NR 111, 112

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Anthony S. Earl
Secretary

BOX 7921
MADISON, WISCONSIN 53707

IN REPLY REFER TO: _____

STATE OF WISCONSIN)
) ss
DEPARTMENT OF NATURAL RESOURCES)

TO ALL TO WHOM THESE PRESENTS SHALL COME, GREETINGS:

I, Anthony S. Earl, Secretary of the Department of Natural Resources and custodian of the official records of said Department, do hereby certify that the annexed copy of Natural Resources Board Order No. WQ-56-77 was duly approved and adopted by this Department on September 22, 1977. 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 and affixed the official seal of the Department at Pyare Square Building in the Village of Shorewood Hills, this 3RD day of January, 1978.

RECEIVED
JAN 6 1978
4:15 pm
REVISOR OF STATUTES
BUREAU

Anthony S. Earl, Secretary

(SEAL)

STATE OF WISCONSIN)
)
DEPARTMENT OF NATURAL RESOURCES)

TO ALL TO WHOM THESE PRESENTS SHALL COME GREETINGS:

I, Anthony S. Earl, Secretary of the Department of Natural Resources and custodian of the official record of said Department, do hereby certify that the annexed copy of Natural Resources Board Order No. SS-56-77 was duly approved and adopted by this Department on September 22, 1977. 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.

STATE OF WISCONSIN NATURAL RESOURCES BOARD

IN THE MATTER of repealing sections NR 111.21, NR 111.22, NR 111.25(4), NR 111.31(11)(a) & (b), NR 111.61(2) and NR 112.03(32); renumbering sections NR 111.30 thru 111.36, NR 111.31(5)(h), (11)(c), (d) & (e), NR 111.60 thru 111.64, NR 111.70 thru 111.77, NR 112.07(2)(1) thru (o), NR 112.14(3) thru (6), NR 112.17(2) and NR 112 table 3; renumbering and amending sections NR 111.61(3) and NR 112.17(4)(a)4.c. & d.; amending sections NR 108 title, NR 108.01, NR 108.02, NR 108.03, NR 108.04(2)(a), NR 108.06(1), (2) & (4)(a), NR 111 title, NR 111.01, NR 111.03, NR 111.11(1)(e)1., NR 111.20, NR 111.23 intro. para., (1)(b), (4)(a) & (c), NR 111.24(1) & (4), NR 111.25 intro. para., (1) intro. para., (1)(c) & (3), NR 111.26(4), NR 111.27(1) intro. para., (2), (3), (4), (5) & (6), NR 111.31(3)(c), (4)(a), (5)(a), (c) & (g) & (11)(b)7., NR 111.32(1)(a) & (d), NR 111.34(7), NR 111.35(1) & (2)(a), NR 111.37(3)(b)2., NR 111.62(1), NR 111.63(8) intro. para., NR 111.71, NR 111.72(1), NR 111.76(3), NR 111.77(4), NR 112.01, NR 112.02, NR 112.03(38), NR 112.07(2)(b), (d), (g), (h) & (j), NR 112.08 (2) intro. para. & (2)(a), NR 112.14(1) & (2)(b), NR 112.16(1), and NR 112.17(4)(a)3. & 4.; repealing and recreating NR 111.31(1)(c), (11)(b)1. & (17), NR 111.34(4)(c) & (d) & (6), NR 111.61 title and NR 111.82; and creating chapter NR 109, and sections NR 111.30, NR 111.31(5)(h), (11)(a) & (e), NR 111.35(1) figure 2 caption, (6)(f) note, NR 111.60, NR 111.61(3), NR 111.70, NR 112.03(12m), (20m), (30m), (34m), (35a), (35m), (40m), (46m) & (51m), NR 112.07(2)(1), NR 112.14(3), NR 112.15(8), NR 112.17(2)(b), (4)(c), (e) & (f), NR 112.26, NR 112.27 and NR 112 table 3 of the Wisconsin Administrative Code pertaining to the safe drinking water program

WQ-56-77

ORDER OF THE STATE OF WISCONSIN NATURAL RESOURCES BOARD

REPEALING, RENUMBERING, RENUMBERING & AMENDING, AMENDING

REPEALING & RECREATING, AND CREATING RULES

Pursuant to the authority vested in the State of Wisconsin Natural Resources Board by sections 144.025, 162.01 and 227.014, Wisconsin Statutes, the State of Wisconsin Natural Resources Board hereby repeals, renumbers, renumbers and amends, amends, repeals and recreates, and creates rules as follows:

SECTION 1 - The title of chapter NR 108 is amended to read:

General Requirements for Community Water Systems, Sewerage Systems and Industrial Wastewater Treatment Facilities.

SECTION 2 - Section NR 108.01 is amended to read:

NR 108.01 Applicability. The rules herein presented govern the submission of plans and specifications for any reviewable project and the general operation and control of community water systems, sewerage systems and industrial wastewater facilities.

SECTION 3 - Section NR 108.02 is amended to read:

NR 108.02 Definitions. (1) "Approval" means the written approval of the department for any project requiring approval pursuant to section 144.04, Wis. Stats., and section NR 108.03.

(2) "Community water system" means a public water system which serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents.

(3) "Department" means the department of natural resources.

(4) Industrial wastewater facility" means a facility which reduces or removes pollutants from industrial wastes prior to discharge to waters of the state, other than through publicly owned treatment works.

(5) "Living unit" means a domicile.

(6) "Municipal water system" means a community water system owned by a county, city, village, town, town sanitary district, utility district, public institution as defined in section 49.10(12)(f)1., Wis. Stats., or a privately owned water utility serving any of the above.

(7) "Public water system" means a water system which has at least 15 service connections or regularly serves an average of 25 individuals daily at least 60 days out of the year as defined in Wis. Adm. Code section NR 109.04(14).

(8) "Reviewable project" means any construction or installation project for which department approval is required, pursuant to section 144.04, Wis. Stats. The following projects are reviewable within the meaning of this chapter:

(a) Any new community water system intended to serve 15 or more living units or having source capacity greater than 70 gallons per minute.

(b) Any improvements, extensions or alterations which may affect the quality or quantity of water delivered by an existing community water system intended to serve 15 or more living units or having source capacity greater than 70 gallons per minute except distribution systems not in streets or easements.

(c) Any new sewerage system.

(d) Any improvements, extensions or alterations of existing sewerage systems which may affect the quality or quantity of effluent or the location of any outfall;

(e) Any new industrial wastewater facility or any modification or alteration of an existing industrial facility.

(9) "Sewerage system" means all structures, including sewage treatment facilities, conduits and pipelines, by which sewage is collected and disposed of.

(10) "Waterworks or water system" means any facility installed or constructed to obtain, treat, store or convey the water for drinking or domestic uses for a public water system.

Note: Plan review of water distribution systems for community water systems intended to serve less than 15 living units or not in streets or easements is required by Wis. Adm. Code chapter H62.

SECTION 4 - Section NR 108.03 is amended to read:

NR 108.03 Construction of reviewable projects. No person shall commence, or cause to be commenced, construction of any reviewable project until such project has been reviewed and approved by the department or until at least 90 days has elapsed since the submission of final plans and specifications to the department, whichever occurs first. The 90-day time period may be extended as provided in section 144.04, Wis. Stats.

SECTION 5 - Section NR 108.04 (2) (a) is amended to read:

(a) All final plans and specifications submitted to the department pursuant to section 144.04, Wis. Stats., and section NR 108.03 shall be accompanied by a request for approval and by information pertinent to the design of the system. Plans submitted without necessary design data will be returned.

Note: Requirements setting forth the necessary accompanying data for sewerage systems and community water systems can be found respectively in Wis. Adm. Code sections NR 110.06-NR 110.11 and NR 111.11.

SECTION 6 - Section NR 108.06 (1) is amended to read:

(1) General. Every owner of a waterworks, sewage treatment facility, or industrial wastewater facility shall operate these facilities as efficiently as possible. If operating difficulties or mechanical breakdown of plant units resulting in impairment of treatment effectiveness should occur, the owner shall immediately notify the appropriate district office of the department.

Note: Where a facility is so operated or constructed that satisfactory results cannot be obtained, the department may require operational changes or modifications to the facility.

SECTION 7 - Section NR 108.06 (2) is amended to read:

(2) Supervision. Every municipal water system, sewage treatment plant and industrial wastewater facility shall employ a certified operator as provided in subsection 144.025(2)(1), Wis. Stats. The owner of any such facility shall notify the department within 15 days of any change in the certified operator or operators employed to operate such facilities.

SECTION 8 - Section NR 108.06 (4) (a) is amended to read:

(a) Reports of operation of all municipal water systems and sewage treatment plants and analyses of samples collected in conjunction thereto shall be

submitted to the department on approved forms. Reports regarding the operation of waterworks during the preceeding month shall be submitted to the department not later than the 10th day of each month. Reports regarding the operation of sewage treatment plants during the preceding month shall be submitted to the department not later than the 28th day of each month.

Note: See Wis. Adm. Code section NR 111.27(2)(b) for other community water system reporting requirements.

SECTION 9 - Chapter NR 109 is created to read:

Index - NR 109

NR 109.74 - Sampling and Analytical Requirements for Other Chemicals

Part IV - Reporting, Public Notification and Record Keeping

NR 109.80 - Reporting Requirements

NR 109.81 - Public Notification

NR 109.82 - Record Maintenance

Part V - Variances and Exemptions

NR 109.90 - Requirements for a Variance

NR 109.91 - Variance Request

NR 109.92 - Consideration of a Variance Request

NR 109.93 - Compliance Schedules

NR 109.94 - Requirements for an Exemption

NR 109.95 - Exemption Request

NR 109.96 - Consideration of an Exemption Request

NR 109.97 - Compliance Schedules

NR 109.98 - Final Exemption Schedule

Proposed Rules for Implementation of

the Safe Drinking Water Act

Chapter NR 109 - Wisconsin Administrative

Code, Safe Drinking Water

NR 109.01 Purpose. The purpose of this chapter is to establish minimum standards and methods for the protection of the public health, safety and welfare in the obtaining of safe drinking water. This chapter is adopted pursuant to the authority granted in chapters 144 and 162, Wisconsin Statutes. (Note - See NR 108, 111, 112 and 114 for other requirements pertaining to public and private drinking water systems.)

NR 109.02 Severability. Should any section, paragraph, phrase, sentence, clause or word of this chapter be declared invalid or unconstitutional for any reason, the remainder of this chapter shall not be affected thereby.

NR 109.03 Applicability. The provisions of this chapter shall apply to all new and existing public water systems as defined in this chapter.

NR 109.04 Definitions.

(1) "Community water system" means a public water system which serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents.

(2) "Contaminant" means any physical, chemical, biological, or radiological substance or matter in water.

(3) "Dose equivalent" means the product of the absorbed dose for ionizing radiation and such factors as account for differences in biological effectiveness due to the type of radiation and its distribution in the body as specified by the International Commission on Radiological Units and Measurements (ICRU).

(4) "Department" means the department of natural resources.

(5) "Gross alpha particle activity" means the total radioactivity due to alpha particle emission as inferred from measurements on a dry sample.

(6) "Gross beta particle activity" means the total radioactivity due to beta particle emission as inferred from measurements on a dry sample.

(7) "Man-made beta particle and photon emitters" means all radionuclides emitting beta particles and/or photons listed in Maximum Permissible Body Burdens and Maximum Permissible Concentration of Radionuclides in Air or Water for Occupational Exposure, NBS Handbook 69, except the daughter products of thorium-232, uranium-235 and uranium-238.

(8) "Maximum contaminant level" means the maximum permissible level of a contaminant in water which is delivered to the consumer service outlet of the ultimate user of a public water system, except in the case of turbidity where the maximum permissible level is measured at the point of entry to the distribution system. Contaminants added to the water under circumstances controlled by the user, except those resulting from corrosion of piping and plumbing caused by water quality, are excluded from this definition.

(9) "Non-community water system" means a public water system that is not a community water system.

(10) "Person" means an individual, corporation, company, association, cooperative, trust, institution, partnership, state, municipality, or federal agency.

(11) "Picocurie (pCi)" means that quantity of radioactive material producing 2.22 nuclear transformations per minute.

(12) "Primary drinking water standards" means those standards which represent minimum public health standards.

(13) "Public water system" means a system for the provision to the public of piped water for human consumption, if such system has at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days out of the year. A public water system is either a "community water system" or a "non-community water system". Such system includes:

(a) any collection, treatment, storage, and distribution facilities under control of the operator of such system and used primarily in connection with such system, and

(b) any collection or pretreatment storage facilities not under such control which are used primarily in connection with such system.

(14) "Rem" means the unit of dose equivalent from ionizing radiation to the total body or any internal organ or organ system. A "millirem" (mrem) is 1/1000 of a rem.

(15) "Sanitary survey" means an onsite inspection of the water source, facilities, equipment, operation and maintenance of a public water system for the purpose of evaluating the adequacy of such source, facilities, equipment, operation and maintenance for producing and distributing safe drinking water.

(16) "Secondary drinking water standards" means those standards for aesthetic parameters which represent minimum public welfare concerns but do not represent health standards.

(17) "Supplier of water" means any person who owns or operates a public water system.

NR 109.05 Coverage. This chapter shall apply to each public water system, unless the public water system meets all of the following conditions:

(1) Consists only of distribution and storage facilities (and does not have any collection and treatment facilities); and

(2) Obtains all of its water from, but is not owned or operated by, a public water system to which such regulations apply; and

(3) Does not sell water to any person; and

(4) Is not a carrier which conveys passengers in interstate commerce.

Part I - Primary Contaminant Standards, Monitoring and Analytical Requirements

NR 109.11 Maximum contaminant levels for inorganic chemicals

(1) The maximum contaminant level for nitrate is applicable to both community water systems and non-community water systems. The levels for the other inorganic chemicals apply only to community water systems. Compliance with maximum contaminant levels for inorganic chemicals is calculated pursuant to NR 109.12.

(2) The following are the maximum contaminant levels for inorganic chemicals:

Contaminant	Level, milligrams per liter (micrograms per liter in parentheses)
Arsenic	0.05 (50 µg/l)
Barium	1. (1000 µg/l)
Cadmium	0.010 (10 µg/l)
Chromium	0.05 (50 µg/l)
Fluoride	2.2
Lead	0.05 (50 µg/l)
Mercury	0.002 (2 µg/l)
Nitrate (as N)	10.
Selenium	0.01 (10 µg/l)
Silver	0.05 (50 µg/l)
Sodium	No limit designated[1]

[1] The supplier of water should periodically notify local physicians of the sodium content of the water supply in order that the physicians may advise their patients of suitable dietary restrictions.

NR 109.12 Inorganic chemical sampling and analytical requirements.

(1) Analyses for the purpose of determining compliance with NR 109.11 are required as follows:

(a) Analyses for all community water systems utilizing surface water sources shall be completed by June 24, 1978. These analyses shall be repeated at yearly intervals.

(b) Analyses for all community water systems utilizing only ground water sources shall be completed by June 24, 1979. These analyses shall be repeated at three-year intervals.

(c) For non-community water systems whether supplied by surface or ground water sources, analysis for nitrate shall be completed by June 24, 1979. These analyses shall be repeated at intervals determined by the department.

(2) If the result of an analysis made pursuant to subsection (1) indicates that the level of any contaminant listed in NR 109.11 exceeds the maximum contaminant level, the supplier of water shall report to the department within 7 days and initiate 3 additional analyses at the same sampling point within one month.

(3) When the average of 4 analyses made pursuant to subsection (2) of this section, rounded to the same number of significant figures as the maximum contaminant level for the substance in question, exceeds the maximum contaminant level, the supplier of water shall notify the department pursuant to NR 109.80 and give notice to the public pursuant to NR 109.81. Monitoring after the maximum contaminant level is exceeded shall be at a frequency designated by the department and shall continue until the maximum contaminant level has not been exceeded in 2 successive samples or until a monitoring schedule as a condition to a variance, exemption or enforcement action shall become effective.

(4) The provisions of subsections (2) and (3) of this section notwithstanding, compliance with the maximum contaminant level for nitrate shall be determined on the basis of the mean of 2 analyses. When a level exceeding the maximum contaminant level for nitrate is found, a second analysis shall be initiated within 24 hours, and if the mean of the 2 analyses exceeds the maximum contaminant level the supplier of water shall report his findings to the department pursuant to NR 109.80 and shall notify the public pursuant to NR 109.81.

(5) For the initial analyses required by subsection (1)(a), (b) or (c) of this section, data for surface waters acquired within one year prior to the effective date and data for ground waters acquired within 3 years prior to the effective date of this part may be substituted at the discretion of the department.

(6) Analyses conducted to determine compliance with NR 109.11 shall be made in accordance with methods approved by the U.S. environmental protection agency. The department shall maintain a current list of approved methods.

NR 109.20 Maximum contaminant levels for organic chemicals. The following are the maximum contaminant levels for organic chemicals. They apply only to community water systems. Compliance with maximum contaminant levels for organic chemicals is calculated pursuant to NR 109.21.

	Level, milligrams per liter
(1) Chlorinated hydrocarbons:	
Endrin (1,2,3,4,10, 10-hexachloro- 6,7-expoxy-1,4, 4a,5,6,7,8,8a-octa-hydro-1,4-endo, endo-5,8 - dimethano naphthalene).	0.0002
Lindane (1,2,3,4,5,6-hexachloro-cyclohexane, gamma isomer).	0.004
Methoxychlor (1,1,1-Trichloro- 2, 2 - bis (p-methoxyphenyl) ethane).	0.1
Toxaphene ($C_{10}H_{10}Cl_8$-Technical chlorinated camphene, 67-69 percent chlorine).	0.005
(2) Chlorophenoxys:	
2,4 - D (2,4-Dichlorophenoxyacetic acid).	0.1
2,4,5 - TP Silvex (2,4,5-Trichlorophenoxypropionic acid).	0.01

NR 109.21 Organic chemical sampling and analytical requirements.

(1) An analysis of substances for the purpose of determining compliance with NR 109.20 shall be made as follows:

(a) For all community water systems utilizing surface water sources, analyses shall be completed by June 24, 1978. Samples analyzed shall be collected during the period of the year designated by the department as the period when contamination by pesticides is most likely to occur. These analyses shall be repeated at intervals specified by the department but in no event less frequently than at 3 year intervals.

(b) For community water systems utilizing only ground water sources, analyses shall be completed for those systems specified by the department.

(2) If the result of an analysis made pursuant to subsection (1) of this section indicates that the level of any contaminant listed in NR 109.20 exceeds the maximum contaminant level the supplier of water shall report to the department within 7 days and initiate 3 additional analyses within one month.

