet.

2. Private interceptor main sewers 6 inches or larger in diameter shall be provided with a manhole at:

- a. The most upstream point of the private interceptor main sewer;
- b. Every change in direction;

- c. Every change in pipe diameter; and
- d. Intervals of not more than 400 feet.

(e) *Junction of building drain and building sewer.* A cleanout shall be provided near the junction of a building drain and a building sewer.

1. The cleanout shall be located within 5 feet of where the building drain and the building sewer connect. The cleanout may be located either inside or outside the building.

2. A cleanout in a drain stack may serve as the cleanout at the junction of the building drain and building sewer, if the stack is within 5 feet of where the building drain and building sewer connect.

(f) *Stacks.* Where a cleanout is provided in a drain stack, the cleanout shall be located 28 to 60 inches above the lowest floor penetrated by the stack.

(g) *Branches.* Cleanouts shall be provided in connection with batteries of fixtures at such points that all parts of the branch drain pipes may be reached for cleaning or removal of stoppages. For the purposes of this requirement, removable fixture traps may serve as a cleanout opening.

(h) *Greasy wastes.* Drain pipes carrying greasy wastes shall be provided with cleanouts located not more than 40 feet apart and at all changes in direction of more than 45°.

(i) *Double sanitary tees.* A cleanout shall be provided immediately above or below a double sanitary tee drain fitting which is installed in a vertical drain pipe of less than 3 inches in diameter, unless a stack cleanout is provided in accordance with par. (e).

(j) *Traps.* All fixture traps shall be designed and installed so that stoppages may be removed from the traps.

1. Except as provided in subd. 2., all fixture traps 2 inches or less in diameter shall have cleanouts of the screw plug or removable dip type. Where the dip is removable, the coupling nut on the discharge side of the trap shall be within the dip of the trap.

2. Traps for urinals rising from the floor and traps serving showers, bathtubs and floor drains, when inaccessible, shall be so installed as to make the removable inlet serve as a cleanout for the trap.

(k) *Conductors.* Where a cleanout is provided in a conductor, the cleanout shall be located 28 to 60 inches above the lowest floor penetrated by the conductor.

(1) *Sampling manholes.* Municipalities or sanitary sewage districts by ordinance or rule may require the installation of sampling manholes for periodic sewage monitoring.

Note: The installation of sampling manholes may be needed for the monitoring of industrial wastes under chs. NR 200 to 299.

(4) **DIRECTION OF FLOW.** Every cleanout shall be installed so as to open in the direction of the waste flow or at a right angle thereto.

(5) **ACCESSIBILITY.** Cleanout plugs shall not be covered with cement, plaster, or any other similar permanent finishing material.

(a) *Underground piping.* Cleanouts installed in underground drain piping shall be extended vertically to or above the finish grade.

1. The cleanout extension to grade shall connect to the drain piping through a wye pattern fitting.

2. A cleanout located outside of a building shall be provided with a frost sleeve.

a. The frost sleeve shall be of a material approved for building sewers in accordance with s. ILHR 84.30 (1) (c).

b. Where a cleanout is located in an area subject to vehicular traffic the top of the frost sleeve shall terminate in a concrete pad at least 4 inches thick and extending at least 9 inches from the sleeve on all sides, sloping away from the sleeve.

c. The bottom of the frost sleeve shall terminate 6 to 12 inches above the top of the drain piping.

d. The frost sleeve shall have a removable watertight top of sufficient thickness and strength to sustain the weight of anticipated traffic.

Note: See Appendix for further explanatory material.

(b) *Concealed piping.* Cleanout access for drain piping located in concealed spaces shall be provided by either extending the cleanout to at least the surface of a wall or floor or by providing access panels of a sufficient size to permit removal of the cleanout plug and proper cleaning of the pipe.

(6) **CLEANOUT SIZE.** Cleanouts and cleanout extensions shall be sized in accordance with Table 82.35.

Table 82.35
CLEANOUT SIZES

Diameter of Pipe Served by Cleanout (inches)	Minimum Diameter of Cleanout Extension (inches)	Minimum Diameter of Cleanout Opening (inches)
1½	1½	1½
2	1½	1½
3	3	2½
4	4	3½
5	5	4
6	6	5
8 and larger	6	6

(7) **PROHIBITED USE OF CLEANOUT OPENINGS.** Cleanout openings shall not be used for the installation of fixtures or floor drains, except where another cleanout of equal access and capacity is provided.

(8) **MANHOLES.** (a) *Diameter.* The minimum diameter of manholes shall be 42 inches. A manhole shall have a minimum access opening of 24 inches.

(b) *Materials.* Manholes shall be constructed of approved materials in accordance with ch. ILHR 84 and in accordance with the design provisions of NR 110.13.

Note 1: The provisions of NR 110.13 regarding the manhole's flow channel, watertightness, and drop pipe indicate the following specifications:

- The flow channel through manholes shall be made to conform to the shape and slope of the sewer. See Appendix for further explanatory material.

- Solid watertight manhole covers are to be used wherever the manhole tops may be flooded by street runoff or high water. Where groundwater conditions are unfavorable, manholes of brick or block shall be waterproofed on the exterior with plastic coatings supplemented by a bituminous waterproof coating or other approved coatings. Inlet and outlet pipes are to be joined to the manhole with a gasketed flexible watertight connection or any watertight connection arrangement that allows differential settlement of the pipe and manhole wall to take place.

- An outside drop pipe is to be provided for a sewer entering a manhole where the invert elevation of the entering sewer is 2 feet or more above the spring line of the outgoing sewer. The entire drop connection shall be encased in the concrete. Inside drop connection may be approved on a case-by-case basis.

Note: See Appendix for further explanatory material.

History: Cr. Register, February, 1985, No. 350, eff. 3-1-85.

ILHR 82.36 Storm and clear water drain systems. (1) **SCOPE.** The provisions of this section set forth the requirements for the design and installation of storm and clear water drain systems including storm building drains and sewers.

(2) **MATERIALS.** All storm and clear water drain systems shall be constructed of approved materials in accordance with ch. ILHR 84.

(3) **DISPOSAL.** (a) *Storm sewer.* Storm water, surface water, groundwater and clear water wastes shall be drained to a storm sewer where available.

(b) *Other disposal methods.* 1. Where no storm sewer system is available or exists or is not adequate to receive the anticipated load, the storm water, surface water, groundwater and clear water wastes shall be discharged in accordance with local governmental requirements.

2. Where approved by the local governmental authority, storm water, surface water, groundwater and clear water wastes of the properties of one- and 2-family dwellings may be discharged onto flat areas, such as streets or lawns, so long as the water flows away from the buildings and does not create a nuisance.

(c) *Segregation of wastes.* 1. Storm and clear water wastes shall not discharge to any part of a sanitary drain system, nor shall sanitary wastes discharge to any part of a storm or clear water drain system; except the clear water wastes of a refrigerated drinking fountain, water heater relief valve or water softener may discharge to a sanitary drain system.

2. Storm water wastes and clear water wastes shall not be combined until discharging into the storm building drain.

(4) **LOAD ON DRAIN PIPING.** (a) *Storm water drainage.* The load factor on storm water drain piping shall be computed in terms of gallons per minute or on the square footage of the horizontal projection of roofs, paved areas, yards and other tributary areas.

(b) *Continuous flow devices.* Where there is a continuous or semicontinuous discharge into the storm building drain or storm building sewer, as from a pump, air conditioning unit, or similar device, each gallon per minute of such discharge shall be computed as being equivalent to 26 square feet of roof area.

(5) **SELECTING SIZE OF STORM AND CLEAR WATER DRAIN PIPING.** (a) *Horizontal storm water drain piping.* The pipe size for horizontal drain piping for storm water shall be determined from Tables 82.36-1 to 82.36-4.

Table 82.36-1

**MINIMUM SIZE OF STORM WATER HORIZONTAL DRAIN PIPING
SERVING ROOF AREAS**

Pipe Diameters (in inches)	Maximum Roof Areas (in square feet)			
	Pitch of Piping Per Foot			
	1/16 inch	1/8 inch	1/4 inch	1/2 inch
3	650	910	1,300	1,820
4	1,300	1,950	2,990	3,770
5	2,470	3,640	5,070	7,020
6	4,160	5,980	8,320	11,700
8	9,320	13,000	18,200	26,000
10	17,680	24,700	33,800	50,440
12	27,300	41,080	57,200	81,900
15	52,000	72,800	105,300	146,640
18	85,800	121,550	174,200	247,000
21	156,520	179,660	256,880	374,400
24	187,200	261,560	382,200	546,000

Note: Divide square footage by 26 to obtain flow in gpm.

Table 82.36-2

**MINIMUM SIZE OF STORM WATER HORIZONTAL DRAIN PIPING SERVING
PAVED OR GRAVELED GROUND SURFACE AREAS**

Pipe Diameters (in inches)	Maximum Surface Areas (in square feet)			
	Pitch of Piping Per Foot			
	1/16 inch	1/8 inch	1/4 inch	1/2 inch
3	810	1,140	1,625	2,270
4	1,625	2,430	3,740	4,720
5	3,090	4,550	6,350	8,760
6	5,200	7,470	10,400	14,600
8	11,650	16,250	22,750	32,600
10	22,100	30,850	44,250	63,000
12	34,150	52,300	71,500	102,200
15	65,000	91,000	131,500	183,000
18	107,000	152,000	210,800	321,000
21	195,000	224,000	321,000	468,000
24	234,000	336,000	478,000	682,000

Note: Divide square footage by 32.5 to obtain flow in gpm.

Table 82.36-3

**MINIMUM SIZE OF STORM WATER HORIZONTAL DRAIN PIPING SERVING
LAWNS, PARKS AND SIMILAR LAND SURFACES**

Pipe Diameters (in inches)	Maximum Surface Areas (in square feet)			
	Pitch of Piping Per Foot			
	1/16 inch	1/8 inch	1/4 inch	1/2 inch
3	2,600	3,640	5,200	7,280
4	5,200	7,800	11,960	15,080
5	9,880	13,560	20,280	28,080
6	16,640	23,920	33,280	46,800
8	37,280	52,000	72,800	112,000
10	69,720	98,800	135,200	201,760
12	109,200	164,320	228,800	327,600
15	208,000	291,200	421,200	586,560
18	343,200	490,200	596,800	983,000
21	626,080	718,640	1,027,520	1,497,600
24	748,800	1,046,240	1,528,800	2,184,000

Note: Divide square footage by 104 to obtain flow in gpm.

