

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

WATER WELL

(No.)

CODE 642

DEFINITION

A hole drilled, dug, driven, bored, jetted or otherwise constructed into an aquifer.

PURPOSE

To provide water for livestock, wildlife, irrigation, human, and other uses.

To provide for general water needs of farming/ranching operations.

To facilitate proper use of vegetation on rangeland, pastures, and wildlife areas.

CONDITION WHERE PRACTICE APPLIES

On all land uses where the underground supply of water is sufficient in quantity and quality for the intended purpose.

This practice standard applies only to production wells. Specifically excluded are any types of wells installed solely for monitoring or observation purposes; injection wells; and piezometers. The standard does not apply to pumps installed in wells; above ground installations, such as pumping plants, pipelines, and tanks; temporary test wells; and decommissioning of wells (ASTM D 5299).

CRITERIA

Any well installed for the “provision of water for human consumption” shall meet the criteria found in Private Water System Rules administered by the Ohio Department of Health, and be permitted by the local health department prior to drilling the well. Private Water System Rules are found in Chapter 3701-28 of the Ohio Administrative Code.

Certain Ohio Counties specify that all wells regardless of whether or not the well has “provision of water for human consumption” must meet the Private Water System Rules and be permitted.

Drilling contractors installing wells under this standard shall be registered with the Ohio Department of Health as described in Chapter 3701-28-20 of the Ohio Administrative Code.

The well drilling contractor is required to file well log and drilling reports, and well sealing reports with the Division of Water, Ohio Department of Natural Resources for any well as defined under the Ohio Revised Code Section 1521.01. Any person that participates in the construction or sealing of a well is required to keep an accurate record and provide that information on well log or sealing forms provided by the Division of Water.

All wells installed under this standard shall be constructed using the guidance document: *State Of Ohio Technical Guidance for Well Construction And Ground Water Protection*, prepared by The State Coordinating Committee On Ground Water 2000.

Abandoned wells and dry holes shall be sealed using the guidance document: *State of Ohio Technical Guidance for Sealing Unused Wells*, prepared by The State Coordinating Committee On Ground Water 1996

Suitability of Site: The availability of ground water for its intended use at the site shall be determined by using reliable local experience and reviewing all available relevant geologic maps and reports; well records maintained by state and federal agencies; and design, construction, and maintenance records of nearby wells. Groundwater resource maps and well logs are available from the Ohio Department of Natural Resources, Division of Water. An appropriate level of investigation, including test well drilling, is conducted on-site, as needed, prior to well construction to determine site-specific hydrogeologic conditions.

The site shall be suitable for safe operation of the drilling equipment.

Well Head Protection: Wells shall be located at safe distances from potential sources of pollution, including unsealed abandoned wells. The allowable distance shall be based on consideration of site-specific hydrogeologic factors and shall comply with requirements of all applicable state or local regulations or construction codes:

Minimum setback distances between a well and common potential sources of contamination are:

Sewers and drains constructed with watertight pipe	10 feet
Underground fuel oil tanks, gasoline storage tanks, LP tanks, chemical tanks	50 feet
Sewage tanks and adsorption fields	50 feet
Leaching pit and leaching privies	100 feet
Vault privies	50 feet
Stables, manure piles, etc.	50 feet
Streams, lakes, ponds, ditches, roads, etc.	25 feet
Properly sealed well	10 feet
Existing properly constructed water well <u>1</u> /	10 feet
Structures	10 feet
Above-ground chemical storage tanks w/secondary containment	10 feet
Above-ground chemical storage tanks w/o secondary containment	25 feet
Vertical or horizontal geothermal loop systems w/low toxicity heat transfer fluid	25 feet
Vertical or horizontal geothermal loop systems w/high toxicity heat transfer fluid	50 feet

1/ *If existing well construction is unknown or of poor quality, then the well should be properly sealed.*

All wells in a floodplain shall be equipped with watertight surface seals and be vented using a metallic pipe which extends to at least 3 feet above the one hundred year flood level, or the well casing shall be extended at least 3 ft. above the 100 yr. flood elevation.

Surface runoff and drainage that might reach the wellhead from areas used by livestock shall be diverted.

Wells shall be located a safe distance from both overhead and underground utility lines and other safety hazards.

