

**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.

**PURPOSES**

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

**CONDITIONS WHERE PRACTICES APPLY**

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. This practice is also applicable where natural “sinkholes” are the vertical drain and erosion control or treatment of surface runoff is a concern.

This practice is applicable only in locations where a determination has been made that it is not contrary to state laws or regulations, will not cause pollution of underground waters, and will not significantly affect underground habitats.

This practice is not applicable where development of the vertical drain will cause existing wetlands to be drained.

This practice does not apply where discharge from any animal confinement operation, private or municipal dump or landfill, or any other concentrated pollutant source may reach the drain.

**CRITERIA**

The number, size and location of vertical drains shall be adequate to discharge the design drainage flow into the underlying stratum or strata, and 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 6 inches and of deep cased wells, 4 inches.

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

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

**Utilities and Permits.** The landowner shall be responsible for locating all buried utilities in the project area, including drainage tile and other structural measures.

The landowner shall obtain all necessary permissions from regulatory agencies, including the US Army Corps of Engineers, US Environmental Protection Agency, and Illinois Department of Natural Resources – Office of Water Resources, or document that no permits are required.

**Criteria Applicable to Sinkhole Treatment.**

Sinkholes shall be backfilled with a graded filter and to grade with site soils. Filter gradations shall be based on the crevice/sinkhole opening and shall meet the requirements of Illinois NRCS Standard Drawings IL-ENG-209 or 210. For crevice/sinkhole openings greater than 12 inches, filter design shall be as per NEH, Part 633, Chapter 26 Gradation Design of Sand and Gravel Filters.

Inlets installed in sinkholes shall be located directly over a visible crevice or sinkhole entrance. Rock or concrete may be used to bridge any gap at the entrance and to support the drain at the base. Openings in the inlet shall extend to the surface.

Surface inlets shall be designed to store the runoff from a 24-hour, 10-year storm for a maximum of 24 hours, where cropland is in the ponded area; or 48 hours, where no cropland exists in the ponded area. Inlets shall include a trash-rack.

## **CONSIDERATIONS**

Significant diversions into underground storage areas may have an effect on the peak discharge rate from a watershed. Planners should consider this, and take steps to mitigate any potential negative effects this may have on riparian habitat downstream from the structure.

Significant additions to subsurface water sources may raise local water tables or cause undesirable surface discharges down gradient from the vertical drain.

## **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.

## **OPERATION AND MAINTENANCE**

An Operation and Maintenance (O&M) plan shall be prepared for and reviewed with the landowner or operator. The plan shall specify that the treated areas and associated practices are inspected annually and after significant storm events to identify repair and maintenance needs.

The O&M plan shall detail the level of repairs needed to maintain the effectiveness and useful life of the practice.

The inlets to vertical drains shall be inspected periodically to insure that they are not plugged

or damaged. Vegetative filters, sediment basins and other filters shall be maintained as per O&M requirements for each of the respective practice standards.

## **REFERENCES**

National Engineering Handbook, Part 633, Chapter 26, Gradation Design of Sand and Gravel Filters.

**NATURAL RESOURCES CONSERVATION SERVICE**  
**ILLINOIS CONSTRUCTION SPECIFICATION**  
**VERTICAL DRAIN**

1. **Site Preparation.** All undesirable materials located in the existing drain or sinkhole should be removed. All potential pollutants or sources of hazardous waste shall be safely disposed of as per state and local regulations.
2. **Excavations.** Carefully excavate overburden from fractured rock in sinkholes in order to expose the crevice/opening. Excavations shall extend, laterally, 2-feet from the crevice/opening. Excavation shall be laid back to 1:1 slopes or flatter or shoring used when excavation is in earth and workmen are to be allowed in the excavation.
3. **Installation.** Collapse and/or remove weak rock exposed near the crevice/opening of sinkholes. Place the inlet directly over the largest part of the opening, cover all other openings with filter fabric and place the drain over the largest part of the opening, cover all other openings with filter fabric, cut forms to fit around the inlet and place concrete or stone to form an inlet base. Do not place backfill over concrete sooner than 24 hours after placement.
4. **Backfill.** Filter Placement - For inlet backfill, where base rock riprap is used at the inlet base, a layer of IDOT CA-7 or CA11 gravel shall be placed 1 to 2 foot deep over the base rock prior to placing soil material. For instances where graded filters are used without an inlet, graded filters shall be placed with the largest rock at the bottom of the sinkhole. The average size of the base layer shall be equal to or greater than the maximum crevice opening. Rock gradations and installation shall be as per IL NRCS Standard Drawings IL-ENG-209 or 210 or as shown on the plans. Use the coarsest soil on site to cover the graded filter to ground level. Crown the backfill 10 percent of the total excavation depth for settlement. The appearance of the completed fill should be smooth and the surface free of any objects larger than 6-inches in any dimension.
5. **Vegetative Treatment.** The surface of the filled sinkhole and all other disturbed areas shall be prepared and seeded as per Illinois Conservation Practice Standard 342, Critical Area Planting.
6. **Materials.** Inlets for vertical drains shall meet requirements of tables 5 through 7, of Conservation Practice Standard 378, Pond. For those tables, the depth from filled surface of sinkhole to base of inlet shall be considered "fill over pipe". Concrete shall be designed to provide a 28 day compressive strength of 3000 PSI.
7. **Filter Drain.** Rock for filter drains shall meet the requirements for IDOT stone and coarse or fine aggregate.
8. **Safety.** All operations shall be performed in a workmanlike manner and proper safety precautions shall be observed. Heavy equipment shall not be operated adjacent to sinkholes unless an attendant is present on the ground to assist the operator in assessing site stability.