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Standard Practice for Monitoring Well Protection[1]

This standard is issued under the fixed designation D5787; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

INTRODUCTION

This practice for monitoring well protection is provided to promote durable and reliable protection of installed monitoring wells against natural and man caused damage. The practices contained promote the development and planning of monitoring well protection during the design and installation stage.

1. Scope*

1.1 This practice identifies design and construction considerations to be applied to monitoring wells for protection from damage and/or impacts.

1.2 The installation and development of a well is a costly and detailed activity with the goal of providing representative samples and data throughout the design life of the well. Damages to the well at the surface frequently result in loss of the well or changes in the data. This standard provides for access control so that tampering with the installation should be evident. The design and installation of appropriate surface protection will mitigate the likelihood of damage or loss.

1.3 This practice may be applied to other surface or subsurface monitoring device locations, such as piezometers, permeameters, temperature or moisture monitors, or seismic devices to provide protection.

1.4 *Units*—The values stated in SI (inch-pound) units are to be regarded as standard. No other units of measurement are included in this standard.

1.5 *This practice offers a set of instructions for performing one or more specific operations. This document cannot replace education or experience and should be used in conjunction with professional judgment. Not all aspects of this practice may be applicable in all circumstances. This ASTM standard is not intended to represent or replace the standard of care by which the adequacy of a given professional service must be judged, nor should this document be applied without consideration of a project's many unique aspects. The word "Standard" in the title of this document means only that the document has been approved through the ASTM consensus process.*

1.6 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D653 Terminology Relating to Soil, Rock, and Contained Fluids

D5918 Test Methods for Frost Heave and Thaw Weakening Susceptibility of Soils

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of common technical terms in this standard, refer to Terminology D653.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *barrier, n*—any device that physically prevents access or damage to an area.

3.2.2 *barrier markers, n*—plastic, or metal posts, often in bright colors, placed around a monitoring well to aid in identifying or locating the well.

3.2.3 *bollards, n*—steel pipe, typically from 10 to 30 cm (4 to 12 in.) in diameter and normally filled with concrete or grout that are placed around a well location to protect the well from physical damage, such as from vehicles.

3.2.4 *sealed cap, n*—a PVC, steel, or alloy pipe end cap, normally gasketed or sealed, that is designed to prevent water or other substances from entering into, or out of the well riser.

4. Significance and Use

4.1 An adequately designed and installed surface protection system will mitigate the consequences of natural damage (that

[1] This practice is under the jurisdiction of ASTM Committee D18 on Soil and Rock and is the direct responsibility of Subcommittee D18.21 on Groundwater and Vadose Zone Investigations.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

*A Summary of Changes section appears at the end of this standard is, freeze/thaw damage) in susceptible areas, or man caused damages (that is, from vehicles), which could otherwise occur and result in either changes to the data, or complete loss of the monitoring well.

4.2 The extent of application of this practice may depend upon the importance of the monitoring data, cost of monitoring well replacement, expected or design life of the monitoring well, the presence or absence of potential risks, and setting or location of the well.

4.3 Monitoring well surface protection should be a part of the well design process, and installation of the protective system should be completed at the time of monitoring well installation and development.

4.4 Information determined at the time of installation of the protective system will form a baseline for future monitoring well inspection and maintenance. Additionally, elements of the protection system will satisfy some regulatory requirements such as for protection of near surface groundwater and well identification.

