

**USDA
 NATURAL RESOURCES
 CONSERVATION SERVICE**
**MARYLAND CONSERVATION
 PRACTICE STANDARD**
WATER WELL
**CODE 642
 (Reported by No.)**

DEFINITION

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

PURPOSES

This practice may be applied for one or more of the following purposes:

1. To provide water for livestock, wildlife, irrigation, human, and other uses;
2. To provide for general water needs of farming/ranching operations;
3. To facilitate proper use of vegetation on rangeland, pastures, and wildlife areas.

**CONDITIONS WHERE PRACTICE
 APPLIES**

This 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).

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. In determining gradient, both pumped and unpumped conditions shall be considered.

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.

CRITERIA

Suitability of Site

Determine the availability of ground water at the site 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 must be suitable for safe operation of the drilling equipment.

Permits

Well installations require authorization from Maryland Department of the Environment under COMAR 26.04.04, Well Construction Regulations. Construct wells in accordance with these regulations. Upon completion of a well, a Well Completion Report must be completed by the well installer. A copy of this report must be maintained in the landowner's case file. Follow all other local, state, and federal laws as they apply.

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the [Natural Resources Conservation Service - Maryland](#) or visit the [electronic Field Office Technical Guide \(eFOTG\)](#).

COMAR regulations are available online at www.dsd.state.md.us/.

Well Head Protection

Locate wells a safe distance from potential sources of pollution, including unsealed abandoned wells. Base allowable distances on site-specific hydrogeologic factors and comply with requirements of all applicable state or local regulations or construction codes.

Divert potentially contaminated surface runoff and drainage away from the wellhead.

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

Use of Casings

Install Casings in a manner to seal out undesirable surface or shallow ground water and to support the side of the hole through unstable earth materials. The intake portion of a well through stable geologic formations may not require casing.

Size casing diameter 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.

Installation

Install wells in accordance with Maryland Department of the Environment under COMAR 26.04.04, Well Construction Regulations.

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.

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.

Grouting and Sealing

Fill the annulus surrounding the permanent well casing at the upper terminus of the well with expansive hydraulic cement (ASTM C 845), shrinkage-compensating concrete, bentonite-based grout, clay, or other material with similar sealing properties as specified in state or locally applicable construction codes. The length of the grout seal shall be no less than 10 feet and not less than the minimum specified in local and state codes.

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, and in all aquifers where commingling of waters is undesirable.

Disinfection

Disinfect wells immediately following their construction or repair to neutralize any contamination from equipment, material or surface drainage introduced during construction. Comply with all local or state requirements when disinfecting wells.

Materials

Casings - 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. Required casing strength shall be determined as shown in NEH Part 631, Chapter 33, Investigations for Ground Water Resources Development.

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 aquifer material likely to produce silt or sand.

Well screens may be constructed of commercially manufactured screen sections, well points, or field-perforated sections. The screen shall be constructed with the slot width determined from aquifer samples (Part 631, NEH, Chapter 33). Perforation by any method is allowable provided proper slot size and entrance velocity limits can be met. Screen open areas can range from 1 percent for field-perforated screens to 25 percent or more for continuous wire-wrapped screens. To assure good well efficiency, open areas should be designed to approximate aquifer porosity. High open area percentages also make well development more effective. 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 (Part 631, NEH, Chapter 33, Example 33-2).

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.

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

Water Quality Testing

Water quality is required for all wells used for human consumption and may be required for other uses as required by law. Sampling and testing must comply with all applicable federal, state, and local requirements. These require-

ments vary according to the water quality parameters associated with the intended use(s) of the water.

Vegetation

Use the Maryland conservation practice standard, Critical Area Planting, Code 342 to determine the appropriate grass species to be established based on site conditions and use. Plants listed on the Maryland noxious weed list must not be planted.

PLANS AND SPECIFICATIONS

Prepare plans and specifications for specific field sites in accordance with this standard and describe the requirements for applying the practice to achieve its intended uses.

The Well Completion Report documents details of the well installation and is considered appropriate documentation.

OPERATION AND MAINTENANCE

Prepare a written operation and maintenance plan for the well. Well construction records and the operation and maintenance plan will be kept in the owner's case file. Include in the plan as a minimum, 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.

SUPPORTING DATA AND DOCUMENTATION

Field Data and Survey Notes

The following is a list of the minimum data needed:

1. System plan sketch;
2. Special control or field features that must be considered in design.

Design Data

Record on appropriate engineering paper. For guidance on the preparation of engineering plans, see Chapter 5 of the Engineering Field Handbook, Part 650. The following is a list of the minimum required design data:

1. Plan view including all system components and construction specifications;
2. Copy of MDE well permit;
3. Job Class on plan;
4. Quantities Estimate;
5. Planting plan. This must meet the criteria, specifications, and documentation requirements of the Maryland conservation practice standard, Critical Area Planting, Code 342;
6. Written Operation and Maintenance Plan.

Construction Check Data/As-Built

Record on survey note paper, SCS-ENG-28, or other appropriate engineering paper. Survey data will be plotted on plans in red. The following is a list of minimum data needed for As-builts.

1. Documentation of site visits on CPA-6. Include the date, who performed the inspection, specifics as to what was inspected, all alternatives discussed, and decisions made and by whom;
2. Copy of Well permit and Well Completion Report;
3. Copy of water quality testing results, when applicable;

4. Statement on site stabilization;
5. Final quantities;
6. Sign and date checknotes and plans to include statement that practice meet or exceed plans and NRCS practice standard.

REFERENCES

1. Code of Maryland Regulations, Title 26, Department of the Environment, Subtitle 04, *Regulation of Water Supply, Sewage Disposal and Solid Waste*, Chapter 04, Well Construction.
2. USDA, Natural Resources Conservation Service. *Conservation Practice Standard for Critical Area Planting, Code 342*. Maryland Field Office Technical Guide, Section IV.
3. USDA, Natural Resources Conservation Service. *National Handbook of Conservation Practices & Preparation of Engineering Plans*. Engineering Field Handbook, Chapter 5