

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

WATER WELL

(No.)

CODE 642

DEFINITION

A hole drilled, cored, dug, driven, bored, washed, jetted, or otherwise constructed to 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

This standard applies to vertical or horizontal wells constructed to supply water from an underground supply of water which 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

Nebraska Health and Human Services Regulation & Licensure (NHH&L) Regulations Title 178 NAC 12 governs the construction of water wells, and all work

performed under this practice standard shall conform to those regulations.

Nebraska statues also mandate water well installation must be carried out or be completed under the supervision of a state licensed water well contractor, water well drilling supervisor, pump installation contractor, or pump installation supervisor. The only exception being, while adhering to Title 178 NAC 12 regulations, a landowner may install a water well on land owned by him or her.

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. 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 details pertaining to local water wells, such as depth, type of construction, vertical zone of influence, etc., together with data on the geological formations and porosity of subsoil strata should be considered in determining the safe allowable distances. Minimum recommended distances between non-public water supplies and sources of contamination are:

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resource Conservation Service.

**NE-T.G. Notice 520
Section IV
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Source of Contamination	* Minimum Distance Feet
Waste disposal lagoons	100
Cesspools	100
Livestock and poultry yards	100
Privies, manure piles	100
Silo pits, seepage pits	100
Septic tanks and disposal fields	100
Gravity sewer or drain (pressure tight)	10
Depression that could retain stagnant water	10

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

Wells shall be readily accessible for maintenance and repair and located a safe distance from both overhead and underground utility lines and other safety hazards.

Borehole: Drilled, cored, jetted, bored, dug and driven wells shall be sufficiently round, straight, and of adequate diameter, to permit satisfactory installation of inlet, well casing, filter pack, annular seal, and passage of tremie pipe (including couplings), if used.

Use of Casing: In accordance with NHHSR&L regulations, all wells except test holes and heat pump wells will be cased. Casing shall be installed to seal out undesirable surface or shallow ground water and to support the side of the hole through unstable earth materials.

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 diameter will also meet NHHSR&L requirements.

Materials: Casings may be of steel, stainless steel, 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. Plastic material used for casing shall be Acrylonitrile-Butadiene-Styrene (ABS) or Polyvinyl chloride (PVC) or Styrene-Rubber (SR).

Where watertight casing is required, NHHSR&L materials criteria will be followed.

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 and meet the criteria of NHHSR&L regulations.

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, as well as corrosion by soil and water environments.

Guidance for the proper sizing of well casing is contained in NRSC National Engineering Handbook Part 631 Geology Chapter 33,-- Investigations for Ground Water Resources Development--Determining critical collapse pressure in design of water well casing.

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 screen 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. Methods of screen aperture perforation will be as stated in NHHSR&L regulations and will provide the proper slot size to meet the following entrance velocity limit. 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 or Gravel Pack: A filter or gravel pack will be installed when it is determined aquifer materials will pass through the well screen or perforated casing. Conditions under which a filter or gravel pack shall be considered are as follows: 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.

The pack will be 3 to 12 inches thick and will be composed of sand or gravel material having a grain size 5 to 12 times the grain size of the strata material. The pack will also meet the criteria stated in NHHSR&L regulations.

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 and soil surrounding the casing shall be tamped and sloped away from the casing to prevent entry of surface and near-surface water.

Plastic cased domestic wells shall be protected through the frost zone in accordance with NHHSR&L regulations.

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 quality unsuitable 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.

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A well log will be maintained by the water well contractor in accordance with NHHSR&L regulations.

All water wells shall be registered with the State in accordance with NHHSR&L regulations.

Well Development: All domestic and other cased wells shall be developed according to NHHSR&L criteria.

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: To protect water bearing formations from contamination by surface runoff, the annulus surrounding the permanent well casing shall be sealed in accordance with the "Surface Seal" criteria of NHHSR&L regulations.

In wells with one water bearing formation, the annular space below the "surface seal" shall be filled in accordance with NHHSR&L requirements.

In wells with confined and unconfined water bearing formations or multiple confined water bearing formations, each confined water bearing formation shall be sealed from the unconfined formation and the other water bearing formations with grout or other substantially equivalent materials. Verification of "substantial equivalency" will be obtained through the procedures detailed in NHHSR&L regulations.

In wells containing contaminated water bearing zones, those zones shall be sealed in accordance with NHHSR&L regulations.

Sealing materials will consist of viscous liquid slurry grouts, granular bentonite, or a substantially equivalent material. The types and requisite components of each slurry grout are as listed in NHHSR&L regulations. Verification of "substantial equivalency" will be obtained through the procedures detailed in NHHSR&L regulations.

Granular bentonite seals and their placement shall be in accordance with NHHSR&L criteria.

Slurry grouts shall be placed by tremie or pressure and under any other NHHSR&L criteria.

Centering of the casing in the borehole prior to sealing shall be as stated in NHHSR&L regulations.

If the water is intended for human consumption, the casing shall be surrounded at the ground surface by a 4-inch thick concrete slab extending at least 2 feet in all directions.

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.

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. Secured 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 NHHSR&L 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.

CONSIDERATIONS

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 operation and 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.