

May 1, 1967

RD 1, 2, 3, 4, 5
RD 8, 9, 10, 11, 12, 13
WP 1

Freeman Holmer, Director
Department of Resource Development
421 Wilson Street State Office Building
Madison, Wisconsin

Re: Standards to be incorporated into Wisconsin
Administrative Code, Chapter RD2

Dear Mr. Holmer:

You have requested my consent pursuant to sec. 227.025, Wis. Stats., for the Department of Resource Development to incorporate by reference in its proposed rules 2.01 and 2.02, several national standards in the following manner:

a. In sec. 2.01 (3): "Standard methods For The Examination of Water and Waste Water", (12th ed., 1965), prepared and edited by the American Public Health Association, the American Waterworks Association and the Water Pollution Control Federation; and, the United States Atomic Energy Commission Rules and Regulations, Title X, Part 20, entitled "Standards for Protection Against Radiation".

b. In sec. RD 2.02 (2) (d): "Public Health Service Drinking Water Standards" (Rev. 1962), issued by the United States Department of Health, Education and Welfare, Public Health Service.

It appears that your proposed rules are of limited public interest. It also appears that the publications to be incorporated by reference are readily available in publication form; that the references in the proposed rules are specific; that incorporating

Mr. Freeman Holmer
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the publications by reference will save considerable space and expense; and that the American Public Health Association, the American Waterworks Association and the Water Pollution Control Federation, along with the United States Atomic Energy Commission and the Public Health Service of the United States Department of Health, Education and Welfare, all meet the statutory definition of "technical societies and organizations of recognized national standing."

Accordingly, I hereby consent to the incorporation by reference in the proposed rules RD 2.01 and 2.02.

Sincerely yours,

BRONSON C. LA FOLLETTE
Attorney General

ARLEN C. Christenson
ARLEN C. CHRISTENSON
Deputy Attorney General

James J. Burke
JAMES J. BURKE
Revisor of Statutes

WFE:sal



STATE OF WISCONSIN

DEPARTMENT OF RESOURCE DEVELOPMENT

MADISON 53702

*Filed May 1, 1967
8 am.*

OFFICE OF THE DIRECTOR

CERTIFICATE

STATE OF WISCONSIN)
) SS
DEPARTMENT OF RESOURCE DEVELOPMENT)

TO ALL OF WHOM THESE PRESENTS SHALL COME, GREETINGS:

I, Freeman Holmer, Director of the Department of Resource Development, and custodian of the official records of said department, do hereby certify that the annexed rules and regulations relating to Procedure and Practice; Water Quality Standards for Interstate Waters; Interstate Waters--Uses and Designated Standards; Interstate Joint Resolutions; Aquatic Nuisance Control; General Requirements for Waterworks, Sewerage, Refuse Disposal; Refuse Disposal Plants; Sewerage; Waterworks; Well Construction and Pump Installation; and Servicing of Septic Tanks, Seepage Pits, Grease Traps or Privies, were duly approved and adopted by this department on April 28, 1967, pursuant to policy determinations made by the Resource Development Board.

I further certify that said copy has been compared by me with the original on file in this department and that the same is a true copy thereof, and of the whole of such original.

IN TESTIMONY WHEREOF, I have hereunto set my hand in the city of Madison this 1st day of May A. D. 1967.

Freeman Holmer

Freeman Holmer, Director



DEPARTMENT OF RESOURCE DEVELOPMENT

MADISON 53702

OFFICE OF THE DIRECTOR

ORDER OF THE DEPARTMENT OF RESOURCE DEVELOPMENT
REPEALING, AMENDING AND ADOPTING RULES

Pursuant to authority vested in the Department of Resource Development by Chapters 144, 146 and 162, Wis. Stats., the Department of Resource Development hereby repeals, amends and adopts rules as follows:

Chapter WP 1 is repealed.

Chapter RD 1 is created (Procedure and Practice).

Chapter RD 2 is created (Water Quality Standards for Interstate Waters).

Chapter RD 3 is created (Interstate Waters--Uses and Designated Standards).

Chapter RD 4 is reserved for the following subject: Water Quality Standards for Intrastate Waters.

Chapter RD 5 is reserved for the following subject: Intrastate Waters--Uses and Designated Standards.

The following rules of the Committee on Water Pollution are renumbered as shown in the following table:

<u>Old Number</u>	<u>Subject</u>	<u>New Number</u>
WP 3.01	Interstate Joint Resolutions	RD 6.01
WP 2.01	Aquatic Nuisance Control	RD 7.01

and the Department of Resource Development is substituted for reference to Committee on Water Pollution where appropriate.

The following rules of the Board of Health are renumbered as shown in the following table:

established by the department of resource development. Supervision shall begin at the time so designated or agreed upon by the operator or sponsor and the supervisor. All preparatory work, with the exception of the pre-treatment inspection and supervision, is considered fundamental for proper supervision and no separate charge is made for this service.

Note: Procedure for Aquatic Nuisance Control adopted by the Committee on Water Pollution on January 26, 1954 and amended January 21, 1964. Ratified by the department of resource development on August 1, 1966.

CHAPTER RD 8

GENERAL REQUIREMENTS FOR WATERWORKS SEWERAGE, REFUSE DISPOSAL

- RD 8.01 Legal status
- RD 8.02 Plant design
- RD 8.03 Plant operation

RD 8.01 Legal status. (1) OWNERS AFFECTED. The rules and regulations herein presented have the force and effect of law and govern the submission of plans and the general supervision and control of waterworks, sewerage systems and refuse disposal plants. They shall apply in general only to municipalities but must be complied with by any owner of such plants upon written notice or order from the department.

(2) RIGHT TO AMEND OR MODIFY CODE RESERVED. The department reserves the right to amend or modify this code at any regular or special meeting.

RD 8.02 Plant design. (1) PRELIMINARY. Upon application, accompanied by an outline of any proposed waterworks, sewerage system or refuse disposal plant, the general requirements which will meet the approval of the department will be outlined. Preliminary or incomplete plans may be submitted for approval and recommendations if accompanied with a statement outlining omitted portions, detail plans for which shall be submitted before final approval or construction.

(2) PLANS AND SPECIFICATIONS TO BE SUBMITTED. Plans and specifications shall be submitted to and approved by the department before commencing construction for:

(a) New water supplies, also for extensions and alterations in the source, pumping equipment, purification, storage or any other part of existing waterworks which may affect the quality or quantity of the water.

(b) New sewerage systems and alterations or extensions of existing systems which may materially affect the quality or quantity of the effluent, or location of the outlet.

(c) New refuse disposal plants and material modifications in existing plants.

(d) All plans and specifications shall be accompanied by an application for approval.

(3) PLANS AND SPECIFICATIONS. (a) Municipalities shall submit three sets of plans for waterworks and sewerage and two for refuse disposal; other owners two sets of all plans. One set of all approved plans will be retained on file with the department and one returned to the owner. The third set of municipal waterworks plans will be retained for filing with the public service commission and of sewerage plans returned to the municipality for filing with the register of deeds.

(b) The plans and specifications shall include general plans, detailed plans, specifications and engineer's report.

(c) Plans shall not be larger than can be conveniently handled. All sheets for the same set of plans shall be numbered and folded to form a folio

8½ inches by 11 inches, and shall consist of sketches or prints upon a medium or light weight, high grade paper that will not crack when folded nor tear with reasonable usage, or upon cloth. The scale in feet to which the plans are drawn, the north point, the date and the name of the designer and owner shall in all cases be indicated. All plans shall be drawn to a suitable scale which for general plans should not be less than 100 feet nor greater than 300 feet to the inch. Plans for modifications or extensions to existing systems or plants shall indicate clearly the connections or relation thereto, and, if not already on file with the department, submittal of plans of the existing system or plant also may be required.

(4) REQUIREMENTS IN DESIGN. In general, approved modern practice shall be followed. In case new appliances or methods are adopted, sufficient data, based upon practical application, experimental or otherwise, shall be submitted to show that satisfactory results can be secured.

(5) PROVISION FOR FUTURE. Waterworks and sewerage plans shall amply provide for the probable population at least twenty-five years hence except in considering parts of the systems that can be readily increased in capacity. Similar consideration shall be given to the ultimate capacity of institutions.

RD 8.03 Plant operation. (1) GENERAL. Because of various local conditions which it is impossible to anticipate, it is impracticable to set forth other than general rules governing the operation of water purification, sewage treatment and refuse disposal plants. Every municipality or institution, however, will be required to so operate these plants as to obtain the highest possible degree of efficiency at all times. Specific instructions based upon investigations will be given from time to time regarding the operation of individual plants.

(2) SUPERVISION. A competent person shall be in charge of the operation of every water purification, sewage treatment or refuse disposal plant, and study the various controlling factors in order that maximum efficiency may be obtained at all times. In case of incompetent supervision or inefficient operation, the board, after due notice, may require the municipality or institution to make such changes as may be considered necessary to obtain efficient results.

(3) CHEMICALS. When chemicals are used in connection with any purification or treatment process, a sufficient quantity of high grade material shall be kept on hand at all times to insure against ineffective operation because of delays in securing these materials.

(4) REPORTS AND RECORDS. Suitable analyses shall be made and records kept upon approved forms of the operation of all municipal water purification and sewage treatment plants. A certified report upon approved forms regarding the operation of municipal water purification plants during the preceding month, shall be submitted to the department not later than the 10th of each month. Reports regarding municipal sewage treatment plants shall be submitted during the month of January for the preceding year and oftener upon written notice of the department. Similar reports and records may also be required upon refuse disposal plants and privately owned water purification and sewage treatment plants by written notice from the department.

(5) ALTERATIONS MAY BE REQUIRED. Where existing plants are so constructed that satisfactory results cannot be secured, such alteration may be required as necessary to secure adequate efficiency.

CHAPTER RD 9

REFUSE DISPOSAL PLANTS

RD 9.01 Construction and maintenance

RD 9.01 Construction and maintenance. In view of the varied character of these plants, it is impracticable to set forth definite rules regarding their design or operation. Each plant will, therefore, be considered separately. They shall, however, be so constructed and maintained that the highest degree of efficiency will result and so operated as not to cause nuisances or complaints because of obnoxious odors, or other objectionable or insanitary conditions.

Chapter RD 10

SEWERAGE

RD 10.01 Plant design
RD 10.02 Operation

RD 10.01 Plant design. (1) GENERAL PLANS. The general plans shall show:

(a) Topography, including all streams or watercourses and approximate contour lines.

(b) Location of wells, or other sources of public water supply.

(c) Location, sizes, grades and direction of flow of all sewers, also the elevation of the inverts and the depth of cut or street elevation at all manholes.

(d) Location of outlets, treatment plants, by-passes or overflows, manholes, lampholes, flush tanks, siphons, pumping stations and other accessories.

(2) **DETAIL PLANS.** The detail plans shall show:

(a) Profile along the line of all sewers except where reasonably accurate contour lines are indicated on the general plan.

(b) The cross section of all sewers unless of standard pipe.

(c) Details of all manholes, flush tanks, catch basins, inverted siphons, etc.

(d) Details of such pumping equipment as may be provided.

(e) A map of the property to be used for the disposal or treatment works on which shall be indicated topography, location with reference to the sewer district, the municipality and built-up sections, and the arrangement of the various treatment units.

(f) Complete details of all treatment units shall be given, including elevations of the various parts of the plant and of the high and low water levels of the streams or body of water into which the effluent is to be discharged. The depth, size and uniformity of all stone or sand for filters shall be indicated.

(3) **TYPE OF SYSTEM.** All new systems shall be designed as sanitary sewers or on the "separate" plan. In existing systems constructed on the "combined" plan, adequate storm water overflows shall be provided in connection with treatment. Furthermore, future developments and extensions shall be constructed as "separate" rather than "combined" systems when practicable. No storm water from streets, roofs, cisterns, etc., shall be allowed to discharge into sanitary sewers.