Table 82.36-4

**MAXIMUM CAPACITY OF STORM WATER
HORIZONTAL DRAIN PIPING FLOWING FULL**

Pipe Diameters (in inches)	Maximum Capacities in Gallons Per Minute			
	Pitch of Piping Per Foot			
	1/16 inch	1/8 inch	1/4 inch	1/2 inch
3	25	35	50	70
4	50	75	115	145
5	97	140	195	270
6	160	230	320	450
8	355	500	700	1,000
10	680	950	1,300	1,940
12	1,050	1,580	2,200	3,150
15	2,000	2,800	4,050	5,640
18	3,300	4,675	6,700	9,500
21	6,020	6,910	9,880	14,400
24	7,200	10,060	14,700	21,000

(b) *Vertical conductors for storm water.* 1. A vertical conductor for storm water shall not be smaller than the largest horizontal branch connected thereto.

2. Vertical conductors shall be sized in accordance with Table 82.36-5 or the diameter D, where

$$D = 1.128 \sqrt{\frac{A}{X}}$$

Where, A = the area of the roof in square feet

X = 300 square feet per square inch for a roof covered with gravel or slag and with a pitch not exceeding ¼ inch per foot; or

= 250 square feet per square inch for a roof covered with gravel or slag and with a pitch of greater than ¼ inch per foot; or

= 200 square feet per square inch for a roof with a metal, tile, brick or slate covering and of any pitch.

Table 82.36-5
MINIMUM DIAMETER OF VERTICAL CONDUCTORS

Type of Roof	Maximum Roof Areas (in square feet)					
	Pipe Diameters (in inches)					
	2½	3	4	5	6	8
Roofs covered with gravel, slag, or similar material and with a pitch of ¼" per foot or less.	1,645	2,120	3,780	5,885	8,490	15,125
Roofs covered with gravel, slag or similar material and with a pitch greater than ¼" per foot.	1,220	1,770	3,150	4,905	7,075	12,600
Roofs covered with metal, tile, brick, slate or similar material and of any pitch.	975	1,415	2,520	3,925	5,660	10,080

Note: Divide square footage by 26 to obtain flow in gpm.

(c) *Clear water drain piping.* Drain piping for clear water shall be sized in accordance with ss. ILHR 82.30 (3) and (4).

(d) *Minimum size of underground drain piping.* Any portion of a storm or clear water drain system installed underground shall not be less than 2 inches in diameter. Underground drain piping which is 2 inches in diameter shall not exceed a length of 20 feet.

(e) *Minimum size of storm building sewers.* The pipe size for storm building sewers shall be determined from Tables 82.36-1 to 82.36-4. Storm building sewers serving combined storm water and clear water wastes shall be sized in accordance with Table 82.36-4.

1. Gravity flow sewers. a. The minimum size of a gravity flow storm building sewer shall be 3 inches in diameter between the building and lot line and 4 inches in diameter between the lot line and public sewer or private interceptor main sewer. A municipality or sanitary district by ordinance may require that portion of the storm building sewer between the lot line and public sewer or private interceptor sewer to be larger than 4 inches in diameter.

b. A gravity flow storm building sewer shall not be smaller than any storm building drain connected thereto, except a decrease in diameter in the direction of flow will be permitted if the increase in slope is sufficient to maintain the volume rate of flow. A reduction in diameter for the storm building sewer shall be made in a manhole.

2. Pressurized or forced sewers. Pressurized storm building sewers shall be not less than 1¼ inches in diameter.

(6) **PITCH OF HORIZONTAL DRAIN PIPING.** All horizontal drain piping shall be installed at a pitch which will produce a computed velocity of at least one foot per second when flowing full.

(a) *Storm water drain piping.* The minimum pitch of horizontal drain piping shall be in accordance with Tables 82.36-1 to 82.36-4.

(b) *Clear water drain piping.* The minimum pitch of horizontal clear water drain piping less than 3 inches in diameter shall be 1/8 inch per foot. The minimum pitch of horizontal drain piping 3 inches or larger in diameter shall be 1/16 inch per foot.

(7) **CHANGES IN DIRECTION OF FLOW.** Changes in direction of flow for storm and clear water drain piping shall be in accordance with s. ILHR 82.30 (8).

(8) **DRAINAGE FITTINGS AND CONNECTIONS.** Drain piping fittings and connections shall be in accordance with s. ILHR 82.30 (9).

(9) **STACK OFFSETS.** Stack offsets in clear water drain piping shall comply with s. ILHR 82.30 (6).

(10) **FIXTURE BRANCH CONNECTIONS NEAR BASE OF STACK.** Branch drains from interior clear water inlets shall not connect downstream from the base fitting or fittings of a drain stack or conductor within the distance equal to 20 pipe diameters of the building drain.

(11) **SUMPS AND PUMPS.** (a) *Sumps.* 1. General. All storm building sub-drains shall discharge into a sump, the contents of which shall be automatically lifted and discharged into the storm drain system.

2. Construction and installation. The sump shall have a rim extending at least one inch above the floor immediately adjacent to the sump, except where the sump is installed in an exterior meter pit. The sump shall have a removable cover of sufficient strength for anticipated loads. The sump shall have a solid bottom.

3. Location. All sumps installed for the purpose of receiving clear water, basement or foundation drainage water shall be located at least 15 feet from any water well.

4. Size. The size of each clear water sump shall be as recommended by the sump pump manufacturer, but shall be not smaller than 18 inches in diameter and 24 inches in depth.

(b) *Sump pump systems.* 1. Pump size. The pump shall have a capacity appropriate for anticipated use.

2. Discharge piping. Where a sump discharges into a storm building drain or sewer, a free flow check valve shall be installed.

(12) **SUBSOIL DRAINS.** Where a subsoil drain for a building is subject to backwater, it shall be protected by an accessible backwater valve or a sump with pump. Subsoil drains may discharge into an area drain, drain tile receiver or a sump with pump.

(13) **STORM BUILDING DRAINS AND SEWERS.** The interior plumbing of each building shall be entirely separated and independent of any other building's plumbing. All storm drain systems shall be connected by means of independent connections with a public sewer or private inter-

ceptor main sewer. No storm building sewer may pass under or through a building to serve another building.

(a) *Extensions to grade.* 1. The connection of a storm water leader discharging to a storm building drain or storm building sewer shall be made above the finished grade. That portion of the piping from the leader to at least one foot below grade shall be of cast iron.

2. The diameter of the drain piping connecting a storm water leader to a storm building drain or sewer shall be in accordance with sub. (5).

(b) *Other requirements.* 1. The elevation of storm building drains shall comply with s. ILHR 82.30 (11) (a) 1.

2. Storm building drains subject to backflow or backwater shall be protected in accordance with s. ILHR 82.30 (11) (a) 2.

3. The location of storm building drains and building sewers shall be in accordance with s. ILHR 82.30 (11) (c).

4. Storm building drains and building sewers shall be installed in accordance with s. ILHR 82.30 (11) (d).

5. Storm building sewers shall be connected to main sewers in accordance with s. ILHR 82.30 (11) (e).

(14) **TRAPS FOR STORM AND CLEAR WATER BASES.** (a) Traps shall be required for interior drain inlets receiving clear water wastes.

(b) Traps shall not be required for roof drains or exterior area drains for storm water waste, unless the drain inlet is located within 10 feet of an air inlet, door or openable window. Where a trap is required, the trap may be located inside the building. More than one drain inlet may discharge to the same trap.

(c) Where a subsoil drain discharges by gravity to a storm sewer the drain shall be trapped. Such a trap shall be provided with a cleanout.

(15) **VENTS.** (a) A trap receiving clear water wastes shall be vented in accordance with s. ILHR 82.31. Vent piping for a clear water drain system shall not be connected to a vent system serving a sanitary drain system or chemical waste system.

(b) Vents shall not be required for traps which receive only storm water or groundwater wastes.

(16) **INTERIOR DRAIN INLETS.** Interior clear water drain inlets shall terminate at least one inch above the finished floor.

(17) **AREA DRAIN INLETS.** (a) *Drain inlet design and construction.* 1. General. Storm water area drain inlets shall be constructed in a water-tight and substantial manner of approved materials in accordance with ch. ILHR 84.

2. Inlet base. All site-constructed storm water area drain inlets subject to vehicular traffic shall be set on a 6 inch thick air-entrained concrete base with a minimum estimated compressive strength at 28 days of 3000 psi or on an approved precast concrete base.

3. Size. The size of masonry or concrete inlet basins shall be in accordance with subpars. a. and b.

a. Inlet basins 36 inches or less in depth shall have a minimum inside diameter of 24 inches. Basins shall be provided with an open bar grate not less than 18 inches in diameter.

b. Inlet basins with a depth greater than 36 inches shall have a minimum inside diameter of 36 inches. Basins shall be provided with an open bar grate not less than 24 inches in diameter.

4. Inlet grates. All inlets shall have an approved, well fitted, removable cast iron or steel grate of a thickness and strength to sustain anticipated loads. The grate shall have an available inlet area equal to or greater than the required waste outlet of the inlet.

Note: See Appendix for further explanatory material.

(b) *Subsurface areas of 50 square feet or less.* All subsurface areas, exposed to the weather, other than stairwells, with areas not exceeding 50 square feet shall be drained. These areas may drain to subsoil drains though a minimum 2 inch diameter pipe or a continuous layer of gravel or may drain to the storm building drain, storm subdrain, or storm sewer through a minimum 3 inch diameter pipe.

(c) *Subsurface areas of more than 50 square feet and stairwells.* An area drain shall be provided in subsurface areas, greater than 50 square feet in area, and all stairwells which are exposed to the weather. These areas shall be drained to the storm building drain, storm subdrain or storm sewer. If no storm sewer exists, the discharge shall be in accordance with sub. (3) (b). The fixture drain shall have a minimum inside diameter of 3 inches and shall not discharge into a subsoil, footing or foundation drain.

(18) **ROOF DRAINS.** (a) *General roofs.* Roof drains shall be equipped with strainers extending not less than 4 inches above the surface of the roof immediately adjacent to the roof drain. Strainers shall have an available inlet area above the roof of not less than 1½ times the area of the conductor to which the drain connects.

(b) *Flat decks.* Roof drain strainers for use on sun decks, parking decks and similar areas may be of the flat surface type level with the deck, and shall have an available inlet area of not less than twice the area of the conductor to which the drain connects.

(19) **CONTROLLED FLOW ROOF DRAIN SYSTEMS.** (a) *Application.* In lieu of sizing the roof storm drain piping on the basis of actual maximum horizontal projected roof areas as specified in sub. (4), the roof drain piping may be sized based on the equivalent adjusted maximum horizontal projected roof areas which result from controlled flow and storage of storm water on the roof.

Note: See s. Ind 53.11 (4) (d) as to provisions relating to the structural design of the roof for controlled flow drain systems.

(b) *Installation.* Control of storm water runoff shall be by control devices. Control devices shall be protected by strainers.

(c) *Sizing.* Not less than 2 drains shall be installed in roof areas 10,000 square feet or less and at least 4 drains in roofs over 10,000 square feet in area.

History: Cr. Register, February, 1985, No. 350, eff. 3-1-85.

