NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

VERTICAL DRAIN

(No.)

CODE 630

DEFINITION

A well, pipe, pit, or bore in porous, underground strata into which drainage water can be discharged.

PURPOSE

To provide an outlet for drainage water from a surface or subsurface drainage system.

CONDITIONS WHERE PRACTICE APPLIES

This practice is applicable in locations where the underlying strata can receive, transmit, or store the design drainage flow and other drainage outlets are not available and cannot be provided at a reasonable cost. The practice is applicable only in locations where a determination has been made that it is not contrary to state laws or regulations, and that it will not cause pollution of underground waters.

DESIGN CRITERIA

The number and size of vertical drains shall be adequate to discharge the design drainage flow into the underlying stratum or strata. The number, size, and location of the drains shall be based on a field determination of the depth, permeability, porosity, thickness, and extent of the strata.

The minimum diameter of shallow uncased wells shall be 24 in. and of deep cased wells, 4 in.

A suitable filter system, desilting basin, or other means for removing sediment from the water before it enters the well shall be provided.

Well casings shall be of adequate strength and longevity to serve planned needs.

PLANS AND SPECIFICATIONS

Plans and specifications for installing vertical drains shall be in keeping with this standard, and shall describe the requirements for properly installing the practice to achieve its intended purpose.

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

NRCS, OK
April 1981

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CONSERVATION PRACTICE SPECIFICATIONS

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RECHARGE WELLS

Holes. The hole will be drilled at the location designated by the responsible technician. The drilling will be performed in such a manner that the resultant hole is plumb. The diameter and depth of the hole will be the same as that indicated on the plans and in no case will the diameter be less than 10 inches. The portion of the hole that requires concrete around the casing will be drilled to a diameter 12 inches larger than the diameter of the casing.

Casing. The pipe used for casing the well will be new material of the diameter, gauge, and length specified on the plans.

Cementing. The area outside the casing and between the large hole will be filled with concrete. The concrete will be placed to avoid separation or honey-combing of the concrete mixture. The concrete mixture will have a ratio of 1:3:4. A concrete slab will be poured around the top of the casing. The slab will be 6 inches thick and extend at least two feet, in all directions, beyond the outside edge of the casing.

Inlet. A horizontal pipe shall be installed to provide drainage into the well. The inlet pipe will be the diameter, gauge, and length as shown on the plans. The inlet pipe will be installed to the grade lines specified on the plans. The section joining the casing will be installed before the concrete is placed and the joint between the inlet pipe and the well casing will be made watertight.

Vent and Cover. A 4" diameter vent pipe will be installed in the cover for the casing. The vent pipe will extend vertically to the elevation shown on the plans. A lid will be welded on top of the casing for a cover. All connections will be made watertight.

Debris Guard. A debris guard, when specified, will be installed around the inlet section of the inlet pipe. The guard will be of the size, dimensions, and material shown on the plans.

SUPPLEMENT

DESIGN CRITERIA

Feasibility. Feasibility of development will be based on detailed investigations and reliable local experience of reputable drillers. Test holes will be drilled and the formation accurately logged to determine location and suitability of formation for taking recharge water.

Location. The recharge well should be located so that maximum recharge benefits can be made from runoff water. The minimum size drainage area will be such that it will produce an average annual runoff of at least 15 acre ft. Other items to consider are diversion and impoundment works needed, depth of recharge well, suitability of formation for recharge and access for operation and maintenance.

The well will be located at least 10 feet outside the back toe of any diversion or embankment works.

Diversions and Impoundments. One of the more practical methods to collect water for recharge will be to intercept runoff water and divert it to an impoundment. A pipe is installed from the impoundment to the recharge well in order to drain the water into the underground formation. The basin created by the impoundment also acts as a sediment basin for silt and debris. In some cases, water is detained for several days and there is opportunity for settlement. Where excessive sediment loads are encountered, the sediment basin should be of

such size that it will hold 6 hours recharge capacity for the well.