(4) **SEWER GRADES.** All sewers shall be laid to a grade not less than that indicated in the following table, except when necessary because of special conditions, in which case detailed reasons therefor shall be given.

Size of pipe	Fall in feet per 100 feet of sewer
6 inches -----	.45
8 inches -----	.30
10 inches -----	.22
12 inches -----	.18
15 inches -----	.14
18 inches -----	.11
21 inches -----	.09
24 inches -----	.08

(5) **MANHOLES.** Manholes shall be installed at all changes in grade or direction and at distances not greater than 400 feet apart. Lamp-holes may be used only for special conditions and shall not be substituted for manholes nor installed at the end of laterals greater than 250 feet in length.

(6) **ALIGNMENT.** All sewers shall be laid in true alignment between manholes.

(7) **TREATMENT.** (a) Treatment shall be provided in connection with all new installations, the extent of which will depend on local conditions. In connection with developing or modifying existing systems where no treatment is now provided, efforts shall be made to so reconstruct the system as to bring the sewage together at points suitable for treatment which shall be provided as soon as practicable.

(b) Plans for sewage treatment will be approved only when the following rates of operation are not exceeded except where special conditions exist, when the board may permit higher rates and modifications.

1. Screens—a minimum of $\frac{1}{2}$ inch in either direction between bars or meshes of coarse screens of the stationary type.

2. Grit chambers—a maximum sectional area such as to give a mean velocity of flow between 0.5 and 1.0 feet per second for maximum rate of sewage flow, and lengths of chambers to be not less than three times the width.

3. Septic tanks—a detention period of eight hours. Septic tanks, except under special conditions, are not approved for municipal sewage treatment.

4. Imhoff or similar tanks—

a. In the flowing-through or settling chamber, a detention period of not less than 2 hours.

b. In the sludge digestion compartment, a capacity of not less than 1.5 cubic feet per capita computed below a horizontal plane 18 inches below the slot.

c. Gas vent area not less than 10 per cent of total surface area of tank and width not less than 2 feet.

5. Intermittent sand filters—1,000 persons per acre of area, the filter to have a minimum depth of 3 feet above the underdrains.

6. Contact beds—1,000 persons per acre of area per foot of depth, with a minimum depth of 4 feet.

7. Trickling filters—3,000 persons per acre of area per foot of depth, with a minimum depth of 5 feet.

The effective size of sand for intermittent sand filters should not be less than .2 millimeter nor more than .4 millimeter. Contact beds should consist of stone not less than one-half inch in diameter nor more than 2 inches, while for trickling filters the corresponding sizes should be $\frac{3}{4}$ of an inch to 2½ inches. Sedimentation or other treatment to remove the suspended matter from the effluent of trickling filters will usually be necessary to prevent local nuisances.

(8) **DISINFECTION**—the contact period of sewage and disinfecting agent, in tanks, or their equivalents, not less than $\frac{1}{4}$ hour. Chlorinating devices shall be of suitable types and ample capacities to apply chlorine at a rate sufficient to produce an excess of not less than 0.5 part per million of chlorine (by ortho-tolidin test) in the final effluent. Treatment plants shall be divided into such a number of units that necessary repairs or alterations can be made without impairing the character of the effluent.

(9) **SLUDGE DISPOSAL**. Adequate provision shall be made for the disposal of sludge or screenings in connection with all treatment plants, and in no case will the discharge of sludge or screenings into a stream or watercourse be permitted. Sludge bed areas should not be less than $\frac{3}{4}$ square foot per capita for Imhoff tanks and $\frac{1}{4}$ for septic tanks.

(10) **ACTIVATED SLUDGE AND SPECIAL PROCESSES**. No definite requirements are made for the activated sludge or special processes. Each installation of this character will be considered separately.

(11) **BY-PASSES**. Plants should be of adequate capacity and so designed that by-passes or overflows are not necessary, but if installed, by-passes shall be equipped with lock and key.

(12) **ENGINEER'S REPORT**. The engineer's report shall cover the following:

(a) *Sewage flow*—State the present and estimated population for municipalities twenty-five years hence, and for institutions the present and ultimate capacity. Estimate the amount of domestic sewage, ground water, industrial waste, etc., that the system or various parts thereof may have to care for, both for present and future needs.

(b) *Source of water supply*—Give location of intake or wells, etc., also approximate maximum, minimum and average daily water consumption if public supply is already in use.

(c) *Extent of system*—Extent to which plans provide sewerage facilities, both for initial installation and future development.

(d) *Industrial waste*—Character of industrial wastes inasmuch as they may affect the sewerage system.

(e) *Special features*—Discuss low grades, special devices, etc.

(f) *Type of purification*—Both for present and future need, and reason for adopting the proposed method.

(g) *Soil*—Probable character of soil or strata through which the sewers are to be laid and portion of the system that will be below normal ground water level.

(h) *Cost*—Give estimated cost of integral parts of system, both for the complete design and original installation.

(i) *Stream*—Describe the stream or body of water into which the final effluent is to discharge. If stream, give width, depth and estimated minimum flow. State for what it is used below the outlet and

whether there are any special conditions, as dam, that will affect the flow. If a lake, give approximate areas, also depth in vicinity of the outlet.

RD 10.02. Operation. (1) SEWER SYSTEM. The sewer system shall be kept free from obstructions at all times by the use of flushing or cleaning devices where necessary. It shall otherwise be maintained in a proper condition.

(2) PUMPING EQUIPMENT. All pumping equipment shall be maintained in an efficient operating condition in order to prevent backing up of the sewage into the collecting system or bringing into play overflows or by-passes which may result in the discharge of untreated sewage.

(3) SCREENS. All screens shall be frequently cleaned so as to prevent stoppage and the screenings shall be properly disposed of.

(4) TANK TREATMENT. In all methods of tank treatment, the sludge shall be removed and properly disposed of at such frequent intervals as not to interfere with the effective operation of the plant. In general, part of the sludge from Imhoff or similar tanks should be removed every three months except that by removing the sludge late in the fall the tank may be allowed to run through the winter without subsequent removal, providing the sludge storage capacity is sufficient. Tanks should have adequate supervision to guard against stoppages which might result in backing up the sewage into the collecting system or in bringing into play overflows which would result in the discharge of untreated sewage.

(5) INTERMITTENT SAND FILTERS. The dosing devices in connection with intermittent sand filters shall be maintained in an efficient operating condition at all times to assure proper dosing of the various beds. The doses should be of sufficient quantity to provide uniform distribution over the bed (about 3 inches in depth), should be so arranged as to allow for a proper rest period and not exceed three per day. In case the filter becomes "foul," it should be put out of service for sufficient time to recuperate. It is recommended that slow sand filters be covered in the winter in order to obtain satisfactory operating results. If not covered, they should be furrowed or otherwise prepared for winter operation. The filters should be cleaned late in the fall in preparation for winter operation and should also be cleaned as early in the spring as possible. When the depth of the filter sand has been reduced to less than 1½ feet by cleaning, the bed shall be brought to its original depth by adding clean sand of a proper size and quality.

(6) TRICKLING FILTERS. The dosing devices shall be carefully maintained to assure proper operation of the plant at all times. The distribution system should be so arranged as to provide as uniform distribution of the sewage as possible and the spraying nozzles be kept free from obstructions. It is recommended that trickling filters be covered during the winter in order to secure efficient operation. If not covered, the cycle of operation and dose should be so arranged as to prevent freezing and assure continuous operation of the plant.

(7) CONTACT BEDS. All dosing devices of contact beds shall be properly maintained in order to assure maintenance of a cycle of

operation that will produce satisfactory results. The standing full period should not be less than 45 minutes nor more than two hours. The rest period should be at least four hours. The number of fillings daily should not exceed three.

(8) **ACTIVATED SLUDGE AND SPECIAL PLANTS.** No specific instructions are given but such plants shall be so operated as to secure effective results at all times.

(9) **SLUDGE DISPOSAL.** The method of sludge disposal should be carefully maintained at all times and in no case shall the sludge from any treatment tank be discharged into any stream or watercourse, or so disposed of as to create a nuisance.

(10) **DISINFECTION.** Equipment for chlorination of sewage shall be carefully maintained at all times and operated at a rate sufficient to produce an excess chlorine content of not less than 0.5 part per million (by ortho-tolidin test) in the final effluent where disinfection is required. The method of operation for odor control shall be based on a study of local conditions and requirements.

Chapter RD 11

WATERWORKS

RD 11.01 Plant design
RD 11.02 Operation

RD 11.01 Plant design. (1) GENERAL PLANS. The general plans shall show the location of:

- (a) All wells, intakes, or other sources of supply.
- (b) The purification plant.
- (c) All mains together with their sizes and depth.
- (d) All shut-off valves, hydrants, cross connections, etc.
- (e) Storage of distribution reservoirs.

(2) **DETAIL PLANS.** The detail plans shall show:

(a) Details regarding intake pipe, crib, screens, etc., if water is taken from stream or lake.

(b) If a ground water supply, details of the well, spring infiltration gallery, etc., the manner of protecting the supply from surface wash and other pollution. A sketch or statement showing all possible sources of pollution within 500 feet, and the direction of the ground water flow, if known, shall also be submitted.

(c) Complete details of the purification plant including sedimentation and mixing chambers; collecting and piping systems; method of applying chemicals; filters, including depth, size and uniformity of various strata; rate controllers; loss of head gauges; washing arrangement; pumps; special devices, etc.

(d) Details of the pumping station and equipment.

(e) Any special appurtenances or fixtures in connection with the distribution system.

(f) Details of elevated tanks, stand pipes or reservoirs used for storage of the water.

(3) **PROTECTION OF SOURCE.** A suitable intake properly screened and located shall be provided for surface supplies. Wells, springs, etc., shall be adequately protected from all surface wash. Ground water sources shall be so located that there will be no danger of pollution from insanitary surroundings such as cesspools, privies, sewers, etc. This practically prevents the use of shallow wells or springs in a municipality or in thickly populated areas and also of deep wells if not properly sealed.

(4) **PUMPING EQUIPMENT.** The pumping equipment shall be divided into two or more units except where ample storage is available to permit necessary repairs without interrupting the service. The capacity shall be ample for fire protection and domestic consumption.

(5) **PURIFICATION.** (a) Some modern method of purification, applicable to the needs of the municipality or institution, and adaptable to the water to be treated, shall be provided in connection with all surface supplies.

(b) Apparatus for direct, positive and accurate application of chemicals, also adequate mixing devices and sedimentation basins, shall be provided in connection with all mechanical gravity or pressure filters. In each case a careful study should be made of the character of the water and experimental work done, if necessary, to determine the type of purification or treatment adaptable.

(c) Rate controllers and loss of head gauges shall be provided for all filters. The depth of the filtering sand shall not be less than 2½ feet, its effective size shall not be less than .2 millimeter nor more than .4 millimeter, and its uniformity coefficient should not exceed 2. Sand shall be practically pure quartz or silica free from dirt or foreign material. The following average rates of filtration shall not be exceeded:

1. Slow sand filters, 4,000,000 gallons per acre per day.
2. Gravity mechanical filters, 125,000,000 gallons per acre per day.
3. Pressure mechanical filters, 75,000,000 gallons per acre per day.

(d) Purification plants shall be divided into a sufficient number of units to allow for necessary repairs and alterations without interrupting service or impairing the quality of the water delivered.