Subchapter IV
Water Supply Systems

ILHR 82.40 Water distribution systems. (1) GENERAL REQUIREMENTS. Every building equipped with plumbing fixtures and used for human occupancy or habitation shall be provided with a potable supply of cold water. No water service shall pass under or through a building to serve another building. In residences and buildings serving the public and places of employment, hot water shall be provided.

(2) **WATER SERVICE. (a) Size.** The minimum inside diameter of a water service pipe shall be $\frac{3}{4}$ -inch. The minimum size water service pipe may be increased by the local government or the utility by published ordinance or rule approved by the department. The size of the water service shall be determined by the requirements of sub. (4) (b) or (c). When sub. (4) (c) is used, the minimum pressures specified in sub. (4) (c) 1. g., shall be included in the calculations.

(b) **Materials.** The water service systems shall be constructed of approved materials in accordance with ch. ILHR 84. Any materials used within bounds of, or beneath an area subject to easement for highway or street purposes or public service right-of-ways, shall be subject to acceptance by the local government or the utility by published ordinance or rule approved by the department.

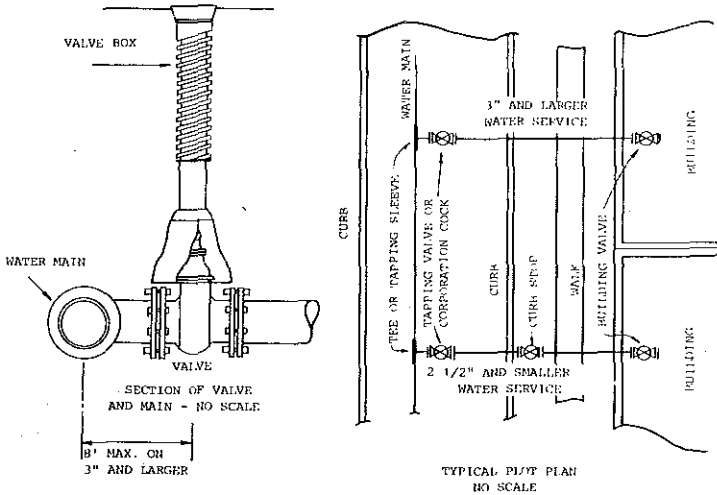
(c) **Valve controls.** Water service controls shall include a corporation cock or valve at the main, a curb stop at or near the property line and inside the wall of each building and on the water distribution side of the water meter.

Note: The water service terminates at the meter valve or within 3 feet where the pipe penetrates the building floor or wall.

1. The corporation cock or valve at the main shall be a ground key stop-cock. An approved gate valve may be used for services 3 inches or larger.

2. The curb stop shall be an approved gate valve, ground key stop-cock or a ball valve which shall be installed between the curb and the property line. When a private water supply serves more than one building a curb stop is required for each building. For a water service 3 inches or larger, one valve may serve as the shut off at the main and for the curb stop. See following sketch.

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3. Building and meter valves. An approved valve shall be provided at the meter or at a point not more than 3 feet inside where the service penetrates the building floor or wall and another on the water distribution side of the meter. A valved bypass shall be provided for all 1½ inch or larger water meters. The bypass may be a minimum of one nominal pipe size smaller than the water service. When parallel meters are installed, a bypass may not be required provided the other meter(s) adequately serve the building water distribution requirements.

4. Prohibited valves. Combination stop and waste valves shall not be installed underground in water service piping. Frost-proof yard hydrants shall be approved by the department.

(d) *Separation of water service and building sewers.* 1. Except as permitted below, the underground water service pipe and building sewer shall not be less than 8 feet apart horizontally and shall be separated by undisturbed or compacted earth. The water service pipe may be placed in the same trench with the building sewer under the following conditions:

- a. The water service and the building sewer are installed concurrently.
- b. The bottom of the water service pipe at all points shall be at least 12 inches above the top of the sewer line.
- c. The water service pipe shall be placed on the solid shelf excavated at one side of the common trench or the water service be installed at the side of the common trench with the 12 inches of bedding material meeting the following criteria. The initial backfill on the sides of the sewer pipe and to the 12-inch depth above the sewer shall be well tamped prior to installing the water service pipe. The bedding material shall be of medium to coarse sand, pea gravel or rock screenings.
- d. The number of joints in the water service pipe shall be kept to a minimum.

e. The water service shall be located a minimum of 10 feet from a septic tank or soil absorption site.

f. The materials and joints of water service pipe shall be installed in such a manner and shall possess the necessary strength and durability to prevent the escape of liquids and gases therefrom under adverse conditions such as corrosion, strain due to temperature changes, settlement, vibrations and superimposed loads.

2. Where the building sewer is existing, the water service pipe shall be installed in a separated trench pursuant to subd. 1., excepting a replaced water service may be installed pursuant to subd. 1. b. and c.

(3) **FIXTURE SUPPLY.** (a) *Potable water.* Only potable water shall be used in the processing of food, medical or pharmaceutical products, serving plumbing fixtures, appliances and appurtenances.

(b) *Identification.* Where 2 or more distribution systems are installed, each system shall be identified either by color marking, metal tags or other methods as may be approved by the department. All valves shall be tagged potable or nonpotable water.

1. *Color marking.* When color marking is used, potable water lines should be painted green and nonpotable water lines should be painted yellow. This requirement may be met by painting 3-inch wide bands at intervals of not more than 25 feet and at points where piping passes through walls, floors or roofs, in which case the bands shall be applied to the piping on both sides of the walls and both above and below the floor or roof. Points of outlets for nonpotable water shall be marked with a tag or color coded.

2. *Metal tags.* When tags are used, potable waterlines and valves shall be identified by 3-inch diameter metal tags bearing the legend **SAFE WATER** in letters not less than ½-inch in height. Nonpotable water lines and valves shall be identified by firmly attached metal tags having the shape of a 4-inch equilateral triangle bearing the legend **WATER UNSAFE** in letters not less than 7/16-inch in height. As in the use of color bands, tags shall be attached to pipes at intervals of not more than 25 feet and at either side of points where pipes pass through walls and above and below points where pipes pass through floors or roofs.

(4) **WATER SERVICE AND DISTRIBUTION DESIGN.** (a) *Design.* Water distribution piping systems shall be designed and installed so the maximum velocity through the piping shall not exceed 8 feet per second. Sizing of the water service and distribution system may be calculated and designed in accord with par. (b) or (c), whichever is applicable. Where street main pressures fluctuate, the water service, water meter and building distribution shall be designed for the minimum pressure available.

(b) *Sizing the water service and water distribution system by tables.* 1. *Limitations.* Where the total developed length of the water service is 75 feet or less and the total developed length of the water service and water distribution piping is 250 feet or less and the quantity of the water supply demand in total water supply fixture units, as determined from table 13 does not exceed the fixture units listed in tables 13a, 13b or 13c, the minimum size of the water service shall be determined from table 13a, 13b or 13c.

2. The following information is required. a. Pressures and elevations.

1) Maximum and minimum pressure at the water main or other supply source. The minimum pressure at the main is used for design purposes.

The maximum design pressure of the water distribution system is 80 p.s.i.g.

2) The difference in elevation between the street main or other source and the highest fixture or outlet and the pressure loss through any equipment such as a water conditioner, water meter, water heater, water filter, pressure regulator, pressure reducing valves, reduced pressure backflow preventer or similar devices.

b. Length. The total developed length of the piping from the water main or other source of supply to the furthestmost fixture.

c. Supply demand. The number of total water supply fixture units (s.f.u.) for all fixtures and other water uses as specified in table 13.

Note: See subd. 2. d., for sizing the water service and distribution when flush valves are installed.

d. Supply demand; Flush valves. Branches, mains and risers serving water closet or similar flush valves may be sized from table 13a, 13b or 13c, when the following values are assigned to each flushometer valve by beginning with the most remote valve on each branch.

First	flushometer valve		40	fixture units
Second	"	"	30	" "
Third	"	"	20	" "
Fourth	"	"	15	" "
Fifth	"	"	10	" "

Five fixture unit value flushometer valves may be computed at half the above values. After the fifth flushometer valve on any main, branch or riser, fixture loadings may be computed using the values given in table 13. No piping supplying a flushometer valve shall be less than the valve inlet.

3. Sizing the water service. a. Table selection. After determining the minimum water pressure at the source as specified in 2. a. 1), subtract $\frac{1}{2}$ pound per square inch of pressure for each 1 foot of difference in elevation between the source and the highest fixture and any pressure loss through equipment as specified subd. 2. a. 2). Select table 13a, 13b or 13c with the pressure ranges that contain the calculated pressure.

b. Length column selection. Select the length column that is equal to or greater than the total developed length.

c. Size column selection. Follow down the column to a fixture unit value (s.f.u.) equal to or greater than the total number of fixture units required for the installation. The size of the water service will be found in the column labeled water service.

4. Sizing the water distribution system. Starting at the most remote fixture on the cold water supply and the hot water supply, apply the cold water or hot water fixture supply demand units as applicable from table 13 to the cold water or hot water supply adding the fixture units as additional fixtures are connected. Using table 13a, 13b or 13c, as selected in subd. 3. a., and the length column selected in subd. 3. b., select a horizontal line that meets or exceeds the fixture unit demand of that section of piping. Except for the minimum requirements in par. (c) 1. e., f. and table 15, the size of the water distribution main, water distribution branch, fixture supply branches and risers will be found in the column

labeled building distribution. The water distribution main serving water heaters and the cold water demand shall be sized to deliver the above required hot water demand, plus all required cold water demands but in no case need the piping be larger than that required for the total building supply as computed in subd. 4.

