DEPARTMENT OF PUBLIC HEALTH
DRINKING WATER SECTION

WELL CASING EXTENSIONS

I. PURPOSE: To clarify the regulatory requirements when drilled well casings for public water supply wells are extended to bring the well head above ground to comply with Regulations of Connecticut State Agencies (RCSA) Section 19-13-B51f(e). Also, to provide technical guidelines and useful information to personnel performing this work.

It is common to encounter older drilled wells in Connecticut that have well heads buried beneath the ground surface or located in below ground well pits. Modern well construction methods and the introduction of pitless adapters in the 1960's have, in most cases, eliminated the need for well heads to be located below the ground surface.

Well heads located below the ground surface increase the risk of contamination to the well because of potential surface water intrusion. In addition, many well pits, even if properly constructed to current PHC standards, are considered ***confined spaces*** subject to strict entry procedures for the safety of personnel entering the space to perform necessary inspection or work. The use of well pits is discouraged and, where they exist, are encouraged to be eliminated by extending the well head out of the pit.

II. PERMIT REQUIREMENT: RCSA Section 25-128-61 requires that a registered well contractor apply for a permit from the Department of Consumer Protection's (DCP) Examining Board for Plumbing and Piping Work, herein referred to as the "Board", before commencing work on the repair of a well. Well casing extensions are considered repair work to a well as defined in RCSA Section 25-128-36(21). A local well drilling permit application is also required to be submitted by the registered well contractor to the local health department.

III. WORK AUTHORIZATION: RCSA Section 25-128-61 requires that a Connecticut registered well drilling contractor apply to the Department of Consumer Protection's (DCP) Examining Board for Plumbing and Piping Work, herein referred to as the "Board", for a permit before commencing work on the repair of a well. Well casing extensions are considered repair work to a well as defined in RCSA Section 25-128-36(21).

RCSA Section 25-128-64 allows the Board to grant informal verbal authorization for well repair work if it determines that an emergency situation exists with respect to the necessity for the well repair work. The well drilling contractor shall also obtain approval from the local director of health or his agent for the work intended to be done. Within a reasonable time after giving its authorization, the Board shall require that a written application for a permit be applied for by the well driller.

IV. MINIMUM HEIGHT OF CASING: RCSA Section 19-13-B51f(e) requires that the casing of every well shall project not less than six (6) inches above the established grade at the well. However, it is strongly recommended that the casing project a minimum of twelve (12) to twenty-four (24) inches above grade at the well.

V. WELL HEAD PROTECTION: In some cases, raising well casings out of well pits may subject the well casing to the additional hazard of collision damage from vehicles, snow plowing activities, or may pose a safety hazard to pedestrians. This is a common problem when wells are located beneath parking lots or sidewalks and when they are located very close to roads or other high traffic areas. When wells are located in these areas, it is strongly recommended that protective barriers be placed around the well for safety purposes and to reduce the risk of accidental collisions with moving vehicles.

When wells are located in or near heavy traffic areas, the area around the well should be curbed a sufficient distance to provide a non-destructive but effective barrier from vehicle traffic and comply with any Department of Transportation (DOT) traffic safety requirements. Curbing should be done in a manner that would prevent ponding of surface water around the well casing. If curbing cannot be accomplished, then four (4) concrete filled steel bollards may be placed around the well for protection. A typical pipe bollard detail is provided in Figure 1.

VI. MATERIALS: Materials should be selected for strength and resistance in corrosion. Corrosion potential is highest closest to the surface of the ground where there is more moisture and air. Electrolytic corrosion can also occur when dissimilar metals are used in contact with each other. Some metals that by themselves are resistant to corrosion (e.g. bronze, brass, copper, aluminum) may corrode, or cause others to corrode, when placed in contact

with a different type of metal. Different metals placed in a corrosive environment should be insulated from each other by rubber, plastic, or some other non-conductor. Care should be taken in the selection of welding materials, as the weld connection is frequently the point where corrosion begins.

Materials and regulatory requirements for specific components used in well casing extensions are described below.

***Well Casing*:** RCSA Section 25-128-43(d) and Section 19-13-B51f(a) require that the primary well casing shall be new steel and shall be free of pits, breaks, or other serious imperfections. Casing pipes shall have minimum weights and thickness per diameter as specified in Table 1.