Holes. Detailed geological investigations, including test hole drilling and exploratory work, will be accomplished before drilling the hole for the recharge well. The depth of the well will be determined from the log of borings at the location where the formation is considered suitable for recharge work. A suitable formation for recharge development would be one that is open and porous or has cavities or caverns 10 to 12 inches or more in depth. The diameter of the hole will be a minimum of 10 inches. The upper portion of the hole beginning at a point 10 ft. below the inlet will be drilled 12 inches larger in diameter than the casing being used.

Casing. All unconsolidated or soft material above the recharge formation will be cased. The casing will be of such size that the volume of water will be discharged in the designated time. A minimum size of 10-inch diameter casing will be used. Materials will meet the requirements for Well (642).

The casing will be centered in the hole. The top of the casing will project up one foot above the surface of the slab, and a cover will be provided to the top of the casing.

Vent. A standpipe a minimum of 4 inches in diameter will be installed on the cover for the casing. The top of the vent will be at an elevation of at least 1 foot above the planned water surface elevation of the impoundment. All connections will be made watertight.

Cementing. The area outside of the casing and between the large hole will be filled with concrete from bottom to top in order to provide a seal. A concrete slab will be poured around the casing at the top. The slab will be 6 inches thick and project a minimum of 2 feet beyond the diameter of the casing. The concrete mixture will have a ratio of 1:3:4.

Inlet. A horizontal pipe with an entrance section will be provided to drain water into the well. The entrance may be a hood inlet, drop inlet, or a pipe section with perforations. The inlet pipe will be no larger than the casing for the well. The inlet pipe will extend from the impoundment or sediment basin through the embankment or dike to the well. The inlet pipe will have positive grade to the well and the joint between the inlet pipe and well casing will be watertight. Where a hood inlet or drop inlet is used, the entrance will be surrounded by a debris guard consisting of 1-1/2" galvanized pipe frame covered with a minimum 14 gauge galvanized wire with openings between one and four square inches. The debris guard will be centered over the inlet and will have a minimum clearance of 12" vertically and horizontally from any part of the inlet. The framework. will consist of four 1-1/2" galvanized pipe posts with 1-1/2" galvanized pipe braces between the posts. One brace will be located at the top of the post and another halfway between the top of the post and the ground. A concrete apron will be poured for the bottom and the posts will be set in 2 ft. of concrete. The apron will be a minimum of 4 inches thick and will extend 6 inches beyond the outside of the posts. Where the pipe is perforated for an entrance, a debris guard is not necessary. The perforated section should have an open area of 1-1/2 times the cross sectional area of the pipe. If the inlet is torch slotted, the slots should be a minimum of 1/2 inches wide.

Design Criteria (Gyp Sink Improvement). Adequate engineering surveys and other site investigations will be made to determine that the gyp sink is feasible to develop. The type and amount of development will need to be determined on individual sites. The sink shall be developed in such a manner that the earthen overburden around the hole will be stabilized with vegetation, riprap, a grade stabilization structure or other suitable inlet. When the excavated material is mounded adjacent to the sink, it shall be shaped to a uniform top with smooth sides so it can be vegetated to prevent erosion.

Where excessive rock is encountered, vegetation may not be practical. Sinks which are not located in natural drainage ways shall have runoff diverted to them by means of a diversion terrace.

PLANS AND SPECIFICATIONS

Component parts of the vertical drain or recharge well, such as embankments or diversions, shall be designed and constructed according to the appropriate standard and specifications.

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Planning considerations for water quantity and quality

Quantity

1. Effect on aquifer recharge.

2. Effect on the water table.

3. The effect on the volume of downstream flow to downstream users and uses.

Quality

1. The potential hazard to ground water quality from the discharge of drainage water containing dissolved substances.

2. The potential for land use changes that may impair aquifer quality.