Table 13
WATER SUPPLY FIXTURE DEMAND UNITS

Fixture	Occupancy	Type Control	Weight in Fixture Units		
			Hot	Cold	Total
Water Closet	Public	FL. Valve		10.	10.
Water Closet	Public	FL. Tank		5.	5.
Urinal	Public	1/2" FL. Valve		5.	5.
Urinal	Public	3/4" FL. Valve		5.	5.
Lavatory	Public	Faucet	1.5	1.5	2.
Bath tub or Shower Head	Public	Faucet	3.	3.	4.
Service Sink	Offices, etc.	Faucet	2.25	2.25	3.
Kitchen Sink	Hotels-Restaurants	Faucet	3.	3.	4.
Drinking Fountain	Offices, etc.	3/8 Valve		0.25	0.25
Water Closet	Private	FL. Valve		6.	6.
Water Closet	Private	FL. Tank		3.	3.
Lavatory	Private	Faucet	0.75	0.75	1.
Lavatory-Treatment or Clinical	Public	Faucet	1.	1.	1.5
Bath tub or Shower Head	Private	Mixing Valve	1.5	1.5	2.
Kitchen Sink	Private	Faucet	1.5	1.5	2.
Laundry Trays (1 to 3 compartments)	Private	Faucet	2.25	2.25	3.
Combination Fixture	Private	Faucet	2.25	2.25	3.
Dishwashing Machine	Private	Automatic	1.		1.
Emergency Eyewash	Public	Faucet		1.	1.
Laundry Machine (8 lb)	Private	Automatic	1.5	1.5	2.
Laundry Machine (8 lb)	Public or General	Automatic	2.25	2.25	3.
Laundry Machine (Large)	Refer to Manufacturer's Requirements				
Bathroom Group	Private	FL. Valve	2.25	8.25	9.
Bathroom Group	Private	FL. Tank	2.25	5.25	6.
Bidet	Public	Variable	3.00	3.00	4.
Coffee Urn Stand	Public	Variable		2.	2.
Food Waste Grinder	Public	Variable			
			Manufacturer's Requirements		
Hose-Pre-Rinse	Public	Variable	2.5	2.5	3.
Hose Station	Public	Variable	3.0	3.0	4.
Ice Maker	Public	Variable		1.	1.
Sink - Baker's Pan	Public	Variable	2.5	2.5	3.
Sink - Back Bar	Public	Variable	1.5	1.5	2.
Sink - Barber and Shampoo	Public	Faucet	1.5	1.5	2.
Sink - Cook's	Public	Variable	2.5	2.5	3.
Sink - Cup	Public	Variable		1.	1.
Sink - Diet Kitchen	Public	Variable	1.5	1.5	2.
Sink - Laboratory	Public	Variable	1.5	1.5	2.
Sink - Laboratory and Trough	Public	Variable	1.5	2.5	3.
Sink - Meat Preparation	Public	Variable	2.5	2.5	3.
Sink - Pot and Pan (Per Faucet)	Public	Variable	3.	3.	4.
Sink - Salad Preparation	Public	Variable	2.5	2.5	3.
Sink - Silver Soak	Public	Variable	2.5	2.5	3.
Sink - Treatment or Exam	Public	Variable	1.5	1.5	2.
Sink - Vegetable	Public	Variable	2.5	2.5	3.
Ice Cuber & Flakers	Public	Variable		1.	1.
Hosebibb - Wall Hydrant	Public and Private	Variable		4.	4.
Wall Hydrant C.W. & H.W.	Public and Private	Variable	3.	3.	4.
Wash Fountain - Factory	Public	Variable	1.5	1.5	2.
Wash-up (20" = 1 Lav Space)					

"Private" fixtures are those in residential areas not freely accessible, such as in private homes, residential apartments, hotel guest rooms, private rooms or apartments in residential hotels, dormitories or executive suites and the like.

Table 13a

**MAXIMUM FIXTURE UNITS (s.f.u.) WATER SERVICE AND DISTRIBUTION
SIZING CALCULATED PRESSURE RANGE 30 THROUGH 45 PSI**

Water Service Not to Exceed 75 Feet	Building Distribution	Maximum Total Developed Allowable Length In Feet				
		75	100	150	200	250
3/4"	3/4"	20	18	15	12	9
3/4"	1"	20	18	16	16	15
1"	1"	30	27	24	21	20
1"	1-1/4"	39	36	32	30	28
1-1/4"	1"	32	32	32	28	23
1-1/4"	1-1/4"	56	49	44	35	32
1-1/4"	1-1/2"	56	56	56	51	48
1-1/2"	1-1/4"	56	56	56	56	56
1-1/2"	1-1/2"	109	103	84	63	56
1-1/2"	2"	127	123	111	103	86
2"	1-1/2"	111	111	111	78	66
2"	2"	275	264	186	175	146

Table 13b

**MAXIMUM FIXTURE UNITS (s.f.u.) WATER SERVICE AND DISTRIBUTION
SIZING CALCULATED PRESSURE RANGE 46 THROUGH 60 PSI**

Water Service Not to Exceed 75 Feet	Building Distribution	Maximum Total Developed Allowable Length In Feet				
		75	100	150	200	250
3/4"	3/4"	20	18	18	18	16
3/4"	1"	30	28	26	24	22
1"	1"	34	34	34	34	30
1"	1-1/4"	58	56	54	49	46
1-1/4"	1"	34	34	34	34	34
1-1/4"	1-1/4"	58	58	58	58	54
1-1/4"	1-1/2"	111	95	86	78	69
1-1/2"	1-1/4"	58	58	58	58	58
1-1/2"	1-1/2"	111	111	111	111	99
1-1/2"	2"	225	220	196	175	170
2"	1-1/2"	111	111	111	111	111
2"	2"	275	275	275	275	250

Table 13c

MAXIMUM FIXTURE UNITS (s.f.u.) WATER SERVICE AND DISTRIBUTION
SIZING CALCULATED PRESSURE RANGE OVER 60 PSI
(but not to exceed 80 PSI)

Water Service Not to Exceed 75 Feet	Building Distribution	Maximum Total Developed Allowable Length In Feet				
		75	100	150	200	250
3/4"	3/4"	20	18	18	18	18
3/4"	1"	34	32	30	28	26
1"	1"	34	34	34	34	34
1"	1-1/4"	58	58	58	58	54
1-1/4"	1"	34	34	34	34	34
1-1/4"	1-1/4"	58	58	58	58	58
1-1/4"	1-1/2"	111	111	111	111	98
1-1/2"	1-1/4"	58	58	58	58	58
1-1/2"	1-1/2"	111	111	111	111	111
1-1/2"	2"	275	275	250	235	215
2"	1-1/2"	111	111	111	111	111
2"	2"	275	275	275	275	275

(c) Friction loss method for sizing the water service and distribution system. 1. The supply demand in gallons per minute in the building water distribution system shall be determined on the basis of the load in terms of supply fixture units and of the relationship between load and supply demand as shown in tables 13 and 14. Water supply outlets for items not listed in table 13 shall be computed at their maximum demand but in no case less than:

FIXTURE	NUMBER OF FIXTURE UNITS	
	PRIVATE USE	PUBLIC USE
3/8-inch pipe	1	2
1/2-inch pipe	2	4
3/4-inch pipe	3	6
1 inch pipe	6	10

a. For supply outlets likely to impose continuous demands, estimate continuous supply separately in gallons per minute and add to total demand in gallons per minute for fixtures.

b. The given weights in table 13 are for total demand and for fixtures with both hot and cold water supplies. The weights for maximum separate demands are taken as 1/4 the listed total demand for the hot water supply and the cold water supply.

c. Compute flush valve demand separately.

d. Demand (GPM) Corresponding to Fixture Load (WSFU). To determine the demand in gallons per minute corresponding to any given load in water supply fixture units, reference must be made to table 14, Table for Estimating Demand.

Table 14

ESTIMATING DEMAND

Supply Systems Predominantly For Flush Tanks		Supply Systems Predominantly For Flush Valves	
Load (Water Supply Fixture Units)	Demand GPM	Load (Water Supply Fixture Units)	Demand GPM
6	5		
8	6.5		
10	8	10	27
12	9.2	12	28.6
14	10.4	14	30.2
16	11.6	16	31.8
18	12.8	18	33.4
20	14	20	35
25	17	25	38
30	20	30	41
35	22.5	35	43.8
40	24.8	40	46.5
45	27	45	49
50	29	50	51.5
60	32	60	55
70	35	70	58.5
80	38	80	62
90	41	90	64.8
100	43.5	100	67.5
120	48	120	72.5
140	52.5	140	77.5
160	57	160	82.5
180	61	180	87
200	65	200	91.5
225	70	225	97
250	75	250	101
275	80	275	105.5
300	85	300	110
400	105	400	126
500	125	500	142
750	170	750	178
1,000	208	1,000	208
1,250	240	1,250	240
1,500	267	1,500	267
1,750	294	1,750	294
2,000	321	2,000	321
2,250	348	2,250	348
2,500	375	2,500	375
2,750	402	2,750	402
3,000	432	3,000	432
4,000	525	4,000	525
5,000	593	5,000	593
6,000	643	6,000	643
7,000	685	7,000	685
8,000	718	8,000	718
9,000	745	9,000	745
10,000	769	10,000	769

e. Size. The diameter of any pipe serving more than one plumbing fixture or appliance shall not be less than 3/4-inch inside diameter.

f. Minimum size. The minimum size of a water distribution branch serving no more than one fixture shall be as shown in table 15. The water distribution branch shall be extended to within at least 18 inches of the point of connection to the fixture.

Table 15

MINIMUM SIZES OF WATER DISTRIBUTION BRANCHES

Type of Fixture or device	I.D. Pipe Size (Inches)	Type of Fixture or device	I.D. Pipe Size (Inches)
Bathtubs	$\frac{1}{2}$	Shower (single head)	$\frac{1}{2}$
Combination sink and tray	$\frac{1}{2}$	Sinks (service, mop)	$\frac{1}{2}$
Drinking fountain	$\frac{3}{8}$ (1' max)	Sinks (flushing rim)	$\frac{3}{4}$
Dishwasher (domestic)	$\frac{1}{2}$	Urinal (direct flush valve)	$\frac{3}{4}$
Electric drinking water cooler	$\frac{3}{8}$ (1' max)	Urinal (direct flush valve)	$\frac{1}{2}$ (1' max)
Kitchen sink, residential	$\frac{1}{2}$	Water closet (tank type)	$\frac{3}{8}$ (1' max)
		Water closet (flush valve type)	1 (1' max)
Kitchen sink, commercial	$\frac{3}{4}$	Hose bibb	$\frac{1}{2}$
Lavatory	$\frac{3}{8}$ (1' max)	Wall hydrant	$\frac{1}{2}$
Laundry tray 1, 2 or 3 compartments	$\frac{1}{2}$		

g. Minimum hydrostatic pressure. Based on the minimum hydrostatic pressure available, pipe sizes shall be selected so that under conditions of peak demand a minimum flow pressure at the point of discharge shall be not less than required to maintain minimum flow rates listed in table 16. Pipe sizes for flush valve water closets and urinals shall be adequate to maintain flow pressures of 20 pounds per square inch for blowout action and jet action fixtures. For fixtures other than those supplied by flush valves, a minimum pressure of 8 pounds per square inch at the highest fixture shall be included in the calculations.

Table 16

MINIMUM AND MAXIMUM FLOW RATES TO FIXTURES AND APPURTENANCES

Fixture	Flow Rate Minimum GPM	Flow Rate Maximum GPM
Lavatory - Residential		3
Lavatory - Public		1 after handle release
Sink	4	4
Bathtub	6	
Laundry tray	5	
Shower except for safety - each head		3
Water closets		
Tank type		4 gal. per flush
Blowout action		4 gal. per flush
Jet action		4 gal. per flush
Drinking fountain	0.75	
Wall hydrant	5	
Urinal		1.5 gal. per flush

h. Variable street pressures. Where street water main pressures fluctuate, the building water distribution system shall be designed for the minimum pressure available.

i. Location and size of water supply source. Location and size of the public water main, where available, should be obtained from the local water authority.

j. Elevations. The relative elevations of the source of water supply and the highest water supply outlets in the building must be determined. In the case of a public main, the elevation of the point where the water service connection is to be made to the public main must be obtained from the local water authority.