Borehole: Drilled, jetted, bored, and driven wells shall be sufficiently round, straight, and of adequate diameter, to permit satisfactory installation of inlet, well casing, filter pack, and annular seal, and passage of tremie pipe (including couplings), if used. The borehole diameter shall be at least 2 inches larger than the casing for up to 14-inch casings or 4 inches larger than casings greater than 14 inches in diameter.

Use of Casing: Casing shall be installed in all wells to seal out undesirable surface or shallow ground water and to support the side of the hole through unstable earth materials. The minimum casing length is 25 ft below the ground surface unless the water bearing aquifer is shallow and overlies non- water bearing bedrock. In this case a waiver of the 25' casing length is required from the local health department and the minimum casing length is 15 ft.

Casing Diameter: Casing diameter shall be sized to permit satisfactory installation and efficient operation of the pump, and large enough to assure that uphole velocity is 5 feet per second or less, to protect against excessive head loss. The minimum casing diameter is 5 inches.

Materials: Casings may be of steel, iron, stainless steel, copper alloys, plastic, fiberglass, concrete, or other material of equivalent strength and durability consistent with the intended use of the water and the maximum anticipated differential head between the inside and outside of the casing.

Steel well casings shall meet or exceed requirements specified in ASTM A 589. Steel pipe manufactured for other purposes may be used if the quality of the pipe meets or exceeds requirements specified in ASTM A 589.

Only steel pipe casings shall be used in driven wells.

To prevent galvanic corrosion, dissimilar metals shall not be joined.

Plastic casings made of acrylonitrile-butadiene-styrene (ABS), polyvinyl chloride (PVC), or styrene-rubber (SR) shall conform to material, dimensional and quality requirements specified in ASTM F 480.

If the water is to be used for human consumption, plastic pipe shall be approved by the National Sanitation Foundation.

Plastic pipe manufactured for water or irrigation pipelines may be used if the quality equals or exceeds requirements specified in ASTM F 480.

Filament-wound fiberglass casings (glass-fiber-reinforced-thermosetting-resin pipe, RTRP) may be used if material meets requirements specified in ASTM D 2996. Tests for long-term cyclic pressure strength, long-term static pressure strength, and short-term rupture strength as required in ASTM D 2996 are not needed because the pipe is to be used for well casing. Joints shall meet requirements specified in section 3.8, ASTM F 480.

Fiberglass pressure pipe, (also called reinforced plastic mortar pipe, RPMP, or fiberglass pipe with aggregate) shall meet or exceed requirements specified in ASTM D 3517.

Casing Strength: Well casing wall thickness shall be sufficient to withstand all anticipated static and dynamic pressures imposed on the casing during installation, well development, and use. Steel casing shall have a minimum thickness of 0.188 inches. PVC casing shall have a minimum standard dimension ratio (SDR) of 21.

Joint Strength: Joints for well casings shall have adequate strength to carry the load due to the casing length and still be watertight, or shall be mechanically supported during installation to maintain joint integrity. Such mechanically supported casings shall terminate on firm material that can adequately support the casing weight.

Screen: Well screens shall be installed in any earth material likely to produce silt or sand. Well screens may be constructed of commercially manufactured screen sections, well points, or field-perforated sections.

Perforation by any method is allowable provided proper slot size and entrance velocity limits can be met. The length and open area of the screen shall be sized to limit entrance velocity of water into the well to less than or equal to 0.1 foot per second.

Depth of the aquifer below ground surface and the thickness of aquifer to be penetrated by the well shall govern the position of the screen in the well.

Maximum drawdown shall not be permitted below the top of the highest screen or pump intake.

Seals (Packers): Telescoped screen assemblies shall be provided with one or more sand-tight seals between the top of the telescoped screen assembly and casing.

Filter Pack: Installation of a filter pack around the well screen shall be considered under the following conditions: presence of a poorly graded, fine sand aquifer; presence of a highly variable aquifer, such as alternating sand and clay layers; presence of a poorly cemented sandstone or similar aquifer; a requirement for maximum yield from a low-yielding aquifer; and holes drilled by reverse circulation.

Prepacked Well Screens: For heaving or caving sands, silty or fine-grained aquifers, and for horizontal or angled wells, a commercial prepacked well screen may be substituted for a conventionally installed (by tremie) filter pack.

Installation: Casing shall extend from above the ground surface down through unstable earth materials to an elevation of at least 2 feet into stable material or to the top of the screen.