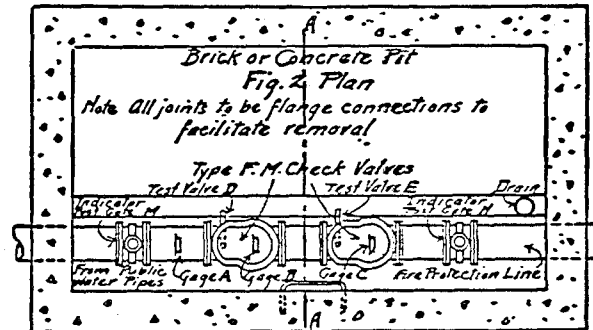
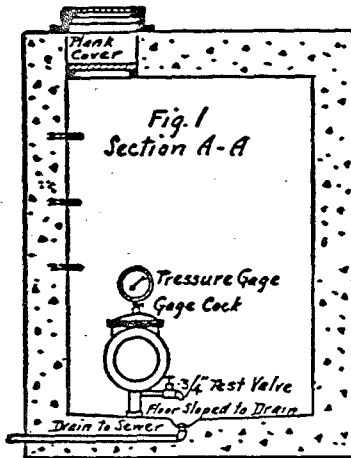
(6) AUXILLIARY INTAKES, BY-PASSES AND CROSS CONNECTIONS. Auxiliary intakes, by-passes or cross connections whereby polluted water may be pumped or allowed to flow into the distribution system of any public supply under any conditions will be prohibited except under the following special conditions:

(a) An existing intake or by-pass may be maintained providing a section of the pipe is removed to be re-inserted only in case of emergency and immediately issuing notice to consumers to boil all water used and notifying the board by wire.

(b) In new supplies, auxiliary intakes or by-passes may be permitted by special approval of the board if satisfactory reasons are set forth as to the necessity therefor, and installation made in accordance with (a) above.

(c) An existing cross connection for fire protection purposes only which was originally installed before January, 1924 may be continued if protected by approved types of double check and gate valves equipped with suitable gauges and drains for testing, as shown in Fig. 1, and on condition that monthly inspections of such equipment are made and reported upon by the owner of the public supply on or before the tenth day of each month. The board reserves the right to require elimination of any cross connection if inspections are not regularly made and reported upon, or if the connection is found faulty. All cross connections other than those used only for fire protection purposes shall be eliminated. New cross connections are prohibited. Permission to maintain any existing cross connection for fire protection purposes must be obtained from the board on or before January 1, 1930.

(7) DISTRIBUTION SYSTEM. The distribution system shall be constructed of suitable material and provided with sufficient shut-off valves to facilitate operation and repairs. Where practical, dead ends shall be connected so as to provide adequate circulation of the water. Pipe smaller than 4 inches in diameter shall not be used in municipal systems except possibly for isolated service connections.



TEST TIGHTNESS of check valves and report to the department once each month as follows—Sec. 18 Rules & Regulations. Close Valve H leaving it open with fire pressure on. Open Test Valve D. If pressure falls at Gage A and holds at B after slight decrease, Check F is tight. While Test Valve D is open and Gage A stands at zero open Test Valve E. If pressure at Gage B falls to zero and flow from E ceases, Check G is tight. If either check leaks repair at once.

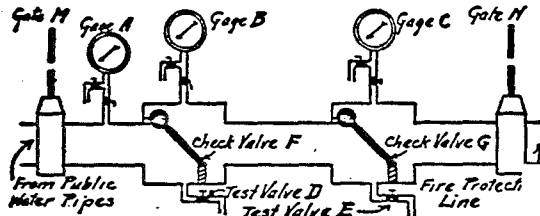


Fig. 3 Arrangement Diagram of Valves

DOUBLE CHECK VALVE INSTALLATION
BETWEEN
Public and Factory Water Supplies
Department of Resource
Development

Note: Adapted from drawing of Associated Factory Mutual Ins. Co. Boston, Mass. June 1918.

Figure 1. Double check valves for cross connections.

(8) **FIRE PROTECTION.** The pumping equipment, storage facilities, distribution system and location of hydrants shall be such as will furnish adequate fire protection.

(9) **ENGINEER'S REPORT.** The engineer's report shall cover the following:

(a) *Water consumption.* State the present and estimated population twenty-five years hence for municipalities; for institutions the present and estimated ultimate capacity. Any special conditions that might affect the growth of the municipality or institution, also any industrial activities that may affect the requirements of the water supply, should be discussed. Give estimate of the daily total and per capita consumption, both for present and future population.

(b) *The source of supply.* 1. If samples of the water can be obtained results of chemical and bacteriological analyses shall be included, otherwise the probable character of the water shall be discussed, basing conclusions on analyses or other available information regarding water from similar sources.

2. If a surface supply, the area, population and a description of the tributary watershed shall be given. All possible sources of pollution, topographical and geological features of the watershed, and other conditions that might in any way affect the quality or quantity of the supply shall be discussed in detail.

3. If the source is ground water, give details regarding the number, depth and character of the wells, springs, infiltration galleries, etc., and definite information regarding the various strata. State whether the source is ever subject to flooding.

(c) *Purification.* State reasons for adopting the method of purification outlined, specifying any experimental work done. Describe completely any special appliances.

(d) *Pumping equipment.* The number, type, size and capacity of the pumps to be installed and type of power should be given; discuss clearly any special features and method of connecting the pumps with the wells, suction lines or other parts of the system.

(e) *Distribution system.* State the class, weight and amount of the various sizes of pipe and describe any special features.

(f) *Storage.* Give amount and location of the storage available, both before and after purification, together with details regarding its effect upon the quality of the supply.

(g) *Fire protection.* Discuss adequacy of fire protection in regard to capacity and pressure.

(h) *Cost.* Give estimated cost of integral parts of the system, both for complete design and original installation.

RD 11.02 -Operation. (1) **DISTRIBUTION SYSTEM.** All intakes, pumping equipment and distribution systems shall be maintained in a proper operating condition at all times. The mains shall be regularly flushed at sufficiently frequent intervals to prevent accumulation of sediment or of stagnant water.

(2) **SEDIMENTATION AND STORAGE RESERVOIRS.** All sedimentation and storage reservoirs shall be cleaned at sufficiently frequent intervals to prevent such accumulation of sediment as will interfere with the efficient operation of the waterworks.

(3) **SLOW SAND FILTERS.** Slow sand filters shall be cleaned at such times as may be necessary to secure efficient operation. In general the "loss of head" should not exceed 5 feet before cleaning. When sand has been removed from the filter so that the remaining depth is less than 1½ feet, the filter bed shall be brought up to its original depth by adding clean sand of a proper size and grade.

(4) **MECHANICAL FILTERS.** (a) In connection with all mechanical filters, the water shall receive preliminary treatment consisting of coagulation and sedimentation. A sufficient amount of the coagulant shall be applied at all times to secure a satisfactory flow. Before the "loss of head" has reached 10 feet, the filters shall be washed with filtered water until the effluent wash water is practically clear. Subsequent to washing the first filtrate shall be wasted for a sufficient period of time to place the plant again in effective operating condition. Sudden changes in the rate of filtration shall be avoided.

(b) Care must be exercised to prevent caking or cementing of the sand in the filter beds and should this occur the sand shall be removed and replaced by new sand or the old sand may be screened and returned to the beds. When the depth of the sand in the filter becomes less than 2 feet because of loss by washing, the filter shall be brought to its original depth by adding new sand of a proper size and quality.

(5) **STERILIZATION.** Where any process of sterilization is used as a method of purification, the plant shall be so operated as to secure effective results at all times. Extra parts or duplicate apparatus shall be kept on hand to avoid unnecessary delays.

CHAPTER RD 12

WELL CONSTRUCTION AND PUMP INSTALLATION

RD 12.01	Scope of the code	RD 12.10	Well construction equip- ment
RD 12.02	Basic principles	RD 12.11	Concrete and grout mix- tures
RD 12.03	Definitions	RD 12.12	Use of wells for drainage purposes
RD 12.04	Location	RD 12.13	Abandonment of wells
RD 12.05	Design and construction	RD 12.14	Orders
RD 12.06	Surface protection	RD 12.15	Existing installations
RD 12.07	Miscellaneous well con- struction requirements		
RD 12.08	Samples and reports		
RD 12.09	Pump installation and con- struction		

RD 12.01 Scope of the code. (1) **APPLICABILITY.** The provisions of the regulations governing well construction and pump installation shall apply to all new or reconstructed wells intended or used for supplying water for human consumption, including those used in the production and preparation of food and food products, excepting those for public utility and institutional water supplies, cooperative water supplies serving ten or more premises of mixed ownership, and new, additional or reconstructed wells on one property, whose capacity and rate of pumping, either singly or in the aggregate, are in excess of 100,000 gallons per day.

(2) **APPROVED COMPARABLE CONSTRUCTION.** When strict compliance with this code appears to be impracticable, the reasons therefor shall be communicated in writing to the department of resource development for advice and approval of comparable specifications.

(3) **CONTRACT APPLICABILITY.** Applicable specifications and provisions of this code are, by law, a part of any order or agreement, written or verbal, for the construction or reconstruction of a well or appurtenances thereto, or for the installation of pumping equipment. Construction or installation shall be deemed complete when all code requirements or approved comparable specifications are complied with. (See RD 12.08 (1))

(4) **EXISTING INSTALLATIONS.** Existing well and pump installations that conform to RD 12.15 will be acceptable. Non-complying pit and pump installations made prior to the effective date of this section shall be corrected to comply with RD 12.15 or the regulations for new construction before January 1, 1956. Well and pump installations that are unsafe should be corrected as soon as possible.

RD 12.02 Basic principles. (1) **GENERAL.** Regulations are hereby prescribed to establish uniform minimum standards and methods of procuring and protecting an adequate supply of ground water safe and fit for human consumption and for the preparation of food products through adequate construction or reconstruction of wells, installation of pumping equipment, or other methods approved by the department of resource development, in conformity with chapter 162, Wis. Stats. The following basic principles, general in

scope and fundamental in character, shall govern the location, construction or reconstruction and maintenance of wells, installation and maintenance of wells, installation and maintenance of pumping equipment, and supervision of well constructors and pumping equipment installers.

(2) WELL CONSTRUCTION. Where a well is constructed to supply ground water for human consumption and preparation of food products, such well shall be:

(a) Located in such manner that the well and its surroundings can be kept in a sanitary condition.

(b) Adequate in size to permit such construction or reconstruction as may be necessary to provide a safe water supply.

(c) Constructed in such manner as to maintain natural protection against contamination of water bearing formations and to exclude known sources of contamination.

(3) PUMP INSTALLATION. The installation of the pumping equipment shall be:

(a) Located in such manner that the pump and its surroundings can be kept in a sanitary condition.

(b) Adequate in capacity to supply the required volume of water, where available, for maintenance of sanitary conditions, all ordinary domestic purposes and other specified uses. (See RD 12.03 (1)).

(c) Designed to meet the well characteristics, durable in character and made in such manner that continued operation without priming is assured at time of installation.

(d) Made in such manner as to provide adequate protection against contamination of any character from any surface or subsurface source.

RD 12.03 Definitions. For the purpose of these regulations the following definitions are established: (1) ADEQUATE WATER SUPPLY means that, where obtainable, the yield of a well or the capacity of a pump and distribution system shall be sufficient to meet the requirements which the user has stated are necessary for drinking, culinary, food processing and other purposes for which well water is intended to be used.

(2) ANNULAR SPACE means the space between two circular objects, one of which surrounds the other, such as the opening between a drillhole and a casing pipe or between a casing pipe and a liner pipe..

(3) APPROVED means sanctioned by the department of resource development in conformity with applicable laws, regulations and specifications.

(4) CONTAMINATION means any matter which will render water unsafe for human consumption.

(5) DRAWDOWN means the extent of lowering of the water level in a well when water flows or is pumped from it.

(6) DRILLHOLE. (a) Lower drillhole means that part of a drillhole below the vertical zone of contamination.

(b) Upper drillhole means that part of a drillhole, augerhole or excavation established through the vertical zone of contamination.