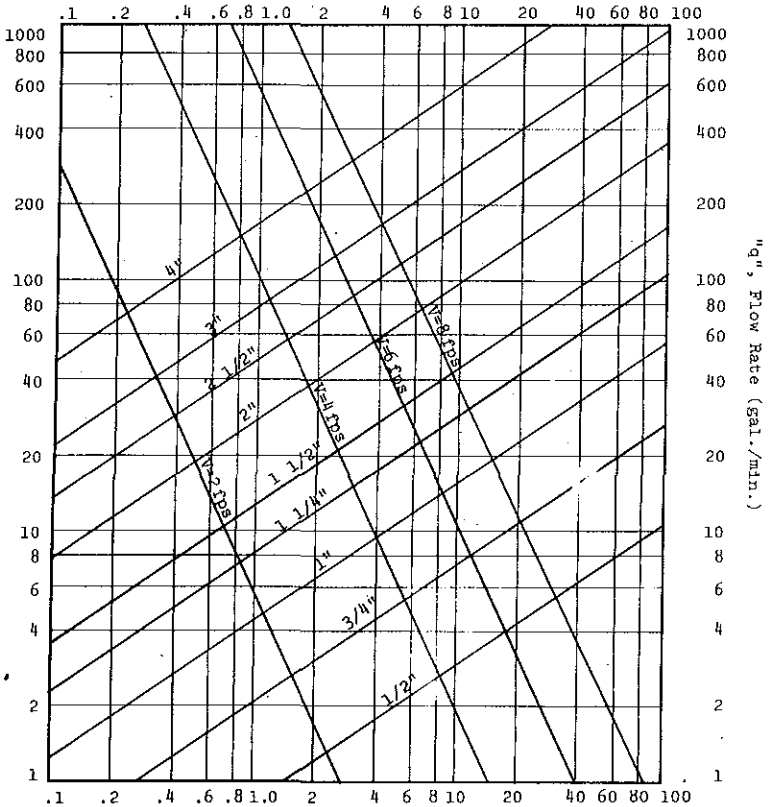
k. Maximum total developed length of system. Information shall be obtained regarding the total developed length of the water service piping from the source of water supply to the water service control valve of the building. Determine the total developed length of the distribution piping from the service control valve to the highest and most remote water outlet on the system.

l. Friction loss. Calculate the permissible uniform pressure loss for friction in the system. The amount of pressure available for dissipation as friction loss due to pipe, fittings, valves and appurtenances or devices in the system, must be divided by the maximum total developed length of the water service and water distribution system. This establishes the pipe friction limit for the circuit or system in terms of pressure loss, in psi, per foot of total pipe length. Multiply this value by 100 in order to express the pipe friction unit in terms of psi per 100 feet of length. If specifications for pressure loss due to fittings and valves are not furnished, add 50% of the maximum total developed length for friction loss.

m. Size all parts of the basic design circuit or system, and all other main lines in accordance with tables 16a, 16b, 16c, 16d or 16e. The table selected shall correspond with the type of material approved for the water service, water distribution or both.

Table 16a

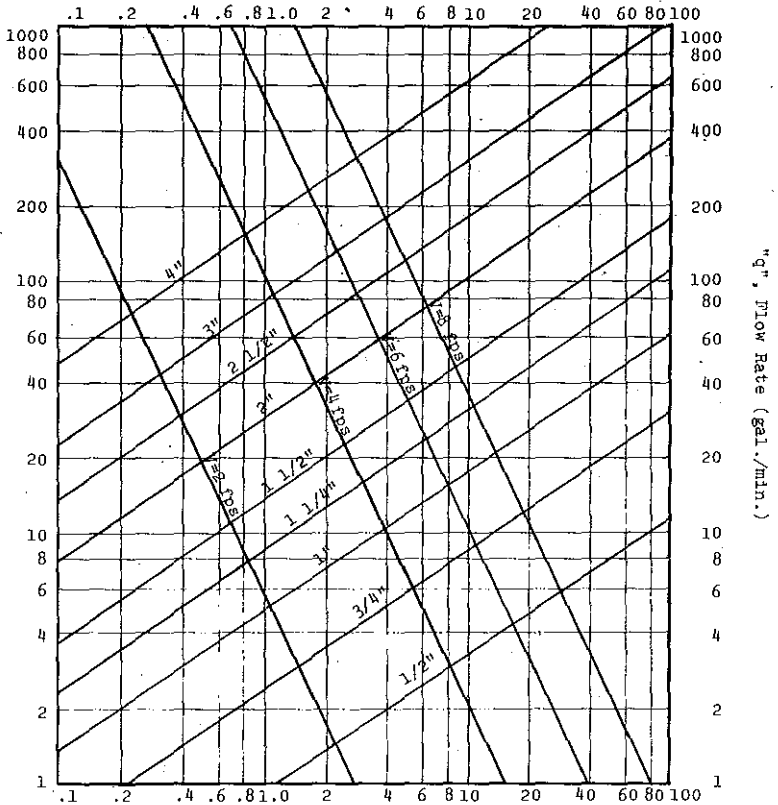
PRESSURE LOSS DUE TO FRICTION—
 COPPER WATER TUBE, TYPE K (ASTM B88)
 Surface Condition: "Fairly Smooth"
 $q = 4.57 p^{0.546} d^{2.64}$



"p", Pressure Loss Due To Friction (psi/100 ft. of pipe)

Table 16b

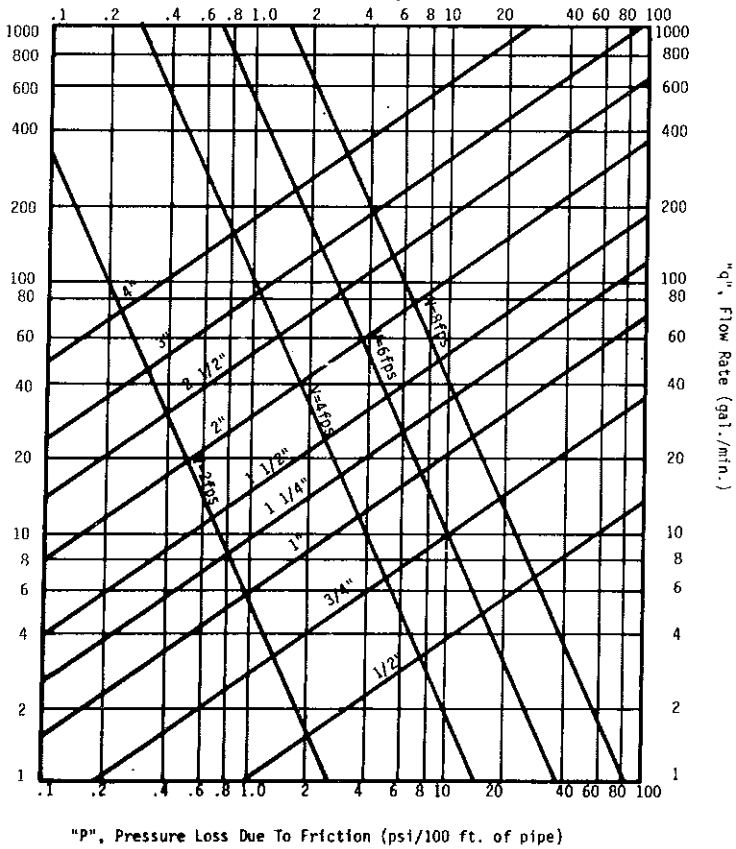
PRESSURE LOSS DUE TO FRICTION—
COPPER WATER TUBE, TYPE L (ASTM B88)
Surface Condition: "Fairly Smooth"
 $q = 4.57 p^{0.526} d^{2.64}$



"p", Pressure Loss Due To Friction (psi/100 ft. of pipe)

Table 16c

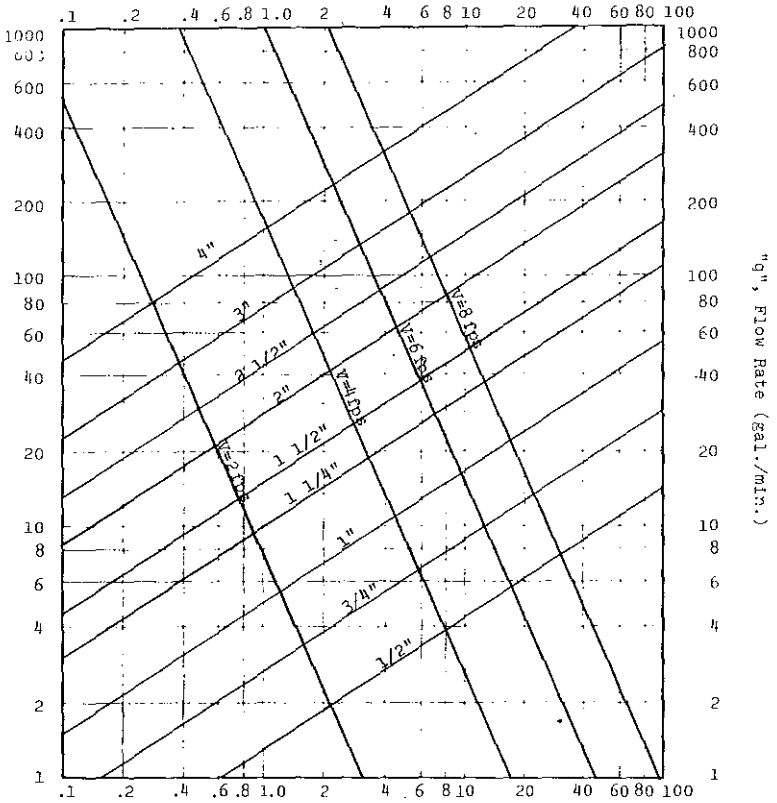
PRESSURE LOSS DUE TO FRICTION—
COPPER WATER TUBE, TYPE M (ASTM B88)
Surface Condition: "Fairly Smooth"
 $q = 4.57 p^{0.546} d^{2.64}$



"p", Pressure Loss Due To Friction (psi/100 ft. of pipe)