(3) When the average of 4 analyses made pursuant to subsection (2) of this section, rounded to the same number of significant figures as the maximum contaminant level for the substance in question, exceeds the maximum contaminant level, the supplier of water shall report to the department pursuant to NR 109.80 and give notice to the public pursuant to NR 109.81. Monitoring after public notification shall be at a frequency designated by the department and shall continue until the maximum contaminant level has not been exceeded in 2 successive samples or until a monitoring schedule as a condition to a variance, exemption or enforcement action shall become effective.

(4) For the initial analysis required by subsections (1)(a) and (b) of this section, data for surface water acquired after June 24, 1976 and data for ground water acquired after June 24, 1974 may be substituted at the discretion of the department.

(5) Analyses made to determine compliance with NR 109.20(1) shall be made in accordance with "Method for Organochlorine Pesticides in Industrial Effluents," MDQARL, Environmental Protection Agency, Cincinnati, Ohio, November 28, 1973. Copies of this document are available for inspection at the office of the department of natural resources, the secretary of state's office and the office of the revisor of statutes, and may be obtained for personal use from the U.S. Environmental Protection Agency, Washington, D.C. 20460.

(6) Analyses made to determine compliance with NR 109.20(2) shall be conducted in accordance with "Methods for Chlorinated Phenoxy Acid Herbicides in Industrial Effluents" MDQARL, Environmental Protection Agency, Cincinnati, Ohio, November 28, 1973. Copies of this document are available for inspection at the office of the department of natural resources, the secretary of state's office and the office of the revisor of statutes, and may be obtained for personal use from the U.S. Environmental Protection Agency, Washington, D.C. 20460.

(7) Other analytical methods, if any, approved by the U.S. environmental protection agency are acceptable. The department shall maintain a list of approved methods.

NR 109.30 Maximum microbiological contaminant levels. The following are the maximum contaminant levels for coliform bacteria applicable to community water systems and non-community water systems. Compliance with maximum contaminant levels for coliform bacteria is determined pursuant to NR 109.31(4)(b) for purposes of public notification requirements pursuant to NR 109.81. The public notification provisions of NR 109.81 shall not apply to subsection (3) or (4).

(1) When the membrane filter technique pursuant to NR 109.31(1) is used, the number of coliform bacteria shall be less than one per 100 milliliters in any sample collected and analyzed pursuant to NR 109.31(2) or (3).

(2) When the fermentation tube method and 10 milliliter standard portions pursuant to NR 109.31(1) are used, coliform bacteria shall not be present in any portions in any sample collected and analyzed pursuant to NR 109.31(2) or (3).

(3) The supplier of water shall initiate definitive action to identify the cause of the positive bacteriological sample results and to eliminate potential health hazards which might exist in the system when monitoring pursuant to subsections NR 109.31(2), (3) or (4) shows the presence of any coliform organisms in any of the following:

(a) More than 10% of the samples in any quarter when more than 20 samples are required per quarter; or

(b) Two or more samples in any quarter when 6 to 20 samples are required per quarter; or

(c) Two or more in any year when less than 24 samples are required per year.

(4) Bacterial plate counts on water distributed to the consumer shall not exceed 500 organisms per (1) milliliter. When this value is exceeded the department shall determine if the bacterial count is of public health or nuisance significance and may require appropriate action.

NR 109.31 Microbiological contaminant sampling and analytical requirements

(1) Suppliers of water for community water systems and non-community water systems shall analyze for coliform bacteria for the purpose of determining compliance with NR 109.30. Analyses shall be conducted in accordance with the analytical recommendations set forth in "Standard Methods for the Examination of Water and Wastewater," American Public Health Association, 14th Edition, pp. 913-937, except that a standard sample size shall be employed. Copies of this publication are available for inspection at the office of the department of natural resources, the secretary of state's office and the office of the revisor of statutes, and may be obtained for personal use from the American Public Health Association, 1015 Eighteenth St., N.W., Washington, D.C. The standard sample used in the

membrane filter procedure shall be 100 milliliters. The standard sample used in the 5 tube most probable number (MPN) procedure (fermentation tube method) shall be 5 times the standard portion. The standard portion is 10 milliliters as described in NR 109.30(2). The samples shall be taken at points which are representative of the conditions within the distribution system.

(2) The supplier of water for a community water system shall take water samples for coliform determination at regular time intervals, and in number proportionate to the population served by the system. In no event shall the frequency be less than as set forth in the following:

Population served:	Minimum number of samples per month
25 to 1,000 (Not serving a municipality)	1
25 to 1,000 (Serving a municipality)	2
1,001 to 2,500	2
2,501 to 3,300	3
3,301 to 4,100	4
4,101 to 4,900	5
4,901 to 5,800	6
5,801 to 6,700	7
6,701 to 7,600	8
7,601 to 8,500	9
8,501 to 9,400	10
9,401 to 10,300	11
10,301 to 11,100	12
11,101 to 12,000	13
12,001 to 12,900	14
12,901 to 13,700	15
13,701 to 14,600	16
14,601 to 15,500	17
15,501 to 16,300	18
16,301 to 17,200	19
17,201 to 18,100	20
18,101 to 18,900	21
18,901 to 19,800	22
19,801 to 20,700	23
20,701 to 21,500	24
21,501 to 22,300	25
22,301 to 23,200	26
23,201 to 24,000	27
24,001 to 24,900	28
24,901 to 25,000	29
25,001 to 28,000	30
28,001 to 33,000	35
33,001 to 37,000	40
37,001 to 41,000	45
41,001 to 46,000	50
46,001 to 50,000	55
50,001 to 54,000	60
54,001 to 59,000	65
59,001 to 64,000	70
64,001 to 70,000	75
70,001 to 76,000	80
76,001 to 83,000	85
83,001 to 90,000	90
90,001 to 96,000	95
96,001 to 111,000	100
111,001 to 130,000	110
130,001 to 160,000	120
160,001 to 190,000	130
190,001 to 220,000	140
220,001 to 250,000	150

Population served:	Minimum number of samples per month
290,001 to 320,000	170
320,001 to 360,000	180
360,001 to 410,000	190
410,001 to 450,000	200
450,001 to 500,000	210
500,001 to 550,000	220
550,001 to 600,000	230
600,001 to 660,000	240
660,001 to 720,000	250
729,001 to 780,000	260
780,001 to 840,000	270
840,001 to 910,000	280
910,001 to 970,000	290
970,001 to 1,050,000	300
1,050,001 to 1,140,000	310
1,140,001 to 1,230,000	320
1,230,001 to 1,320,000	330
1,320,001 to 1,420,000	340
1,420,001 to 1,520,000	350
1,520,001 to 1,630,000	360
1,630,001 to 1,730,000	370
1,730,001 to 1,850,000	380
1,850,001 to 1,970,000	390
1,970,001 to 2,060,000	400

Based on a history of no coliform bacterial contamination and on a sanitary survey by the department showing the water system to be supplied solely by a protected ground water source and free of sanitary defects, non-municipal community water system serving 25 to 1,000 persons, with written permission from the department, may reduce this sampling frequency except that in no case shall it be reduced to less than one per quarter.

(3) The supplier of water for a non-community water system shall sample for coliform bacteria in each calendar quarter during which the system provides water to the public. Such sampling shall begin by June 24, 1979. If the department, on the basis of a sanitary survey, determines that some other frequency is more appropriate, that frequency shall be the frequency required under these regulations. Such frequency shall be confirmed or changed on the basis of subsequent surveys.

(4)(a) When a sample collected pursuant to subsection (2) or (3) of this section exceeds a maximum contaminant level set forth in NR 109.30(1) or (2), the supplier of water shall collect a repeat sample which shall be considered the check sample from the same sampling point within 48 hours.

(b) When the examination of the check sample required in NR 109.31(4)(a) shows the presence of coliform organisms, the supplier of water shall:

1. Report to the department within 48 hours; and

2. Initiate an investigation, including the collection within 48 hours and examination of additional check samples from the same point and other sampling points in the area, to define the extent of the problem; and

3. Notify the public in the area affected by the indicated contamination as prescribed in NR 109.81 unless the department determines that no health hazard has actually existed.

(c) The department, at its discretion, may require that additional check samples be collected at a specified frequency from the same sampling point and other sampling points in the area and examined to identify and eliminate suspected health hazards when a sample exceeds a maximum contaminant level pursuant to NR 109.30(1) or (2), even if the check sample required in NR 109.31(4)(a) does not indicate the presence of coliform bacteria.

(d) When the cause of the indicated contamination has been determined and corrected, additional check samples shall be collected at a frequency directed by the department.

(e) The location at which the check sample was taken pursuant to subsection (4)(a) of this section shall not be eliminated from future sampling without approval of the department.

(5) The department may determine that unreliable examination results for a sample collected in a monitoring period pursuant to NR 109.31(2) were caused by factors beyond the control of the water supplier. Such factors could be excessive transit time between collection and examination of the sample, samples being broken in transit, or interference in test results when the membrane filter technique is used. If this is the case, another sample collected immediately upon learning of these results may be used in determining compliance with sampling requirements in NR 109.31(2) or (3). However, a single sample may not be attributed to more than one monitoring period.

(6) Check samples, samples with unreliable examination results, and special purpose samples, such as those taken to determine whether disinfection practices following water main placement, replacement, or repair have been sufficient, shall not be used to determine compliance with NR 109.31(2) or (3).

(7) In addition to sampling from the distribution system, each supplier of water for a system providing chlorination shall obtain at least one sample every three months from each well prior to the point of any chemical addition. For waterworks which have more than one well in the same location and utilizing the same aquifer, only one of the wells needs to be sampled each time on an alternating basis. If a well has a high potential for contamination, the department may in individual cases require more frequent sampling.

(8) At surface water facilities, the bacteriological quality of the water shall be monitored often enough to maintain quality control of the treatment process. Each plant shall establish a schedule which will be subject to review and modification by the department.

(Note: Generally, membrane filter or five tube fermentation tests and plate counts of the raw, settled and finished water on an established schedule will be necessary to meet this requirement.)

(9) At all waterworks which have a potential for high total bacteria levels because of the water quality, the method of treatment, chemical addition or other cause, the department may require plate counts pursuant to an established schedule. Analyses shall be conducted in accordance with

the analytical recommendations set forth in "Standard Methods for the Examination of Water and Wastewater", American Public Health Association, 14th Edition, pp. 908-913. Copies of this publication are available for inspection at the office of the department of natural resources, the secretary of state's office and the office of the revisor of statutes, and may be obtained for personal use from the American Public Health Association, 1015 Eighteenth St., N.W., Washington, D.C.

NR 109.40 Maximum contaminant levels for turbidity. The maximum contaminant levels for turbidity are applicable to both community water systems and non-community water systems using surface water sources in whole or in part.

(Note: Water systems governed by chapter NR 112 may not utilize surface water sources.)

The maximum contaminant levels for turbidity in drinking water, measured at a representative entry point(s) to the distribution system, are:

(1) One nephelometric turbidity unit (NTU), as determined by a monthly average pursuant to NR 109.41, except that five or fewer turbidity units may be allowed if the supplier of water can demonstrate to the state that the higher turbidity does not do any of the following:

(a) Interfere with disinfection;

(b) Prevent maintenance of an effective disinfectant agent throughout the distribution system; or

(c) Interfere with microbiological determinations.

(2) Five nephelometric turbidity units (NTU) based on an average for two consecutive days pursuant to NR 109.41.

NR 109.41 Turbidity sampling and analytical requirements.

(1) The requirements of this section shall apply only to public water systems which use water in whole or in part from surface water sources.

(2) Samples shall be taken by suppliers of water for both community water systems and non-community water systems at a representative entry point(s) to the water distribution system at least once per day, for the purpose of making turbidity measurements to determine compliance with NR 109.40. The measurement shall be made by the Nephelometric Method in accordance with the recommendations set forth in "Standard Methods for the Examination of Water and Wastewater," American Public Health Association, 14th Edition, pp. 132-134, or "Methods for Chemical Analysis of Water and Wastes," pp. 295-298, Environmental Protection Agency, Office of Technology Transfer, Washington, D.C. 20460, 1974. Copies of these publications are available for inspection at the office of the department of natural resources, the secretary of state's office and the office of the revisor of statutes, and may be obtained for personal use from, respectively, the American Public Health

Association, 1015 Eighteenth St., N.W., Washington, D.C. and the U.S. Environmental Protection Agency, Washington, D.C. 20460.

(3) If the result of a turbidity analysis indicates that the maximum allowable limit has been exceeded, the sampling and measurement shall be confirmed by resampling as soon as practicable and preferably within one hour. If the repeat sample confirms that the maximum allowable limit has been exceeded, the supplier of water shall report to the department within 48 hours. The repeat sample shall be the sample used for the purpose of calculating the monthly average. If the monthly average of the daily samples exceeds the maximum allowable limit, or if the average of two samples taken on consecutive days exceeds 5 NTU, the supplier of water shall report to the department and notify the public as directed in NR 109.80 and NR 109.81.

(4) Sampling for non-community water systems shall begin by June 24, 1979.

NR 109.50 Maximum contaminant levels for radium-226, radium-228, and gross alpha particle radioactivity in community water systems. The following are the maximum contaminant levels for radium-226, radium-228, and gross alpha particle radioactivity:

(1) Combined radium-226 and radium-228 -- 5 pCi/l.

(2) Gross alpha particle activity (including radium-226 but excluding radon and uranium) -- 15 pCi/l.

(Note: Sections NR 109.50 through NR 109.52 are identical to the radioactivity standards of the Department of Health and Social Services in chapter H 57, Wis. Adm. Code, and to the National Interim Primary Drinking Water Regulations, 40 Code of Federal Regulations 141. These sections are adopted pursuant to subsection 140.56(2), Wis. Stats.)

NR 109.51 Maximum contaminant levels for beta particle and photon radioactivity from man-made radionuclides in community water systems.

(1) The average annual concentration of beta particle and photon radioactivity from man-made radionuclides in drinking water shall not produce an annual dose equivalent to the total body or any internal organ greater than 4 millirem/year.

(2) Except for the radionuclides listed in Table A, the concentration of man-made radionuclides causing 4 mrem total body or organ dose equivalents shall be calculated on the basis of a 2 liter per day drinking water intake using the 168 hour data listed in "Maximum Permissible Body Burdens and Maximum Permissible Concentrations of Radionuclides in Air or Water for Occupational Exposure," NBS Handbook 69 as amended August, 1963, U.S. Department of Commerce. Copies of this document are available for inspection at the office of the department of natural resources, the secretary of state's office and the office of the revisor of statutes, and may be obtained for personal use from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. If two or more radionuclides are present, the sum of their annual dose equivalent to the total body or to any organ shall not exceed 4 millirem/year.

Table A. - Average annual concentrations assumed to produce a total body or organ dose of 4 mrem/yr.

Radionuclide	Critical Organ	pCi per liter
Tritium	Total body	20,000
Strontium-90	Bone marrow	8

(Note: Sections NR 109.50 through NR 109.52 are identical to the radioactivity standards of the Department of Health and Social Services in chapter H 57, Wis. Adm. Code, and to the National Interim Primary Drinking Water Regulations, 40 Code of Federal Regulations 141. These sections are adopted pursuant to subsection 140.56(2), Wis. Stats.)

NR 109.52 Analytical methods for radioactivity.

(1) Analyses conducted to determine compliance with NR 109.50 and NR 109.51 shall be made in accordance with approved methods outlined in 40 Code of Federal Regulations (CFR) 141.25 or other methods approved by the U.S. environmental protection agency. Copies of this document are available for inspection at the office of the department of natural resources, the secretary of state's office and the office of the revisor of statutes, and may be obtained for personal use from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

(2) The department shall maintain a current list of approved analytical methods.

(Note: Sections NR 109.50 through NR 109.52 are identical to the radioactivity standards of the Department of Health and Social Services in chapter H 57, Wis. Adm. Code, and to the National Interim Primary Drinking Water Regulations, 40 Code of Federal Regulations 141. These sections are adopted pursuant to subsection 140.56(2), Wis. Stats.)

NR 109.53 Monitoring frequency for radioactivity in community water systems.

(1) Monitoring Requirements for Gross Alpha Particle Activity, Radium-226 and Radium-228.

(a) Initial sampling to determine compliance with NR 109.50 shall begin by June 24, 1979 and the analysis shall be completed by June 24, 1980. Compliance shall be based on the analysis of an annual composite of four consecutive quarterly samples or the average of the analyses of four samples obtained at quarterly intervals.

1. A gross alpha particle activity measurement may be substituted for the required radium-226 and radium-228 analysis, provided that the measured gross alpha particle activity does not exceed 5 pCi/l at a confidence level of 95 percent (1.65σ where σ is the standard deviation of the net counting rate of the sample). In localities where radium-228 may be present in drinking water, the department may require radium-226 and/or radium-228 analyses when the gross alpha particle activity exceeds 2 pCi/l.

2. When the gross alpha particle activity exceeds 5 pCi/l, the same or an equivalent sample shall be analyzed for radium-226. If the concentration of radium-226 exceeds 3 pCi/l the same or an equivalent sample shall be analyzed for radium-228.

a. For the initial analysis required by subsection (1)(a), data acquired after June 24, 1976 may be substituted at the discretion of the department.

b. Suppliers of water shall monitor at least once every 4 years following the procedure required by paragraph (1)(a). At the discretion of the department, when an annual record taken in conformance with paragraph (1)(a) has established that the average annual concentration is less than half the maximum contaminant levels established by NR 109.50, analysis of a single sample may be substituted for the quarterly sampling procedure required by subsection (1)(a).

i. More frequent monitoring shall be conducted when ordered by the department in the vicinity of mining or other operation which may contribute alpha particle radioactivity to either surface or ground water sources of drinking water.

ii. A supplier of water shall monitor in conformance with subsection (1)(a) within one year of the introduction of new water source for a community water system. More frequent monitoring shall be conducted when ordered by the department in the event of possible contamination or when changes in the distribution system or treatment processing occur which may increase the concentration of radioactivity in finished water.

iii. A community water system using two or more sources having different concentrations of radioactivity shall monitor source water, in addition to water from the consumer service outlet, when required by the department.

iv. Monitoring for compliance with NR 109.50 after the initial period need not include radium-228 except when required by the department, provided, that the average annual concentration of radium-228 has been assayed at least once using the quarterly sampling procedure required by subsection (1)(a).

v. Suppliers of water shall conduct annual monitoring of any community water system in which the radium-226 concentration exceeds 3 pCi/l, when required by the department.

c. If the average annual maximum contaminant level for gross alpha particle activity or total radium as set forth in NR 109.50 is exceeded, the supplier of a community water system shall give notice to the department pursuant to NR 109.80 and notify the public as required by NR 109.81. Monitoring at quarterly intervals shall be continued until the annual average concentration no longer exceeds the maximum contaminant level or until a monitoring schedule as a condition to a variance, exemption or enforcement action shall become effective.

