567—49.9(455B) Material standards. All materials utilized in well water construction shall conform to the standards of the American Water Works Association (AWWA), the American Petroleum Institute (API), the American Society for Testing and Materials (ASTM), and the National Ground Water Association (NGWA) except as modified by these standards.

49.9(1) *Water well casing.*

[1]*a. Steel well casing and couplings.*

(1) Steel well casing pipe shall have the dimensions and weights specified in Table 49.9(1)*"a"*(4). Well casing pipe shall be new steel pipe meeting one of the following standards:

1. ASTM A 53-96,
2. ASTM A 106-95,
3. ASTM A 589-95a - Type I, II or III,
4. API 5CT (5th Edition, 4/1/95),
5. API 5D (3rd Edition, 8/1/92), or
6. API 5L (41st Edition, 4/1/95).

(Copies of these standards are available for inspection at the Des Moines office of the department of natural resources records center or may be obtained for personal use from the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania 19428-2959, or the American Petroleum Institute, 1220 L Street NW, Washington, DC 20005.)

(2) Each length of casing shall be legibly marked in accordance with API or ASTM marking specifications showing the manufacturer's or processor's name or trademark, size in inches, weight in pounds per foot, whether seamless or welded (type of weld) and the API or ASTM specification or trade monogram.

(3) All casing pipe joints shall be watertight welded construction or threaded couplings.

(4) Minimum casing pipe and coupling weights and dimensions are as follows:

Table 49.9(1)*"a"*(4)

Minimum Casing Pipe and Coupling Weights and Dimensions

Size (inches)	Weight (lbs/ft)		Pipe				Couplings	
	Threads & Coupling	Plain End	Thickness (inches)	External Diameter (inches)	Internal Diameter (inches)	Threads per inch	External Diameter (inches)	Length (inches)
1	1.70	1.68	.133	1.315	1.049	11-1/2	1.576	2-5/8
1-1/4	2.30	2.27	.140	1.660	1.380	11-1/2	1.900	2-3/4
1-1/2	2.75	2.72	.145	1.900	1.610	11-1/2	2.200	2-3/4
2	3.75	3.65	.154	2.375	2.067	11-1/2	2.750	2-7/8
2-1/2	5.90	5.79	.203	2.875	2.469	8	3.250	3-15/16
3	7.70	7.58	.216	3.500	3.068	8	4.000	4-1/16
3-1/2	9.25	9.11	.226	4.000	3.548	8	4.625	4-3/16
4	11.00	10.79	.237	4.500	4.026	8	5.200	4-5/16
5	15.00	14.62	.258	5.563	5.047	8	6.296	4-1/2
6	19.46	18.97	.280	6.625	6.065	8	7.390	4-11/16
6-5/8 OD	20.00	19.49	.288	6.625	6.049	8	7.390	4-11/16
7 OD	20.00	19.54	.272	7.000	6.366	8 R	7.657	4-11/16
8	29.35	28.55	.322	8.625	8.071	8	9.625	5-1/16
10	41.85	40.48	.365	10.750	10.136	8	11.750	5-9/16
12	51.15	49.56	.375	12.750	12.090	8	14.000	5-15/16
14 OD	57.00	54.57	.375	14.000	13.250	8	15.000	6-3/8

Size (inches)	Weight (lbs/ft)		Pipe				Couplings	
	Threads & Coupling	Plain End	Thickness (inches)	External Diameter (inches)	Internal Diameter (inches)	Threads per inch	External Diameter (inches)	Length (inches)
16 OD	65.30	62.58	.375	16.000	15.250	8	17.000	6-3/4
18 OD	73.00	70.59	.375	18.000	17.250	8	19.000	7-1/8
20 OD	81.00	78.60	.375	20.000	19.250	8	21.000	7-5/8

R = Round Threads

b. Thermoplastic casing and couplings.

(1) Materials. Thermoplastic well casing pipe and couplings shall be new polyvinyl chloride (PVC) or acrylonitrile-butadiene-styrene (ABS) material produced to and meeting the ASTM F 480 standard and shall have a standard dimension ratio (SDR) of 21, 17, or 13.5, a dimension ratio (DR) of 18 or 14, or a schedule 40 or 80 rating depending upon the specification. Styrene-rubber thermoplastic well casing pipe, including ASTM F 480, may not be used.