Table 16d

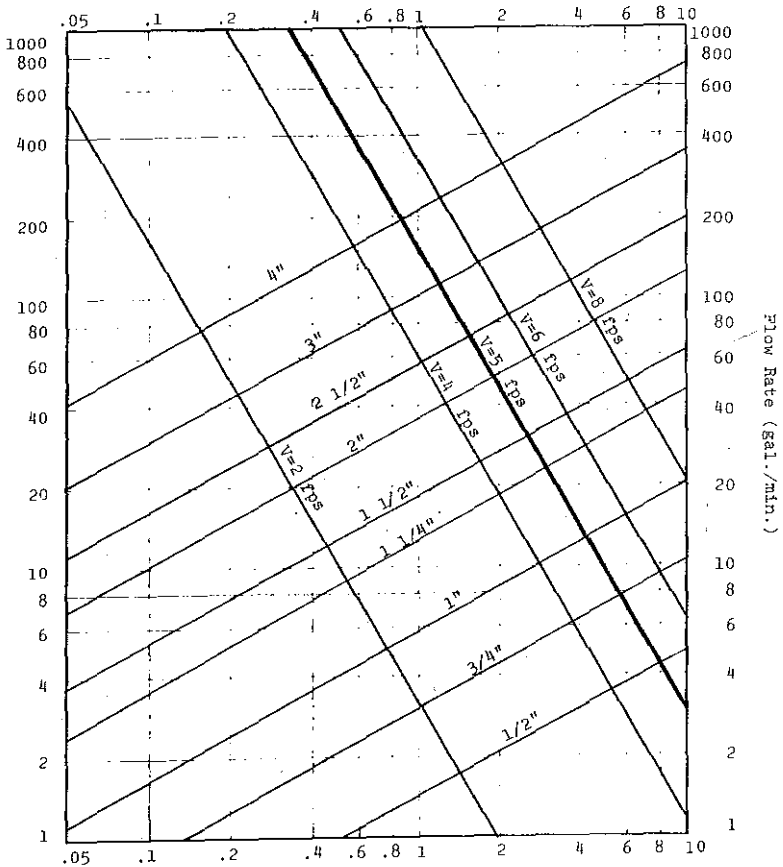
PRESSURE LOSS DUE TO FRICTION—
GALV. IRON & STEEL STANDARD WEIGHT PIPE
(ASTM A72, A120)
Surface Condition: "Fairly Rough"
 $q = 4.29 p^{0.521} d^{2.562}$



"p", Pressure Loss Due To Friction (psi/100 ft. of pipe)

Table 16e

FLOW DATA FOR THERMOPLASTIC PIPE
SCHEDULE 40



"p", Pressure Loss Due To Friction (psi/100 ft. of pipe)

n. Hot water distribution. In residences, buildings serving the public and places of employment, hot water shall be supplied to all plumbing fixtures and equipment used for personal hygiene, bathing, washing, culinary purposes, cleansing, laundry or building maintenance.

2. Excessive pressures. Water pressure at any fixture, appliance or appurtenance shall not exceed 80 psi for a period not to exceed 60 minutes in any 24-hour period under no flow conditions. When the water pressure in a part of or the entire water distribution system serving a fixture(s), appliance(s), or appurtenance(s) exceeds 80 psi for a period of more than 60 consecutive minutes, an approved type pressure reducing valve, preceded by a strainer, shall be installed and the pressure reduced to 80 psi or less for that part or all of the system that serves a fixture(s), appliance(s) or an appurtenance(s). Outside wall hydrants, sill cocks, water supply directly to a water pressure booster system, elevated water gravity tank or to pumps provided in connection with a hydropneumatic or elevated gravity water supply system may be left at full pressure.

3. Design methods. The methods utilized in designing and sizing the water distribution system may vary and recognized engineering practices meeting the criteria established in this section shall be acceptable. Plans and specifications submitted to the department for plan examination shall include all calculations and data relating to the sizing of the water distribution system.

(d) *Materials and installation.* 1. Materials. Water distribution systems shall be constructed of approved materials in accordance with ch. ILHR 84.

2. Frost protection. All water pipe, storage tanks, fixtures, appliances and appurtenances subject to low temperatures shall be, so far as practical, effectively protected against freezing.

3. Bending of pipe. Bending of water distribution piping except fixture supply tubing is prohibited.

(e) *Supports.* 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 or sags in water piping shall be avoided where possible. When unavoidable such sags, traps or inverts shall have provisions for properly draining same.

(f) *Water temperature control — public buildings.* Temperature of mixed water to multiple or gang showers shall be controlled by a master thermostatic blender or such showers may be individually regulated by pressure balance mixing valves. Individual showers in commercial and public buildings shall have pressure balance mixing valves in addition to flow regulation as indicated in table 16.

1. Return circulation where required. Hot water supply risers in buildings 5 or more stories in height or in buildings where developed length of hot water piping from the source of the hot water supply to the farthest fixture exceeds 100 feet, shall be of the return circulation type and no uncirculated branch line shall exceed 25 feet in length. Valves shall be provided on the inlet and outlet of all circulating return lines and on the inlet and outlet of the return circulation pump.

2. Insulation - storage tanks. Heat loss from unfired hot water storage tanks shall be limited to 15 BTU per hour per square foot of external tank surface area. The design ambient temperature shall be no higher than 65°F.

3. Insulation - piping. Piping heat loss for recirculation systems shall be limited to a maximum of 25 BTU per hour per square foot of external pipe surface for aboveground piping and a maximum of 35 BTU per hour per square foot of external pipe surface for underground piping. Maximum heat loss shall be determined at a ΔT equal to the maximum water temperature minus a design ambient temperature no higher than 65°F.

(g) *Water heaters and hot water storage tanks.* 1. General. All water heaters either for domestic or industrial use shall be of an approved type and shall connect to the water distribution system in an approved manner. All heaters except electric heaters shall be provided with a flue of rust resistant material connected to a chimney or gas vent stack. All water heaters shall be permanently marked with the rated input of the heater in B.T.U. or watts. Such marking shall be in an accessible position on the outside of the heater for inspection purposes.

2. Safety devices. All safety devices, except mixing valves, shall meet the current requirements of one or more of the following: American Gas Association, Underwriters Laboratories, Inc., American Society of Mechanical Engineers or National Board of Boiler and Pressure Vessel Inspectors. Test and certification by a laboratory in accordance with one of the above applicable standards shall also be considered acceptable. All water safety devices shall be of the temperature and pressure type installed in accordance with this code.

Note: The above standards are on file in the offices of the department of industry, labor and human relations, secretary of state, and revisor of statutes, and may also be obtained for personal use as follows:

1) Approval requirements for gas water heaters, volume I, Seventeenth Edition, 1965.

Approval requirements for gas water heaters, volume II, effective January 1, 1963.

Approval requirements for gas water heaters, volume III, third edition, 1965. Listing requirements for relief valves and automatic gas shutoff devices for hot water supply systems, effective January 1, 1965 and addenda effective January 1, 1966.

The above standards are available from American Gas Association, Inc., 605 Third Avenue, New York, New York 10016.

2) Standards for safety, household electric storage-tank water heaters, UL 174, third edition, May 1, 1970, and revision pages dated June 16, 1971, January 18, 1971.

The above standards are available from:

Underwriters' Laboratories, Inc.
207 E. Ohio Street, Chicago, IL 60611
333 Pfingsten Road, Northbrook, IL 60062
1655 Scott Boulevard, Santa Clara, CA 95050
1285 Walt Whitman Road, Melville, L.I., NY 11746

3) ASME Boiler and Pressure Vessel Codes, Heating Boilers, section IV, 1971, available from American Society of Mechanical Engineers, 29 West 39th Street, New York, NY 10018.

4) Relieving capacities of safety valves and relief valves, January 1, 1970.

The above standards are available from The National Board of Boiler and Pressure Vessel Inspectors, 1155 North High Street, Columbus, OH 43201.

3. Tank construction. Storage tanks for direct fired storage type water heaters shall be constructed to withstand a minimum of 300 psi test pressure. Register, February, 1985, No. 350

sure without leakage or permanent distortion and shall bear the manufacturers' marking showing test and working pressure, except that in lieu thereof, pressure markings appearing on AGA or UL listed water heater units will be considered acceptable.

4. Hot water storage tank and heater drain valves. a. Location. A drain valve shall be installed at the lowest point of each hot water storage tank and be readily accessible.

b. The drain valve shall be hand-operable without the use of tools.

c. The drain valve inlet shall be a minimum 3/4-inch nominal iron pipe size and the outlet end shall be equipped with a minimum standard 3/4-inch hose thread.

5. Water heaters, storage tanks and boilers. a. Combination domestic water heating/space heating boilers. Space heating boilers shall not be used for service water heating from May 1 to September 30 unless the service water heating load equals or exceeds 30% of the net boiler load.

b. Temperature controls. Service water heating systems shall be equipped with automatic temperature controls capable of adjusting from the lowest to the highest acceptable temperature setting for the intended use.

c. Shut down. A separate means shall be provided to permit turning off the energy supplied to service water heating systems.

(h) *Relief valves.* 1. Pressure relief valves. Pressure relief valves shall meet the A.S.M.E. standards. The valves shall have a relief rating adequate to meet the pressure conditions in the equipment served. The relief valve shall be installed either directly in a top tank tapping or in the hot water outlet line close to the tank. In a tankless-type heater, the relief valve shall be installed in the hot water outlet line as close as possible to the unit. There shall be no shut-off valve between the pressure relief valve and the tank. The pressure relief valve must be set to open at not less than 25 p.s.i. above the street main pressure or not less than 25 p.s.i. above the setting of any building water pressure regulating valve. The setting shall not exceed the tank rated working pressure.

2. Temperature relief valves. Temperature relief valves shall be of adequate relief rating expressed in B.T.U./hr for the equipment served. They shall be installed so that the temperature sensing element is immersed within the top 6 inches of the tank. The valve shall be set to open when the stored water temperature is 210°F. (or less).

3. Combination pressure temperature relief valves. Combination pressure temperature relief valves shall comply with all the requirements of the separate pressure and temperature relief valves.

4. Energy cut-off devices. Energy cut-off devices shall be of adequate performance rating for the equipment served. Immersion type energy cut-off devices shall be located so that the temperature sensing element is immersed in the water within the tank and controls the temperature of the water within the top 6 inches of the tank. When approved by the department, contact types shall be installed so that the sensing element is responsive to the highest water temperature within the equipment served and is securely fastened in place. When an energy cut-off device is used, it shall be factory applied by the heater manufacturer and comply

fully with the appropriate standards of A.N.S.I. or U.L. They shall be installed in a manner that will isolate them from ambient flue gas temperatures and other conditions not indicative of the temperature of the water within the heater.

5. Installation of relief valve discharge. Every relief valve shall have a discharge pipe the same size as the outlet drain on the relief valve which shall terminate not more than 10 inches above the floor as close as possible to a drain properly connected to the building drain or sewer. Such discharge pipe shall be galvanized steel, copper or brass, installed with approved fittings. The relief valve discharge pipe shall be pointed and drained downward in such a manner to allow the drain and discharge pipe to drain dry. The base or end of such discharge pipe shall not be threaded. No discharge pipe shall terminate into an open fixture such as a sink, laundry tub, bathtub, bathtub overflow, urinal, fixture tailpiece or supply tank, etc., or installed in a freezing area. No check valve or shut-off valve shall be installed between any safety device and the hot water equipment used, nor shall there be any valve in the discharge pipe from the relief valve.