(2) Monitoring requirements for man-made radioactivity in community water systems.

(a) By June 24, 1979, systems using surface water sources and serving more than 100,000 persons and such other community water systems as are designated by the department shall be monitored for compliance with NR 109.51 by analysis of a composite of 4 consecutive quarterly samples or analysis of 4 quarterly samples. Compliance with NR 109.51 may be assumed without further analysis if the average annual concentration of gross beta particle activity is less than 50 pCi/l and if the average annual concentrations of tritium and strontium-90 are less than those listed in Table A, provided, that if both radionuclides are present the sum of their annual dose equivalents to bone marrow shall not exceed 4 millirem/year.

1. If the gross beta particle activity exceeds 50 pCi/l, an analysis of the sample must be performed to identify the major radioactive constituents present and the appropriate organ and total body doses shall be calculated to determine compliance with NR 109.51.

2. Suppliers of water shall conduct additional monitoring, as required by the department to determine the concentration of man-made radioactivity in principal watersheds designated by the department.

3. At the discretion of the department, suppliers of water utilizing only ground waters may be required to monitor for man-made radioactivity.

(b) For the initial analysis required by subsection (2)(a) data acquired since June 24, 1976 may be substituted at the discretion of the department.

(c) After the initial analysis required by subsection (2)(a) suppliers of water shall monitor at least every 4 years following the procedure given in paragraph (2)(a).

(d) By June 24, 1979 the supplier of any community water system designated by the department as utilizing waters subject to contamination by effluents from nuclear facilities shall initiate quarterly monitoring for gross beta particle and iodine-131 radioactivity and annual monitoring for strontium-90 and tritium.

1. Quarterly monitoring for gross beta particle activity shall be based on the analysis of monthly samples or the analysis of a composite of 3 monthly samples. The former is recommended. If the gross beta particle activity in a sample exceeds 15 pCi/l, the same or an equivalent sample shall be analyzed for strontium-89 and cesium-134. If the gross beta particle activity exceeds 50 pCi/l, an analysis of the sample must be performed to identify the major radioactive constituents present and the appropriate organ and total body doses shall be calculated to determine compliance with NR 109.51.

2. For iodine-131, a composite of 5 consecutive daily samples shall be analyzed once each quarter. As required by the department, more frequent monitoring shall be conducted when iodine-131 is identified in the finished water.

3. Annual monitoring for strontium-90 and tritium shall be conducted by means of the analysis of a composite of 4 consecutive quarterly samples or analysis of 4 quarterly samples.

4. The department may allow the substitution of environmental surveillance data taken in conjunction with a nuclear facility for direct monitoring of man-made radioactivity by the supplier of water where the department determines such data is applicable to a particular community water system.

(e) If the average annual maximum contaminant level for man-made radioactivity set forth in NR 109.16 is exceeded, the operator of a community water system shall give notice to the department pursuant to NR 109.80 and to the public as required by NR 109.81. Monitoring at monthly intervals shall be continued until the concentration no longer exceeds the maximum contaminant level or until a monitoring schedule as a condition to a variance, exemption or enforcement action shall become effective.

Part II - Secondary Chemical and Physical Standards and Monitoring Requirements

NR 109.60 Secondary inorganic chemical and physical standards.

(1) Waters containing inorganic chemicals in quantities above the limits contained in this section are not hazardous to health but may be objectionable to an appreciable number of persons.

(2) The following are the secondary standards for inorganic chemicals:

Standard	Milligrams per liter (micrograms per liter in parenthesis) - except as noted
Chloride	250
Color	15 units
Copper	1.0 (1,000 µg/l)
Foaming agents	
MBAS (Methylene-Blue Active Substances)	0.5
Hydrogen Sulfide	not detectable
Iron	0.3
Manganese	0.05 (50 µg/l)
Odor	3 (Threshold No.)
Sulfate	250
Total Residue	500
Zinc	5 (5,000 µg/l)

(3) The secondary standards contained in this section apply to all public water systems. Compliance with these standards shall be calculated in accordance with NR 109.61.

NR 109.61 Sampling and analytical requirements for secondary standards.

(1) If the department receives complaints regarding the aesthetic quality of the water the supplier of water may be required to implement a monitoring program to determine compliance with NR 109.60.

(2) If it is determined by the department that physical and/or chemical substances in excess of those standards contained in NR 109.60 are objectionable to an appreciable number of persons and is detrimental to the public welfare the department may, on its own motion, require remedial action by the supplier of water to insure that the public receives the highest quality water practicably obtainable.

Part III - Miscellaneous Chemical Monitoring Requirements, Raw Surface Water Standards and Approved Laboratories.

NR 109.70 Additional requirements for systems which chlorinate or fluoridate water.

(1) Fluoride.

(a) The supplier of water for a community water system artificially fluoridating the water shall establish a monitoring program in order to maintain the fluoride concentration within the range of 1.0 to 1.5 milligrams per liter as recommended by the dental health section of the department of health and social services for optimum dental benefits.

(b) The monitoring program shall include:

1. Submission of the results of fluoride tests of samples from the distribution system taken at least once per day, and

2. One sample per month taken from a representative location in the distribution system and submitted to the state laboratory of hygiene.

(Note: For waterworks with large distribution systems and multiple sources, more than one fluoride test per day may be necessary to assure proper feed rates. See NR 111.54(5) for testing equipment requirements. Exceptions to the daily fluoride test requirement may be approved by the department if it is demonstrated that the optimum fluoride concentration in sub. (a) above will be maintained by a reduced monitoring program.)

(c) The sample submitted to the state laboratory of hygiene shall be a portion of a split sample so that the operator can determine the fluoride concentration with his equipment and compare it to the state laboratory results. The fluoride concentration obtained by the operator shall be noted on the data sheet prior to submission to the state laboratory.

(2) Chlorine. The suppliers of water for all waterworks which chlorinate water shall test chlorine residuals at locations and intervals necessary to control the chlorination process. At ground water supplies, the chlorine residual of a sample from a representative location in the distribution system shall be checked at least twice per week. Waterworks having surface water treatment plants shall determine the chlorine residual in the plant effluent at least every two hours and in the distribution system at least daily in representative locations. Where water quality changes rapidly, residuals shall be tested at more frequent intervals as specified by the department and in those individual cases, continuous monitoring equipment may be required if the department determines it is necessary to protect public health.

(Note: Chlorine residual testing is recommended when bacteriological samples are taken; results should be included on the sample slip.)

NR 109.71 Raw surface water standards.

(1) The intake water shall be the highest quality reasonably available and which, with appropriate treatment and adequate safeguards, will meet the drinking water standards in this chapter.

NR 109.72 Laboratories. For the purpose of compliance with this chapter, samples shall be analyzed at the state laboratory of hygiene, at a laboratory facility acceptable to the U.S. environmental protection agency, or, for bacteriological analysis, at a laboratory facility approved by the department of health and social services.

NR 109.73 Monitoring of consecutive public water systems. When a public water system supplies water to one or more other public water systems, the department may modify the monitoring requirements imposed by this chapter to the extent that the interconnection of the systems justifies treating them as a single system for monitoring purposes. Any modified monitoring shall be conducted pursuant to a schedule specified by the department and concurred in by the administrator of the U.S. environmental protection agency.

NR 109.74 Sampling and analytical requirements for other chemicals.

(1) If the department determines that the public health, safety or welfare requires testing for chemical or physical constituents in water which are not contained in this chapter the department may order such testing as it deems necessary.

(a) The department shall provide public notice and an opportunity for public hearing within 90 days after any order under this subsection.

(b) Hearings under this subsection shall be Class 1 hearings and shall be held in accordance with chapter 227, Wisconsin Statutes.

(2) Testing for other chemical constituents shall be performed at water systems as necessary for control of treatment processes.

Part IV - Reporting, Public Notification and Recordkeeping

NR 109.80 Reporting requirements.

(1) Except where a shorter reporting period is specified in this chapter, the supplier of water shall report to the department within 40 days following a test, measurement or analysis required to be made by this chapter, the results of that test, measurement or analysis.

(2) The supplier of water shall report to the department within 48 hours the failure to comply with any maximum contaminant level or monitoring requirement set forth in this chapter.

(3) The supplier of water is not required to report analytical results to the department in cases where the state laboratory of hygiene performs the analysis and reports the results to the department or where a laboratory facility approved by the department of health and social services performs a bacteriological analyses and reports the results to the department within the time required by NR 109.31.

NR 109.81 Public notification.

(1)(a) The supplier of water of a community water system shall notify persons served by the system if the water supply system:

1. Fails to comply with an applicable maximum contaminant level established in sections NR 109.11, 109.20, 109.30(1) or (2), 109.40, 109.50, or 109.51; or

2. Is granted a variance or an exemption from an applicable maximum contaminant level; or

3. Fails to comply with the requirements of any schedule prescribed pursuant to a variance or exemption.

(b) In all cases notice under this subsection shall be by inclusion of a notice in the first set of water bills of the system issued after the failure or grant and in any event by written notice within 3 months. In the case of a failure to comply with a maximum contaminant level such notice shall be repeated at least once every 3 months so long as the system's failure continues or the variance or exemption remains in effect. If the system issues water bills less frequently than quarterly, or does not issue water bills, the notice shall be made by or supplemented by another form of direct mail.

(2) If a non-community water system fails to comply with an applicable maximum contaminant level established in Part I of this chapter, is granted a variance or an exemption from an applicable maximum contaminant level, or fails to comply with the requirement of any schedule prescribed pursuant to a variance or exemption the supplier of water shall be given notice of such failure or grant to the persons served by the system. Such notice shall be by conspicuous posting in a location where it can be seen by consumers and shall insure that the public using the system is adequately informed of the failure or grant.

(3) Notices given pursuant to this section shall be written in a manner reasonably designed to fully inform the users of the system. The notice shall be conspicuous and shall not use unduly technical language, unduly small print or other methods which would frustrate the purpose of the notice. The notice shall disclose all material facts regarding the subject including the nature of the problem and, when appropriate a clear statement that a primary drinking water regulation has been violated and any preventive measures that should be taken by the public. Where appropriate, or where designated by the department, bilingual notice shall be given. Notices may include a balanced explanation of the significance or seriousness to the public health, a fair explanation of steps taken by the system to correct any problem and the results of any additional sampling.

(4) In the case of a failure to comply with a maximum contaminant level which is not corrected promptly after discovery, the supplier of water for a community water system shall provide public notification in addition to that required under subsection (1).

(a) Such notification shall be given as immediately after discovery of the failure to comply as practicable unless the department determines that the failure to comply with a maximum contaminant level does not create an imminent hazard to public health. In such case, the additional notification required under this subsection may be given at any time within the time period prescribed for the notice under subsection (1)(b) of this section.

(b) The notification shall be by appropriate means as may be required by the department and may include newspaper advertisement, news release to radio and television stations, and door-to-door contact.

NR 109.82 Record maintenance. Any owner or operator of a public water system subject to the provisions of this part shall retain on the premises or at a convenient location near the premises the following records:

(1) Records of bacteriological analyses made pursuant to this part shall be kept for not less than 5 years. Records of chemical analyses made pursuant to this part shall be kept for not less than 10 years. Actual laboratory reports may be kept, or data may be transferred to tabular summaries, provided that the following information is included:

(a) The date, place, and time of sampling, and the name of the person who collected the sample;

(b) Identification of the sample as to whether it was a routine distribution system sample, check sample, raw or process water sample or other special purpose sample;

(c) Date of analysis;

(d) Laboratory and person responsible for performing analysis;

(e) The analytical technique/method used; and

(f) The results of the analysis.

(2) Records of action taken by the supplier of water to correct violations of this chapter shall be kept for a period not less than 3 years after the last action taken with respect to the particular violation involved.

(3) Copies of any written reports, summaries or communications relating to sanitary surveys of the system conducted by the supplier of water, by a private consultant, or by any local, state or federal agency, shall be kept for a period not less than 10 years after completion of the sanitary survey involved.

(4) Records concerning a variance or exemption granted to the system shall be kept for a period ending not less than 5 years following the expiration of such variance or exemption.

Part V - Variances and Exemptions

(Note: A supplier of water may apply for a "variance" when a maximum contaminant level cannot be met despite application of the best technology available at a reasonable cost. A supplier of water may apply for an "exemption" when a maximum contaminant level temporarily cannot be met until new facilities are constructed.)

NR 109.90 Requirements for a variance.

(1) The department may grant one or more variances to any public water system from any requirement respecting a maximum contaminant level established in this chapter upon a finding that:

(a) Because of characteristics of the raw water sources which are reasonably available to the system the system cannot meet the requirements respecting a maximum contaminant level despite application of the best technology, treatment techniques, or other means, which the department finds are generally available (taking costs into consideration); and

(b) The granting of a variance will not result in an unreasonable risk to the health of persons served by the system.

NR 109.91 Variance request. A supplier of water may petition for the granting of a variance pursuant to this chapter. Suppliers of water may submit a joint request for variances when they seek similar variances under similar circumstances. Any petition for a variance shall include the follow information:

(1) The nature and duration of variance requested.

(2) Relevant analytical results of water quality samples collected from the system, including results of relevant tests conducted pursuant to the requirements of the chapter.

(3) For any request made under NR 109.90(1):

(a) Explanation in full and evidence of the best available treatment technology and techniques.

(b) Economic and legal factors relevant to ability to comply.

(c) Analytical results of raw water quality relevant to the variance request.

(d) A proposed compliance schedule, including the date each step toward compliance will be achieved. Such schedule shall include as a minimum the following dates:

1. Date by which arrangement for alternative raw water source or improvement of existing raw water source will be completed.

2. Date of initiation of the connection of the alternative raw water source or improvement of existing raw water source.

3. Date by which final compliance is to be achieved.

(e) A plan for the provision of safe drinking water in the case of an excessive rise in the contaminant level for which the variance is requested.

(f) A plan for interim control measures during the effective period of variance.

(4) A statement that the system will perform monitoring and other reasonable requirements prescribed by the department as a condition to the variance.

(5) Other information, if any, believed to be pertinent by the applicant or required by the department.

NR 109.92 Consideration of a variance request.

(1) The department shall provide a Class 1 public notice under chapter 985, Wisconsin Statutes, within 90 days of the receipt of a variance petition and an opportunity for hearing on any variance petition submitted pursuant to NR 109.91. Hearings under this section shall be Class 1 hearings and shall be held in accordance with chapter 227, Wisconsin Statutes.

(2) In consideration of whether the public water system is unable to comply with a contaminant level required by this chapter because of the nature of the raw water source, the department shall consider such factors as the following:

(a) The availability and effectiveness of treatment methods for the contaminant for which the variance is requested.

(b) Cost and other economic considerations such as implementing treatment, improving the quality of the source water or using an alternate source.

(3) If the department is not in opposition to a variance petition, the variance shall become effective 30 days after notice and opportunity for hearing is given pursuant to subsection (1) if no timely request for hearing is submitted.

(4) If the department is in opposition to a variance petition, the variance shall be deemed denied 30 days after notice and opportunity for hearing is given pursuant to subsection (1) if no timely request for hearing is submitted.

(5) If the department decides to deny the petition for a variance it shall notify the applicant in writing of the reasons for such denial.

(6) Any final determination of the department shall be subject to review as provided in chapter 227, Wisconsin Statutes.

NR 109.93 Compliance schedules.

(1) For any variance granted pursuant to NR 109.92, the department shall establish, either at the time of granting a variance or within one year after the granting of a variance, a schedule for:

(a) Compliance (including increments of progress) by the public water system with each maximum contaminant level requirement covered by the variance; and,

(b) Implementation by the public water system of such control measures as the department may require for each contaminant covered by the variance.

(2) The schedule for compliance shall specify dates by which steps towards compliance are to be taken, including at the minimum, where applicable:

(a) Date by which arrangements for an alternative raw water source or improvement of existing raw water source will be completed.

(b) Date of initiation of the connection for the alternative raw water source or improvement of the existing raw water source.

(c) Date by which final compliance is to be achieved.

(3) The schedule may, if the public water system has no access to an alternative raw water source, and can effect or anticipate no adequate improvement of the existing raw water source, specify an indefinite time period for compliance until a new and effective treatment technology is developed at which time a new compliance schedule shall be prescribed by the department.

(4) The proposed schedule for implementation of interim control measures during the period of variance shall specify interim treatment techniques, methods and equipment, and dates by which steps toward meeting the interim control measures are to be met.

(5) If a schedule is established at any time other than the initial granting of a variance an opportunity for a hearing shall be given in compliance with NR 109.92.

(6) The department shall retain jurisdiction in all cases and may, upon its own motion or upon the motion of the supplier of water, modify a compliance schedule, after opportunity for hearing in compliance with NR 109.92, if changed circumstances warrant such a modification.

(7) If a public water system does not comply with a schedule established pursuant to this section the department may, after an opportunity for hearing pursuant to NR 109.92, terminate the variance.

NR 109.94 Requirements for an exemption.

(1) The department may grant an exemption to any public water system from any requirement respecting a maximum contaminant level upon a finding that:

(a) Due to compelling factors (which may include economic factors), the public water system is unable to comply with such contaminant level or treatment technique requirement; and

(b) The public water system was in operation on the effective date of such contaminant level or treatment technique requirement; and

(c) The granting of the exemption will not result in an unreasonable risk to health.

NR 109.95 Exemption request. A supplier of water may petition for the granting of an exemption pursuant to this chapter. Suppliers of water may submit a joint request for exemptions when they seek similar exemptions under similar circumstances. Any petition for an exemption shall include the following information:

(1) The nature and duration of exemption requested.

(2) Relevant analytical results of water quality sampling of the system, including results of relevant tests conducted pursuant to the requirements of this chapter.

(3) Explanation of the compelling factors such as time or economic factors which prevent such system from achieving compliance.

(4) Other information if any, believed by the applicant to be pertinent to the application or such other information as the department may require.

(5) A proposed compliance schedule, including the date when each step toward compliance will be achieved.

NR 109.96 Consideration of an exemption request.

(1) The department shall provide a class 1 public notice under chapter 985, Wisconsin Statutes, within 90 days of the receipt of a variance petition and an opportunity for hearing on any exemption petition submitted pursuant to NR 109.51. Hearings under this section shall be class 1 hearings and shall be held in accordance with chapter 227, Wisconsin Statutes.

(2) In consideration of whether the public water system is unable to comply due to compelling factors, the department shall consider factors such as the following, including:

(a) Construction, installation, or modification of treatment equipment or systems.

(b) The time needed to put into operation a new treatment facility to replace an existing system which is not in compliance.

(c) Economic feasibility of compliance.