(2) Potable water standards. The thermoplastic well casing pipe, pipe couplings, cement, primer and other components used shall be approved for well casing pipe in potable water supplies by the NSF Standard Number 61 or the health effects portion of Standard Number 14 as they relate to well casing pipe, or an approved equivalent organization.

(3) Markings. Each length of casing shall be legibly marked showing the manufacturer's or processor's name or trademark, size in inches, and the ASTM F 480 specification or trade monogram.

(4) Casing joints. The thermoplastic pipe shall be assembled with either flush-threaded joints, integral-bell, solvent-cemented joints, one-piece solvent-cemented couplings or nonmetallic restrained joint system in a manner according to the specifications in ASTM F 480.

(5) Hydraulic collapse pressure for plastic casing. The following table provides specifications for maximum hydraulic collapse pressure (in feet of water head) to which PVC well casing of different strengths can be installed.

Table 49.9(1)*"b"*(5)

PVC WELL CASING

Maximum Hydraulic Loading (in feet of water head) [1]

	ASTM F 480 or ASTM 2241			C-900		ASTM 1785	
	SDR	SDR	SDR	DR	DR	SCH.	SCH.
SIZE	21	17	13.5	18	14	40	80
4″	257′	496′	1,024′	—	—	353′	1,055′
4½″	257′	496′	1,024′	—	—	—	—
5″	257′	496′	1,024′	—	—	236′	758′
6″	257′	496′	1,024′	490′	956′	177′	678′
8″	257′	496′	1,024′	490′	956′	121′	471′
10″	257′	496′	1,024′	490′	956′	90′	404′
12″	257′	496′	1,024′	490′	956′	74′	376′
16″	257′	496′	1,024′	490′	956′	70′	350′

[1] Determined by formulae in ASTM F 480 with Poisson's ratio of .38

(6) When cement grout is used with thermoplastic casing, the manufacturer's specifications for use shall be followed except in the top 40 feet.

(7) Thermoplastic pipe extending above ground shall be protected from ultraviolet light exposure.

(8) Under no circumstances shall thermoplastic water well casing be driven.

49.9(2) *Grouting guides.* Casing that is to be grouted shall have a minimum of two sets of centering guides attached to the casing so as to permit the unobstructed flow and deposition of grout.

49.9(3) *Grouting.* Materials and procedures for grouting shall be as follows:

a. Concrete grout. The mixture, used with bored and augered wells, shall consist of cement, sand aggregate and water, in the proportion of one bag cement (94 lbs.) and an equal volume of aggregate to not more than six gallons of clean water. Concrete grout shall not be used below the water table. Admixtures to reduce permeability or control setting time must meet ASTM Standard C 494-92. Concrete grout may be used with permission of the administrative authority where large void spaces need to be filled.

b. Neat cement grout. The mixture shall consist of one bag of cement (94 lbs.) to not more than six gallons of clean water. Admixtures to reduce permeability or control setting time must meet ASTM Standard C 494-92.

c. Bentonite grout. This is a mixture of water and commercial sodium-bentonite clay manufactured for the purpose of water well grouting. Mixing shall be per manufacturer's specifications. Sodium-bentonite mixtures that have high viscosity but contain less than 10 percent solids are designed for drilling purposes and shall not be used as grout. Organic polymers used in grout mixtures must meet NSF Standard 60.

d. Exclusion. Drilling fluids and cuttings may not be used as grouting material to satisfy the minimum grouting requirements.

e. Application. Grouting shall be performed by pumping the mixture into the annular space from the bottom upward through the casing or through a tremie pipe until the annular space is filled. Grouting shall be done in one continuous operation, if possible. The bottom of the tremie pipe must remain submerged in grout while grouting.

f. Exceptions. The exceptions to this method of application are the use of buried-slab, percussion, or casing-hammer/rotary methods to construct a well. The proper grouting methods for these types of wells are specified in 49.8(1) and 49.8(2). Another exception is where dry bentonite is required because circulation cannot be maintained as described in 49.8(1)*"b"*(5).

49.9(4) *Pitless adapters and pitless units.* Rescinded IAB 7/21/04, effective 8/25/04.

[1] Effective date of 49.9(1)*"a"* delayed 70 days by the Administrative Rules Review Committee at its meeting held May 12, 1998.