Couplings: RCSA Section 25-128-43(e) requires that when lengths of well casing are assembled together, they shall be joined by means of watertight welded joints, screw coupling joints, or slip joints. Where welded joints are used, the weld shall be
at least as thick as the wall thickness of the well casing and welding should be performed by a qualified welder under the supervision of a registered well contractor.

Welded joints using ***steel screw couplings*** are the common method of joining new sections of well casing. This allows for the best vertical alignment of well casings, offers the greatest strength, and provides the most reliable watertight seal. Steel screw couplings are pipe couplings where both inside ends of the coupling are threaded. In most cases, when extending an existing well casing, the use of these couplings would require the existing well casing to be threaded by the well drilling contractor to accept the coupling. This is commonly difficult to do and may not be possible if the old section of casing is of different dimensions than the new section. When steel screw couplings are used both the upper and lower external ends of the coupling should be welded. These couplings must meet the minimum dimensional characteristics in Table 1.

Welded joints using ***half-weld half-screw steel couplings*** may also be used to join sections of well casing. When half-weld half-threaded couplings are used the lower inside and outside end of coupling should be welded as well as the upper external end. These couplings are more commonly used for extending older well casings rather than steel screw couplings. These couplings must meet the minimum dimensional characteristics in Table 1.

Slip joint couplings may be used to join well casing but provide the lowest joint strength. These couplings are often used when the old and new sections of well casing have slightly different dimensional characteristics. Commonly, older well casings may have thinner wall construction than the minimum casing thicknesses required by the current well drilling code. Many manufacturers have compression couplings available to account for these dimensional differences and provide a positive seal to both sections of well casing. When slip joint couplings must be used, the top of the coupling shall be located below the frost line, as determined by the applicable building codes, to reduce the possibility of premature separation of the joined sections of well casing due to frost heave. Only slip joint couplings conforming to the current ***American Water Works Association (AWWA) Standard C219*** or pitless units conforming to the ***Water Systems Council's (WSC) Pitless Adapter Standard 97 (PAS-97)*** shall be used to extend well casings for public water systems. Pitless units meeting the PAS-97 standard can found by accessing the WSC website at **www.wschome.org**.

Figure 2 shows some common examples of couplings used to extend well casing.

Pitless Adapter: Pitless adapters shall be installed on wells that are extended above ground in order to keep the well discharge piping below the frost line. All pitless adapters must meet PAS-97.

Building Service Line Connection to Pitless Adapter: All connectors used to transition the pitless adapter discharge hub to the building's water service line shall be made of the same non-corrosive metal as the pitless adapter discharge end, typically stainless steel or brass. Galvanized steel, plastic, or other non-metallic connectors should never be used for this purpose.

***Well Cap*:** After the well casing has been successfully raised above grade, the well must be fitted with a watertight vented well cap as required by RCSA Section 19-13-B51j(a). All watertight vented well caps must meet PAS-97.

VII. TESTING: Pitless adapters and couplings are installed within the upper 10 feet of the well structure. This area is the zone of greatest potential for corrosion and contamination. Procedures for testing the completed casing extension are therefore important and highly recommended.

Field connections on pitless adapters and couplings can be tested and Figure 3 provides a typical testing apparatus setup. First, the lower plumber's test plug is positioned just below the deepest joint to be tested, and then inflated to

the required pressure. The test apparatus sanitary well seal is then positioned in the top of the well and tightened securely to form an airtight seal. The discharge end of the pitless adapter is capped. This isolated section of the casing or unit is then pressurized through the discharge fitting in the sanitary well seal. A pressure of 5 to 7 pounds per square inch (psi) should be applied and maintained, without the addition of more air, for 1 hour. ***Warning: do not overpressurize and do not face over the well seal while pressurized!*** While under pressure, all field connections should be tested for leaks with non-toxic soap foam. Any sign of leakage, either by loss of pressure or by the appearance of bubbles through the soap, calls for repair and retesting.