(3) If the department is not in opposition to an exemption petition, the exemption shall become effective 30 days after notice and opportunity for hearing is given pursuant to subsection (1) if no timely request for hearing is submitted. If the department is in opposition to an exemption petition, the exemption shall be deemed denied 30 days after notice and an opportunity for hearing is given pursuant to subsection (1) if no timely request for hearing is submitted.

(4) If the department decides to deny the petition for an exemption it shall notify the applicant in writing of the reasons for such denial.

(5) Any final determination of the department shall be subject to review as provided in chapter 227, Wisconsin Statutes.

NR 109.97 Compliance schedules.

(a) For any exemption granted pursuant to NR 109.52, the department shall establish, either at the time of granting an exemption or within one year after the granting of an exemption, a schedule for:

(1) Compliance (including increments of progress) by the public water system with each maximum contaminant level requirement and treatment technique requirement covered by the exemption; and

(2) Implementation by the public water system of such control measures as the department may require for each contaminant covered by the exemption.

(b) If a schedule is established at any time other than the initial granting of an exemption an opportunity for hearing shall be given in compliance with NR 109.96.

(c) The department shall retain jurisdiction in all cases and may, upon its own motion or upon the motion of the supplier of water, modify a compliance schedule, after opportunity for hearing in compliance with NR 109.96, if changed circumstances warrant such a modification.

(d) If a public water system does not comply with a schedule established pursuant to this section the department may, after an opportunity for hearing pursuant to NR 109.52, terminate the exemption.

NR 109.98 Final exemption schedule.

(1) Any exemption schedule established pursuant to this chapter shall require compliance by the public water system with each maximum contaminant level prescribed by:

(a) The interim national primary drinking water regulations pursuant to 40 Code of Federal Regulations 141 by no later than January 1, 1981; and

(b) Any maximum contaminant levels established by this chapter but not contained in the interim national primary drinking water regulations pursuant to 40 Code of Federal Regulations 141, by no later than seven years after the effective date of such maximum contaminant levels.

(2) If the public water system has entered into an enforceable agreement to become a part of a regional public water system, as determined by the department, such schedule shall require compliance by the public water system with each maximum contaminant level prescribed by:

(a) The interim national drinking water regulations pursuant to 40 Code of Federal Regulations 141 by no later than January 1, 1983; and

(b) Any maximum contaminant levels established by this chapter but not contained in the interim national primary drinking water regulations pursuant to 40 Code of Federal Regulations 141, by no later than nine years after the effective date of such maximum contaminant levels.

SECTION 10 - The title of Chapter NR 111 is amended to read:

Requirements for the Operation and Design of Community Water Systems.

SECTION 11 - Section NR 111.01 is amended to read:

NR 111.01 Applicability. This chapter governs the general operation, design and construction of community water systems or waterworks. The standards for design and construction shall be considered minimum standards for new facilities and the standards to which existing facilities shall be upgraded when improvements are undertaken.

Note: The authority to promulgate and enforce these rules is contained in chapters 144 and 162, Wis. Stats. Pursuant to section 144.57, Wis. Stats., any person who violates this chapter shall forfeit not less than $10 nor more than $5,000 for each violation. Each day of continued violation is a separate offense.

SECTION 12 - Section NR 111.03 is amended to read:

NR 111.03 Definitions. (1) "Approval" means the written approval of the department for any project requiring approval pursuant to section 144.04, Wis. Stats., and Wis. Adm. Code section NR 108.03.

(2) "Community water system" means a public water system which serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents. Any public water system serving 7 or more homes, 10 or more mobile homes, 10 or more apartment units, or 10 or more condominium units shall be considered a community water system unless information is available to indicate that 25 year-round residents will not be served.

(3) "Cross connection" means any physical connection or arrangement between two otherwise separate systems, one of which contains potable water from a public water system, and the other, water from a private source, water of unknown or questionable safety, or steam, gases, 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.

(4) "Department" means the department of natural resources.

(5) "Distribution system" means all pipes or conduits by which water is delivered to consumers except piping inside buildings served and service pipes from a building to a distribution main or pipe.

(6) "Ground water" means that part of the subsurface water which is in the zone of saturation.

(7) "Ground water source" means all ground water obtained from horizontal collectors, infiltration lines, springs and dug, drilled or other types of wells.

(8) "Living unit" means a domicile.

(9) "Municipal water system" means a community water system owned by a city, village, county, town, town sanitary district, utility district or public institution as defined in section 49.10(12)(f)1., Wis. Stats., or a privately owned water utility serving any of the above.

(10) "Non-community water system" means a public water system that is not a community water system.

(11) "Person" means an individual, corporation, company, association, cooperative, trust, institution, partnership, state, municipality, or federal agency.

(12) "Public water system" means a system for the provision to the public of piped water for human consumption, if such system has at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days out of the year. Such system includes:

(a) Any collection, treatment, storage, and distribution facilities under control of the operator of such system and used primarily in connection with such system, and

(b) Any collection or pretreatment storage facilities not under such control which are used primarily in connection with such system. A public water system is either a "community water system" or a "non-community water system".

(13) "Reviewable project" shall have the same meaning as set forth in Wis. Adm. Code section NR 108.02(8).

(14) "Supplier of water or owner" means any person who owns or operates a public water system.

(15) "Utility" means a public utility as defined in chapter 196, Wis. Stats.

(16) "Waterworks or water system" means any facility installed or constructed to obtain, store, treat or convey water for drinking or domestic use for a public water system.

(17) "Well" means an excavation or opening into the ground made by digging, boring, drilling, driving or other methods for the purpose of obtaining ground water.

(18) "Well driller" means a person defined as a well driller by section 162.02(5), Wis. Stats.

(19) Abbreviations. The following abbreviations are used in this chapter:

(a) The term "A.P.I." means the American Petroleum Institute, 300 Corrigan Tower Building, Dallas, Texas 72501.

(b) The term "A.S.T.M." means the American Society for Testing and Material, 1916 Race Street, Philadelphia, Pennsylvania 19103.

(c) The term "A.W.W.A." means the American Water Works Association, 6666 West Quincy Avenue, Denver, Colorado 80235.

SECTION 13 - Section NR 111.11(1) (e) 1. is amended to read:

1. Descriptions of feed equipment, including feed ranges;

SECTION 14 - Section NR 111.20 is amended to read:

NR 111.20 General. The supplier of water shall be responsible for insuring that the water system is operated in accordance with this chapter to provide an adequate quantity of safe drinking water to consumers. This responsibility

includes performing maintenance and replacement of equipment when necessary to keep the facility in good operating condition as well as providing adequate laboratory testing equipment to control and monitor treatment processes and chemical addition programs.

SECTION 15 - Sections NR 111.21 and NR 111.22 are repealed.

SECTION 16 - Section NR 111.23 intro. para. is amended to read:

NR 111.23 General treatment and disinfection requirements. Treatment shall be provided by each supplier of water in order to insure that the water meets the drinking water standards contained in Wis. Adm. Code chapter NR 109 and is not offensive or hazardous to consumers. In addition, the following requirements must be met:

SECTION 17 - Section NR 111.23 (1) (b) is amended to read:

(b) The finished water from a surface water treatment plant shall contain sufficient chlorine to maintain a free chlorine residual of at least 0.1 mg/l throughout the distribution system, or if chloramines are present, the combined residual throughout the distribution system shall be a minimum of 0.5 mg/l.

SECTION 18 - Section NR 111.23 (4) (a) is amended to read:

(a) All municipal water systems and new subdivision water systems intended to serve 15 or more living units shall be equipped with chemical feed equipment and the necessary appurtenances which can continuously disinfect the water.

SECTION 19 - Section NR 111.23 (4) (c) is amended to read:

(c) Approval from the department is required for the addition of any chemical to a community water system. A 30-day supply of chemicals shall be kept on hand as required by Wis. Adm. Code section NR 108.06(3). Chemicals shall meet current A.W.W.A. standards and be approved by the department. Colored chemicals will be approved if coloring agents are not used in toxic concentrations or in amounts

which impart taste, odor or color to the water supply. The department may require the analysis of chemicals if necessary to insure use of safe chemicals. Copies of the above standards are available for inspection at the office of the department of natural resources, the secretary of state's office and the office of the revisor of statutes, and may be obtained for personal use from the American Water Works Association, 6666 West Quincy Avenue, Denver, Colorado 80235.

SECTION 20 - Section NR 111.24 (1) is amended to read:

(1) Ownership of municipal water systems. The distribution system, as defined in NR 111.03, shall be owned and maintained by the waterworks owner. All water mains on private property which are, or in the future may be, connected to the distribution system at more than one point, thereby allowing flow through the piping system, shall be owned and maintained by the waterworks owner. (Note: To insure the use of approved materials and the proper installation and maintenance, the department recommends that proposed fire hydrants and water mains serving fire hydrants on private property be installed in easements and owned and maintained by the waterworks owner.)

SECTION 21 - Section NR 111.24 (4) is amended to read:

(4) Maintenance. Each supplier of water shall establish a schedule for flushing dead-end mains or mains in other areas to remove sediment or objectionable water. Water storage facilities shall be inspected on a routine basis and maintenance provided as necessary. Record keeping shall be established to insure routine scheduling and performance of valve and hydrant maintenance.

(Note: Requirements for the design and construction of distribution systems are contained in part 7 of this chapter, NR 111.70 and following.)

SECTION 22 - Section NR 111.25 intro. para. is amended to read:

NR 111.25 Cross-connections and interconnections. Cross-connections are prohibited except as provided in subsections (2) and (3) below and in Wis. Adm. Code section H 62.14.

SECTION 23 - Section NR 111.25 (1) intro. para. is amended to read:

(1) Cross-connection control program. The supplier of water for every municipal water system shall develop and implement a comprehensive control program for the elimination of all existing cross-connections and prevention of all future cross-connections. A record of the cross-connection control program shall be kept current and available for annual review by the department. The program plan shall include but not be limited to:

SECTION 24 - Section NR 111.25 (1) (c) is amended to read:

(c) A time schedule for inspection and reinspection of consumer premises for cross-connections including appropriate record keeping.

SECTION 25 - Section NR 111.25 (3) is amended to read:

(3) Interconnections with other acceptable water sources. Interconnections between the public water supply system and another source of water which is of acceptable quality are prohibited unless permitted by the department in individual cases. Approval of the department shall be obtained prior to the interconnection.

SECTION 26 - Section NR 111.25 (4) is repealed.

SECTION 27 - Section NR 111.26 (4) is amended to read:

(4) Private wells. In addition to the requirements for abandonment of public water system wells, suppliers of water for municipal water systems shall require the abandonment of all unused, unsafe or noncomplying private wells

located on premises served by their system. Such abandonment is required to prevent the well from acting as a channel for contamination or vertical movement of water. Implementation shall be by local ordinance or water utility rule.

SECTION 28 - Section NR 111.27 (1) intro. para. is amended to read:

(1) Authorization for operation of new systems. Before a new municipal water system can be placed into service, written authorization of the department shall be obtained. To obtain authorization the owner shall meet the following requirements:

SECTION 29 - Section NR 111.27 (2) is amended to read:

(2) Reports. (a) All suppliers of water for municipal water systems shall submit monthly reports on forms supplied by the department to the appropriate district office of the department as required by Wis. Adm. Code section NR 108.06(4). Reports shall include the following data if applicable:

1. Daily quantities of water pumped;

2. Daily quantities of chemicals added to the water;

3. Daily operation of treatment processes;

4. Results of chemical, physical or any other tests performed for plant control;

5. Ground water depth measurements (static and pumping) at least weekly where applicable;

6. Totals and averages of the above where spaces are provided on the report form;

7. Other data determined necessary by the department.

(b) Suppliers of water for nonmunicipal community water systems which have ground water source capacity exceeding 70 gallons per minute shall submit monthly reports on forms supplied by the department. Reports shall include the following data:

1. Total monthly pumpage of water;

2. Ground water depth measurements (static and pumping);

3. Other data (including information on any chemical addition) deemed necessary by the department.

SECTION 30 - Section NR 111.27 (3) is amended to read:

(3) Maps. Each supplier of water shall keep current a map of the system which shows the size and location of all facilities and appurtenances, such as, water mains, valves, hydrants, wells or sources, pumping stations, treatment plants and storage facilities. Contour lines or ground elevations at street intersections shall be shown as well as the overflow elevations of the system storage units. Any pressure zones shall be delineated. Two current copies of this map shall be kept on file with the department at all times.

(Note: Use of standard symbols as shown in A.W.W.A. M8 Distribution Manual is recommended. This manual is available for inspection at the office of the department of natural resources, the secretary of state's office and the office of the revisor of statutes, and may be obtained for personal use from the American Water Works Association, 6666 West Quincy Avenue, Denver, Colorado 80205.)

SECTION 31 - Section NR 111.27 (4) is amended to read:

(4) Certified operator. All suppliers of water for municipal water systems shall comply with the certified operator requirements in Wis. Adm. Code section NR 108.06(2) and chapter NR 114.

SECTION 32 - Section NR 111.27 (5) is amended to read:

(5) Auxiliary power. Each supplier of water for a municipal water system shall insure that minimal service is provided during emergencies resulting from failure of power supply, fire, storm, or similar emergency.

SECTION 33 - Section NR 111.27 (6) is amended to read:

(6) Meters. Each supplier of water except those for water systems serving less than 15 living units and having source capacity less than 70 gallons per minute shall provide a means of accurately measuring the daily quantity of water pumped or delivered.

SECTION 34 - Sections NR 111.30 thru NR 111.36 are renumbered NR 111.31 thru NR 111.37.

SECTION 35 - Section NR 111.30 is created to read:

NR 111.30 Applicability. This part covers community water systems using ground water sources which are intended to serve 15 or more living units or having source capacity greater than 70 gallons per minute. Wells and facilities for community water systems which are intended to serve less than 15 living units or having source capacity less than 70 gallons per minute shall be constructed in accordance with the requirements of Wis. Adm. Code chapter NR 112.

SECTION 36 - Section NR 111.31 (1) (c) is repealed and recreated to read:

(c) The protective casing is the casing which provides the sanitary protection to the well and is surrounded by the grout seal. The grout seal shall be a minimum of 1.5 inches in thickness to the depths specified in NR 111.32 and NR 111.33. A minimum of 5 feet of grout shall be in contact with the native geologic formation.

SECTION 37 - Section NR 111.31 (3) (c) is amended to read:

(c) If notice of objection is filed and good cause is shown, the department will hold a public hearing at which all interested parties may present testimony to be used by the department in determining if a restriction shall be placed on the volume of water withdrawn from the proposed well or existing utility wells.

SECTION 38 - Section NR 111.31 (4) (a) is amended to read:

(a) For wells to serve municipalities and subdivisions a lot or parcel of land shall be reserved for the construction of the well which has minimum dimensions of 100 feet by 100 feet. The well shall be located near the center of the lot or parcel. These dimensions may be modified by the department on a case-by-case basis if it is demonstrated that they are unnecessary or inadequate to protect water quality.

SECTION 39 - Section NR 111.31 (5) (a) is amended to read:

(a) The protective casing shall be new pipe produced to and meeting A.S.T.M., A-53, A-106, A-120; A.P.I., 5L, 5LX or A.W.W.A. 202 specifications. No previously used or reclaimed pipe shall be used.

SECTION 40 - Section NR 111.31 (5) (c) is amended to read:

(c) If the protective casing is to be installed without driving it may have a thickness less than indicated in Table 1 but shall be surrounded by at least 4 inches of grout. It shall have a minimum thickness of 0.312 inches except in the case of 6-inch diameter casing which shall be a minimum of 0.280 inches.

SECTION 41 - Section NR 111.31 (5) (g) is amended to read:

(g) Casing and liners shall be assembled watertight by means of joints welded in accordance with the standard welding procedure specifications of the department of industry, labor and human relations, Wis. Adm. Code section Ind. 53.53(3) or by threaded couplings meeting or equivalent to the specifications listed in NR 111.31(5)(a).

SECTION 42 - Section NR 111.31 (5) (h) is renumbered NR 111.31 (5) (i).

SECTION 43 - Section NR 111.31 (5) (h) is created to read:

(h) For wells in which the protective casing is suspended, the grout shall be supported on a steel ring, or approved packer attached to the bottom of the casing. The bottom of the casing may be flared out to meet this requirement also.

SECTION 44 - Sections NR 111.31 (11) (a) and (b) are repealed.

SECTION 45 - Section NR 111.31 (11) (a) is created to read:

(a) Grout mixtures. 1. Neat cement grout shall be cement and water with not more than 6 gallons of water per sack (94 lbs.) of cement. Approved additives may be used to increase fluidity, reduce shrinkage or control time of set.

2. Sand cement grout may be used for annular openings greater than 3 inches. The mixture shall not exceed 2 parts by weight of sand to one part of cement and not more than 6 gallons of water per sack (94 lbs.) of cement.

3. Concrete grout may be used for annular openings greater than 6 inches. The concrete shall contain not less than 6 sacks (94 lbs.) of cement per cubic yard and not more than 6 gallons of water per sack (94 lbs.) of cement. The gravel size shall not exceed 3/4 inch. The ratio of either gravel or sand to cement shall not exceed 2.5 parts to one part. Wisconsin department of transportation grade A concrete is also acceptable. (Note: see Standard Specifications for Road and Bridge Construction, 1975).

SECTION 46 - Section NR 111.31 (11) (c) is renumbered NR 111.31 (11) (b).

SECTION 47 - Section NR 111.31 (11) (b) 1. is repealed and recreated to read:

1. All grout shall be placed from the bottom of the annular opening to the surface in one continuous operation. When a conductor pipe in the annular opening is used it shall be submerged in the grout during the entire operation. For grout depths in excess of 100 feet, a pump shall be used to inject the grout.

SECTION 48 - Section NR 111.31 (11) (b) 7. is amended to read:

7. In some cases, partial withdrawal of the outer casing may be necessary during grouting to comply with NR 111.31(1)(c). The grout level shall be maintained above the bottom of the outer casing during the withdrawal procedure.

SECTION 49 - Section NR 111.31 (11) (d) is renumbered NR 111.31 (11) (c).

SECTION 50 - Section NR 111.31 (11) (e) is renumbered NR 111.31 (11) (d).

SECTION 51 - Section NR 111.31 (11) (e) is created to read:

(e) Annular openings outside of surface or outer casings shall also be filled with grout.

SECTION 52 - Section NR 111.31 (17) is repealed and recreated to read:

(17) Chemical quality. Every new well shall be sampled for chemical analysis. Reconditioned or modified wells shall be sampled for chemical analysis in cases where changes in water quality may occur. The samples shall be collected near the end of the test pumping period and submitted as soon as practical to the state laboratory of hygiene, Madison. Bottles, sampling slips, and authorization for the sampling may be obtained at a district office of the department.