(7) DRIVEN POINT WELL means a well constructed by joining a "drive point" with a length of pipe, extended as may be necessary, and driving the assembly

into the ground without a preliminary excavation in excess of 10 feet depth. So called "tubular" type wells are considered drilled type wells.

(8) ESTABLISHED GRADE means the permanent point of contact of the ground or artificial surface with the casing pipe or curbing of the well.

(9) **ESTABLISHED GROUND SURFACE** means the permanent elevation of the surface of the site of the well.

(10) **FLUSHING** means the act of causing a rapid flow of water from a well by pumping, bailing or similar operation.

(11) **NEAR-SURFACE WATER** means water in the zone immediately below the ground surface. It may include seepage from barnyards, leaching pools and disposal beds or leakage from sewers, drains and similar sources of contaminated water.

(12) **PREPARATION OF FOOD PRODUCTS** means washing, cooling, cooking, pasteurizing, bottling, canning, or otherwise preparing food for human consumption, and including the washing of utensils and equipment used in production or preparation of food.

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

(14) **PUMPING WATER LEVEL** means that elevation of the surface of the water in a well when water flows or is pumped from it at the customary rate.

(15) **SAFE WATER** means water that is free from contaminating matter.

(16) **SANITARY CONDITION.** (a) When referring to a well it means that the construction of the well and the installation of the pumping equipment are such that the well is effectively protected against entrance of contaminating matter.

(b) When referring to the surroundings of a well it means that the location and surrounding area are free from debris or filth of any character and not subject to flooding.

(17) **SEWER** means a conduit used or intended for conveying sewage.

(18) **SPECIFIC CAPACITY** means the continuous yield of a well at a given drawdown expressed in gallons per minute, per foot of drawdown.

(19) **STATIC WATER LEVEL** means that elevation of the surface of the water in a well when no water flows or is being pumped therefrom.

(20) **STOCK WATERING WELL** means a well used to supply water for farm animals and agricultural purposes, water from which is not used in the production or preparation of food or food products for human consumption.

(21) **STUFFING BOX** means an approved receptacle in which packing may be compressed to form a water-or airtight junction between two objects.

(22) **VERTICAL ZONE OF CONTAMINATION** means that depth of near-surface formations containing connecting pore spaces, crevices or similar openings, including artificial channels, such as unprotected wells, through which contaminated water may gain access to a well or the ground-water body.

(23) **WATER-TIGHT CONSTRUCTION** implies cased and grouted construction through firm formations like clay or rock. Through granular material like sand or gravel, it implies that the casing pipe is of approved quality and assembled water-tight.

(24) WELL SEAL means an approved removable arrangement or device used to cap a well or to establish and maintain a junction between the casing or curbing of a well and the piping or equipment installed therein, so as to prevent water from entering the well at the upper terminal.

(25) WELL VENT means an outlet at the upper end of the well casing to allow equalization of air pressure in the well.

(26) YIELD means the quantity of water per unit of time, which may flow or be pumped from a well.

(Note: For definitions of board, ground water, permit, well, well driller, well drilling, see chapter 162, Wis. Stats.)

RD 12.04 Location. (1) GENERAL. Every well shall be located in keeping with the following principles:

(a) At the highest point in the premises consistent with general layout and surroundings, but in any case protected against surface wash.

(b) As far removed from any known or probable source of contamination as the general layout of the premises and the surroundings permit.

(2) RELATION TO POLLUTION SOURCES. Minimum distances between wells and sources of contamination shall be maintained as follows:

(a) Seepage pit, filter bed, soil absorption field or similar sewage disposal unit—50 feet.

(b) Water-tight grease trap, septic tank or tile sewer—25 feet.

(c) Cast iron sewer having leaded joints—8 feet.

(d) Sewer-connected foundation drain—15 feet.

(e) Independent clear water drain, downspout, cistern or similar unit—10 feet.

(3) RELATION TO BUILDINGS. With respect to buildings the location of a well shall be as follows:

(a) When a well is located adjacent to a building, it shall be located so that the center line of the well extended vertically will clear any projection from the building by not less than two feet.

(b) Every well shall be located so that it will be reasonably accessible with proper equipment for cleaning, treatment, repair, test, inspection, and such other attention as may be necessary.

(c) No well shall be located so that the top thereof will be within the basement of any building nor under a building having no basement.

RD 12.05 Design and construction. (1) GENERAL. The construction of every well shall be planned and carried out so that it is:

(a) Adapted to the geologic (earth structure) and ground water conditions existing at the site of the well so as to insure full utilization of every natural protection afforded thereby.

(b) Designed to facilitate such supplementary construction as may be required to provide a sufficient and safe water supply, where obtainable, and to conserve ground water.

(c) Capable of yielding, where obtainable, the quantity of water required to satisfy the requirements which the user has stated are necessary and for which well water is intended to be used.

(2) DRILLED TYPE WELLS. The foregoing requirements shall be deemed to be fulfilled to the minimum extent when a drilled well has been installed in conformity with the applicable construction set forth in table 1. (See figures 1, 2, 3, 4, 5.)

Table 1
DRILLED TYPE WELL REQUIREMENTS

No.	Water-Bearing Formation	Overlying Material	Drillhole			Well Pipe		Construction Conditions
			Upper		Lower Diameter	Casing Diameter	Liner Diameter	
			Diameter	Depth				
a.	Sand or Gravel	Sand or mixture of sand and gravel.			Same as casing.	Minimum 2"		<p>a, b, c. An adequate screen shall be provided where necessary. They shall be installed in such a manner that removal or replacement can be accomplished without adversely affecting the water-tight construction of the well.</p>
b.	Sand or Gravel	Clay or similar material to depth of 30' or more, containing layers of sand or gravel.	Casing diameter plus 4"	5' into clay below any sand or gravel above the 20' depth.	Same as casing.	Minimum 2"		
c.	Sand or Gravel	Clay or similar material only to depth of 25' or more.	Casing diameter plus 4"	Minimum 20'	Same as casing.	Minimum 2"		
d.	Limestone, Granite or Quartzite	Drift, mainly sand or gravel, to depth of at least 40' to a radius of ½ mile. No record of sink holes, test holes or abandoned wells in above area.			6"	Minimum 6"	Minimum 4"	<p>d, e. The casing pipe shall be firmly seated in the rock formation. Liner pipe 2" smaller than casing pipe or drillhole shall be assembled without couplings.</p>
e.	Limestone, Granite or Quartzite	Clay or similar material to depth of at least 40' to a radius of ½ mile. No record of sink holes, test holes or abandoned wells in above area.	Casing diameter plus 4"	Minimum 20'	6"	Minimum 6"	Minimum 4"	

Table 1—Continued
DRILLED TYPE WELL REQUIREMENTS

No.	Water-Bearing Formation	Overlying Material	Drillhole			Well Pipe		Construction Conditions
			Upper		Lower Diameter	Casing Diameter	Liner Diameter	
			Diameter	Depth				
f.	Limestone, Granite or Quartzite	Drift material for depth less than 40' within a radius of ½ mile. No record of sink holes, test holes or abandoned wells in above area.	Casing diameter plus 4"	10' into uncreviced rock below 30'	6"	Minimum 6"	Minimum 4"	f, g, h. Neat cement grout shall be used. When grout material is placed by a suitable pump from the bottom of the casing the upper drillhole diameter need be only 2" larger than the casing pipe. Liner pipe 2" smaller than casing pipe or drillhole shall be assembled without couplings.
g.	Sandstone	Any material except limestone to depth of 20' or less.	Casing diameter plus 4"	15' into firm sandstone or to 30' depth.	4"	Minimum 4"	Minimum 2"	
h.	Sandstone	Any material except limestone to depth of 21 to 25'.	Casing diameter plus 4"	Into firm sandstone. Minimum depth 30'.	4"	Minimum 4"	Minimum 2"	g, h. The casing pipe shall be effectively seated into sandstone.
i.	Sandstone	Mixed deposits mainly sand and gravel to depth of 25' or more.		Into firm sandstone.	4"	Minimum 4"	Minimum 2"	
j.	Sandstone	Clay or similar material to depth of 25' or more.	Casing diameter plus 4"	Minimum 20'	4"	Minimum 4"	Minimum 2"	i, j. The casing pipe shall be effectively seated into sandstone. Liner pipe 2" smaller than casing pipe or drillhole shall be assembled without couplings.
k.	Sandstone	Limestone at variable depth.	Casing diameter plus 4"	Minimum 15' into firm sandstone.	6"	Minimum 6"	Minimum 4"	
								The upper drillhole shall be kept about ½ filled with clay slurry throughout driving of permanent well casing. The balance of the annular space shall be filled with clay slurry or cement grout.
								The annular space shall be filled with cement grout. When grout material is placed by a suitable pump from the bottom of the casing the upper drillhole diameter need be only 2" larger than the casing pipe.

(a) Well casing pipe. The minimum standard of quality for casing material through the vertical zone of contamination shall be steel or wrought iron pipe having weights as specified in table 2.

Table 2
CASING PIPE WEIGHTS AND DIMENSIONS

Size in Inches	Wt. Lbs. Per Ft. Threads and Couplings	Pipe			Threads Per Inch	Couplings	
		Thickness in Inches	Diameter-Inches			Length in Inches	External Diameter Inches
			External	Internal			
1	1.68	.138	1.315	1.049	11 1/2	1 7/8	1.556
1 1/4	2.28	.140	1.660	1.380	11 1/2	2 1/8	1.907
1 1/2	2.73	.145	1.900	1.610	11 1/2	2 3/8	2.218
2	3.68	.154	2.375	2.067	11 1/2	2 7/8	2.760
2 1/4	5.82	.203	2.875	2.469	8	2 7/8	3.276
3	7.62	.216	3.500	3.068	8	3 1/8	3.948
3 1/2	9.20	.226	4.000	3.548	8	3 3/8	4.591
4	10.89	.237	4.500	4.026	8	3 7/8	5.091
4 1/2	12.64	.247	5.000	4.506	8	4 1/8	5.591
6	14.81	.258	5.563	5.047	8	4 3/8	6.296
6	19.18	.280	6.625	6.065	8	4 3/8	7.358
7	23.769	.301	7.625	7.023	8	4 3/8	8.358
8	25.00	.277	8.625	8.071	8	4 3/8	9.420
10	35.00	.307	10.750	10.136	8	6 1/8	11.721
12	45.00	.330	12.750	12.090	8	6 1/8	13.958
14 OD	67.00	.375	14.000	13.260	8	7 1/8	15.446
15 OD	61.15	.375	15.000	14.260	8	7 1/8	16.446
16 OD	65.30	.375	16.000	15.260	8	7 1/8	17.446
17 OD	73.20	.375	17.000	16.260	8	7 1/8	18.683
18 OD	81.20	.375	18.000	17.260	8	7 1/8	19.921
20 OD	90.00	.375	20.000	19.260	8	7 3/8	21.706

(b) Well casing pipe shall be assembled water-tight by means of joints welded in accordance with approved practice or by correctly mated, standard weight couplings.

(c) Well casing pipe shall be driven or installed so that no injury affecting the safety of the water supply results.

(d) No second hand or reclaimed pipe shall be used as the protective casing in the permanent construction of a well.

(3) FLOWING WELLS. The construction of flowing wells shall comply with the minimum requirements of

(a) Every practicable effort shall be made to extend the water-tight (cased and cement grouted) construction into the upper confining bed of the artesian basin.

(b) When it is impractical to extend the water-tight construction as indicated in subsection (a), an adequate packer shall be set and maintained in the confining bed with a flowpipe extending therefrom to a point at least one foot above the established grade.

(Note: Owners of flowing wells can contribute substantially to the conservation of their artesian ground-water supply by maintaining their wells in good repair and controlling the flow therefrom within the limits of their actual needs.)