Positive pressure may be applied to the isolated section by means of a tire pump or powered air compressor. ***The plumber's test plug should only be inflated by a hand-operated tire pump.***

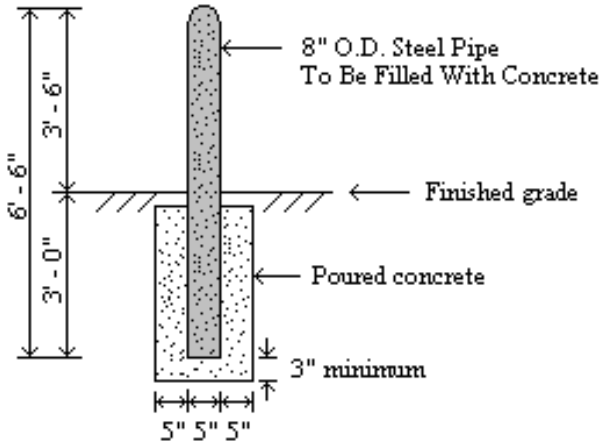
Adapters and pitless units that depend on rubber or plastic seals in the field connection should also be tested under "negative" pressure conditions. This can be accomplished by connecting the hose fitting to a vacuum source and applying a vacuum in the desired range of 10-14 inches of mercury vacuum. Once the desired vacuum is reached the vacuum hose is clamped shut or plugged. The negative pressure is read on the vacuum gauge and the vacuum reading is observed over a period of one hour to see if there is any detectable loss of negative pressure.

Leaks found in rubber or plastic seals should be closed by tightening the clamps, if possible. If a cement sealant must be used, it should be one that will provide a strong yet flexible bond between the sealing surfaces, and should be compounded to provide long service when buried. All sealants used must be certified under the ***National Sanitation Foundation's Standard 61 (Listing of Certified Drinking Water System Components)***.

VIII. WATER SERVICE LINE/EXCAVATION/BACKFILLING: In many cases, excavation around the well is required in order to perform the work necessary to successfully raise a well casing. Proper safety measures must be employed for personnel working in excavated trenches.

Excavation creates unstable soil conditions, and later settlement will occur. Settlement may place a sufficient load on the pitless adapter and well discharge pipe to cause the connection to break or leak. For this reason it is recommended that flexible pipe be used for the water line from the pitless adapter to the building entrance point. If rigid pipe is necessary, connection to the pitless adapter should be made by means of a "gooseneck", a "swing joint", or other device that will adjust to settlement without transferring the load to the pitless adapter. The best fill material to use to minimize settlement of the well discharge line is fine to medium sand, washed into place. With a correctly placed cement grout seal around the well casing below the casing extension coupling (See Figure 3) the sand will not find its way into the well. Sand does not shrink or crack in drying, and several feet of it will help to filter out any bacteria.

Figure 1: Typical pipe bollard detail



Notes:
1) Steel pipe shall be 28.55 pounds per foot conforming to ASTM A53.
2) Bollards shall be painted. Color to be safety yellow.

