

CONSTRUCTION SPECIFICATION

AR-351 WATER WELL DECOMMISSIONING

1. Scope

The work shall consist of recording well data; preparing the well site for sealing and permanent closure including the removal of pumping equipment, piping, removable casing and screens, and obstructing materials; disinfecting the well; providing and installing well sealing materials; and shaping the well area.

This specification does not cover the capping of a non-deteriorated well. A non-deteriorated well contains casing in good condition and is beneficial to the landowner.

2. Public and Private Utilities

Utilities are defined to be overhead and underground power or communication lines, and pipelines. All utilities discovered to be in the work area are shown on the drawings or sketches. However, the absence of indicators on the drawings or sketches does not assure the nonexistence of utilities in the work area. The contractor should conduct their own search and discovery of utilities in order to lessen or avoid potential damages. The landowner shall contact *Arkansas One Call* (866-237-5028) ten days prior to the commencement of construction activities to have underground utilities located in the work area

3. Regulations

Water well drillers and pump installers must be licensed by the Arkansas Water Well Construction Commission to plug wells in the State of Arkansas. Well drillers, pump installers, and landowners must also comply with all Federal, State, and local laws and regulations. It is the responsibility of the landowner to obtain all necessary permits from applicable Federal, State, and local agencies.

Abandoned and/or deteriorated wells shall be sealed and closed in accordance with rules and regulations of the Arkansas Water Well Construction Commission (AWWCC):

<http://www.accessarkansas.org/awwcc/August%201%202009%20AWWCC%20rules.pdf>

4. Site Preparation

All well pumping equipment and piping, removable casing and screens, obstructing materials, trash, debris, and existing surface materials shall be removed from the well and immediate area, and disposed of in an appropriate manner before disinfection or sealing procedures begin.

5. Disinfection

If the well contains standing water, the well shall be brought to a minimum of 100-ppm chlorine concentration to kill existing microorganisms within the well water before sealing (see Table 1). When practical, the chemical solution shall be left for no less than 24-hours to assure complete disinfection. The disinfection process shall also comply with all state and local requirements.

Table 1: Well Volumes and Approximate Disinfection Quantities

Well or Hole Diameter ¹	Volume of Water (Per Linear Foot)	Added Chlorine ^{2,3} (Per Linear Foot)
Inches	Gallons/Foot	Fluid Ounces/Foot
2	0.16	0.04
3	0.37	0.09
4	0.65	0.17
5	1.02	0.26
6	1.50	0.38
7	2.00	0.51
8	2.61	0.66
9	3.30	0.84
10	4.08	1.04
12	5.88	1.49
14	8.00	2.03
16	10.44	2.65
18	13.22	3.35
20	16.32	4.15
24	23.50	5.97
36	52.88	13.43
40	65.28	16.58
44	78.99	20.06
48	94.00	23.87

Notes:

¹ Diameters are for cylindrical wells only.

² Typical 5.25% to 6.0% chlorine product. Common brand names include: Clorox, Purex, Snowwhite, Kandu, Topco, etc

³ Added volume produces an equivalent concentration of 100 parts per million of chlorine per linear foot of water.

6. Casing

All removable casing shall be removed from the well. At a minimum where the well casing cannot be removed, the casing shall be cut off at a depth not less than 3 feet below the land surface. Where the well casing cannot be removed and an open annular space exists between the outside of the casing and the well bore, the annular space must be sealed using the sealing materials and methods described in Sections 7 and 8. All casing left in place shall be perforated or ripped sufficiently to ensure sealing materials completely fill the casing and any annular space.

7. Sealing Materials

Properties of sealing materials shall conform to characteristics listed in ASTM D-5299, Part 6.3 Plugging Materials. Sealing materials do not require disinfection. A guide to determining the quantities required for a given well is shown in Table 2.

- (a) Cement – A neat slurry of Portland cement, having a density of not less than 15.36 gal/cu. ft. (This density may be achieved by mixing 5.5 gallons of water with one 94 pound sack of Portland cement), or a cement slurry which contains cement along with bentonite, gypsum or other additives achieving the same density requirement.
- (b) Bentonite Slurry – A fluid mixture of sodium bentonite and potable water mixed at manufacturers' specifications to a slurry consistency that can be pumped through a pipe and achieving a weight of not less than 10 pounds per gallon of mix.
- (c) Granular Sodium Bentonite – 3/8 inch or larger, coarse ground, untreated, sodium-based

bentonite (montmorillonite).

Table 2: Calculation Guide for well plugging materials.