SECTION 53 - Section NR 111.32 (1) (a) is amended to read:

(a) The cased and grouted depth will be dependent on the controlling geologic conditions. Where practical, the grouted casing shall extend to at least 5 feet below the normal pumping water level and to within 5 feet of the top of the screen unless the grout depth is at least 60 feet. Grouted casing depths less than 30 feet will not be approved if suitable alternatives are available.

SECTION 54 - Section NR 111.32 (1) (d) is amended to read:

(d) If clay or hardpan is encountered above the formation to be developed, the protective casing and grout shall extend through such materials, but the outer casing shall be withdrawn at least 5 feet above the clay or hardpan during grouting.

SECTION 55 - Sections NR 111.34 (4) (c) and (d) and repealed and recreated to read:

(c) Be connected to the sanitary sewer where available and if the floor is sufficiently elevated to prevent back-up of wastewater into the pump station.

(d) Terminate a minimum of 25 feet from the pump station if discharge is to be to the ground surface or a gravel pocket. A greater distance may be required for wells developed in sand and gravel formations.

SECTION 56 - Section NR 111.34 (6) is repealed and recreated to read:

(6) Line shaft pumps. (a) The pump shall be supported by a concrete foundation which is at least 6 inches, and preferably 12 inches, above the pump station floor. The protective casing shall extend a minimum of one inch above the concrete foundation. If this is impractical and where there also is an inner casing it shall extend a minimum of one inch above the foundation and the protective casing shall extend a minimum of 4 inches above the floor and be incorporated into the concrete foundation. For these installations a steel ring shall be welded between the inner and protective casings.

(b) The metal surfaces between the pump head and base plate shall be machined or gasketed to provide a tight seal. A gasket or grout seal shall be provided between the base plate and concrete pump foundation.

SECTION 57 - Section NR 111.34 (7) is amended to read:

(7) Submersible pumps. Where a submersible pump is used, the top of the casing shall be effectively sealed against entrance of water under all conditions of vibration or movement of conductors or cables. The protective casing shall terminate at least 12 inches above the floor and be surrounded by a concrete collar to at least 6 inches above the floor.

SECTION 58 - Section NR 111.35 (1) is amended to read:

(1) Pump capacities. (a) Figure 2 shall be used for determining pump capacities for domestic service only. More detailed engineering studies are necessary for determining pump capacities in systems providing water for multiple uses, including domestic, commercial, and industrial usage and fire protection.

(b) If no elevated storage is available and more than 50 homes are to be served, 2 or more pumping units shall be provided each of which can supply the normal daily demands. An approved interconnection with another water system or a ground reservoir with booster pumps may be used in lieu of this requirement.

SECTION 58a - Section NR 111.35 (1), Figure 2, Caption is created to read:

The number of homes may be reduced by one-third for apartment units, condominium units and mobile homes.

SECTION 59 - Section NR 111.35 (2) (a) is amended to read:

(a) Water lubricated pumps are required, except where oil lubricated pumps are necessary to provide positive lubrication at deep pump settings. However, in no case shall oil lubricated pumps be approved for wells in unconsolidated formations or wells with shallow pump settings.

SECTION 60 - A Note is created following section NR 111.35 (6) (f):

(Note: It is recommended that all wells be provided with a means to pump to waste. This could be a valve and hose connection inside the pump station or a valve and hydrant outside.)

SECTION 61 - Section NR 111.37 (3) (b) 2. is amended to read:

2. The design capacity for hardness removal shall not exceed 20,000 grains per cubic foot when resin is regenerated with 0.3 pounds of salt per kilograin of hardness removed.

SECTION 62 - Sections NR 111.60 thru NR 111.64 are renumbered NR 111.61 thru NR 111.65.

SECTION 63 - Section NR 111.60 is created to read:

NR 111.60 Applicability. This part covers reservoirs for community water systems which are intended to serve 15 or more living units or having source capacity greater than 70 gallons per minute. Reservoirs for community water systems which are intended to serve less than 15 living units or having source capacity less than 70 gallons per minute shall be constructed in accordance with the requirements of Wis. Adm. Code chapter NR 112.

SECTION 64 - NR 111.61, Title, is repealed and recreated to read:

NR 111.61 General requirements.

SECTION 65 - Section NR 111.61 (2) is repealed.

SECTION 66 - Section NR 111.61 (3) is renumbered NR 111.61 (2) and amended to read:

(2) Pressure requirements. The storage facilities shall be designed to meet the minimum and maximum pressure requirements specified in NR 111.65 and, in conjunction with distribution system design, provide flows as specified in NR 111.72. A hydro-pneumatic tank or other reliable means shall be provided to maintain system pressure when a gravity storage reservoir is not available. (Note: See NR 111.36 for hydro-pneumatic tank requirements.)

SECTION 67 - Section NR 111.61 (3) is created to read:

(3) Bypass piping. If the system design is such that all water must pass through one ground reservoir there shall be bypass piping from the well pump(s) to the high lift pump(s) to allow the reservoir to be taken out of service for cleaning and maintenance. This requirement can be waived where the well pump(s) can provide sufficient volume and pressure directly to the distribution system or where the well pump(s) and high lift pump(s) are greatly different in capacity.

SECTION 68 - Section NR 111.62 (1) is amended to read:

(1) Storage facilities shall not be located within a floodway. If it is necessary to locate a reservoir in a floodplain outside of the floodway the bottom shall be a minimum of 2 feet above the regional flood elevation. (Note: See Wis. Adm. Code chapter NR 116 for floodway and floodplain criteria.)

SECTION 69 - Section NR 111.63 (8) intro. para. is amended to read:

(8) Roof and sidewall. The roof and sidewalls of all structures must be watertight with no openings except vents, manholes, overflows, risers, drains, pump mountings, control ports, or piping for inflow and outflow. In addition:

SECTION 70 - Sections NR 111.70 thru NR 111.77 are renumbered NR 111.71 thru NR 111.78.

SECTION 71 - Section NR 111.70 is created to read:

NR 111.70 Applicability. This part covers water distribution systems for community water systems which are intended to serve 15 or more living units and will be located in street rights-of-way or easements. Other piping systems shall be constructed in accordance with the requirements of Wis. Adm. Code chapter H62. (Note: See NR 111.24 for ownership requirements.)

SECTION 72 - Section NR 111.71 is amended to read:

NR 111.71 Materials. All pipe used for water main installations shall be cast iron, ductile iron, steel, reinforced concrete, asbestos-cement, polyvinyl chloride, copper or materials specially approved by the department for restricted or experimental use. Where a restricted or experimental use approval is issued, the department may require special precautions until such time as a satisfactory use record has been established. Pipes, joints, fittings, valves and fire hydrants shall have been manufactured in conformity with the latest standards issued by the American water works association and shall be approved by the

department. All pipe shall be minimum A.W.W.A. pressure class 150 except as approved by the department for special low pressure applications. For polyvinyl chloride pipe, only joints with elastomeric gaskets are acceptable. (The latest standards are those which are effective on the effective date of these rules.) A copy of the A.W.W.A. standards are available for inspection at the office of the department of natural resources, the secretary of state's office and the office of the revisor of statutes, and may be obtained for personal use from the American Water Works Association, 6666 West Quincy Avenue, Denver, Colorado 80235.

SECTION 73 - Section NR 111.72 (1) is amended to read:

(1) Minimum water main size. The minimum diameter of water main to provide water for fire protection and to serve fire hydrants shall be 6 inch. Larger mains shall be required if necessary to allow the withdrawal of the required fire flow while maintaining a minimum residual pressure of 20 psi within the main. The minimum flow requirement for water mains serving fire hydrants is 500 gpm at 20 psi residual pressure. All water mains, including those not designed to provide fire protection, shall be sized after a hydraulic analysis based on flow demands and pressure requirements. The minimum residual pressure in the main during peak demand periods shall be 20 psi. (Note: See appropriate sections of Wis. Adm. Code chapters H 62 and PSC 185 for guidance in sizing mains to provide domestic service only to residential and other type customers.)

SECTION 74 - Section NR 111.76 ~~(3)~~ (1)(c) is amended to read:

(3) Pressure testing of the installed pipe, including measurement of leakage, and testing for electrical conductivity, where appropriate.

SECTION 75 - Section NR 111.77 (4) is amended to read:

(4) Exception. When it is impossible to obtain the proper horizontal and vertical separation as specified in NR 111.77(2) and (3), a gravity sanitary sewer shall be constructed of materials and with joints that are equivalent to water main standards of construction and pressure tested to assure water tightness. When the 8-foot separation distance cannot be provided for storm sewers, the horizontal and vertical separation shall be as great as practicable. The department must specifically approve any variance from the requirements in NR 111.77(2) and (3).

SECTION 76 - Section NR 111.82 is repealed and recreated to read:

NR 111.82 Floor drainage. Floor drains in pump stations and treatment plants shall comply with the requirements of NR 111.34(4).

SECTION 77 - Section NR 112.01 is amended to read:

NR 112.01 Purpose. The purpose of this chapter is 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 and reservoirs, installation of pumping equipment, or other methods approved by the department, in conformity with chapters 144 and 162, Wis. Stats. This chapter shall govern the location, construction or reconstruction and maintenance of wells and reservoirs, the installation and maintenance of pumping and treatment equipment, and the supervision of well drillers and pumping equipment installers.

SECTION 78 - Section NR 112.02 is amended to read:

NR 112.02 Applicability. The provisions of this chapter shall apply to all new and existing private water supplies, high capacity water systems, school water systems, and public water systems, community water systems serving

15 or more living units.

Note: An approval from the department is required for high capacity water systems, school water systems and sewage treatment plant water systems pursuant to chapters 144 and 162, Wis. Stats., respectively, prior to construction of any well and installation of any pump. See NR 112.26.

SECTION 79 - Section NR 112.03 (12m) is created to read:

(12m) "Community water system" means a public water system which serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents.

SECTION 80 - Section NR 112.03 (20m) is created to read:

(20m) "Drinking water standards" means those standards listed in Wis. Adm. Code chapter NR 109.

SECTION 81 - Section NR 112.03 (30m) is created to read:

(30m) "High capacity water supply or system" means one where new and existing wells to be constructed, reconstructed, rehabilitated, installed or operated on one property whose operating capacity singly or in the aggregate with that of other wells on the property will be in excess of 70 gallons per minute.

SECTION 82 - Section NR 112.03 (32) is repealed.

SECTION 83 - Section NR 112.03 (34m) is created to read:

(34m) "Living unit" means a domicile.

SECTION 84 - Section NR 112.03 (35a) is created to read:

(35a) "Non-community water supply system" means a public water system that is not a community water system.

SECTION 85 - Section NR 112.03 (35m) is created to read:

(35m) "One property" means all contiguous lands controlled by one owner, lessee, or any other person having a possessory interest. For the purposes of this chapter, lands under single ownership bisected by highways or railroad right-of-ways are considered contiguous.

SECTION 86 - Section NR 112.03 (38) is amended to read:

(38) "Private water supply" means one or more sources of ground water, including facilities for storage and conveyance thereof, such as wells, springs, pumps, pressure tanks and reservoirs, on one property, other than those serving a public water system.

SECTION 87 - Section NR 112.03 (40m) is created to read:

(40m) "Public water system" means a system for the provision to the public of piped water for human consumption, if such system has at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days out of the year. A public water system is either a "community water system" or a "non-community water system". Such system includes:

(a) Any collection, treatment, storage and distribution facilities under control of the operator of such system and used primarily in connection with such system, and

(b) Any collection or pretreatment storage facilities not under such control which are used primarily in connection with such system.

SECTION 88 - Section NR 112.03 (46m) is created to read:

(46m) "School water supply or system" means a water system serving an educational institution.

SECTION 89 - Section NR 112.03 (51m) is created to read:

(51m) "Sewage treatment plant water supply or system" means a self-supplied water system for a sewage treatment plant for drinking, toilet, laboratory, showers, eye wash fountains, plant wash-down and sewage disinfection purposes.

SECTION 90 - Section NR 112.07 (2) (b) is amended to read:

(b) Ten feet between well and independent clear water waste drain, rain-water downspout outlet, cistern, hydrant drain, or similar unit; building foundation-drain connected to independent clear water waste drain or other subsoil drain; nonconforming existing or unapproved new well pit, pump pit, pressure-tank pit, pressure-tank access pit or subsurface pumproom; nonconforming reservoir except that for school water systems, high capacity water systems and sewage treatment plant water systems there shall be a minimum separating distance of 20 feet between a well or reservoir and a well pit, pump pit, pressure-tank pit, pressure-tank access pit, or subsurface pumproom.

SECTION 91 - Section NR 112.07 (2) (d) is amended to read:

(d) Twenty-five feet between well or reservoir and watertight grease basin, septic tank, holding tank, subdrain other than cast iron or equivalent pipe; sewage sump other than cast iron or equivalent material, sanitary building or storm building sewer other than cast iron or equivalent material; sanitary building or storm building drain other than cast iron or equivalent material; floor drain connected to sanitary building sewer or drain of other than cast iron or equivalent pipe material; lake or stream shoreline; below-ground swimming pool; except that for school water systems and high capacity water systems the minimum separating distance between a well and a lake or stream shoreline shall be 60 feet.

SECTION 92 - Section NR 112.07 (2) (g) is amended to read:

(g) Fifty feet between well or reservoir and seepage pit, seepage bed, seepage trench or other similar sewage or waste water disposal unit; privy; pet-waste pit disposal unit; animal yard, animal shelter, animal enclosure or animal lot; conventional silo with pit; glass-lined storage facility with pit; outlet of water tight milkhouse drain; seepage pit for drain of conventional silo or glass-lined storage facility; loose-jointed field-drain pipe lines, except that for school water supply systems, there shall be a minimum separating distance of 200 feet between a well or reservoir and seepage pit, seepage bed, seepage trench or similar sewage or waste water disposal unit.

SECTION 93 - Section NR 112.07 (2) (h) is amended to read:

(h) Fifty feet between well or reservoir and street sanitary or storm sewer; similar sanitary or storm sewer piping comprising part of the drainage system on public or private property, except that for sewage treatment plant wells, there shall be a minimum separating distance of 150 feet between a well or reservoir and a gravity or pressurized collector, branch or trunk sewer.

SECTION 94 - Section NR 112.07 (2) (j) is amended to read:

(j) One hundred feet between well or reservoir and bulk subsurface storage tanks for refined petroleum products such as gasoline and fuel oil, except in the case of fuel oil tanks for private residential use, in which case the separating distance shall be at least 25 feet or farther where practical.

SECTION 95 - Sections NR 112.07 (2) (l) thru (o) are renumbered (m) thru (p).

SECTION 96 - Section NR 112.07 (2) (l) is created to read:

(l) One hundred and fifty feet between well or reservoir and sewage treatment plant structures.

SECTION 97 - Section NR 112.08 (2) intro. para. is amended to read:

(2) Specific. The requirements of NR 112.08(1) for drilled-type wells for low capacity supplies, including community systems serving less than 15 living units and non-community systems, but excluding schools, shall be deemed to be fulfilled when minimum construction and material requirements set forth in table 1 and in paragraphs (a) through (i) below are met, and for high capacity water systems and school water systems when minimum construction and material requirements of table 3 and also paragraphs (a) through (i) are met, except for sewage treatment plant water systems, a minimum of 100 feet of well casing pipe shall be installed. (Note: See appendix figures A1 through A25 for low capacity water supply standards required by table 1.)

SECTION 98 - Section NR 112.08 (2) (a) is amended to read:

(a) Well casing pipe. The protective well casing pipe materials shall be steel pipe having the nominal diameters and the weights as specified in table 2, except that for wells for potable school water systems and high capacity water systems, the minimum wall thickness for 8-inch, 10-inch, and 12-inch diameter pipe shall be 0.322-inch, 0.365-inch, and 0.375-inch, respectively, and for non-potable systems pipe of any diameter used shall have an adequate wall thickness to make the well structurally sound.

SECTION 99 - Section NR 112.14 (1) is amended to read:

(1) Water supplies except those for less than 4 families, schools, sewage treatment plants and high capacity installations. All wells governed by this chapter, except those serving residential units housing a total of not more than 3 families, and school water systems, high capacity water systems and sewage treatment plant water systems shall be provided surface protection in accordance with the provisions of this subsection.

SECTION 100 - Sections NR 112.14 (3) thru (6) is renumbered (4) thru (7).

SECTION 101 - Section NR 112.14 (2) (b) is amended to read:

(b) Any pitless subsurface connection to such a well shall be made with approved threaded fittings as defined in NR 112.14(1)(b) or by means of joints welded in accordance with the standard welding procedure specifications of the department of industry, labor and human relations, Wis. Adm. Code section Ind. 53.53(3), and the connection shall be made above ground water level. In addition, the pump location shall not be subject to flooding. Weld-on pitless adapter units shall be approved units.

SECTION 102 - Section NR 112.14 (3) is created to read:

(3) All school water systems, high capacity water systems and sewage treatment plant water systems. The watertight protective well casing pipe of wells for all school water systems, high capacity water systems and sewage treatment plant water systems shall terminate at least 12 inches above the established ground grade at the well except in flood plains where the top of the well shall terminate at least 2-feet above the regional flood elevation; no well pits may be constructed; and, except for sewage treatment plant systems, no subsurface pump piping connections shall be made to the well casing pipe.

SECTION 103 - Section NR 112.15 (8) is created to read:

(8) Injection of fertilizers or other chemicals for agricultural purposes. (a) Potable water supplies or systems. The injection of fertilizers and pesticides into the discharge pipe or water system is prohibited. Use of such chemicals shall be accomplished by repumping from a steel reservoir tank or a watertight pond. The discharge from the well pump into such reservoir or pond shall have a free fall from a point at least 2 feet above the established reservoir or pond overflow elevation.

(b) Non-potable water supplies. The injection of fertilizers into the well or pump suction pipe is prohibited. Injection of fertilizers into a pump discharge pipe should preferably be done in the discharge pipe of a booster pump delivering water from a reservoir or pond into which the well pump discharges with a free air-break. If injection of fertilizer into the well pump discharge pipe is planned, it shall be done with a positive feed pump at a point following an underwriters laboratories approved check valve and preferably a double check valve. The chemical feed pump shall be shut off at least 5 minutes prior to shutting off of the well pump so as to purge the chemical from the water line. Injection of pesticides into the well pump discharge line is prohibited.