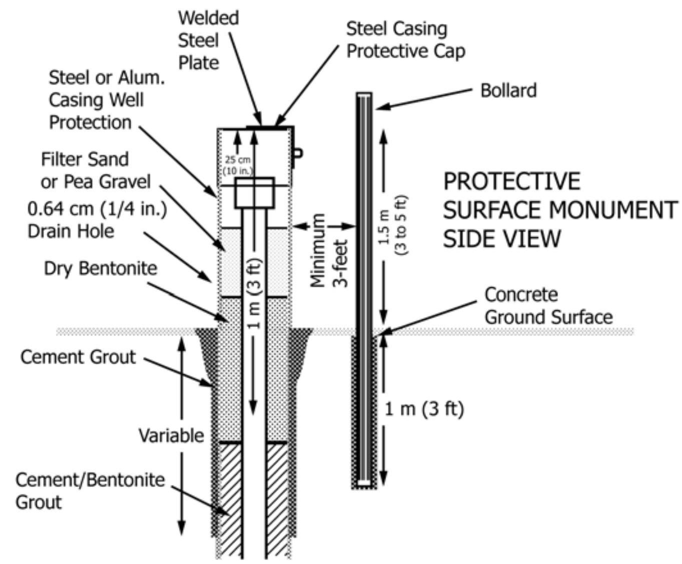

FIG. 1 Example of Protective Design

5. Design Considerations

5.1 The design of a monitoring well protective system is like other design processes, where the input considerations are determined and the design output seeks to remedy or mitigate the negative possibilities, while taking advantage of the site characteristics.

5.2 The factors identified in this practice should be considered during the design of the monitoring well protective system. The final design should be included in the monitoring well design and installation documentation and be completed and verified during the final completion and development of the well.

5.3 In determining the level or degree of protection required, the costs and consequences, such as loss of data or replacement of the well, must be weighed against the probability of occurrence and the desired life of the well. For monitoring wells which will be used to obtain data over a short time period, the protection system may be minimal. For wells which are expected to be used for an indefinite period, are in a vulnerable location, and for which the costs of lost data could be high, the protective system should be extensive. Factors to consider and methods of mitigating them are presented in the following sections.

5.3.1 *Impact Damages*—Physical damages resulting from construction equipment, livestock, or vehicles striking the monitoring well casing frequently occur. Protective devices and approaches include:

5.3.1.1 Extra heavy protective casings with a reinforced concrete apron extending 1 m or more (3 ft or more) around the casing may be an acceptable design in those areas where frost heave is not a problem. The principle behind this is to design the protective casing so that it will be able to withstand the impact of vehicles without damage to the riser within.

5.3.1.2 Bollards placed in an array such that any anticipated vehicle can not pass between them to strike the protective casing. Bollards are typically filled with concrete and set in post holes 1 m and greater (3 ft and greater) in depth, which are backfilled with concrete. Bollards typically extend from 1 to 1.5 m (3 to 5 ft) above the ground surface. Bollards are frequently used in and around industrial or high vehicle traffic areas. Costs for installation can be substantial however they provide a high degree of protection for exposed wells. Cost of removal at decommissioning can also be substantial.

NOTE 1—Cattle frequently rub against above ground completions leading to damage of unprotected casings. Concrete filled posts or driven T-posts, wrapped with barbed wire, are frequently used.

5.3.1.3 Barrier markers are relatively lightweight metal or often plastic posts which provide minimal impact resistance but which by their color, location, and height, warn individuals of the well presence. The use of barrier markers is effective in areas that are well protected from impact type damage by other features, such as surrounding structures or fences. They are relatively inexpensive to install.

5.3.1.4 Recessed or Subsurface casings may be used to mitigate impact damage by allowing the vehicles to pass over. Frequently used techniques include recessing the casing below ground level, using commercially available covers. These may take the form of valve pits or manholes, as examples. Advantages include both protecting the well while minimizing the interference to surface traffic, such as in parking lots or urban areas and screening the well from view. Using this technique, wells may be located in the most desired locations from a groundwater monitoring perspective. Disadvantages include the need to ensure surface drainage does not enter the well riser, either by maintaining positive drainage or by using a sealed riser cap (or both). When the risk is from the influx of surface water, drains below the level of the riser should be installed. In extreme cases, such as in location with high groundwater levels or potential drainage from surrounding areas, automatic sump pumps may be required. Consideration should be given to the sampling personnel who will require adequate space to perform sampling, particularly in manhole situations. Additionally, personnel protection requirements from working in a confined space should be considered.