6. Vacuum relief valves. Where a hot water storage tank or direct or indirect water heater is located at an elevation of 20 feet from the bottom of the heater or more above the lowest fixture outlets in the hot water system, a vacuum relief valve shall be installed on the storage tank or heater.

7. Pressure marking of hot water storage tanks. Hot water storage tanks shall be permanently marked in an accessible place with the maximum allowable working pressure.

(i) *Water hammer suppressors.* 1. Water hammer suppressors. All water supply systems, water distribution systems and components connected thereto, subject to water hammer, shall be provided with approved shock absorbing devices located and sized to suppress water hammer. All appliances, devices, equipment, fixtures and appurtenances with quick closing valves or which may create water hammer, shall be provided with shock absorbing devices. When copper air chambers are used, the minimum size shall be $\frac{1}{2}$ " x 1" x 14".

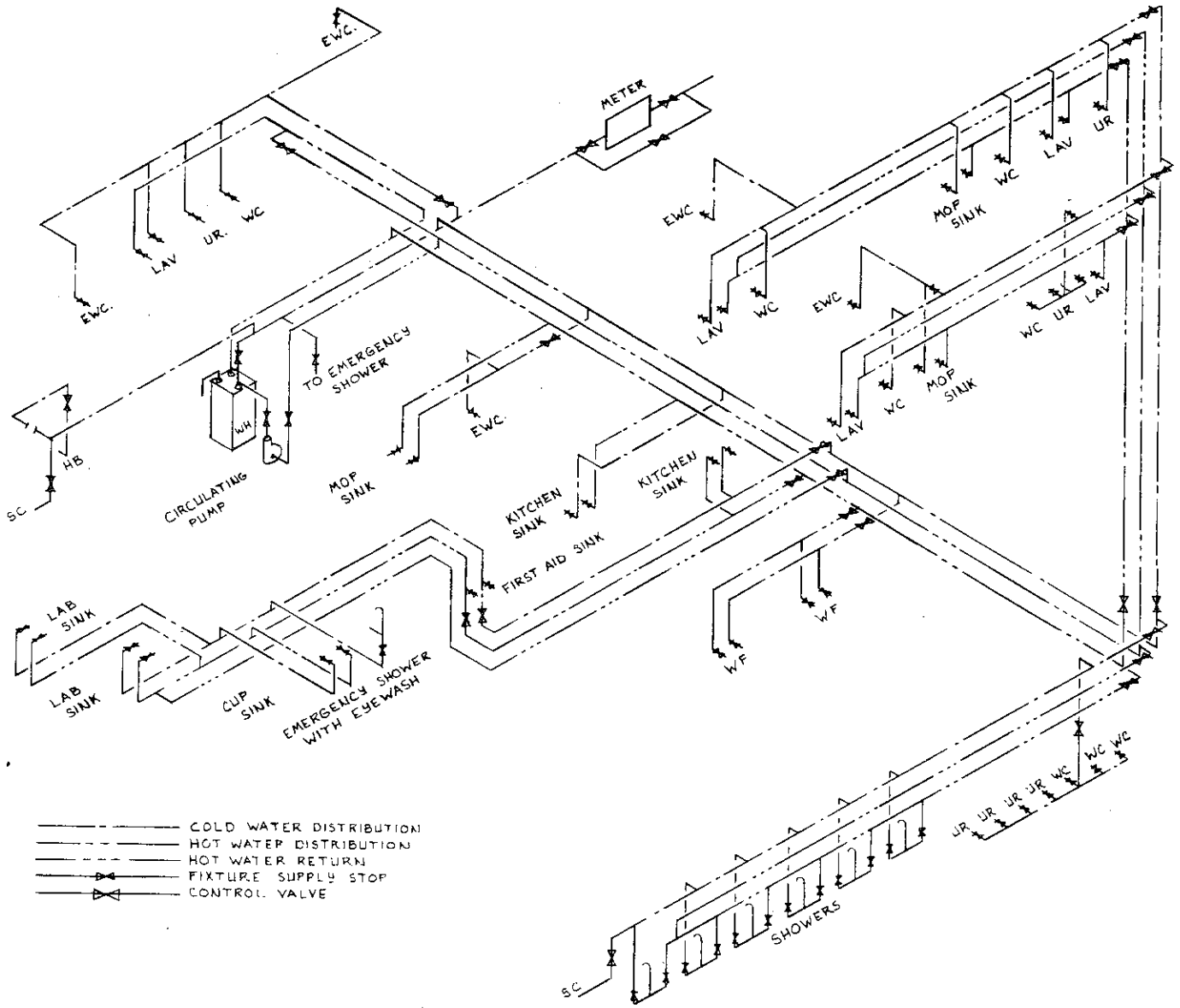
2. Mechanical suppressors. The size and location of the suppressors shall be in accord with the hydraulic design of the piping system served and to the manufacturer's recommendations. All mechanical water hammer suppressors shall be accessible.

Note: The water hammer suppressor may be eliminated provided the appliance, appurtenance, device, equipment or fixture has a slow closing or manually closed valve and does not create water hammer.

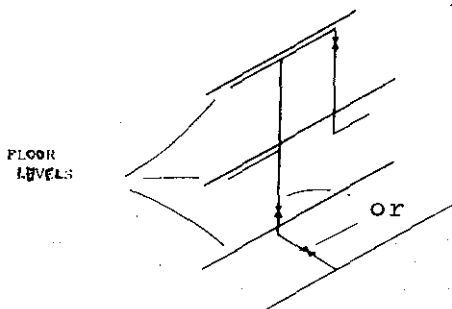
(j) *Water distribution control valves.* 1. Single family dwellings. Controls within a single family dwelling unit shall include a valve for each lawn sprinkler faucet, water heater, water closet, point of entrance of the water service, discharge side of the water meter and each appliance or appurtenance.

2. Multiple dwellings and public buildings. a. In all public buildings and multiple dwelling units, each hot and cold water distribution main, riser and branch main shall be valved. All fixtures, appliances, appurtenances, lawn sprinkler faucets and wall hydrants shall be valved. The

meter valve on the discharge side of the meter may serve as the water distribution main valve. See following sketch.



b. Riser valves. A valve shall be installed at the foot of each water supply riser or in the branch main serving a single riser. In buildings incorporating down feed risers a valve shall be installed at the top of each water supply down feed riser. See following sketch.



c. Water heating equipment valve. The cold water branch to each hot water storage tank or water heater shall be provided with a valve located in the same room near the equipment and serving only this equipment. Each tank or heater shall be equipped with an approved safety relief valve as specified in pars. (g) and (h).

d. Water conditioner bypass. All commercial water conditioners shall be provided with a valved bypass. The bypass may be a minimum of one nominal pipe size smaller than the water supply to the unit.

e. Valves location. All water supply control valves shall be placed so as to be accessible for service and maintenance.

f. Control valve design. Fixture supply valves shall have flow capacity, without reducing the pressure at the fixture to less than the minimum specified in this section, to provide the minimum flows as required in table 16. Line valves ¾-inch inside diameter and larger shall be the same size as the pipe being served and have a Cv factor not less than that specified in the following table for the particular pipe size.

I.D. Pipe Size	Minimum Cv Factor
¾	18
1	35.5
1-¼	61
1-½	107
2	175
3	255
4	340

Note: The Cv factor is defined as the flow coefficient for valves, expressing the flow rate in gallons per minute of 60° with a 1 psi pressure drop across the valve.

g. Tank controls. Supply lines from pressure or gravity tanks shall be valved in the same room at or near the tanks.

h. Valving requirements for hospitals and nursing homes shall comply with s. ILHR 82.50 (10) (b).

(5) **WATER PRESSURE BOOSTER SYSTEMS.** (a) *Where required.* When the water pressure in the public water main or individual water supply system is insufficient to supply the probable peak demand flow to all plumbing fixtures and other water needs freely and continuously within the minimum pressures and quantities specified in sub. (4) (c), tables 13, 14, 15 and 16; or elsewhere in this section and in accordance with good practice, the rate of supply shall be supplemented by an elevated water tank, a hydropneumatic pressure booster system, or a water pressure booster pump.

(b) *Overflows for water supply tanks.* Each gravity or unpressurized water supply tank shall be provided with an overflow having a diameter not less than shown in table 17. The overflow outlet shall discharge above and within 6 inches of a roof drain or site drain which terminates in a storm sewer. The overflow outlet shall be covered by a corrosion resistant screen of not less than 16 x 20 mesh to the inch and by ¼ inch hardware cloth or shall terminate in a horizontal angle seat check valve. Drainage from overflow pipes shall be directed so as not to freeze on roof walkways.

Table 17

SIZES FOR OVERFLOW PIPES FOR WATER SUPPLY TANKS

Maximum Capacity of Water Supply Line of Tank	Diameter of Overflow Pipe (Inches ID)	Maximum Capacity of Water Supply Line to Tank	Diameter of Overflow Pipe (Inches ID)
0- 13 gpm -----	1½	356- 640 gpm -----	5
14- 55 gpm -----	2	641-1040 -----	6
56-100 gpm -----	2½	over-1040 gpm -----	8
101-165 gpm -----	3	-----	—
166-355 gpm -----	4	-----	—

(c) *Covers.* All gravity and unpressurized water supply tanks shall have a locked overlapping cover. The covers of these tanks shall be vented with a return bend vent pipe having an area not less than the area of the down feed riser pipe and the vent shall be screened with corrosion resistant screening having not less than 14 and not more than 20 openings per linear inch.

(d) *Potable water inlet control and location.* Potable water inlets to gravity and unpressurized tanks shall be controlled by an automatic supply valve so installed as to prevent the tank from overflowing. The inlet shall be terminated so as to provide an approved air-gap, but in no case less than 6 inches above the overflow.

(e) *Tank drain pipes.* Each tank shall be provided at its lowest point with a valved pipe to permit emptying the tank which shall discharge as required for overflow pipes and not smaller in size than shown in table 18.

Table 18

SIZE OF DRAIN PIPES FOR NONPRESSURIZED WATER TANKS

Tank Capacity (gallons)	Drain Pipe (inches)	Tank Capacity (gallons)	Drain Pipe (inches)
Up to 750	1	3001 to 5000	2½
751 to 1500	1½	5001 to 7500	3
1501 to 3000	2	over 7500	4

(f) *Low pressure cut-off required on booster pumps.* When a booster pump is used on a water pressure booster system, there shall be installed a low pressure cut-off on the booster pump to prevent a pressure of less than 20 p.s.i.g. on the inlet side of the pump.

(g) *Pressure tanks, vacuum relief.* All elevated water pressure tanks 20 feet to the bottom of the tank or more above the lowest fixture shall be provided with a vacuum relief valve at the top of the tank which will operate up to a maximum water pressure of 200 p.s.i. and to maximum water temperatures of 200°F. The minimum size of such vacuum relief valves shall be ½ inch.

