Designation: D5787 – 20

Standard Practice for Monitoring Well Protection At or Near Land Surface[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 anthropogenic damage, which may compromise the condition of the well to provide representative potentiometric and water quality data for which it was constructed. 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 events, which may impair the intended purpose of the well such as water level or water quality monitoring data.

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. Damage to the well at the surface frequently results in the loss of the well or can potentially impact measured water level and/or groundwater quality data. This standard provides for access control so that tampering with the installation should be evident.

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

1.4 *Units*—The values stated in SI units are to be regarded as the standard. The inch/pound units given in parentheses are for information only. Reporting of test results in units other than SI shall not be regarded as non-conformance with the standard.

1.5 All observed and calculated values shall conform to the guidelines for significant digits and rounding established in Practice D6026, unless superseded by this standard.

1.6 *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.*

1.7 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.8 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

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

D5092 Practice for Design and Installation of Groundwater Monitoring Wells

D6026 Practice for Using Significant Digits in Geotechnical Data

3. Terminology

3.1 *Definitions:*

[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.

Current edition approved Jan. 1, 2020. Published January 2020. Originally approved in 1995. Last previous edition approved in 2014 as D5787 – 14. DOI: 10.1520/D5787-20.

[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**

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

4. Significance and Use

4.1 An adequately designed and installed surface protection system will mitigate the consequences of natural damage (e.g., freeze/thaw damage) in susceptible areas, or anthropogenic damages, which could otherwise occur and result in either changes to water level and/or groundwater quality 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.

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 very limited in scope. 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 to reasonably prohibit vehicle traffic from passing between them to prevent striking 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 visual markers that are relatively lightweight metal or often plastic posts, which provide minimal impact resistance. The barrier marker 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. Weight ratings and susceptibility to snowplows should be considered prior to selection. For example, these may take the form of valve pits or manholes or vaults (see D5092). 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 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

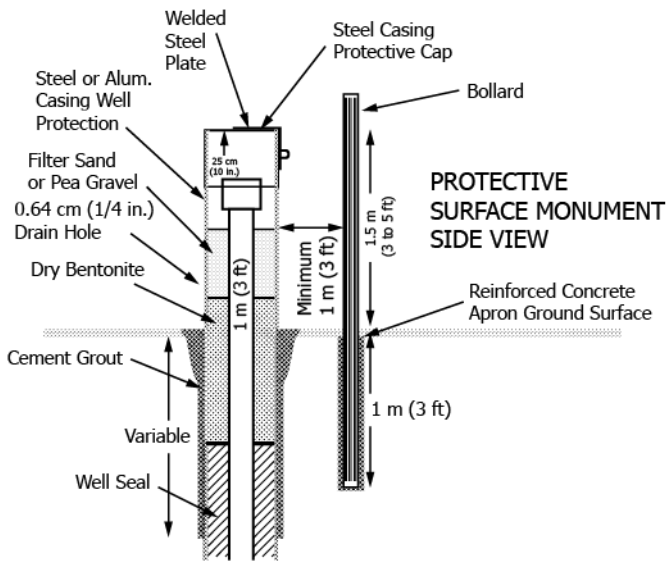

FIG. 1 Example of Protective Design