(4) BORED TYPE WELLS. Through the vertical zone of contamination the construction of a bored type well shall conform to the specifications for drilled type wells. (RD 12.05(2) and figure 6.)

(a) The minimum diameter of the casing pipe shall be 6 inches.

(b) The curbing below the vertical zone of contamination shall be properly cured concrete pipe or equal. In such case the joints shall be the tongue and groove type. Plain end or bell and spigot pipe shall not be used.

(c) The minimum inside diameter of well curbing shall be 8 inches.

(Note: By placing a short length of casing pipe concentrically within a section of curbing pipe and filling the resulting annular space with rich concrete, a very satisfactory junction is obtained between the casing and curbing pipe.)

(5) **DRIVEN POINT WELLS.** Through the vertical zone of contamination the depth of the unperforated pipe of a driven point well shall conform to the specifications for drilled type wells. (See 12.05 (2)).

(a) The depth of a driven point well shall be sufficient to prevent breaking suction when pumping the well at a rate 50 per cent greater than the capacity of the permanent pump.

(b) Protection against freezing shall be accomplished by means of casing pipe. So-called "frost-pits" curbed with stones, brick, tile, wood and the like are prohibited. (See figure 7.)

(6) **DUG TYPE WELLS.** The retaining wall of every dug type well shall be substantial and water-tight to a depth of at least two feet below the vertical zone of contamination but in no case less than twelve feet below the established grade at the well. The curbing through the intake area shall be of adequate strength to withstand any external pressure to which it may be subjected and must be seated sufficiently firm to prevent settling.

(a) *Concrete wall.* The concrete mixture shall conform with the provisions of RD 12.11. The wall shall be circular and at least six inches thick with concrete so placed as to be free from voids. Vertical and horizontal reinforcing with three-eighths inch rods on 12-inch centers shall be provided. Rods shall lap 12 inches but such lap shall not occur at construction joints. If possible, the wall shall be poured in one operation but in no case shall there be a construction joint within 10 feet of the surface. Construction joints shall be left rough and shall be washed and brushed with neat cement grout before pouring of concrete is continued. (See figure 8 (a).)

(b) *Metal wall.* A metal retaining wall of steel or wrought iron shall be at least three-sixteenths of an inch thick, with welded joints. The wall shall be sufficiently thick and so reinforced as to resist any external pressure to which it may be subjected.

(c) *Casing pipe reduction.* In lieu of extending well curbing of full dug well diameter to the surface, a standard weight steel or wrought iron pipe at least six inches in diameter may be used. This pipe shall be firmly seated in a reinforced concrete slab which shall be mounted on the full diameter curbing. Such slab shall be located so that the top is at least 12 feet below the established grade at the well. If the vertical zone of contamination extends below a depth of 12 feet, the casing pipe or water-tight curbing shall extend to any additional depth necessary. (See figure 8 (b).)

(d) *Curbing installation.* In caving soil formation, the curbing shall be constructed at the surface and carried down by excavating from the interior. If wood forms are used on the exterior of the wall, they shall be removed before the wall is lowered. Use of exterior wood forms below the ground surface is prohibited. Metal forms may be left in place.

(e) *Annular opening.* The opening between the face of the excavation and curbing or casing through the vertical zone of contamination shall be filled with clean puddled clay or equal.

(f) *Upper terminal.* Except when a dug well is constructed in accordance with subsection (c), the curbing shall extend at least eight inches above an established free draining grade, and the ground graded up around same to a height of six inches, above the ground so as to conduct all surface water away from the well.

(g) *Dug well cover.* The cover of a well curbed according to subsection (a) or (b) shall be made of substantial reinforced water-tight concrete at least five inches thick and of sufficient diameter to overlap the wall or curb by at least two inches. The cover shall be free from joints. A tight joint shall be provided between the top of the wall and the cover, using a plastic compound, if necessary. The top of the slab shall be sloped to drain away from the pump. A manhole, if installed, shall be provided with a metal curb, the top of which extends four inches above the slab and is equipped with an overlapping cover, the sides of which extend downward at least one and one-half inches. The manhole cover shall be locked or bolted in place in such manner as to be safe and to prevent entrance of water. (See RD. 12.09 (1).)

(h) *Equipment location.* No pumping equipment or appurtenances requiring access to the interior of the well for maintenance or repair operations shall be installed in the well.

(7) **DEEPENING DUG TYPE WELLS.** A drilled type well may be constructed through an existing dug type well in accordance with the following procedures:

(a) *Preparation for deepening.* Any sediment or debris in the bottom of the dug well shall be removed. The bottom shall be disinfected by distributing a chlorine solution over the bottom or mixing such solution to water in the well. A concentration of 200 parts per million of chlorine should be attained for disinfection.

(b) *Applicability to drilled type construction.* Deepening construction done by drilling methods shall conform to applicable conditions RD 12.05(2) (See figure 9.)

(Note: Existing "dug and drilled" type wells can be effectively protected against entrance of surface and near-surface water by extending the casing pipe of the drilled part of the well to the surface and filling the dug part of the well with puddled clay or equally impermeable material.)

RD 12.06 **Surface protection.** (1) The water-tight casing or curbing of any well supplying water used in production or preparation of food or food products or supplying water to premises serving the public shall extend to a point above the established ground surface. A sub-surface pipe connection to such a well shall not be allowed, unless it is made with an approved threaded fitting, the connection is above ground-water level, the piping is under pressure and no pit is required. On off-set installations in basements, the pump impeller or cylinder shall be located at an elevation above the ground surface or at a height of two or more feet above the basement floor. Pressure conduits may terminate at the end of the horizontal line entering the basement if the point of entrance is two feet or more above a basement floor that is in active use. Exceptions to this section may be

made only where a permit for a well pit has been obtained from the board. Such a permit shall be granted where the plans and specifications submitted for the construction of the pit and the pump installation assure a reasonably safe water supply.

(2) The water-tight casing or curbing of any well supplying water to residential units housing not more than three families shall extend to a point above the established ground surface unless a permit for a well pit is obtained from the board. A pitless sub-surface connection is permitted if made with approved fittings or welding procedures, the connection is above ground-water level, and the pump location is not subject to flooding. Suction, submersible and jet pump piping shall be enclosed in a pipe conduit having a minimum thickness of 0.237 inches. (See RD 12.09 (1)).

(Note: Application for a permit to install a well pit shall be made to the district office of the board.)

RD 12.07 Miscellaneous well construction requirements. (1) ALIGNMENT. The deviation of the center line of a well of a drilled or bored type from a straight line per one hundred feet of depth shall not exceed the following tolerances to the depth of pump setting plus 25 per cent.

Diameter of curb in inches	-----	2 to 6	8 to 10	12 or more
Deviation based on diameter, %	--	100	75	50

For greater or lesser depths or for any given well length the allowable deviation shall be proportional.

(2) CAVING PROTECTION. When caving or sloughing formations that would interfere with the proper functioning of the well or the pumping equipment are encountered, entrance of foreign material shall be prevented by means of liner pipe, cementing or other approved methods.

(3) FINISHING OPERATIONS. Upon completing construction or reconstruction operations, the constructor of the well shall carry out finishing operations as follows:

(a) *Disinfection.* Disinfect the well in the manner prescribed by the board.

(Note: Adequate chlorination or other approved disinfection of all water used or present in the well during construction operations insures maximum effectiveness and reduces the time and effort involved in final disinfection to a minimum.)

(b) *Flushing.* Flush the well sufficiently to remove all traces of the disinfectant and to condition the well for use.

(c) *Testing.* Test the well by pumping, except when flowing in excess of requirements, to determine the amount of drawdown and the quantity and stability of the yield within the requirements of RD 12.02(3)(b), RD 12.03(1), RD 12.05(1)(c) or if in excess thereof, as specified by agreement with the purchaser.

(d) *Sealing.* Seal the well water-tight. (See RD 12.09 (2) (a) and RD 12.09 (3)).

(Note: A properly fitted and firmly driven, solid wooden plug is considered the minimum acceptable method of sealing a well until the pumping equipment is installed.)

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(4) **BLASTING.** The use of explosives for increasing or recovering yield of any well developed into limestone, granite or quartzite formations, or of any sandstone well in which casings and liners are not grouted or in which the diameter of the drillhole is larger than that of casings or liners above the point of shooting, shall be undertaken only under permit from the department. (See RD 12.08 (3).)

(5) **CHEMICAL CONDITIONING.** The use of dry ice, detergents, chlorine, acids, or other chemicals in wells for the purpose of increasing or restoring yield shall be undertaken only under permit from the department. Any chemical treatment of a well shall be under supervision of a registered well contractor, professional engineer, or qualified water superintendent. (See RD 12.08 (3).)

RD 12.08: Samples and reports. (1) **WATER SAMPLES.** After flushing and testing a well and after completing installation of pumping equipment the constructor or installer shall collect one or more water samples from the well for bacteriological analysis. Such samples shall be submitted to the state laboratory of hygiene or one of its branch or cooperative laboratories.

(Note: If the well contractor installs the pumping equipment, submission of a sample upon completion of the pump installation will be satisfactory compliance. Where unforeseeable contamination is encountered the initial construction of a well will be considered complete if the construction conforms to these regulations.)

(2) **WELL CONSTRUCTION REPORTS TO DEPARTMENT.** Within ten days after completing the construction or reconstruction of a well the constructor thereof shall submit a construction report to the department upon a form prescribed and furnished by the department.

(3) **WELL CONDITIONING REPORT TO DEPARTMENT.** Within ten days after completing any well blasting or chemical treatment operation the contractor or supervisor shall submit a complete report as to methods used (unless covered in a permit application) and the results achieved.

(4) **REPORTS TO OWNERS.** The well constructor and pump installer shall report to the owner or his agent the laboratory analysis of the sample submitted at completion of the respective work. The well constructor shall also supply to the owner or his agent a copy of the well construction report at the time the report is made to the department.

RD 12.09 Pump installation and construction. (1) **UPPER WELL TERMINAL.** The casing pipe of any drilled, bored or driven type well and the pump installation pipe sleeve on any dug well shall project not less than eight inches above the permanent established ground surface at the well, or eight inches above a pump house floor, platform or cover installed above such established ground surface unless a permit for a subsurface terminal has been obtained.

(2) **HAND PUMP.** Every shallow well type hand pump and every deep well type hand pump head, stand or similar device shall be so constructed that no unprotected opening connecting with the interior of the pump exists. The spout shall be of the closed type.

(a) A hand pump shall be mounted firmly to the well casing pipe or pump mounting sleeve in such manner as to effectively seal the top of the casing or sleeve.

(3) **POWER DRIVEN PUMP.** Any power driven pump located over the well shall be mounted on the well casing, a pump foundation or a pump stand in such manner as to effectively seal the top of the well. In case the pump unit is not located over the well, and the pump delivery or suction pipe emerges from the top thereof, a water-tight expanding or equivalent seal shall be provided between the well casing and the piping. A similar seal shall be provided at the terminal of a conduit containing suction, submersible or jet pump piping. (See RD 12.06 (1) (2) and RD 12.09 (4).)

(Note: On the above ground pump installations the extension of the well casing at least one inch into the pump base will be considered an effective seal provided the pump base is mounted on a base plate or foundation in such manner as to exclude entrance of insects into the well and the elevation at the top of the well is at least two feet above any known flood water level.)

(a) **Pumphouse.** The structure housing a power driven pump shall be constructed so as to permit access to the pump for maintenance and repair work. The pumphouse floor shall be constructed of concrete. On above ground installations the surface thereof shall be located not less than four inches above the established ground surface. (See RD 12.06 (2).)

(b) **Protection against freezing.** The pump, discharge line and accessory equipment shall be protected against freezing by insulation of structure and piping and installation of dependable heating facilities, preferably of a thermostatically controlled type.

