

Spring Development (No.)

Definition

Improving springs and seeps by excavating, cleaning, capping, or providing collection and storage facilities.

Scope

This standard applies to springs and seeps developed as a source of water. It does not apply to troughs or tanks (614) or to pipelines (516).

Purpose

Mainly to improve the distribution of water or to increase the quantity of water for livestock or wildlife. Also to obtain water for irrigation if water is available in a suitable quantity and quality.

Conditions where practice applies

Developments shall be confined to springs or seepage areas that can furnish a dependable supply of suitable water during the planned period or periods of use.

The need for and feasibility of protection from flooding, sedimentation, and contamination shall be considered in determining the suitability of a site for development.

Planning considerations

Water Quantity

Potential changes in surface water quantity, especially base flow. Factor is the removal of obstructions and vegetation in the spring area.

Water Quality

Potential temporary degradation of water quality caused by erosion and sedimentation from the area disturbed during construction.

Design criteria

Fracture and tubular springs. If water issues from rock fractures, the individual openings shall be cleaned and enlarged, as needed, to provide

an increase in flow. The water from these individual openings shall be collected and conveyed to a central sump or spring box by means of tile or perforated pipeline or by a gravel-filled ditch. The collection works shall be constructed an adequate distance below the elevation of the openings to permit free discharge.

If water issues from a single opening, such as a solution channel in a soluble rock formation or a tunnel in lava, the opening shall be cleaned or enlarged as needed. A collection system usually is not required, but a spring box or sump shall be installed at an elevation sufficiently low that water will not pond over the spring opening to a depth that will materially reduce the yield.

Perched or contact springs. Perched or contact springs occur where an impermeable layer outcrops beneath a water-bearing permeable layer. These springs shall be developed by intercepting and collecting the flow from the water-bearing formation. Collection trenches shall be used for developing these types of springs.

Artesian springs. Artesian springs shall be developed by removing obstructions, cleaning or enlarging joints or fractures, or by lowering the outlet elevation. Sumps and spring boxes shall be located so as to hold ponding over the spring outlet to a minimum.

Collection systems. If a collecting trench along the outcrop of the water-bearing formation is to be used, the trench shall be excavated so that it extends into the impervious layer.

An impervious cutoff wall of well-tamped clay, masonry, concrete, or other suitable materials shall be constructed along the downstream side of the trench if needed to insure that the flow enters the collection system.

The collection system shall consist of subsurface drainage tubing or perforated pipe not less than 3 in. in diameter, or a wood box drain enclosed in a sand-gravel filter. A crushed rock or gravel backfill, not less than 12 in. deep, may be used instead of these types of drains.

Spring boxes. Spring boxes, if needed, shall be of durable material and shall have a tight, removable cover. The boxes shall have a

minimum cross-sectional area of 1-1/2 ft². The floor of the spring box shall be not less than 6 in. below the outlet of the collection system. Spring boxes for perched springs shall be floored with concrete unless the underlying material is solid rock or other stable impervious material.

Outlets. The outlet pipe from a spring box shall be placed not less than 6 in. above the floor of the box to provide a sediment trap. However, the outlet must not be so high as to cause a head on the spring that can reduce flow. The outlet pipe shall be installed so as to insure a watertight

connection with the spring box. Measures required to protect the development from damage by freezing, flooding, sedimentation, contamination, and livestock shall be included in the design.

Plans and specifications

Plans and specifications for installing spring developments shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose.

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Design Criteria

Fracture and Tubular Springs

For springy areas a collection system consisting of perforated 4 inch or larger pipe or tubing should be installed in a trench and covered with rocks or coarse gravel. An impervious antiseep cutoff wall may be needed below (downstream of) the collector pipe. The perforated collector pipe should connect to a non-perforated pipe leading to the collection basin. The connection should be just above the antiseep wall.

Spring Boxes

Spring boxes that can be contaminated by livestock shall be fenced. Surface runoff shall be diverted from the spring box to prevent entry into the water system.

Outlets

The outlet pipe shall have a minimum diameter of 1 inch. Water from the spring box shall be conveyed to a permanent type tank or trough which meets Service standards. The outlet pipe shall have provisions to prevent clogging.

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SPRING DEVELOPMENT SPECIFICATIONS

All loose rock, sediment, encrustations, logs, and vegetation that can obstruct the free discharge of the spring shall be removed and disposed of so that they will not endanger the spring development.

Collection trenches, drain tiles, perforated pipe lines, sumps and spring boxes shall be constructed to the elevation and grade shown on the plans.

Crushed rock or gravel for collection systems and sand-gravel material for filters shall be composed of clean hard particles.

All materials used will be in good condition and meet the requirements of the applicable ASTM specifications or commercial standards.

All construction will be accomplished in a workmanlike manner that results in a "finished" appearance.

Construction operations shall be carried out in such a manner that erosion and air and water pollution are minimized and held within legal limits.

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SPRING DEVELOPMENT ENGINEERING NOTEKEEPING

Design and Layout Survey

- A. Record the following information:
1. Location sketch showing all components.
 2. Length, width, and depth of trench, if applicable.
 3. Length, size, and kind of collector pipes and outlet pipes.
 4. Specification of backfill material for filters.
 5. Dimensions and kinds of materials for spring box or sump.
 6. Dimensions and kind of antiseep cutoff wall, if applicable.
 7. Adequate grades and elevations for all components to ensure that system will function as planned.
 8. Signature and title of person approving design and date of approval.

Construction Check

- A. Make and record the following construction check items:
1. Elevations of spring area, collection pipes (perforated and non-perforated), spring box, and outlet pipe.
 2. Dimensions and type of antiseep cutoff wall.
 3. Quantity and type of components installed.
 4. Record, date, and sign statement concerning adequacy of construction.

Recording Data

- A. Data will be recorded in a standard engineering field book or an approved job sheet.