Figure 2 – Common examples of couplings used to extend well casing

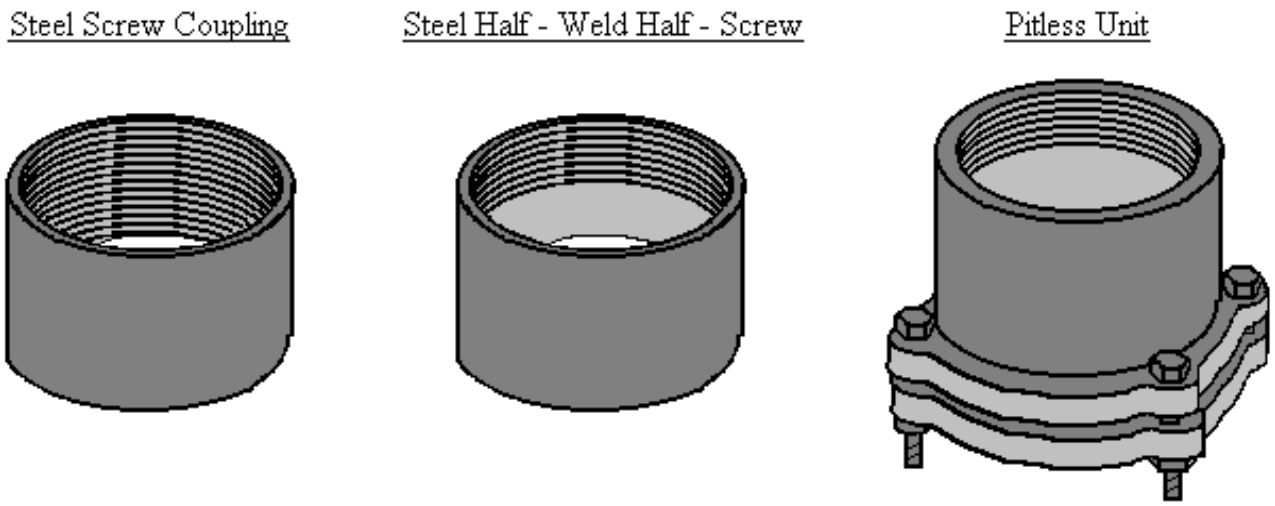


Figure 3 – Pitless adapter and coupling testing apparatus

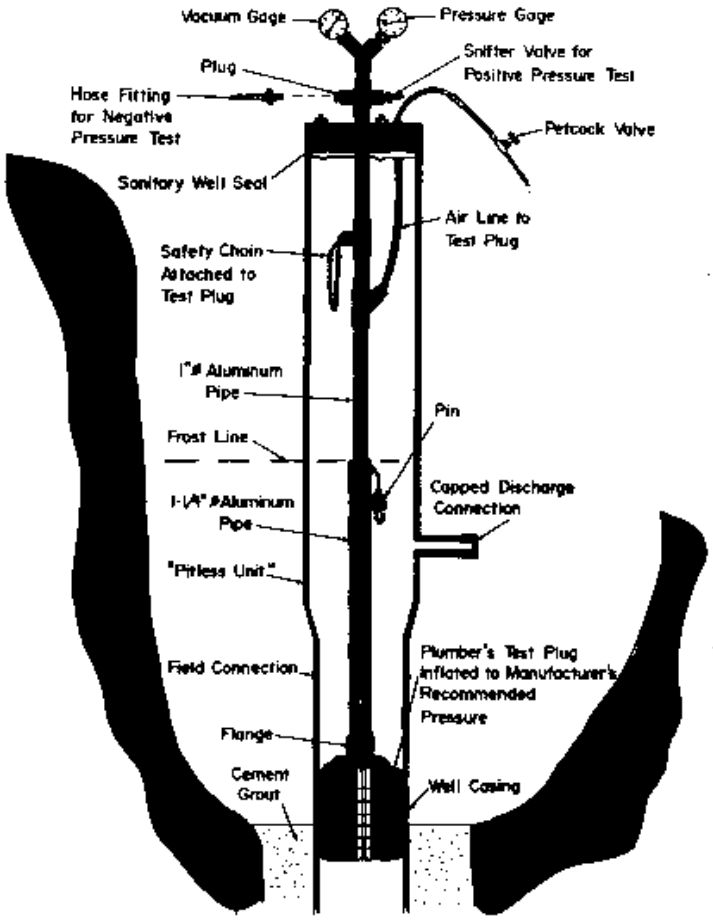


Table 1: Casing Pipe Weights and Dimensions

Size in inches	Wt. Lbs. Per Ft. Threads and Couplings	Pipe			Threads Per Inch	Couplings	
		Thickness in Inches	Diameter-inches			Length in Inches	External Diameter Inches
			External	Internal			
1	1.68	.133	1.315	1.049	11.5	1.875	1.556
1.25	2.28	.140	1.660	1.380	11.5	2.125	1.907
1.5	2.73	.145	1.900	1.610	11.5	2.375	2.218
2	3.68	.154	2.375	2.067	11.5	2.625	2.760
2.5	5.82	.203	2.875	2.469	8	2.875	3.276
3	7.62	.216	3.500	3.068	8	3.125	3.948
3.5	9.20	.226	4.000	3.548	8	3.625	4.591
4	10.89	.237	4.500	4.026	8	3.625	5.091
4.5	12.64	.247	5.000	4.506	8	4.125	5.591
5	14.81	.255	5.563	5.047	8	4.125	6.296
6	17.00	.250	6.625	6.375	8	4.125	7.358
7	23.769	.301	7.625	7.023	8	4.125	8.358
8	25.00	.277	8.625	8.071	8	4.625	9.420
10	35.00	.307	10.750	10.136	8	6.125	11.721
12	45.00	.330	12.750	12.090	8	6.125	13.958
14	57.00	.375	14.000	13.250	8	7.125	15.446
15	61.15	.375	15.000	14.250	8	7.125	16.446
16	65.30	.375	16.000	15.250	8	7.125	17.446
17	73.20	.375	17.000	16.250	8	7.125	18.683
18	81.20	.375	18.000	17.250	8	7.125	19.921
20	90.00	.375	20.000	19.250	8	7.625	21.706