(4) **WELL VENT.** Any well vent opening shall be piped watertight to a point not less than twenty-four inches above any known flood water level but at least twelve inches above the top of the well. Such vent opening and extension thereof shall be not less than one-quarter inch in diameter, the extension pipe to be firmly attached. The terminal of the vent pipe shall be shielded and screened so as to prevent entrance of foreign matter. Any opening in a pump base shall be sealed water-tight.

(5) **SAMPLING FAUCET.** In all pressure water systems provision shall be made for collection of water samples by installation of a faucet or pet cock on the discharge side of the pump.

(6) **CASING NOT PART OF PUMP INSTALLATION.** In areas where ground water is known to be corrosive, no pipe serving as the casing of any well shall be used as a delivery pipe or be utilized in the pumping operation. Moving pump parts located in any well shall be enclosed.

(7) **DISINFECTION AND SAMPLING.** Upon completing the installation of pumping equipment, the installer thereof shall conform to RD 12.07 (3) (a) (b) and RD 12.08 (1) (4).

RD 12.10 Well construction equipment. (1) **ADEQUACY.** Every registered well constructor shall be adequately equipped or shall have unquestionable access to adequate equipment to enable full compliance with all regulatory requirements applicable to any construction undertaken by him.

(2) **IDENTIFICATION.** The well constructor's name and current permit number shall be conspicuously displayed on every well construction job, preferably on his equipment.

RD 12.11 Concrete and grout mixtures. (1) CONCRETE AGGREGATE AND MIXTURE. Concrete for use in construction of wells, well platforms and pump floors shall be made of clean, hard, tough and durable aggregates. The maximum diameter of aggregate particles shall not exceed one-fifth of the minimum width between forms. The fine aggregate, or sand, should be separated from the coarse aggregate by means of one-fourth inch screen, the ratio of coarse aggregate to fine aggregate shall be about one and one-half to one, by volume. This ratio shall not exceed two to one nor be less than one to two. From 30 to 70 per cent of the sand passing a one-fourth inch screen should be retained on a number 30 sieve. In proportioning concrete, sufficient sand and coarse aggregate shall be mixed to make approximately three cubic feet of mixed aggregate. To this aggregate shall be added one sack of cement and five and one-half gallons of water. If the aggregate is wet, the water ratio shall be five gallons per sack of cement. The consistency shall be wet enough to permit easy placement without an excess of water.

(2) **CONCRETE GROUT.** The mixture shall consist of cement, sand and water in the proportion of one bag of cement (94 pounds), and an equal volume of dry sand, and five to six gallons of clean water.

(3) **NEAT CEMENT GROUT.** The mixture shall consist of cement and water in the proportion of one bag of cement (94 pounds) to five to six gallons of clean water. Approved ingredients to increase fluidity, reduce shrinkage or control time of set may be used in a grout mixture.

RD 12.12 Use of wells for drainage purposes. (1) DRAINAGE WELLS PROHIBITED. The use of any well for disposal of sewage or other drainage, other than shallow leaching pools installed under governing regulations, is prohibited. (See H 62.20, Wisconsin plumbing code.)

RD 12.13 Abandonment of wells. (1) METHODS. When a well is permanently abandoned, the owner thereof shall fill and seal the well in such manner as to prevent it from acting as a channel for contamination or vertical movement of water by one of the following methods:

(a) *Drift formations.* Fill with clean puddled clay or concrete.

(b) *Limestone formation.* Fill any limestone strata with concrete or alternate layers of concrete and gravel or stone aggregate capping with a layer of concrete 20 feet deep at the top of formation.

(c) *Sandstone formation.* Fill any sandstone formations with concrete or with sand capped with layer of concrete at least 20 feet in depth at top of formation.

(d) *Mixed formation wells.* Fill limestone and sandstone strata in compliance with preceding sections, providing concrete plugs 20 feet in depth, at the top of every recognized geologic formation.

(e) *Flowing wells.* Confine flow and fill well in accord with preceding sections or seal by pressure cementing.

(f) *Obstructions.* Any debris or obstructions that may interfere with sealing operations shall be removed from well to be abandoned.

(2) **TEMPORARY ABANDONMENT.** When a well is temporarily removed from service the top shall be sealed with a water-tight threaded or welded cap or it shall be filled with clean puddled clay.

(3) REPORT TO DEPARTMENT. A report shall be made to the department by the owner of every well which has been abandoned or temporarily removed from service. Such report shall include a detailed description of location, construction and geologic features, and method of sealing.

RD 12.14 Orders. (1) GENERAL. The director may, upon receiving written notice of any alleged failure on the part of any well constructor or installer of pumping equipment to observe and comply with any rule or regulations of this code, order any such constructor or installer to give at least forty-eight hours' notice to the department of the day and date upon which any well under construction or any installation of pumping equipment, by such constructor or installer, or any employe or agent thereof, will be completed; and, require any such constructor or installer to assist the supervisor of well construction in ascertaining the size, depth and character of the construction of any such well or the character of the samples of water from any such well, and such other information as may be required by the said supervisor to determine if any such well has been constructed or any such equipment has been installed in accordance with the rules and regulations of this code. The aforesaid order shall remain in effect for such time as in the discretion of the department may be deemed necessary to attain full compliance with the rules and regulations of this code and until terminated by written notice issued by the said officer.

RD 12.15 Existing installations. (1) LOCATION AND CONSTRUCTION. Each existing water supply system shall be viewed as an individual unit and its safety shall be interpreted on basis of location and construction.

(a) Location. The location shall reasonably conform to RD 12.04.

(b) Construction. The underground construction shall be in reasonable compliance with RD 12.05 as to depth and type of casing and curbing. Existing well pit installations shall meet the following requirements.

1. The floor and roof of any well pit shall be crack-free poured concrete having a thickness of at least four inches. The walls of the pit shall be six-inch thick poured concrete or equivalent construction unless the pit is provided with an independent drain discharging by gravity to the ground surface at an elevation not subject to flooding or gives a history of being continuously dry in which case masonry walls of cement block, brick or stone shall be acceptable. A three-inch thick concrete facing on substantial masonry walls shall be accepted as equivalent wall construction. The junction of walls and floors shall be water-tight. The pit roof or deck shall be above the ground surface.

2. The well pit shall be fitted with a manhole opening having a raised curbing edge at least 3 inches higher than the pit roof. A substantial, water-tight, overlapping, tight-fitting cover with skirted sides shall be provided for the manhole.

3. Where practical the well pit shall be drained by a separate gravity type drain discharging to the ground surface or to a seepage point above ground-water level and be laid water-tight from the pit to a point at least 10 feet from the pit, such drain being constructed either with steel or with

cast iron pipe. When such a drain is not installed, a water-tight sump shall be provided, except that where ground water gains access to the pit an automatic sump pump shall also be required. A pump room adjoining a basement may be drained to the basement provided the basement in turn is adequately drained. No pit drain or sump pump discharge pipe shall be connected directly with any other sewer, drain, or plumbing system.

4. The well casing shall terminate at least six inches above the pit floor and be provided with a sanitary expanding type well seal.

5. Well pits should preferably be vented by use of two 2-inch galvanized steel pipes located in opposite corners, one pipe to extend to within one foot of the pit floor and the other to extend only through the pit roof. The upper end of the vent pipes should terminate with return bends.

(2) PUMP INSTALLATION. Existing pump installations shall conform to the following requirements:

(a) Offset units. The suction line of an offset shallow well pump or the piping of an offset jet pump shall be contained in a sealed conduit between the well and a basement, be connected to the well through a stuffing box or short sealed conduit in a conforming well pit, or be connected to the well with a pitless adapter. It is recommended that the pump impeller or cylinder of pump units located in basements be located above the ground level or be at least three feet above the floor.

(b) Pit setting. A deep well reciprocating, turbine or jet pump and set-length type force pump located in a conforming pit shall be so installed as to permit the sealing of the top of the well with an approved type seal. Any well vent pipe shall extend to the top of the pit and terminate with a return bend.

(c) Hand type pumps. Hand type pumps may be continued in service provided that the pump base flange rests upon a casing flange and the flanges are separated by a gasket. The casing flange must be placed at least 6 inches above the ground or a concrete pump platform. If water is pumped from a hand pump to a reservoir, the piping attachment to the pump should be a closed system.

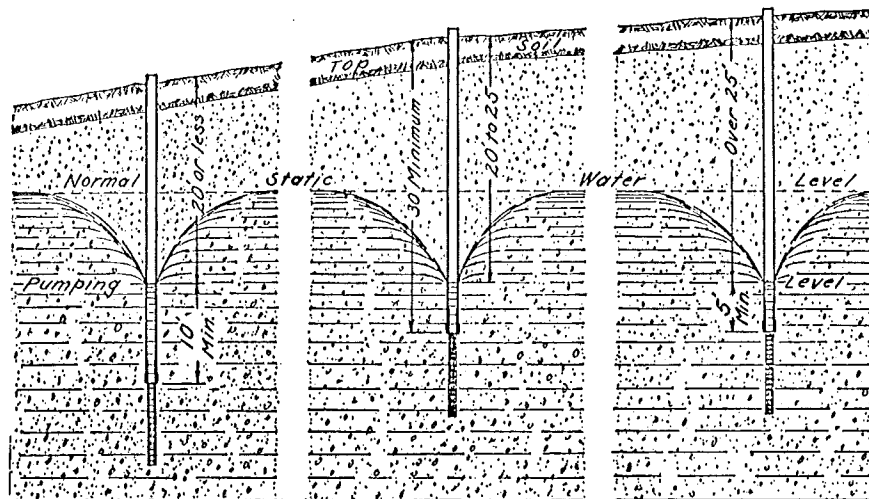


Figure 1. Construction of Wells in Sand and Gravel. See Table 1, a.

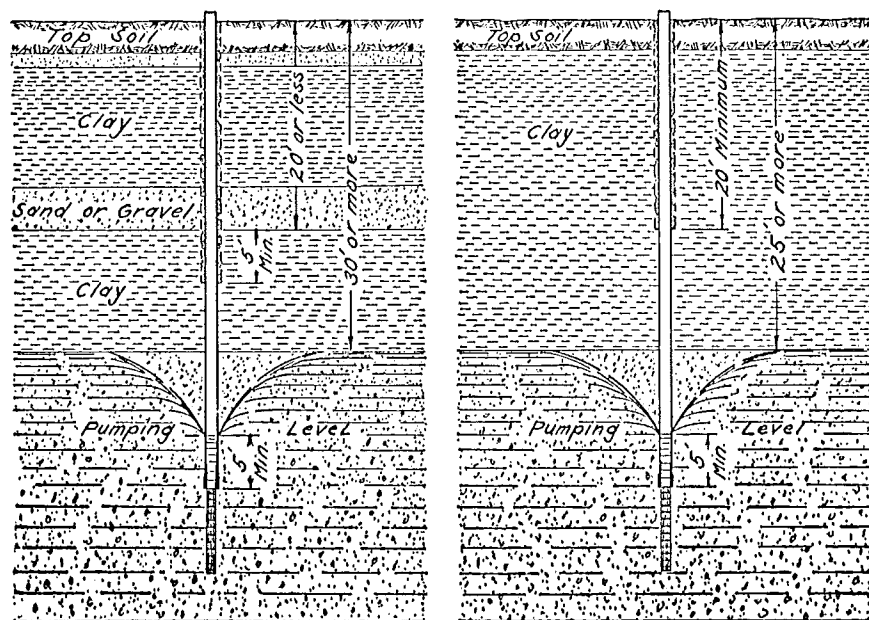


Figure 2. Construction of Wells Terminating in Sand and Gravel Underlying Clay. See Table 1, b and c.