SECTION 104 - Section NR 112.16 (1) is amended to read:

(1) Water samples. Upon completion of the well construction, except those not intended as a source of water supply for drinking or food processing purposes, the well driller shall collect a water sample from the well, by use of a pump, for bacteriological analysis. Likewise, upon completion of the installation of pumping equipment and disinfection and flushing of the well and water system, except those not intended as a source of water supply for drinking and food processing purposes, the pump installer shall collect a sample from the well for bacteriological analysis. Exceptions to these procedures will be permitted when the well driller also installs the pump, in which case submission of the required sample upon completion of the pump installation will be considered satisfactory compliance. Where unforeseeable contamination is encountered, the initial construction of a well will be considered complete if the construction conforms to provisions of this chapter. The water samples shall be submitted either to the state laboratory of hygiene or to an independent laboratory certified under the state laboratory certification program to do bacteriological examination of water; provided that such certified laboratory will file the water sample data sheet and a copy of the water sample analysis report with the department within 20 days following completion of the analysis.

SECTION 105 - Section NR 112.17 (2) is renumbered NR 112.17 (2) (a) and amended to read:

NR 112.17 (2) Upper well terminal. (a) For all low capacity water supplies other than for schools, and sewage treatment plants, the casing pipe of any drilled, bored or driven type well or of a dug well having a casing pipe reduction shall project not less than 8 inches above the permanent established ground surface at the well, or 8 inches above a pump house or building floor or platform installed above such established ground surface unless a permit for a subsurface terminal has been obtained. The well casing pipe shall be sealed or covered with an approved type well seal or cap, except that a nonwatertight cap shall not be used in pit installations. Seals for wells terminating outside of buildings shall have a one-piece top plate. (Note: See NR 112.14(1), (2) and (3).)

SECTION 106 - Section NR 112.17 (2) (b) is created to read:

(b) For all school water systems, high capacity water systems and sewage treatment plant water systems, the casing pipe of any well shall project not less than 12 inches above the permanent established ground surface at the well, or 12 inches above a pump house or building floor or platform installed above such established ground surface. The well casing pipe shall be sealed or covered with an approved type well seal or cap. Seals for wells terminating outside of building shall have a one-piece top plate. (Note: See NR 112.14(3).)

SECTION 107 - Sections NR 112.17 (4) (a) 3. and 4. are amended to read:

3. On above-ground pump installations, provided the elevation of the top of the well is at least 2 feet above the regional flood water level at the site and provided the discharge head base of a vertical centrifugal pump will be mounted on a base plate or foundation in such manner as to exclude entrance of insects into the well, the discharge head shall preferably be set on a

concrete pump support base with protective well casing pipe projecting at least one inch above the concrete pump support base and into the base of the discharge head or the discharge head shall be installed with its base flange set with gasket onto a pipe flange attached to the top of the protective well casing by threaded or welded joint and with the discharge head flange bolted to the pipe flange. (Note: See sections NR 112.14(1), (2) and (3) and NR 112.17(8).)

4. If the pump base of a deep well vertical centrifugal pump discharge head is not of a recessed type or if the pump support flange for the pump column is of larger diameter than the protective well casing, the extension of the well casing one inch above the bottom of a pump discharge head subbase also will be considered an effective seal, subject to the same restrictions as stipulated in subparagraph 3. and provided that:

a. The top of the subbase and the bottom of the pump discharge head base are secured together as an integral unit by bolts, and

b. If either the top surface of the subbase or the bottom of the pump discharge head base is not a machined surface, a gasket is provided between the 2 surfaces prior to joining them permanently together.

SECTION 108 - Section NR 112.17 (4) (a) 4. c. is renumbered as NR 112.17 (4) (b) and amended to read:

(b) Above-ground pumphouse or well house or shelter. The structure housing a power driven pump shall be constructed having the following minimum features:

1. Reinforced poured-concrete floor with top of the floor at least 4 inches above the established grade.

2. Walk-in door opening outward when the pumproom is large enough.

3. Trapped floor drain discharging to the ground surface when a door is not installed.

4. Thermostatically controlled electrical heating unit.

5. Removable or hinged roof.

6. Insulated walls and roof.

7. Walls firmly secured to floor.

8. Dimensions and actual details of wall and roof design are optional. The dimensions in table 4, figure 12 are recommendations. (Note: See section NR 112.14(2) and figures 12 and 13.)

SECTION 109 - Section NR 112.17 (4) (c) is created to read:

(c) Lubrication of vertical centrifugal pumps. 1. Oil lubricated vertical centrifugal pumps are limited to those cases where they are necessary to provide positive lubrication at deep pump settings but in no case shall they be approved for wells in unconsolidated formations or where the pump operation is expected to lower the water level in the well during pumping to a point less than 5 feet above the bottom of the protective well casing pipe.

2. Normally water lubricated vertical centrifugal pumps are required. For water levels deeper than 50 feet, provision shall be made for prelubricating the column bearings prior to pump startup. The necessity of lubrication during pump backspin when allowed to occur shall be determined and provided if necessary. Water for lubrication of pumps shall be supplied by piping connected to the water pressure system.

SECTION 110 - Section NR 112.17 (4) (a) 4. d. is renumbered NR 112.17 (4) (d) and amended to read:

(d) Protection from freezing. Unless an approved-type above ground discharge unit is installed or the discharge pipe is installed above grade and drains back above grade into the well between pumping cycles, the pump discharge line and accessory equipment installed above grade shall be protected against

freezing by insulation of structure and piping and installation of dependable heating facilities, preferably a thermostatically controlled type.

SECTION 111 - Section NR 112.17 (4) (e) is created to read:

(e) Pressure tank accessibility. Hydropneumatic tanks in sizes of 1,000 gallons or greater preferably shall be installed above ground but if buried shall have the head end cradled in a basement wall or in the wall of an access pit constructed to the specifications for well pits. A permit shall be obtained for the construction of the access pit. Such large tanks shall have other additional support cradles. (Note: See NR 112.14(4) and (5).)

SECTION 112 - Section NR 112.17 (4) (f) is created to read:

(f) Installation of meters. Water meters shall be installed at a point in the pump discharge pipe prior to its connection to the hydropneumatic tank and prior to any branch service line.

SECTION 113 - Section NR 112.26 is created to read:

NR 112.26 Well and pump installation approvals. (1) High capacity well approvals. (a) No wells shall be constructed, reconstructed, rehabilitated, installed or operated to withdraw water from underground sources for any purpose where the operating capacity, either singly or in the aggregate with that of other wells on the property will be in excess of 70 gallons per minute, unless the owner, lessee, or any other person having a possessory interest obtains a written approval from the department. In any case involving an application by a person other than the owner of the subject property the owner shall join in the application.

(b) If the department finds that a proposed high capacity well will reduce the availability of groundwater to any public utility as defined by section 196.01, Wis. Stats., it may deny approval or grant a limited approval under

which it imposes such conditions as to locations, depth, pumping capacity or rate of flow and ultimate use so that the water supply of any public utility will not be impaired.

(c) Any well constructed pursuant to this subsection shall be constructed in accordance with NR 112.08.

(d) Approval applications shall provide the following basic information:

1. Description of property, including any contiguous property owned or leased by the applicant.

2. Property owner, giving names of partners, if a partnership, and officials if a corporation.

3. Proposed well owner, giving name of lessee if lessee is to construct well.

4. Proposed well operator, giving name of lessee if lessee is to operate well.

5. Existing well locations on property.

6. Description of designs of existing wells and pump installations on same and contiguous property owned or leased by the applicant.

7. Estimate of current water use from each well and proposed water use from each well following completion of the proposed well or wells or pump installation or installations, giving type of use.

8. Plan and specifications of proposed well construction indicating geologic formations expected to be encountered; drillhole diameters and depths; type of drilling equipment to be used; well casing pipe and liner pipe wall thickness, weight ASTM or API specification and grade and type of end finish; proposed area of grouting; material to be used to seal the annular space surrounding the well casing pipe and liner pipe; and the proposed method of grouting.

9. Plan of proposed pump installation, including interconnection of the pump discharge pipe with water system, pressure or storage tanks, elevated tanks, reservoirs, booster pumps, metering and proposed means for measuring well water levels and sampling.

10. Plan of property showing the location of buildings, wells, and possible contamination sources such as sewers, drains, septic tanks, waste disposal system units, buried fuel storage tanks.

11. Map giving location of nearest public utility wells.

12. Map giving location of private wells on different properties within 2,500 feet. Where the department determines that the possibility of interference to neighboring wells may occur at a greater distance it may require additional information on private well locations.

13. Alternative sources of supply.

(e) If the original applicant relinquishes control of the well, a new approval shall be obtained from the department by lessee or new owner for continuation of operation of a high capacity water system.

(f) Emergency approval may be granted by the department where fire hazard, imminent crop damage, or other similar emergency requires it when it has been determined that such well will not adversely affect the availability of ground water to a public utility. The owner, lessee, or any other person having a possessory interest shall obtain, within 60 days from the issuance of an emergency approval under this subsection, written approval from the department for continued operation of any well constructed pursuant to this subsection. The applicant for emergency approval shall provide information on the proposed well location, construction, reconstruction, rehabilitation, reactivation or pump installation and proposed rate of operation.

(g) Approval by the department does not relieve the applicant of any liability which may result from injury or damage suffered by any person upon operation of the well.

(h) The department may require the installation of metering and water level measuring equipment.

(i) The owner, lessee or any other person who owns or operates a high capacity water supply at any time shall submit on forms supplied by the department, monthly pumpage and well water level reports, as requested by the department.

(j) Failure of applicant to comply with any conditions of approval or the construction and operation of any well in violation of the rules of the department shall void said approval.

(k) The department shall retain jurisdiction over all wells approved under this section and may limit or deny pumping if changed circumstances warrant such action for protection of a public utility.

(l) Any well driller, pump installer or contractor shall independently verify the approval of the department prior to initiation of construction, reconstruction, rehabilitation, installation, or operation of a high capacity well. Failure to verify the existence of such approval shall be a violation of this chapter.

(2) School water supply approvals. (a) No well shall be constructed, reconstructed, rehabilitated, installed or operated for a school water supply unless the school district or other owner obtains a written approval from the department.

(b) Any well constructed pursuant to this section shall be constructed in accordance with NR 112.08.

(c) Plans and specifications for any wells to be constructed and for any pumps to be installed pursuant to this subsection shall be submitted in

duplicate by a registered professional engineer or registered driller, in case of wells and by a registered professional engineer or registered pump installer in the case of pumps.

(d) Approval applications shall provide the following basic information:

1. Name of school.

2. Ownership of school and mailing address.

3. Location of school.

4. Name and address of school clerk and school officials, superintendent or director, etc.

5. Number of classrooms.

6. Number of pupils currently and ultimately.

7. Plan and specifications of proposed well construction indicating geologic formations expected to be encountered; drillhole diameters and depths; type of drilling equipment to be used; well casing pipe and liner pipe wall thickness, weight, ASTM or API specification and grade and type of end finish; proposed area of grouting; material to be used to seal the annular space surrounding the well casing pipe and liner pipe; and the proposed method of grouting.

8. Description of existing wells and pump installations.

9. Plan and specifications for the pump installation including interconnection of the pump discharge pipe with the water system pressure or storage tanks, reservoirs, booster pumps, metering and proposed means for measuring well water levels and sampling.

10. Plan of property showing the location of the buildings, wells and possible pollution sources such as sewers, drains, septic tanks and sewage disposal units and buried fuel oil tanks.

11. Computations made to determine the quantity of water necessary to adequately serve the school at its ultimate capacity.

(e) Approval by the department does not relieve the applicant of any liability which may result from injury or damage suffered by any person upon operation of the well.

(f) The department may require the installation of metering and water level measuring equipment to obtain pumpage and water level data.

(g) The school shall submit on forms provided by the department monthly pumpage and well water level reports as requested by the department.

(h) Prior approval is required for any proposed installation of chemical treatment equipment in any school water system.

(i) Failure of school to comply with conditions of approval of the construction and operation of any well in violation of this chapter shall void the approval.

(j) Any well driller, pump installer or contractor shall independently verify the approval of the department prior to initiation of construction, reconstruction, rehabilitation, installation or operation of a school water system well. Failure to verify the existence of such approval shall be a violation of this chapter.

(3) Sewage treatment plant water system approvals. (a) No well shall be constructed, reconstructed, rehabilitated, installed or operated for a sewage treatment plant unless the municipality, sanitary district or private owner obtains a written approval from the department.

(b) Any well constructed pursuant to this section shall be constructed in accordance with NR 112.08.

(c) Plans and specifications for any well to be constructed and any pump to be installed pursuant to this subsection shall be submitted in duplicate under the seal of a registered professional engineer.

(d) Approval applications shall provide the following basic information:

1. Ownership.

2. Officials and their addresses.

3. Plan and specification of proposed well construction indicating geologic formations expected to be encountered; drillhole diameters and depths; type of drilling equipment to be used; well casing pipe and liner pipe wall thickness, weight, ASTM or API specification and grade, and type of end finish; proposed area of grouting; material to be used to seal the annular space surrounding the well casing pipe and liner pipe; and the proposed method of grouting.

4. Plan of proposed pump installation, including interconnection of the pump discharge pipe with the water system, pressure or storage tanks, booster pumps and method of protection of the water system from back siphonage of lines supplying hoses for plant wash down or lines supplying water used in disinfection of sewage.

5. Plan of property showing the locations of buildings, wells, sewers (giving types of sewers), manholes and sewage treatment structures.

(e) Approval of the department does not relieve the applicant of any liability which may result from injury or damage suffered by any person upon operation of the well.

(f) Failure of owner to comply with a condition of approval or the construction and operation of any well in violation of the rules of the department shall void said approval.

(g) Any well driller, pump installer or contractor shall independently verify the approval of the department prior to initiation of construction, reconstruction, rehabilitation, installation, or operation of a sewage treatment plant well. Failure to verify the existence of such approval shall be a violation of this chapter.

SECTION 114 - Section NR 112.27 is created to read:

NR 112.27 Drinking water standards. Community water systems serving less than 15 living units and non-community water systems shall comply with the drinking water standards contained in Wis. Adm. Code chapter NR 109.

SECTION 115 - Chapter NR 112, Table 3 is renumbered to be Table 4.

SECTION 116 - Chapter NR 112, Table 3 is created to read:

TABLE 3

HIGH CAPACITY, SCHOOL AND SEWAGE TREATMENT PLANT
DRILLED WELL REQUIREMENTS – POTABLE WATER SUPPLY

1	2	3	4	Upper Drillhole				9	10	11
				Upper Enlarged Drillhole		Regular Drillhole				
Type	Nature of Water Bearing Formation (Aquifer)	Geologic Formations Overlying Aquifer	Minimum Nominal Casing Diameter Inches	5 Minimum Diameter	6 Minimum Depth	7 Minimum Diameter	8 Bottom Elevation	Lower Drillhole Minimum Well Diameter	Maximum Nominal Protective Liner Diameter	Construction Conditions
a.	Sand or gravel	Sand or mixture of sand and gravel; or clay or similar material containing layers of sand and gravel; or clay or similar material to varying depths.	6" See construction conditions.	Well casing pipe outside diameter plus 3" if well casing will be assembled with welded joints; or coupling outside diameter plus 3" if well casing will be assembled with threaded and coupled joints.	60' with cable tool drilling & 60' plus such additional depth necessary to place the desired length of screen, with rotary drilling, unless a gravel-pack is planned, in which case the depth of outer drillhole shall be a minimum of 65' plus the desired screen length in either type of drilling. Exception to this requirement holds for sewage treatment plant wells where the minimum amount of protective well casing pipe shall be 100'. See note 2 below.	6" See construction conditions.	Exception See note 2 below.	6"	Not applicable.	a. The protective well casing pipe normally shall extend to a minimum depth of 65' and to a minimum depth of 100' for sewage treatment plant wells or to such greater depth that will assure that the well casing will extend to a minimum of 5' below the pumping water level. With cable tool drilling the upper enlarged drillhole shall be kept open with temporary well casing, unless the drillhole will penetrate clay or other material which will similarly stand open, and the upper drillhole shall be kept 1/3 filled with clay slurry throughout the driving of permanent well casing. With rotary drilling, the outer drillhole shall be maintained at full diameter with drilling mud. The annular space surrounding the protective well casing to minimum depth of 60 feet normally and to 95 feet in sewage treatment plant wells shall be permanently sealed with cement grout placed by a suitable pump from the bottom of the annular space upward. When an outer pipe is used to maintain the enlarged upper drillhole it shall be pulled back at least 10' but preferably shall be entirely removed immediately following completion of grouting the well. The vertical zone of contamination shall be sealed off. See notes 1 and 2 below. An adequate screen shall be provided. Unless a gravel-pack well is planned, the screen shall be installed in such manner that removal or replacement can be accomplished without adversely affecting the watertight construction of the well. For economic reasons an inner pipe separate from the protective well casing to which the screen would be attached is not required, but it is preferred. Either the placement of the screen to the bottom of the drillhole and jacking back of the casing or the bail-down method will be acceptable for the initial screen placement. When a separate pipe is used to place the screen within the protective casing, the pipe shall have a nominal diameter at least 2" less than that of the inside diameter of the protective well casing, in which case the protective well casing shall have a minimum diameter of 8", unless a gravel-pack well construction is planned. With a construction having an inner pipe attached to a screen and a gravel-pack, the inner pipe nominal diameter shall be 4" less than the diameter of the protective casing diameter and the outer drillhole shall have a diameter conforming to requirements of column 5. In either case, the protective well casing pipe shall conform to the pipe standards of NR 112.08(2) (d). In a gravel-pack well construction, the gravel used shall be properly graded, washed and sterilized igneous rock gravel free from foreign material. If filler pipes will be installed, they shall not be attached to the protective well casing at an elevation less than 12" above the established ground grade at the well or the floor of a building or pump house or well house. The gravel-pack shall be placed through an adequately sized temporary pipe and the gravel-pack shall not extend to an elevation higher than 62' normally, and 97' in the case of sewage treatment plant wells, below the established ground surface. A minimum of a 2' sand seal shall be placed upon the gravel-pack and the remainder of the annular space shall be filled with cement grout placed by an approved pressure method. There shall normally be placed a minimum of 60' of cement grout. See notes 1 and 2 below.

NOTE 1. Greater depth of casing is required in areas where well histories show that the vertical zone of contamination extends to a greater depth.
NOTE 2. Minimum casing depth for sewage treatment plant wells shall be 100'.