(6) **DISINFECTION OF POTABLE WATER SYSTEM.** (a) *Procedure.* New or repaired potable water systems shall be disinfected prior to use. The method to be followed shall be as follows.

1. The pipe system shall be flushed with clean, potable water until no dirty water appears at the points of outlet.

2. The system or part thereof shall be filled with a solution of water and chlorine containing at least 50 parts per million of chlorine and the system or part thereof shall be valved off and allowed to stand for 24 hours or the system or part thereof shall be filled with a solution of water and chlorine containing at least 200 parts per million of chlorine and allowed to stand for 3 hours.

3. Following the allowed standing time, the system shall be flushed with clean potable water until no chlorine remains in the water coming from the system.

4. The procedures shall be repeated if it is shown by a bacteriological examination that contamination still exists in the system.

(b) *Water quality analysis.* The department may require a water quality analysis to be done for a new or repaired potable water system. The analysis shall be performed in accordance with acceptable nationally recognized laboratory practices. The water samples for the analysis may not be taken sooner than 24 hours after the system has been disinfected under par. (a).

(7) **SPECIAL EQUIPMENT.** (a) *Separate piping for each source.* A water supply that meets accepted standards for purity for human consumption shall be distributed through a piping system entirely independent of any piping system conveying another water supply.

(b) *Piping by plumber.* Only persons licensed by the department as a master, journeyman plumber or a registered plumber apprentice, under supervision, shall install water supply piping to any system designed for steam power, heating, temperature regulation, automatic fire protection,

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air-conditioning, comfort cooling, process piping, hydraulic power or for any special water usage for industrial or manufacturing purposes. All such piping for supplying water for any of the above listed uses shall be brought by the licensed plumber to a point within the building or structure and within 10 feet of the point of entry to any of the above systems where it shall terminate with an air-gap or other method approved by the department.

(c) *Piping by equipment installers.* Connection of systems specified in par. (b) to the water supply pipe and the discharge therefrom through an air-gap into a trap, fixture, receptacle or interceptor installed by the licensed plumber, as prescribed by rules and regulations, may be made by the person installing such systems.

History: 1-2-56; r. and recr. Register, November, 1972, No. 203, eff. 12-1-72; r. and recr. Register, February, 1979, No. 278, eff. 3-1-79; renum. from H 62.13, Register, July, 1983, No. 331, eff. 8-1-83; renum. from ILHR 82.13 and r. and recr. (2) (b) and (4) (d) 1., am. (4) (c) 3. and (6) (a) (intro.), cr. (6) (b), Register, February, 1985, No. 350, eff. 3-1-85.

ILHR 82.41 Back-siphonage, cross-connections and potability control. (1) **PROTECTION OF POTABLE WATER SUPPLY.** (a) *General.* Potable water supply systems shall be designed, installed and maintained in such manner as to prevent contamination from non-potable liquids, solids or gases from being introduced into the potable water supply through cross-connections or any other piping connections to the system.

(b) *Interconnections.* Interconnections of water services between 2 or more public water systems, water distribution systems, or a private and public supply shall be permitted only with approval of the department.

(c) *Cross-connection control.* Cross-connections are prohibited except as approved by the department when suitable protective devices such as the reduced pressure zone backflow preventer or equal are installed, tested and maintained to insure proper operation on a continuing basis.

(d) *Water treatment.* All water treatment compounds approved by the department for introduction into the potable water distribution system shall be by a positive displacement pump.

(e) *Painting of water tanks.* The interior surface of the potable water tank shall not be lined, coated, painted or repaired with any material which will affect either the taste, odor, color or potability of the water supply when the tank is placed in or returned to service.

(f) *Used piping.* Piping which has been used for any other purpose than conveying potable water shall not be used for conveying potable water.

(g) *Water supply to boilers.* Potable water supply to boilers or boiler feed water systems shall be through an air-gap or approved backflow preventer.

(h) *Prohibited connections to fixtures and equipment.* Connection to the potable water supply system for the following shall be protected against backflow or back-siphonage.

1. Operating, dissection, embalming and mortuary tables or similar equipment. In such installations the hose used for water supply shall terminate at least 12 inches away from every point of the table or attachments. See following sketch.

(13) RADIOACTIVE MATERIALS. See ch. HSS 157.

History: 1-2-56; am. (3) (4) and (5), Register, August, 1961, No. 68, eff. 9-1-61; r. and recr. Register, November, 1972, No. 203, eff. 12-1-72; r. and recr., Register, February, 1979, No. 278, eff. 3-1-79; renum. from H 62.16, Register, July, 1983, No. 331, eff. 8-1-83; renum. from ILHR 82.16 and am. (7) (b), (10) (a) 1. and 2., (b) 2., (f) (Intro.) and (h), Register, February, 1985, No. 350, eff. 3-1-85.

ILHR 82.51 Mobile home sites and parks. (1) DRAIN SYSTEMS. (a) Private interceptor main sewer. The maximum number of mobile homes served by private interceptor main sewer shall be in accordance with Table 82.51.

Table 82.51
MAXIMUM NUMBER OF MOBILE HOMES SERVED BY A PRIVATE
INTERCEPTOR MAIN SEWER

Diameter of Private Interceptor Main Sewer (in inches)	Pitch (inch per foot)		
	1/16	1/8	1/4
4	None	2	2
5	2	2	2
6	26	34	49
8	Load Shall Not Exceed Capacity of Pipe ^a		

Note a: See s. ILHR 82.30 (4) (d).

(b) *Building sewer.* The building sewer for a mobile home shall be at least 4 inches in diameter.

(c) *Mobile home drain connector.* The piping between the mobile home drain outlet and the building sewer shall have a minimum slope of ¼ inch per foot, and shall be of materials approved for above ground drain and vent pipe in accordance with ch. ILHR 84. The connector shall be protected against freezing.

(d) *Other requirements.* Mobile home park sewer systems shall also conform to the applicable requirements of s. ILHR 82.30.

(2) **WATER SUPPLY SYSTEMS. (a) Private water mains. 1.** Supply demand. The supply demand in gallons per minute in the private water main system shall be determined on the basis of the load in terms of water supply fixture units, and in terms of the relationship between load and supply demand. The demand load of a mobile home site shall be equivalent to at least 15 water supply fixture units.

2. **Sizing.** The private water mains shall be sized in accordance with s. ILHR 82.40. A private water main serving a mobile home park shall not be less than one inch in diameter.

3. **Pressure.** The minimum pressure within a private water main shall be sufficient to maintain a pressure of 20 psi at each mobile home site under normal operating conditions.

4. **Valving.** Each private water main shall be provided with a gate or full flow valve at its source and at each branch connection. The valves shall be installed in a manhole or valve box so as to be accessible for operation.

(b) *Water services. 1. Size.* Each mobile home site shall be served by a separate water service not less than ¾ inch in diameter.

2. Valving. a. Each water service shall be provided with a curb stop within each mobile home site but not under the parking hard stand or pad.

b. A valve, of at least $\frac{3}{4}$ inch diameter, shall be located on the upper end of the water service pipe. In lieu of the valve located on the upper end of the water service, a freezeless type hydrant of at least $\frac{3}{4}$ inch diameter may be used.

c. The installation of underground stop and waste valves shall be prohibited.

3. Mobile home water connector. The piping between the mobile home water inlet and the water service shall be of materials approved for water distribution pipe in accordance with s. ILHR 84.30 (3).

(c) *Protection against freezing.* All water main and water service piping shall be protected against freezing.

(d) *Separation of water and sewer piping.* Separation of water and sewer piping shall be in accordance with s. ILHR 82.40 (2) (d).

(e) *Other requirements.* Mobile home park water supply systems shall also conform to the applicable requirements of s. ILHR 82.40.

(3) **BUILDING SEWER AND WATER SERVICE TERMINATIONS.** (a) *Frost sleeves.* Each building sewer and water service shall have a frost sleeve extending at least 42 inches below grade. The sleeve shall be of a material approved for building sewers. Frost sleeves shall terminate at grade. A frost sleeve shall be covered or sealed when not in use.

(b) *Termination elevation.* Each water service shall terminate at least 6 inches above the surrounding finished grade. Each building sewer shall terminate at least 4 inches above the surrounding finished grade and shall not terminate higher than the water service pipe.

(c) *Piping not in use.* A building sewer or water service pipe not connected to a mobile home shall be capped or plugged.

Note: See Appendix for further expository material.

History: Cr. Register, February, 1985, No. 350, eff. 3-1-85.

Subchapter VI Installation

ILHR 82.60 Pipe hangers and supports. The provisions of this section control the types, materials and installation of anchors, hangers and supports for plumbing piping.

(1) **MATERIAL.** (a) *Strength.* Hangers, anchors and supports for piping less than $1\frac{1}{4}$ inch in diameter shall be of sufficient strength to support the piping and its contents. Hangers, anchors and supports for piping $1\frac{1}{4}$ inch or larger in diameter shall be of sufficient strength to support the piping, its contents and a load of 25 pounds per lineal foot of pipe length. Drain piping shall be considered as being full of water. Underground piers for pipe support shall be of concrete, masonry or pressure treated wood.

(b) *Compatibility.* 1. Hangers and straps shall be of a material as to avoid galvanic action with the piping.

2. Hangers and straps shall not distort, cut or abrade piping and shall allow longitudinal free movement of the pipe.

(c) *Prohibited types.* Hangers, anchors and supports shall not be constructed of chain, rope, unbraided strands or plastic strap.

(2) ATTACHMENT. (a) Hangers and anchors shall be securely attached to the building's structure at intervals to support the piping and its contents.

(b) Hangers shall not be attached to a building's structure by means of wood plugs.

(3) PIPE SUPPORT. Pipe shall be supported at distances not to exceed those specified in Table 82.60.

Table 82.60
SUPPORT SPACING

Pipe Material	Maximum Horizontal Spacing	Maximum Vertical Spacing
Cast iron	5'-0" or within 18" of each joint which is between lengths of pipe over 5'-0" long.	Each story height, but not to exceed 15'-0".
Steel and Brass	10'-0" for pipe ¾" or less in diameter. 12'-0" for pipe larger than ¾" in diameter.	Every other story height, but not to exceed 30'-0".
Copper	6'-0" for pipe 1¼" or less in diameter. 10'-0" for pipe larger than 1-¼".	Each story height, but not to exceed 10'-0".
Lead	Continuous support	4'-0"
Plastic	4'-0"	Each story height, but not to exceed 10'-0".
Borosilicate glass ^a	8'-0"	Each story height for pipe 3" or larger in diameter. Every other story height for pipe less than 3" in diameter.

Note a: Padded hangers shall be used.

History: Cr. Register, February, 1985, No. 350, eff. 3-1-85.