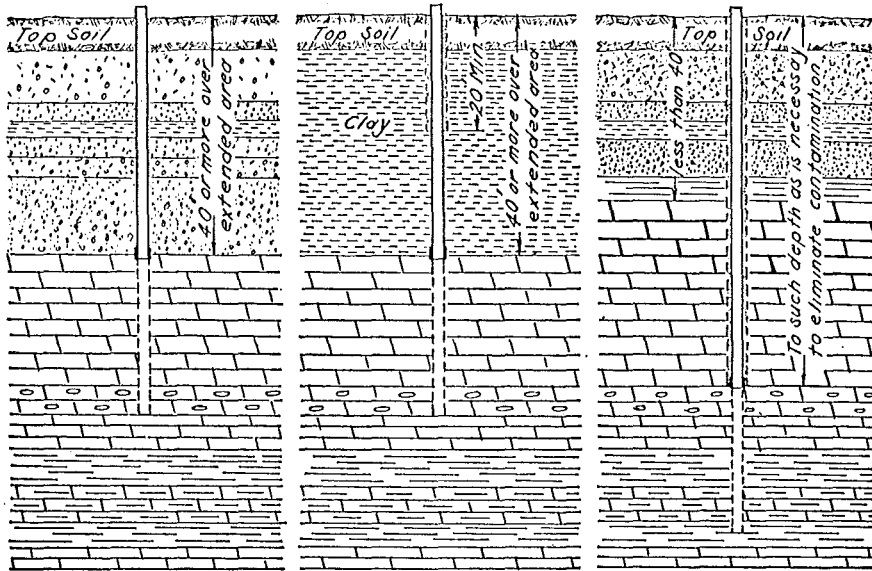


Figure 3. Construction of Wells Terminating in Limestone, Granite, or Quartzite. See Table 1, d, e and f.

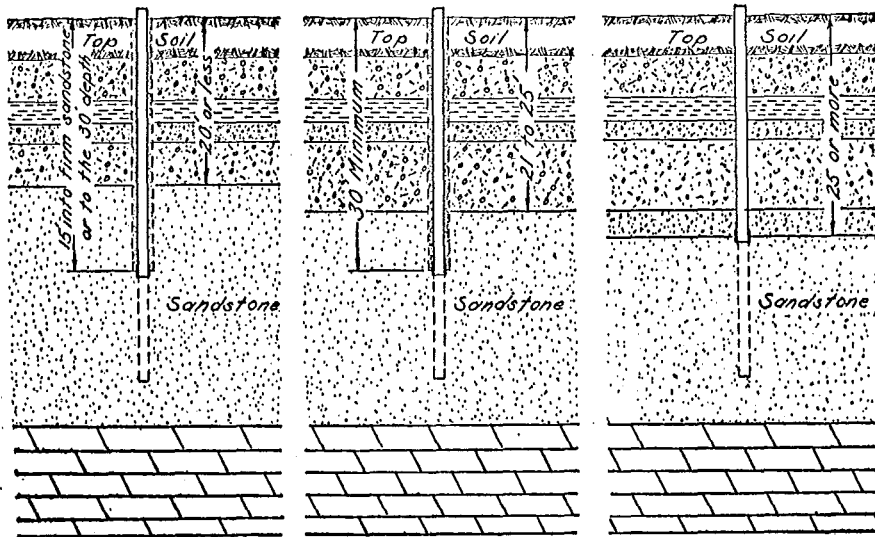


Figure 4. Construction of Wells Terminating in Sandstone Underlying Unconsolidated Material. See Table 1, g, h and i.

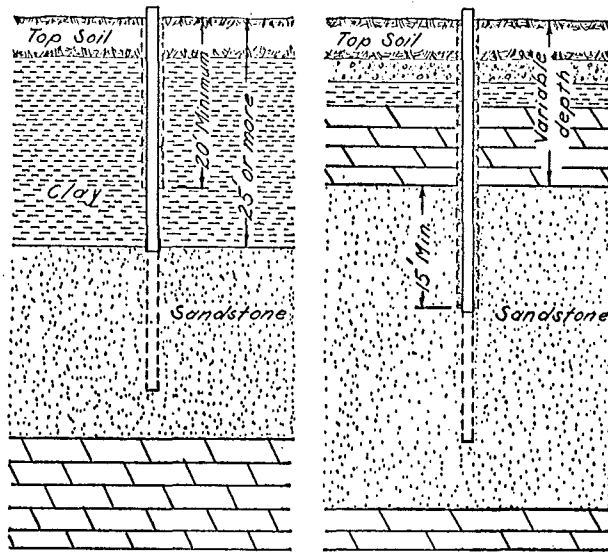


Figure 5. Construction of Wells Terminating in Sandstone Overlain with Clay or Limestone. See Table 1, j and k.

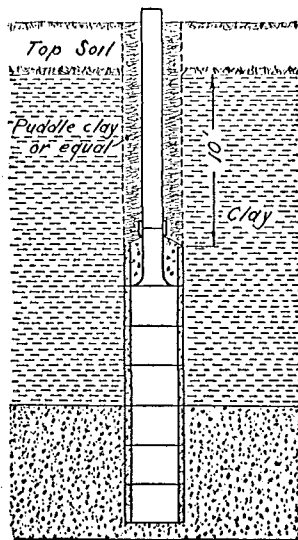


Figure 6. Bored Type Well Construction. See H 55.05 (4).

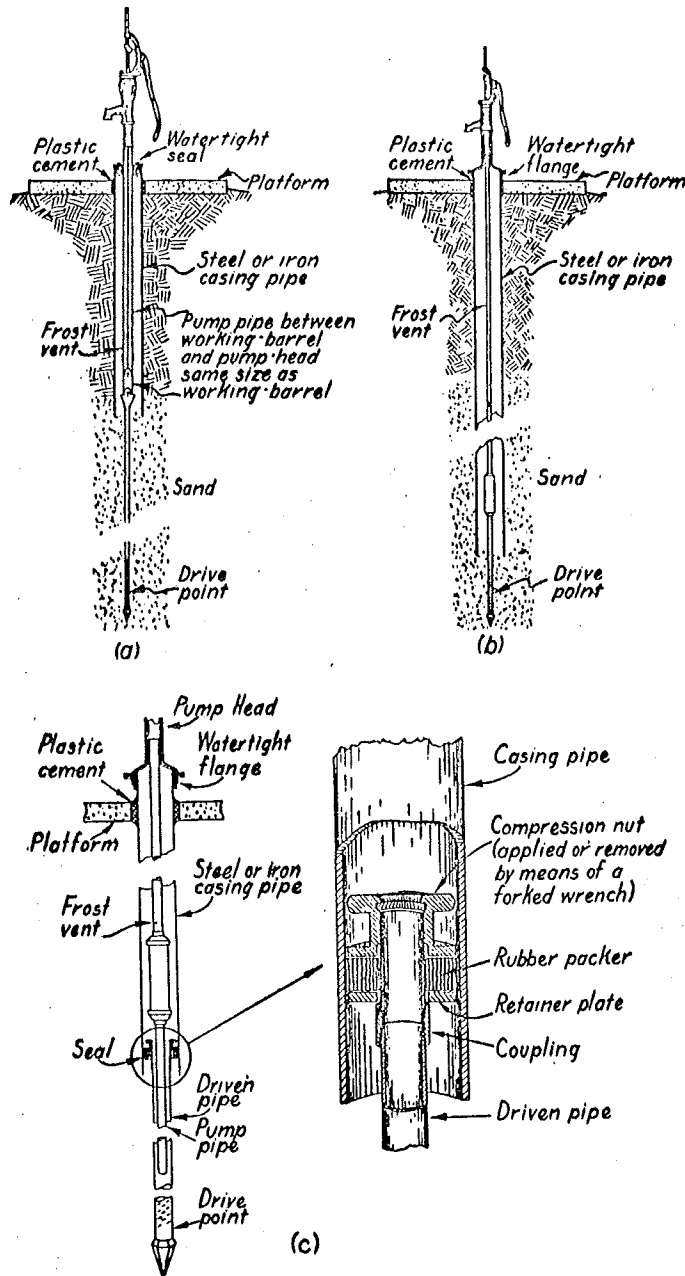
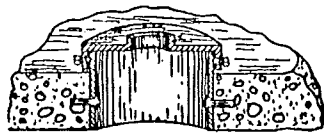
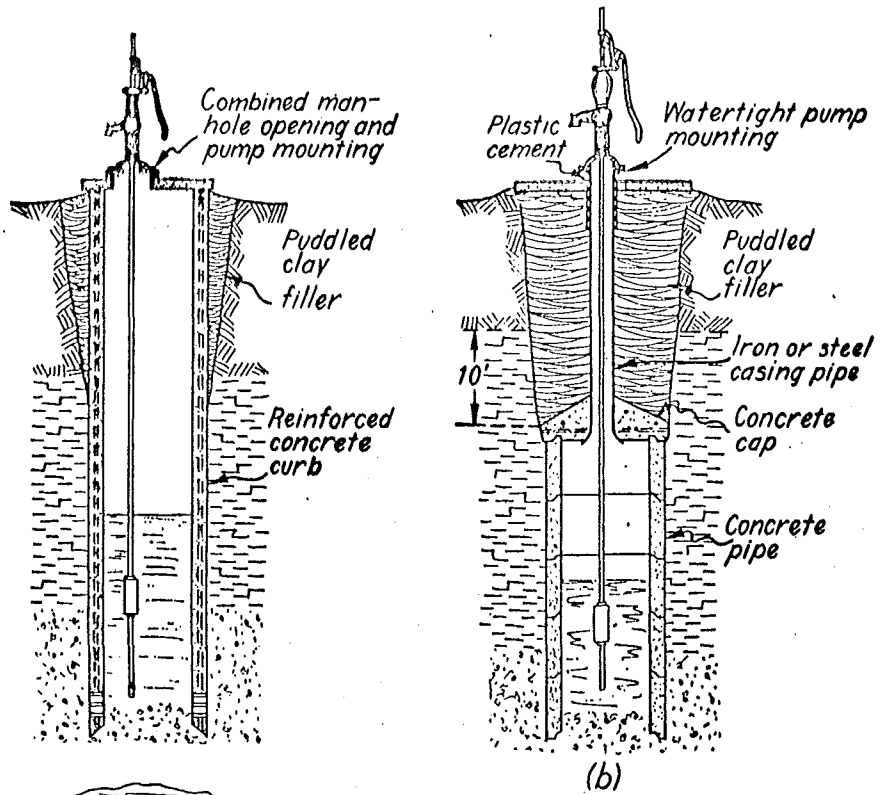


Figure 7. Driven Point Well Construction. Illustration (c) shows suitable method of returning frost drain water to well when impervious soil is present. No H 55.05 (5).



Detail of manhole cover with raised opening for pump

(a)




-  Porous soil
-  Clay
-  Sand or gravel

Figure 8. Sanitary Construction of Dug Wells. See H 55.05 (6).