All wells shall be cased to a sufficient height (minimum of 12 inches) above the ground surface to prevent entry of surface and near-surface water. Flowing wells shall have the well casing extended to stop the flow or be equipped in such a way as to be able to stop the flowing to retain the confining pressure in the aquifer.

Casing for artesian aquifers shall be sealed into overlying, impermeable formations in such a manner as to retain confining pressure.

If a zone is penetrated that is determined or suspected to contain water of unsuitable quality for the intended use, the zone shall be sealed to prevent infiltration of the poor-quality water into the well and the developed portion of the aquifer.

Well Development: Wells to be completed without a filter pack in unconsolidated granular aquifers shall be developed following guidance provided in ASTM D 5521, Standard Guide for Development of Ground-Water Monitoring Wells in Granular Aquifers.

The method shall be selected based on geologic character of the aquifer, type of drilling rig, and type of screen.

Aquifer Development: For massive, unfractured rock formations unresponsive to well development procedures, the use of aquifer stimulation techniques may be considered to improve well efficiency and specific capacity. Techniques may include dry ice, acidizing, explosives, or hydrofracturing, depending on the composition and structure of the formation.

Grouting and Sealing: The annulus surrounding the permanent well casing from the top of the screen or filter pack to the ground surface shall be filled with expansive hydraulic cement (ASTM C 845), neat cement, or bentonite grout.

A positive seal (grouted in place) or packer shall be provided between the casing and the less pervious material overlying the aquifer of artesian wells, and in all aquifers where co-mingling of waters is undesirable.

Access Port: An access port with a minimum diameter of 0.5 inch shall be installed to allow for unobstructed measurement of depth of the water surface, or for a pressure gage for measuring shut-in pressure of a flowing well. Access ports and pressure gages or other openings in the cover shall be sealed or capped to prevent entrance of surface water or foreign material into the well. Removable caps are acceptable as access ports.

Disinfection: Wells shall be disinfected immediately following their construction or repair to neutralize any contamination from equipment, material, or surface drainage introduced during construction. The disinfection process shall comply with all local or state requirements.

Water Quality Testing: Sampling and testing shall comply with all applicable federal, state, and local requirements. These requirements vary according to the water quality parameters associated with the intended use(s) of the water.

Well security: The area surrounding the finished well casing shall be graded away from the casing to prevent ponding of surface water at the casing, and the disturbed area will be permanently vegetated. If livestock are present, they shall be permanently fenced from the well casing. The fence shall be placed a minimum of 10 ft. from the well casing.

CONSIDERATIONS

A livestock watering system should be designed to deliver and or store enough water to meet peak demand i.e. summer time drinking for the projected numbers of animals. Peak demand is defined as 30 gallons per day (at 90 ° F) per 1000 lbs. liveweight

The potential for adverse interference with existing nearby production wells needs to be evaluated in planning.

The potential for ground water overdraft and the long-term safe yield of the aquifer needs to be considered in planning.

If practicable, wells should be located in higher ground and up gradient from sources of contamination or flooding.

Potential effects of installation and operation of the well on cultural, historical, archeological, or scientific resources at or near the site need to be considered in planning.

PLANS AND SPECIFICATIONS

Plans and specifications shall be prepared for specific field sites in accordance with this standard and shall describe the requirements for applying the practice to achieve its intended uses.

OPERATION AND MAINTENANCE

A plan for maintenance of a well shall be prepared. The well construction records shall be kept on file with the maintenance plan by the owner/operator. As a minimum, the plan shall include a statement of identified problems, corrective action taken, date, and specific capacity (yield per unit drawdown) of well before and after corrective action was taken.

REFERENCES

The Ohio Administrative Code is available from Anderson Publishing at:

<http://www.state.oh.us/ohio/ohiolaws.htm>

State Of Ohio Technical Guidance for Well Construction And Ground Water Protection document is available as a PDF download at: <http://www.epa.state.oh.us/ddagw/WellConsGuid2000.pdf>

State of Ohio Technical Guidance for Sealing Unused Wells document is available as a PDF download at:

<http://www.epa.state.oh.us/ddagw/wellsealguid.pdf>

Water well logs from ODNR, Division of Water, can be located on-line at:

<http://www.dnr.state.oh.us/water/maptechs/wellogs/app/default.asp>

County Ground Water Resource maps are available from ODNR, information on maps is available by calling (614) 265-6740, or on-line at: http://www.dnr.state.oh.us/water/pubs/fs_div/fctsht10.htm