TABLE 3

HIGH CAPACITY AND SCHOOL
DRILLED WELL REQUIREMENTS – NONPOTABLE WATER SUPPLY

1	2	3	4	Upper Drillhole				9	10	11
				Upper Enlarged Drillhole		Regular Drillhole				
Type	Nature of Water Bearing Formation (Aquifer)	Geologic Formations Overlying Aquifer	Minimum Nominal Casing Diameter Inches	5 Minimum Diameter	6 Minimum Depth	7 Minimum Diameter	8 Bottom Elevation	Lower Drillhole Minimum Well Diameter	Maximum Nominal Protective Liner Diameter	Construction Conditions
b.	Sand or gravel	Sand or a mixture of sand and gravel.	6" See construction conditions.	None required with cable tool drilling but shall be casing diameter plus 4" if one is constructed. See construction conditions. Casing diameter plus 2" with rotary drilling.	30' with cable tool drilling & 30' plus such additional depth necessary to place the desired length of screen, with rotary drilling, unless a gravel-pack is planned, in which case the depth of outer drillhole shall be a minimum of 35' plus the desired screen length in either type of drilling.	6" See construction conditions.	See construction conditions	6"	Not applicable	bc. The well casing pipe normally shall extend to a minimum depth of 35' or to such greater depth that will assure that the well casing will extend to a minimum of 5' below the pumping water level. With cable tool drilling the upper enlarged drillhole shall be kept open with temporary well casing, unless the drillhole will penetrate clay or other material which will similarly stand open, and the upper drillhole shall be kept 1/3 filled with clay slurry throughout the driving of permanent well casing. With rotary drilling, the outer drillhole shall be maintained at full diameter with drilling mud. The annular space surrounding the protective well casing to a minimum depth of 30 feet, when one is constructed, shall be permanently sealed with clay slurry or cement grout placed by a suitable pump from the bottom of the annular space upward. When an outer pipe is used to maintain the enlarged upper drillhole it shall be pulled back at least 10' but preferably shall be entirely removed immediately following completion of grouting the well. See note 1 below. An adequate screen shall be provided. The screen shall be installed in such manner that removal or replacement can be accomplished. For economic reasons an inner pipe separate from the protective well casing to which the screen would be attached is not required, but it is preferred. Either the placement of the screen to the bottom of the drillhole and jacking back of the casing or the bail-down method will be acceptable for the initial screen placement. When a separate pipe is used to place the screen within the well casing, the pipe shall have a nominal diameter at least 2" less than that of the inside diameter of the well casing, in which case the well casing shall have a minimum diameter of 8", unless a gravel-pack well construction is planned. With a construction having an inner pipe attached to a screen and a gravel-pack, the inner pipe nominal diameter shall be 4" less than the diameter of the well casing diameter and the outer drillhole shall have a diameter conforming to requirements of column 5. In a gravel-pack well construction, the gravel used shall be properly graded, washed and sterilized igneous rock gravel free from foreign material. If filler pipes will be installed, they shall not be attached to the protective well casing at an elevation less than 12" above the established ground grade at the well or the floor of a building or pump house or well house. The gravel-pack shall be placed through an adequately sized temporary pipe and the gravel-pack shall not extend to an elevation higher than 32' below the established ground surface. A minimum of a 2' sand seal shall be placed upon the gravel pack and the remainder of the annular space shall preferably be filled with cement grout placed by an approved pressure method, but drill cuttings or clay slurry will be acceptable. See note 1 below.
c.	Sand and gravel	Sand or mixture of sand and gravel; or clay or similar material containing layers of sand and gravel; or clay or similar material to varying depths.	6" See construction conditions.	None required in sand and gravel with cable tool drilling. Casing diameter plus 4" with cable tool if one drilled in sand and gravel or is required when drilling in clay or similar material. Casing diameter plus 2" with rotary drilling.	30' with cable tool drilling & 30' plus such additional depth necessary to place the desired length of screen, with rotary drilling, unless a gravel-pack is planned in which case the depth of outer drillhole shall be a minimum of 35' plus the desired screen length in either type of drilling.	6" See construction conditions.	See construction conditions	6"	Not applicable	

NOTE 1. Some drillers construct an enlarged upper drillhole to a depth of several feet with cable tool equipment by choice under geologic conditions of column 3, line b, to facilitate use of long lengths of pipe.

TABLE 3

HIGH CAPACITY, SCHOOL AND SEWAGE TREATMENT PLANT
DRILLED WELL REQUIREMENTS – POTABLE WATER SUPPLY

1	2	3	4	Upper Drillhole				9	10	11	
				Upper Enlarged Drillhole		Regular Drillhole					
Type	Nature of Water Bearing Formation (Aquifer)	Geologic Formations Overlying Aquifer	Minimum Nominal Casing Diameter Inches	5 Minimum Diameter	6 Minimum Depth	7 Minimum Diameter	8 Bottom Elevation	Lower Drillhole Minimum Well Diameter	Maximum Nominal Protective Liner Diameter	Construction Conditions	
d.	Limestone (See note 2) or shale (See note 3)	Unconsolidated materials, mainly sand or gravel to depth of at least 60' to a radius of ½ mile. No record of sink holes, test holes, quarries or abandoned wells in above area.	6"	Casing outside diameter plus 3" if well casing pipe will be assembled with welded joints. Coupling outside diameter plus 3" if well casing will be assembled with threaded and coupled joints.	60' with cable tool drilling & to rock with rotary drilling, except for sewage treatment plant wells if rock lies at depth less than 100' the minimum depth of drillhole is 100'. See note 4 below.	6" with cable tool drilling. Not applicable with rotary drilling.	See construction conditions exception-see note 4 below.	6"	Pipe O.D. 3" less than lower drillhole diameter except that for wells 10" in dia. or less pipe dia. shall be nominal 2" less than drillhole dia.	The protective well casing pipe shall be firmly seated in the rock formation. With cable tool drilling, the upper enlarged drillhole shall be kept open with temporary well casing and the annular space shall be permanently sealed with cement grout. With rotary drilling, the upper enlarged drillhole shall be maintained at full diameter with drilling mud or with temporary well casing and the annular space shall be permanently sealed with cement grout. Temporary outer casing shall be removed immediately following grouting. The vertical zone of contamination must be sealed off. See notes 1 and 4 below.	d, e, f Protective well casing pipe shall be placed concentrically within the upper enlarged drillhole having a minimum diameter conforming to column 5, lines d, e and f, depending upon the manner of assembly of pipe. The pipe shall be sealed in place with cement grout applied by a suitable pump from the bottom of the casing upward. Protective liner pipe shall be assembled with welded joints, placed concentrically within the drillhole and sealed in place with cement grout placed by a suitable placed by a suitable pump or other approved method from the bottom of the liner pipe upward. When developing wells in the sandstone aquifer overlain by the "Maquoketa" shale and Niagara formation, the Niagara formation should be cased off in all cases and shall be cased off where the deep aquifer water has a high dissolved solids content. Liner pipe placed through the shale only to prevent caving shall be a minimum of 2" less in diameter than the drillhole and the bottom 20' shall be sealed in place with cement grout or clay slurry.
e.	Limestone (See note 2) or shale (See note 3)	Clay or similar material or such materials with some sand and gravel zones to depth of at least 60' to a radius of ½ mile. No record of sink holes, test holes, quarries or abandoned wells in above area.	6"	Casing outside diameter plus 3" if well casing pipe will be assembled with welded joints. Coupling outside diameter plus 3" if well casing will be assembled with threaded and coupled joints.	60' with cable tool drilling & to rock with rotary drilling, except for sewage treatment plant wells if rock lies at depth less than 100' the minimum depth of drillhole is 100'. See note 4 below.	6" with cable tool drilling. Not applicable with rotary drilling.	See construction conditions exception-see note 4 below.	6"	Pipe O.D. 3" less than lower drillhole diameter except that for wells 10" in dia. or less pipe dia. shall be nominal 2" less than drillhole dia.	The protective well casing pipe shall be firmly seated into the rock formation. With cable tool drilling, the upper enlarged drillhole shall be kept 1/3 filled with clay slurry throughout the driving of the protective well casing, unless caving formations are expected, in which case a temporary outer casing shall be used. The annular space shall be permanently filled with cement grout applied in an approved manner. Construction conditions for drilling with rotary equipment are the same as above for d. Temporary outer casing shall be removed immediately following grouting. The vertical zone of contamination must be sealed off. See notes 1 and 4 below.	
f.	Limestone (See note 2) or shale (See note 3)	Unconsolidated materials for depth less than 60' within a radius of ½ mile. No record of sink holes, test holes, quarries or abandoned wells in above area.	6"	Casing outside diameter plus 3" if well casing pipe will be assembled with welded joints. Coupling outside diameter plus 3" if well casing will be assembled with threaded and coupled joints.	10' into unbreviced rock below 50' in either limerock or shale, except for sewage treatment plant wells the minimum depth is 100'. See note 4 below.	Not applicable.		6"	Pipe O.D. 3" less than lower drillhole diameter except that for wells 10" in dia. or less pipe dia. shall be nominal 2" less than drillhole dia.	The upper enlarged drillhole through caving formations above the rock shall be kept open by temporary well casing with cable tool drilling and with such casing or drilling mud with rotary drilling. If the formation over the rock is clay or material which will similarly stand open, with rotary drilling the drill cuttings shall be removed by drilling mud. The annual space shall be permanently filled with cement grout. Temporary outer casing shall be removed immediately following grouting. The vertical zone of contamination must be sealed off. See notes 1 & 4 below.	

NOTE 1. Casing only to rock under conditions of column 3, lines d & e and to the depth indicated in column 6, line f for condition of column 3, line f, is only acceptable as a minimum when it is adequate to seal off the vertical zone of contamination. Greater depth of protective casing is required in areas where well histories show that the vertical zone of contamination extends to a greater depth.

NOTE 2. Although the carbonate rocks in this state are primarily dolomites, the term limestone has been given to them in the well construction specifications because it is the common term given to them by drillers.

NOTE 3. Wells normally shall not be developed into a shale formation. Such constructions are limited primarily to "Maquoketa" shale where the limestone is missing or very thin but only when the shale is known to be firm enough so that the drillhole will remain open and the water therefrom is not turbid. These wells may occur along the western edge of the Niagara dolomite extending from Door County to the Illinois border, at Blue Mound, at the Platteville Mound and in the Sinsinawa area in Grant County. Shale wells under similar geologic conditions in other areas of the state where overlying rock is missing or thin will also be acceptable.

NOTE 4. Minimum casing depths for sewage treatment plant wells shall be 100'.

TABLE 3

HIGH CAPACITY AND SCHOOL
DRILLED WELL REQUIREMENTS – NONPOTABLE WATER SUPPLY

1	2	3	4	Upper Drillhole				9	10	11	
				Upper Enlarged Drillhole		Regular Drillhole					
Type	Nature of Water Bearing Formation (Aquifer)	Geologic Formations Overlying Aquifer	Minimum Nominal Casing Diameter Inches	5 Minimum Diameter	6 Minimum Depth	7 Minimum Diameter	8 Bottom Elevation	Lower Drillhole Minimum Well Diameter	Maximum Nominal Protective Liner Diameter	Construction Conditions	
g.	Limestone (See note 2) or shale (See note 3)	Unconsolidated materials, mainly sand or gravel, to depth of at least 40'.	6"	Casing diameter plus 4" if one is constructed with cable tool drilling. See construction conditions. Casing diameter plus 2" with rotary drilling.	None required with cable tool drilling. To rock with rotary drilling.	6" with cable tool drilling. Not applicable with rotary drilling.	See construction conditions	6"	Not applicable.	The protective well casing pipe shall be firmly seated in the rock formation. When an upper enlarged drillhole is constructed with cable tool equipment, the annular space shall be filled with clay slurry or cement grout placed in an approved manner. See note 1 below. With rotary drilling, the upper enlarged drillhole shall be maintained at full diameter with drilling mud or with temporary well casing and the annular space shall be permanently sealed with drilling mud or cement grout, except that only cement grout shall be used when the upper enlarged drillhole is constructed more than 2' into the limestone.	g, h Well casing pipe placed in an upper enlarged drillhole only 2" greater in diameter than the nominal well casing pipe diameter, as is only permissible with rotary drilling, shall be assembled with welded joints and sealed in place with drilling mud or cement grout placed in the annular space by a suitable pump from the bottom of the casing upward.
h.	Limestone (See note 2) or shale (See note 3)	Clay or similar material or such materials with some sand and gravel zones to depth of at least 40'.	6"	Casing diameter plus 4" with cable tool drilling. Casing diameter plus 2" with rotary drilling. See construction conditions.	To the bottom of the clay or to the 20' depth, whichever is the lesser, with cable tool drilling. To rock with rotary drilling.	6" with cable tool drilling. Not applicable with rotary drilling.	See construction conditions	6"	Not applicable.	The well casing shall be firmly seated into the rock formation. With cable tool drilling, the upper enlarged drillhole shall be kept 1/3 filled with clay slurry throughout the driving of the well casing, unless caving formations are expected, in which case a temporary outer casing shall be used. The annular space shall be permanently sealed with clay slurry or cement grout applied in an approved manner. Construction conditions are the same as for line g. Temporary outer casing shall be removed immediately following grouting of the well.	i The upper enlarged drillhole diameter need be only 2" greater than the nominal well casing pipe diameter when the well casing pipe is assembled with welded joints and the cement grout is placed in the annular space by a suitable pump or other approved pressure method from the bottom of the casing upward.
i.	Limestone (See note 2) or shale (See note 3)	Unconsolidated materials for depth less than 40'.	6"	Casing diameter plus 4" with cable tool drilling. Casing diameter plus 2" with rotary drilling. See construction conditions.	10' into uncreviced rock below 30' in limerock. 40' in shale.	Not applicable.		6"	Not applicable.	The upper enlarged drillhole through caving formations above the rock shall be kept open by temporary well casing with cable tool drilling and with such casing or drilling mud with rotary drilling. If the formation over the rock is clay or material which will similarly stand open, with rotary drilling the drill cuttings preferably shall be removed by drilling mud but use of air will be permitted for such geologic formations. The annular space shall be permanently filled with cement grout.	

NOTE 1. Some drillers construct an enlarged upper drillhole with cable tool equipment by choice under geologic conditions of column 3, line g, to facilitate use of longer lengths of pipe.

NOTE 2. Although the carbonate rocks in this state are primarily dolomites, the term limestone has been given to them in the well construction specifications because it is the common term given to them by drillers.

NOTE 3. Wells normally shall not be developed into a shale formation. Such constructions are limited primarily to "Maquoketa" shale where the limestone is missing or very thin but only when the shale is known to be firm enough so that the drillhole will remain open and the water therefrom is not turbid. These wells may occur along the western edge of the Niagara dolomite extending from Door County to the Illinois border, at Blue Mound, at the Platteville Mound and in the Sinsinawa area in Grant County. Shale wells under similar geologic conditions in other areas of the state where overlying rock is missing or thin will also be acceptable.

TABLE 3

HIGH CAPACITY, SCHOOL AND SEWAGE TREATMENT PLANT
DRILLED WELL REQUIREMENTS – POTABLE WATER SUPPLY

1	2	3	4	Upper Drillhole				9	10	11	
				Upper Enlarged Drillhole		Regular Drillhole					
Type	Nature of Water Bearing Formation (Aquifer)	Geologic Formations Overlying Aquifer	Minimum Nominal Casing Diameter Inches	5 Minimum Diameter	6 Minimum Depth	7 Minimum Diameter	8 Bottom Elevation	Lower Drillhole Minimum Well Diameter	Maximum Nominal Protective Liner Diameter	Construction Conditions	
j.	Granite or Quartzite (See note 1)	Unconsolidated materials mainly sand or gravel, to depth of at least 60' to a radius of ½ mile.	6"	Casing outside diameter plus 3" if well casing pipe will be assembled with welded joints. Coupling outside diameter plus 3" if well casing will be assembled with threaded and coupled joints.	60' with cable tool drilling & to rock with rotary drilling, except for sewage treatment plant wells if rock lies at depth less than 100' the minimum depth of drillhole is 100'. See note 3 below.	6" with cable tool drilling. Not applicable with rotary drilling.	See construction conditions. Exception see note 3 below.	6"	Pipe O.D. 3" less than lower drillhole dia. except that for wells 10" in dia. or less pipe dia. shall be nominal 2" less than drillhole dia.	The protective well casing pipe shall be firmly seated in the rock formation. With cable tool drilling, the upper enlarged drillhole shall be kept open with temporary well casing and the annular space shall be permanently sealed with cement grout. With rotary drilling, the upper enlarged drillhole shall be maintained at full diameter with drilling mud or with temporary well casing and the annular space shall be permanently sealed with cement grout. Temporary outer casing shall be removed immediately following grouting. The vertical zone of contamination must be sealed off. See notes 2 and 3 below.	j, k, l Protective well casing pipe shall be placed concentrically within the upper enlarged drillhole having a minimum diameter conforming to column 5, lines j, k and l, depending upon the manner of assembly of pipe. The pipe shall be sealed in place with cement grout applied by a suitable pump from the bottom of the casing upward. Protective liner pipe shall be assembled with welded joints, placed concentrically within the drillhole and sealed in place with cement grout placed by a suitable pump or other approved method from the bottom of the liner pipe upward.
k.	Granite or Quartzite (See note 1)	Clay or similar material or such materials with some sand and gravel zones to a depth of at least 60' to a radius of ½ mile.	6"	Casing outside diameter plus 3" if well casing pipe will be assembled with welded joints. Coupling outside diameter plus 3" if well casing will be assembled with threaded and coupled joints.	60' with cable tool drilling & to rock with rotary drilling, except for sewage treatment plant wells if rock lies at depth less than 100' the minimum depth of drillhole is 100'. See note 3 below.	6" with cable tool drilling. Not applicable with rotary drilling.	See construction conditions. Exception see note 3 below.	6"	Pipe O.D. 3" less than lower drillhole dia. except that for wells 10" in dia. or less pipe dia. shall be nominal 2" less than drillhole dia.	The protective well casing pipe shall be firmly seated into the rock formation. With cable tool drilling, the upper enlarged drillhole shall be kept 1/3 filled with clay slurry throughout the driving of the protective well casing, unless caving formations are expected, in which case a temporary outer casing shall be used. The annular space shall be permanently filled with cement grout applied in an approved manner. Construction conditions for drilling with rotary equipment are the same as above for j. Temporary outer casing shall be removed immediately following grouting. The vertical zone of contamination must be sealed off. See notes 2 and 3 below.	
l.	Granite or Quartzite (See note 1)	Unconsolidated materials for depth less than 60' within a radius of ½ mile.	6"	Casing outside diameter plus 3" if well casing pipe will be assembled with welded joints. Coupling outside diameter plus 3" if well casing will be assembled with threaded and coupled joints.	60' except for sewage treatment plant wells the minimum depth is 100'. See note 3 below.	Not applicable.		6"	Pipe O.D. 3" less than lower drillhole dia. except that for wells 10" in dia. or less pipe dia. shall be nominal 2" less than drillhole dia.	The upper enlarged drillhole through caving formations above the rock shall be kept open by temporary well casing with cable tool drilling and with such casing or drilling mud with rotary drilling. If the formation over the rock is clay or material which will similarly stand open, with rotary drilling the drill cuttings shall be removed by drilling mud. The annular space shall be permanently filled with cement grout. Temporary outer casing shall be removed immediately following grouting. The vertical zone of contamination must be sealed off. See notes 2 and 3 below.	