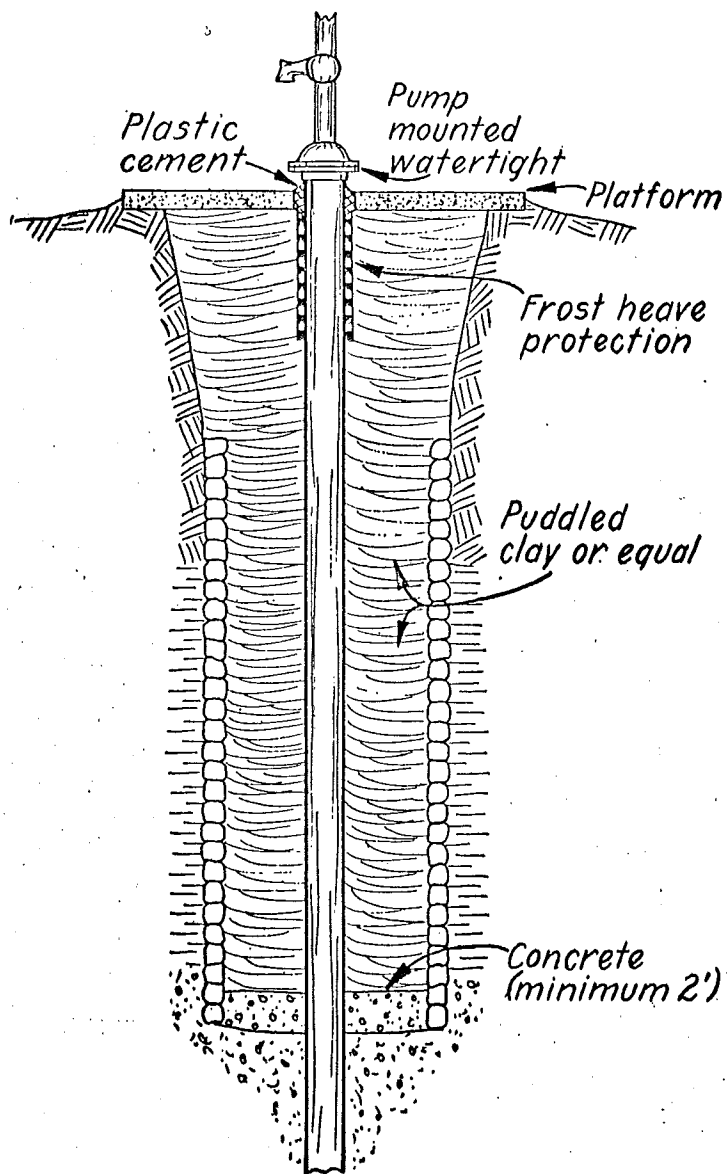


Figure 9. Drilled Well Constructed in Existing Dug Well.
See H 55.05 (7).

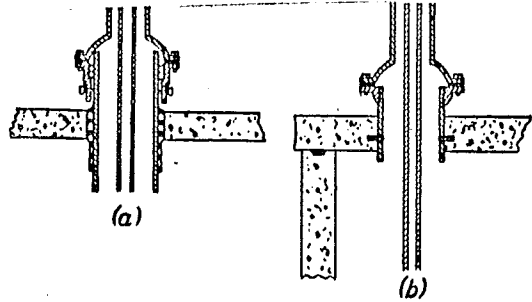


Figure 10. Hand Pump Mountings. (a) On well casing pipe through a water-tight pump flange. (b) On a section of pipe set in concrete well top and fitted with a pipe flange. See H 55.09 (1) and (2) (a).

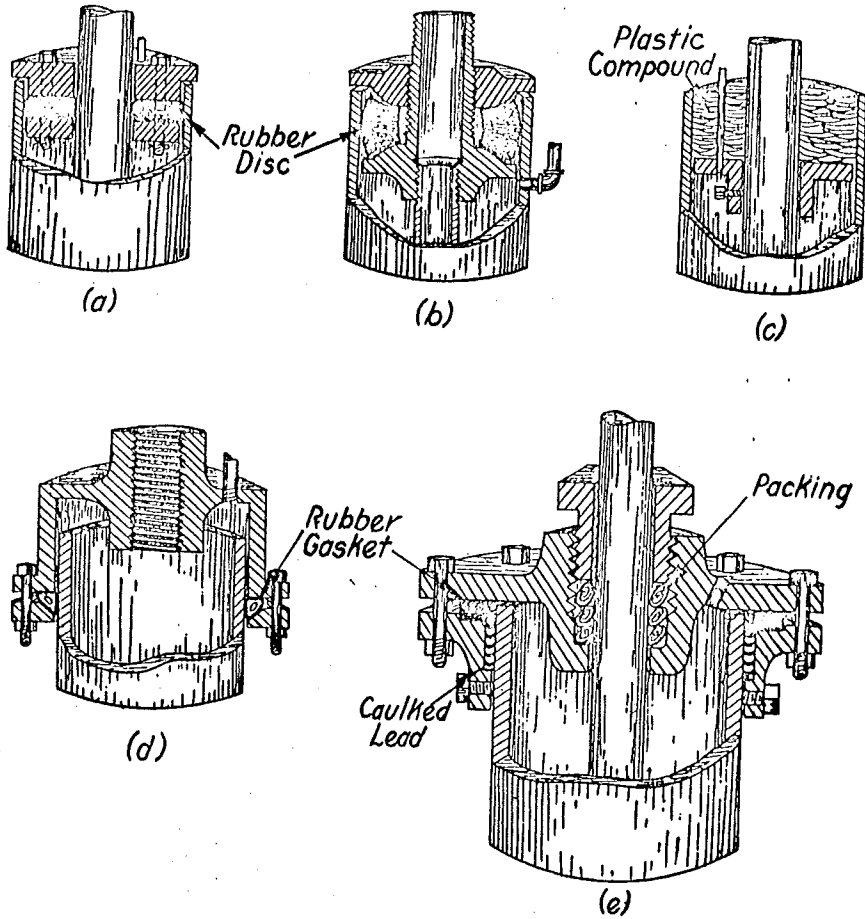


Figure 11. Types of Well Seals. (a) and (b): Seals using inside compressed rubber. (c) using inside plastic compound. (d) using outside compressed rubber gasket. (e) using caulked lead, compressed rubber and packing. See H 55.09 (3).

CHAPTER RD 13

SERVICING SEPTIC TANKS, SEEPAGE PITS,
GREASE TRAPS OR PRIVIES

RD 13.01	Applicability	RD 13.04	Vehicles, implements and containers
RD 13.02	Definitions	RD 13.05	Inspection
RD 13.03	General requirements	RD 13.06	License renewal denial

RD 13.01 Applicability. These rules relating to the servicing of septic tanks, seepage pits, grease traps or privies shall be applicable to any person who engages in the servicing business and to any person servicing sewage treatment and disposal units on real estate owned or leased by him in keeping with section 146.20, Wis. Stats.

History: Cr. Register, November, 1957, No. 23, eff. 12-1-57.

RD 13.02 Definitions. For the purpose of these rules:

- (1) Department means the department of resource development.
- (2) Person means any individual, partnership, association and body politic or corporate.
- (3) Licensee means any person, including any licensed plumber, engaged in the business of servicing septic tanks, seepage pits, grease traps or privies who has met the requirements of law and rules of the department.
- (4) Servicing means the cleaning, removing and disposing of scum, liquid, sludge or other wastes from a septic tank, seepage pit, grease trap or privy.

History: Cr. Register, November, 1957, No. 23, eff. 12-1-57.

RD 13.03 General requirements. (1) Hereafter any person proposing to engage in the business of servicing sewage disposal units shall have his equipment inspected by and obtain a license from the department before commencing operations. A person engaged in the business prior to July 1, 1957, shall be licensed upon application to the department without pre-inspection. Any licensee shall permit his equipment to be inspected upon request and at such time and place as may be designated by the department.

(2) Every licensee shall have sufficient knowledge of sanitation and of the principles underlying the operation of septic tanks, seepage pits, grease traps and privies to safeguard public health and welfare. In the case of a new licensee or in case of doubt as to qualifications of an existing licensee the department may require applicants, initially or upon renewal, to take an oral or written examination to demonstrate that they qualify for licensure.

(3) All work shall be performed in a proper and sanitary manner to the benefit of the property owners and the public at large. The property served shall be left in a sanitary condition.

(4) Every licensee or every person servicing sewage disposal units for himself shall conform to the requirements of Wis. Adm. Code section H 62.20 (1) (f), in the disposal of wastes. Disposal sites selected by local officials for disposal of wastes removed from sewage treatment and soil absorption units shall be located and operated so as to prevent stream or lake pollution and nuisances. In spreading of wastes over lands, as permitted in section H 62.20 (1) (f), the rate of application shall not exceed 30 gallons per each 100 square feet of area.

(5) Pumping or dumping the contents of the serviced unit on the premises or on the highway when transporting the contents for dumping shall be prohibited. Any accidental spillage on the ground on the premises serviced or on highways shall be cleaned up and the area be disinfected so as to render it harmless to humans and animals.

(6) When in use, the vehicle, implements and containers shall be operated in such manner as not to become a health hazard or a nuisance. When in storage all vehicles, tanks, containers, hoses, pipes, pumps and appurtenances shall be covered, capped, sealed or so protected as not to cause an odor nuisance, permit the breeding of flies, attract rodents or become objectionable to any person.

(7) The filling of servicing tanks or containers with water derived directly from lakes or streams is not permitted whenever other sources are available. If water is taken from a stream or lake for flushing purposes, the water shall be disposed of in the same manner as the wastes. Discharge of wastes or flushing water to a stream or lake shall be cause for immediate suspension of the license.

History: Cr. Register, November, 1957, No. 23, eff. 12-1-57.

RD 13.04 Vehicles, implements and containers. (1) The vehicles and implements used in the servicing business shall be used for no other purpose except operations of a similar nature, namely, the hauling of waste materials. However, use of the vehicles for fire protection service if flushed, decontaminated and filled with clean water will be allowed.

(2) Each tank shall be strong enough for all conditions of operation, be leak proof, and designed to be kept tightly closed to prevent spillage of contents or escape of odors while in transit or storage. Tanks should be constructed of steel or other suitable metal and be mounted on a truck chassis.

(3) Licensed plumbers engaged in the business of servicing sewage disposal units shall paint their name and type and number of plumbing license on each side of each vehicle used in the business in the manner set forth in section 146.20 (3) (c) Wis. Stats. The capacity of the tank in gallons shall be painted in a contrasting color on the rear end of any vehicle used in the business by any licensee in letters and numbers at least 2 inches high. The sides and rear end of the tanks should preferably be used for the identification and capacity signs.

(4) All portable containers used in the servicing of sewage disposal units shall be constructed of metal, be water-tight, and be equipped with tight fitting lids. Transportation of wastes in portable containers shall not be allowed by a licensee without board approval of the equipment to be used, such approval to be only for one year periods.

(5) Hoses and piping shall be mounted and stored so as to prevent leakage in transit. Ends of hoses and pipes shall be connected or be fitted with caps when not in use.

(6) Discharge valves on tanks shall be water-tight and shall be located and constructed so as to permit unobstructed discharge into the place of disposal.

(7) Pumps shall be adequate for the required service and preferably of the diaphragm type. The installation shall be designed to prevent backflow or leakage. Connections shall be provided with caps or seals.

(8) Facilities for washing the vehicles, tanks, implements, tools, etc., shall be available and of such design as to prevent an odor nuisance, breeding of flies, attraction of rodents or other objectionable conditions.

(9) All vehicles and all equipment shall be maintained in good condition at all times.

History: Cr. Register, November, 1957, No. 23, eff. 12-1-57.

RD.13.05 Inspection. (1) When a vehicle is to be inspected the licensee or prospective licensee shall have the tank one-third full of water. During the inspection, the operator shall insert the suction hose into an opening in the tank and recirculate the water through the pump and back into the tank, however, if this is impractical, a suitable alternate means of testing shall be provided. At this time, the pumping equipment, hoses, hose connections and tanks shall be checked for adequacy and for leaks. Discharge valves shall be checked for leaks and as to location.

(2) All portable receptacles shall be present at the time of inspection. The licensee shall fill several of the portable receptacles with water upon request to demonstrate that they are water-tight. The receptacles shall be clean.

History: Cr. Register, November, 1957, No. 23, eff. 12-1-57.

RD 13.06 License renewal denial. Equipment and operating procedures shall be inspected before the end of each license year. The renewal of license shall be denied if the equipment is found to be unsatisfactory or the operations are faulty and not in accord with the law or rules.

History: Cr. Register, November, 1957, No. 23, eff. 12-1-57.