Well or Hole Diameter ¹	Cement ²	Bentonite Chips ³
Inches	Linear Feet	Linear Feet
2	50.3	31.3
3	28.8	13.9
4	16.2	1.9
5	10.4	5
6	7.2	3.5
7	5.3	2.6
8	4	2
9	3.2	1.5
10	2.6	1.3
12	1.8	0.86
14	1.3	0.63
16	1	0.48
18	0.8	0.38
20	0.6	0.31
24	0.4	0.21
36	0.2	0.097
40	0.16	0.078
44	0.13	0.065
48	0.11	0.054

Notes:

- ¹ If measured well diameter falls in-between listed diameters, use the larger diameter to ensure adequate material purchase. Diameter for cylindrical wells only.
- ² Linear feet filled by cement slurry consisting of one 94-pound sack of Portland cement and 7 gallons of water.
- ³ Linear feet filled by 50-pound sack of 3/8 to 3/4- inch bentonite chips.

8. Sealing Methods

The well shall be filled and sealed by one of the following methods:

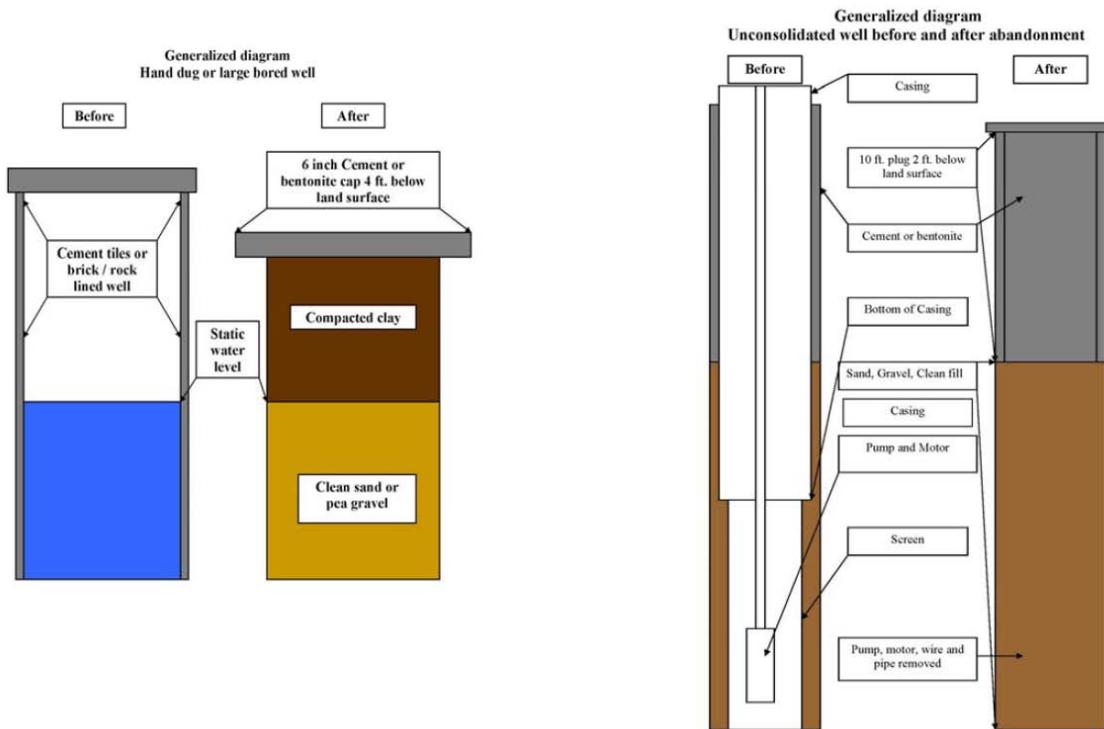
- (a) The entire well shall be pressure-filled via a tremie pipe with cement from the bottom up to the land surface.
- (b) The entire well shall be pressure-filled via tremie pipe with clean bentonite slurry from the bottom up. The top 2 feet of the well shall be filled with cement as an atmospheric barrier. Bentonite slurry may not be used if a water zone contains chlorides above 1500 ppm or if hydrocarbons are present.
- (c) If the well has 100 feet or less of standing water, the entire well may be filled with a solid column of granular sodium bentonite hydrated at frequent intervals while strictly adhering to the manufacturers' recommended rate and method of application. Care should be taken to ensure bridging does not occur by pouring the material slowly and/or agitation. The top 2 feet of the well shall be filled with cement as an atmospheric barrier. Granular sodium bentonite may not be used if a water zone contains chlorides above 1500 ppm or if hydrocarbons are present.
- (d) Method (a), (b), or (c) above with the following exceptions. The well shall be filled from the bottom of the well to within 6 feet of the land surface. The interval between the land surface and the 4 foot depth shall be filled with soil materials that achieve an in-place