NOTE 1. Crystalline rocks are classed as granite because they are commonly referred to as granite by drillers regardless of their true rock type. This includes trap rock.

NOTE 2. Casing only to rock under conditions of column 3, lines j & k and to the depth indicated in column 6, line l, for condition of column 3, line 1, is only acceptable as a minimum when it is adequate to seal off the vertical zone of contamination. Greater depth of protective casing is required in areas where well histories show that the vertical zone of contamination extends to a greater depth.

NOTE 3. Minimum casing depths for sewage treatment plant wells shall be 100'.

TABLE 3

HIGH CAPACITY AND SCHOOL
DRILLED WELL REQUIREMENTS – NONPOTABLE WATER SUPPLY

1	2	3	4	Upper Drillhole				9	10	11	
				Upper Enlarged Drillhole		Regular Drillhole					
Type	Nature of Water Bearing Formation (Aquifer)	Geologic Formations Overlying Aquifer	Minimum Nominal Casing Diameter Inches	5 Minimum Diameter	6 Minimum Depth	7 Minimum Diameter	8 Bottom Elevation	Lower Drillhole Minimum Well Diameter	Maximum Nominal Protective Liner Diameter	Construction Conditions	
m.	Granite or Quartzite (See note 1)	Unconsolidated materials mainly sand or gravel, to depth of at least 40'.	6"	Casing diameter plus 4" if one is constructed with cable tool drilling. See construction conditions. Casing diameter plus 2" with rotary drilling.	None required with cable tool. To rock with rotary drilling.	6" with cable tool drilling. Not applicable with rotary drilling.	See construction conditions.	6"	Not applicable	The well casing pipe shall be firmly seated in the rock formation. When an enlarged upper drillhole is constructed with cable tool equipment, the annular space shall be filled with clay slurry or cement grout placed in an approved manner. See note 2 below. With rotary drilling equipment, the upper enlarged drillhole shall be maintained at full diameter with drilling mud or temporary well casing and the annular space shall be permanently sealed with drilling mud or cement grout, except that only cement grout shall be used when the upper enlarged drillhole is constructed more than 2' into the granite.	m, n Well casing pipe placed in an upper enlarged drillhole only 2" greater in diameter than the nominal well casing pipe diameter, as is only permissible with rotary drilling, shall be assembled with welded joints and sealed in place with drilling mud or cement grout placed in the annular space by a suitable pump from the bottom of the casing upward.
n.	Granite or Quartzite (See note 1)	Clay or similar material or such materials with some sand and gravel zones to a depth of at least 40'.	6"	Casing diameter plus 4" with cable tool drilling. Casing diameter plus 2" with rotary drilling. See construction conditions.	To the bottom of the clay or to the 20' depth whichever is the lesser with cable tool drilling. To rock with rotary drilling.	6" with cable tool drilling. Not applicable with rotary drilling.	See construction conditions.	6"	Not applicable	The well casing shall be firmly seated into the rock formation. With cable tool drilling, the upper enlarged drillhole shall be kept 1/3 filled with clay slurry throughout the driving of the well casing, unless caving formations are expected, in which case a temporary outer casing shall be used. The annular space shall be permanently sealed with clay slurry or cement grout applied in an approved manner. Construction conditions are the same as for line m. Temporary outer casing shall be removed immediately following grouting of the well.	
o.	Granite or Quartzite (See note 1)	Unconsolidated materials for depth less than 40'.	6"	Casing diameter plus 4" with cable tool drilling. Casing diameter plus 2" with rotary drilling. See construction conditions.	40'	Not applicable		6"	Not applicable	The upper enlarged drillhole through caving formations above the rock shall be kept open by temporary well casing with cable tool drilling and with such casing or drilling mud with rotary drilling. If the formation over the rock is clay or material which will similarly stand open, with rotary drilling the drill cuttings preferably shall be removed by drilling mud but use of air will be permitted for such geologic formations. The annular space shall be permanently filled with cement grout.	o. The upper enlarged drillhole diameter need be only 2" greater than the nominal well casing pipe diameter when the well casing pipe is assembled with welded joints and the cement grout is placed in the annular space by a suitable pump or other approved pressure method from the bottom of the casing upward.

NOTE 1. Crystalline rocks are classed as granite because they are commonly referred to as granite by drillers regardless of their true rock type. This includes trap rock.
NOTE 2. Some drillers construct an enlarged upper drillhole with cable tool equipment by choice under geologic conditions of column 3, line m, to facilitate use of longer lengths of pipe.

TABLE 3

HIGH CAPACITY, SCHOOL AND SEWAGE TREATMENT PLANT
DRILLED WELL REQUIREMENTS – POTABLE WATER SUPPLY

1	2	3	4	Upper Drillhole				9	10	11	
				Upper Enlarged Drillhole		Regular Drillhole					
Type	Nature of Water Bearing Formation (Aquifer)	Geologic Formations Overlying Aquifer	Minimum Nominal Casing Diameter Inches	5 Minimum Diameter	6 Minimum Depth	7 Minimum Diameter	8 Bottom Elevation	Lower Drillhole Minimum Well Diameter	Maximum Nominal Protective Liner Diameter	Construction Conditions	
p.	Sandstone	Unconsolidated materials mainly sand and gravel to a depth of 60' or more.	6"	Casing outside diameter plus 3" if well casing pipe will be assembled with welded joints. Coupling outside diameter plus 3" if well casing will be assembled with threaded and coupled joints.	60' with cable tool drilling & to rock with rotary drilling, except for sewage treatment plant wells if rock lies at depth less than 100' the minimum depth of drillhole is 100'. See note 2 below.	6" with cable tool drilling. Not applicable with rotary drilling.	See construction conditions. Exception see note 2 below.	6"	Pipe O.D. 3" less than lower drillhole dia. except that for wells 10" in dia. or less pipe dia. shall be nominal 2" less than drillhole dia.	The protective well casing pipe shall be firmly seated in the rock formation. With cable tool drilling, the upper enlarged drillhole shall be kept open with temporary well casing and the annular space shall be permanently sealed with cement grout. With rotary drilling, the upper enlarged drillhole shall be maintained at full diameter with drilling mud or with temporary well casing and the annular space shall be permanently sealed with cement grout. Temporary outer casing shall be removed immediately following grouting. The vertical zone of contamination must be sealed off. See notes 1 and 2 below.	p, q, r Protective well casing pipe shall be placed concentrically within the upper enlarged drillhole having a minimum diameter conforming to column 5, lines p, q and r, depending upon the manner of assembly of pipe. The pipe shall be sealed in place with cement grout applied by a suitable pump from the bottom of the casing upward. Protective liner pipe shall be assembled with welded joints, placed concentrically within the drillhole and sealed in place with cement grout placed by a suitable pump or other approved method from the bottom of the liner pipe upward.
q.	Sandstone	Clay or similar material or such material with some sand and gravel zones to depth of 60' or more.	6"	Casing outside diameter plus 3" if well casing pipe will be assembled with welded joints. Coupling outside diameter plus 3" if well casing will be assembled with threaded and coupled joints.	60' with cable tool drilling & to rock with rotary drilling, except for sewage treatment plant wells if rock lies at depth less than 100' the minimum depth of drillhole is 100'. See note 2 below.	6" with cable tool drilling. Not applicable with rotary drilling.	See construction conditions. Exception see note 2 below.	6"	Pipe O.D. 3" less than lower drillhole dia. except that for wells 10" in dia. or less pipe dia. shall be nominal 2" less than drillhole dia.	The protective well casing pipe shall be firmly seated into the rock formation. With cable tool drilling, the upper enlarged drillhole shall be kept 1/3 filled with clay slurry throughout the driving of the protective well casing, unless caving formations are expected, in which case a temporary outer casing shall be used. The annular space shall be permanently filled with cement grout applied in an approved manner. Construction conditions for drilling with rotary equipment are the same as above for p. Temporary outer casing shall be removed immediately following grouting. The vertical zone of contamination must be sealed off. See notes 1 and 2 below.	
r.	Sandstone	Any material except limestone to a depth of less than 60'.	6"	Casing outside diameter plus 3" if well casing pipe will be assembled with welded joints. Coupling outside diameter plus 3" if well casing will be assembled with threaded and coupled joints.	Into firm sandstone or to the 60' depth whichever is greater, except for sewage treatment plant wells the minimum depth is 100'. See note 2 below.	Not applicable.		6"	Pipe O.D. 3" less than lower drillhole dia. except that for wells 10" in dia. or less pipe dia. shall be nominal 2" less than drillhole dia.	The upper enlarged drillhole through caving formations above the rock shall be kept open by temporary well casing with cable tool drilling and with such casing or drilling mud with rotary drilling. If the formation over the rock is clay or material which will similarly stand open, with rotary drilling the drill cuttings shall be removed by drilling mud. The annular space shall be permanently filled with cement grout. Temporary outer casing shall be removed immediately following grouting. The vertical zone of contamination must be sealed off. See notes 1 and 2 below.	

NOTE 1. Casing only to rock under conditions of column 3, lines p and q and to the depth indicated in column 6, line r for condition of column 3, line r, is only acceptable as a minimum when it is adequate to seal off the vertical zone of contamination. Greater depth of protective casing is required in areas where well histories show that the vertical zone of contamination extends to a greater depth.

NOTE 2. Minimum casing depth for sewage treatment plant wells shall be 100'.

TABLE 3

HIGH CAPACITY AND SCHOOL
DRILLED WELL REQUIREMENTS – NONPOTABLE WATER SUPPLY

1 Type	2 Nature of Water Bearing Formation (Aquifer)	3 Geologic Formations Overlying Aquifer	4 Minimum Nominal Casing Diameter Inches	Upper Drillhole				9 Lower Drillhole Minimum Well Diameter	10 Maximum Nominal Protective Liner Diameter	11 Construction Conditions	
				Upper Enlarged Drillhole		Regular Drillhole					
				5 Minimum Diameter	6 Minimum Depth	7 Minimum Diameter	8 Bottom Elevation				
s.	Sandstone	Unconsolidated materials mainly sand and gravel to a depth of 25' or more.	6"	Casing diameter plus 4" if one is constructed with cable tool drilling. See construction conditions. Casing diameter plus 2" with rotary drilling.	None required with cable tool. Into firm sandstone with rotary drilling.	6" with cable tool drilling. Not applicable with rotary drilling.	See construction conditions.	6"	Not applicable.	The well casing pipe shall be firmly seated in the rock formation. When an upper enlarged drillhole is constructed with cable tool equipment, the annular space shall be filled with clay slurry or cement grout placed in an approved manner. See note 1 below. With rotary drilling, the upper enlarged drillhole shall be maintained at full diameter with drilling mud or with temporary well casing and the annular space shall be permanently sealed with drilling mud or cement grout, except that only cement grout shall be used when the upper enlarged drillhole is constructed more than 2' into the sandstone.	s, t Well casing pipe placed in an upper enlarged drillhole only 2" greater in diameter than the nominal well casing pipe diameter, as is only permissible with rotary drilling, shall be assembled with welded joints and sealed in place with drilling mud or cement grout placed in the annular space by a suitable pump from the bottom of the casing upward.
t.	Sandstone	Clay or similar material or such material with some sand and gravel zones to depth of 25' or more.	6"	Casing diameter plus 4" with cable tool drilling. Casing diameter plus 2" with rotary drilling. See construction conditions.	To the bottom the clay or to the 20' depth whichever is the lesser, with cable tool drilling. Into firm sandstone with rotary drilling.	6" with cable tool drilling. Not applicable with rotary drilling.	See construction conditions.	6"	Not applicable	The well casing pipe shall be firmly seated in the rock formation. With cable tool drilling, the upper enlarged drillhole shall be kept open by temporary well casing, when necessary and shall be kept 1/3 filled with clay slurry throughout the driving of the well casing. The balance of the annular space shall be filled with clay slurry or cement grout applied in an approved manner. Construction conditions for drilling with rotary equipment are the same as above for line s.	
u.	Sandstone	Any material except limestone to a depth of less than 25'.	6"	Casing diameter plus 4" with cable tool drilling. Casing diameter plus 2" with rotary drilling. See construction conditions.	Into firm sandstone or to the 30' depth whichever is greater.	Not applicable.		6"	Not applicable.	The upper enlarged drillhole through caving formations above the rock shall be kept open by temporary well casing with cable tool drilling and by such casing or drilling mud with rotary drilling. If the formation over the rock is clay or material which will similarly stand open, with rotary drilling the drill cuttings preferably shall be removed by mud but use of air will be permitted for such geologic formations. The annular space surrounding the well casing shall be permanently filled with cement grout.	u The upper enlarged drillhole diameter need be only 2" greater than the nominal well casing pipe diameter when the well casing pipe is assembled with welded joints and the cement grout is placed in the annular space by a suitable pump or other approved pressure method from the bottom of the casing upward.

NOTE 1. Some drillers construct enlarged upper drillholes to a depth of several feet with cable tool equipment by choice under geologic conditions of column 3, line s, to facilitate use of longer lengths of pipe.

TABLE 3

HIGH CAPACITY, SCHOOL AND SEWAGE TREATMENT PLANT
DRILLED WELL REQUIREMENTS – POTABLE WATER SUPPLY

1	2	3	4	Upper Drillhole				9	10	11	
				Upper Enlarged Drillhole		Regular Drillhole					
Type	Nature of Water Bearing Formation (Aquifer)	Geologic Formations Overlying Aquifer	Minimum Nominal Casing Diameter Inches	5 Minimum Diameter	6 Minimum Depth	7 Minimum Diameter	8 Bottom Elevation	Lower Drillhole Minimum Well Diameter	Maximum Nominal Protective Liner Diameter	Construction Conditions	
v.	Sandstone	Limestone to depth of 60' or less with or without unconsolidated overburden over the limestone.	6"	Casing outside diameter plus 3" if well casing pipe will be assembled with welded joints. Coupling outside diameter plus 3" if well casing will be assembled with threaded and coupled joints.	60' or 15' into firm sandstone, whichever is greater, except for sewage treatment plant wells the minimum is 100'. See note 3 below.	Not applicable.		6"	Pipe O.D. 3" less than lower drillhole dia. except that for wells 10" in dia. or less pipe dia. shall be nominal 2" less than drillhole dia.	The upper enlarged drillhole through caving formations above the rock shall be kept open by temporary well casing with cable tool drilling and by such casing or drilling mud with rotary drilling. If the formation over the rock is clay or material which will similarly stand open, with rotary drilling the drill cuttings preferably shall be removed by mud but use of air will be permitted for such geologic formation. The annular space surrounding the protective well casing shall be permanently filled with cement grout. The vertical zone of contamination must be sealed off. See notes 2 & 3 below.	v, w Protective well casing pipe shall be placed concentrically within the upper enlarged drillhole having a minimum diameter conforming to column 5, lines v, and w, depending upon the manner of assembly of pipe. The pipe shall be sealed in place with cement grout applied by a suitable pump from the bottom of the casing upward.
w.	Sandstone	Limestone extending to a depth greater than 60' with or without unconsolidated overburden over the limestone.	6"	Casing outside diameter plus 3" if well casing pipe will be assembled with welded joints. Coupling outside diameter plus 3" if well casing will be assembled with threaded and coupled joints.	10' into uncreviced rock below 50', except for sewage treatment plant wells the minimum depth is 100'. See note 3 below.	Not applicable.		6"	Pipe O.D. 3" less than lower drillhole dia. except that for wells 10" in dia. or less pipe dia. shall be nominal 2" less than drillhole dia.		Protective liner pipe shall be assembled with welded joints, placed concentrically within the drillhole and sealed in place with cement grout placed by a suitable pump or other approved method from the bottom of the liner pipe upward.

NOTE 1. Although the carbonate rocks in this state are primarily dolomites, the term limestone has been given to them in the well construction specifications because it is the common term given to them by the drillers.

NOTE 2. Casing only to the depth indicated in column 6, lines v & w, for conditions of column 3, lines v & w, is only acceptable as a minimum when it is adequate to seal off the vertical zone of contamination. Greater depth of protective casing is required in areas where well histories show that the vertical zone of contamination extends to a greater depth.

NOTE 3. Minimum casing depth for sewage treatment plant wells shall be 100'.

TABLE 3

HIGH CAPACITY AND SCHOOL
DRILLED WELL REQUIREMENTS – NONPOTABLE WATER SUPPLY

1	2	3	4	Upper Drillhole				9	10	11	
				Upper Enlarged Drillhole		Regular Drillhole					
Type	Nature of Water Bearing Formation (Aquifer)	Geologic Formations Overlying Aquifer	Minimum Nominal Casing Diameter Inches	5 Minimum Diameter	6 Minimum Depth	7 Minimum Diameter	8 Bottom Elevation	Lower Drillhole Minimum Well Diameter	Maximum Nominal Protective Liner Diameter	Construction Conditions	
x.	Sandstone	Limestone to depth of 40' or less with or without unconsolidated overburden over the limestone.	6"	Casing diameter plus 4" with cable tool drilling. Casing diameter plus 2" with rotary drilling. See construction conditions.	40'	Not applicable.		6"	Not applicable.	The upper enlarged drillhole through caving formations above the rock shall be kept open by temporary well casing with cable tool drilling and by such casing or drilling mud with rotary drilling. If the formation over the rock is clay or material which will similarly stand open, with rotary drilling the drill cuttings preferably shall be removed by mud but use of air will be permitted for such geologic formation. The annular space surrounding the well casing shall be permanently filled with cement grout. The upper enlarged drillhole diameter need be only 2" greater than the nominal well casing pipe diameter when the well casing pipe is assembled with welded joints and the cement grout is placed in the annular space by a suitable pump or other approved pressure method from the bottom of the casing upward.	x, y Well casing pipe placed in an upper enlarged drillhole only 2" greater in diameter than the nominal well casing pipe diameter, shall be assembled with welded joints and sealed in place with cement grout placed in the annular space by a suitable pump from the bottom of the casing upward.
y.	Sandstone	Limestone extending to a depth greater than 40' with or without unconsolidated overburden over the limestone.	6"	Casing diameter plus 4" with cable tool drilling. Casing diameter plus 2" with rotary drilling. See construction conditions.	40'	Not applicable.		6"	Not applicable.		

NOTE 1. Although the carbonate rocks in this state are primarily dolomites, the term limestone has been given to them in the well construction specifications because it is the common term given to them by the drillers.

The foregoing rules were approved and adopted by the State of Wisconsin Natural Resources Board on September 22, 1977.

The rules contained herein shall take effect upon publication.

Dated at Madison, Wisconsin 3 January 1978

STATE OF WISCONSIN DEPARTMENT OF NATURAL RESOURCES

By _____
Anthony S. Earl, Secretary

(SEAL)