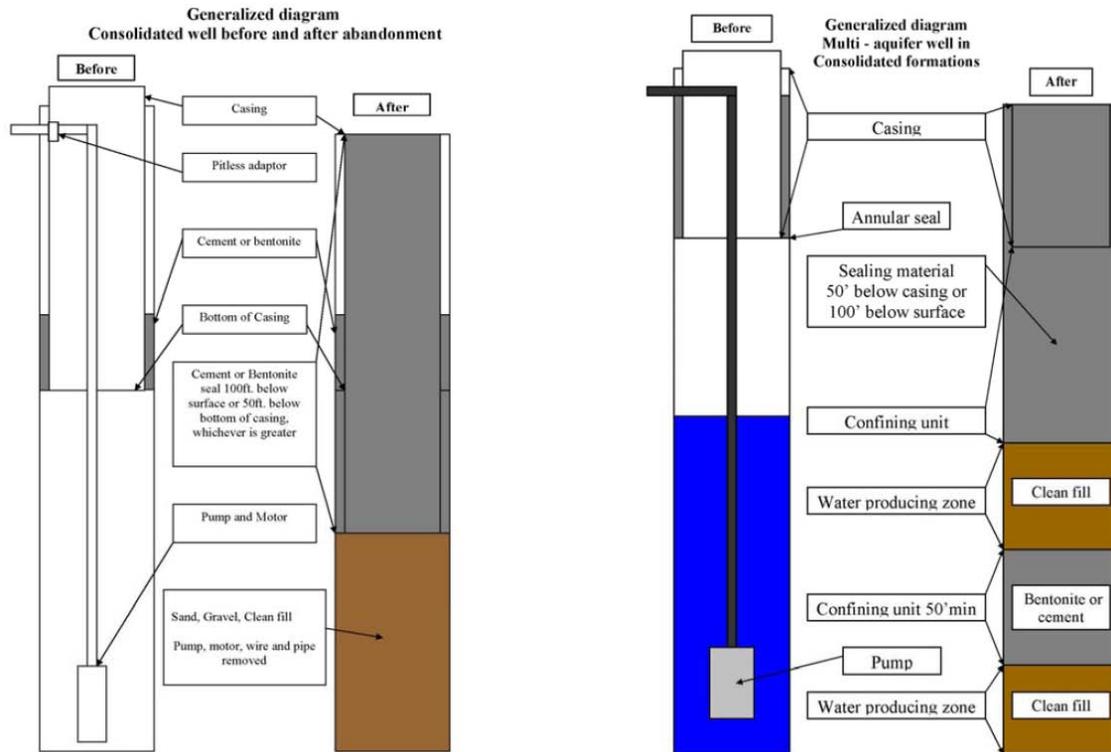
hydraulic conductivity equivalent to or less than the surface soil surrounding the well. The land surface shall be mounded to compensate for settling and shall be graded in a manner that prevents ponding of surface runoff.

- (e) Hand-dug and bored wells 36 inches or greater in diameter to 100 feet in depth may be filled to the surface with compacted clay. The backfill material shall be placed in a manner that minimizes segregation and bulking, mounded above the surface to compensate for settling, and shall be graded in a manner that prevents ponding of surface runoff.
- (f) Undesirable water or constituents shall be isolated from the fresh water zone(s) with cement plugs and the remainder of the well bore filled with cement or clean bentonite grout. The top 2 feet of the well shall be filled with cement as an atmospheric barrier.

9. AWWCC Drawings

The following drawings are from the Arkansas Water Well Construction Commission fact sheet concerning well abandonment.





10. Certification

The contractor shall furnish the owner/operator (with a copy provided to the USDA-NRCS) with a written certification that the decommissioned well conforms to the requirements of this specification and to the current rules and regulations of the Arkansas Water Well Construction Commission (AWWCC),

<http://www.accessarkansas.org/awwcc/August%201%202009%20AWWCC%20rules.pdf>

The contractor shall also certify that they are licensed by the State of Arkansas as a well driller or pump installer. The certification shall include the following:

- Copy of the AWWCC record of well abandonment (original mailed to AWWCC within 90 days of well abandonment).
- Signed and completed USDA-NRCS Job Sheet

11. Measurement

Payment will only be made for decommissioned wells that meet this specification. The measurement for payment will be based on a per-foot of depth basis of the well sealed or decommissioned. The depth will be reported in feet on the associated USDA-NRCS Job Sheet and AWWCC record of well abandonment form. Payment will be one price per linear foot of depth, which includes the removal of pumping equipment, piping, removable casing and screens, and obstructing materials; disinfecting the well; providing and installing well sealing materials; and shaping the well area. An onsite check of the completed work will be performed by a USDA-NRCS representative.