

Iowa Department of Natural Resources
Solid Waste Section of Land Quality Bureau

Related to
567 IAC 113.10(2)"c", 114.23(5), and 115.23(5)
Groundwater Monitoring Systems – Well Construction
Method for Sealing
September 22, 2016

Methods for Sealing

The following is applicable to all monitoring well installation at solid waste landfills.

Background

567 IAC 113.10(2)"c"(8) requires:

"(8) Monitoring well annular space shall comply with the following requirements:

1. Grouting materials must be installed from the top of the filter pack up in one continuous operation with a tremie tube.
2. The annular space between the filter pack and the frostline must be backfilled with bentonite grout.
3. The remaining annular space between the protective casing and the monitoring well casing must be sealed with bentonite grout from the frostline to the ground surface."

Significant literature exists that indicate that tremie tube grouting is not the most effective seal for monitoring wells. The use of bentonite chips out-performed tremie tube grouting in a Nebraska study reported in 2009, and later reviewed by State of California.

The rules in 114.23(5) for construction and demolition landfills and 115.23(5) for industrial landfills are similar to 113.10(2)"c".

Decision

The Iowa Department of Natural Resources (DNR) will allow dry bentonite well grouting/sealing as an alternative to the requirements of 113.10(2)"c"(8), 114.23(5), or 115.23(5). The following procedures shall be used if using dry bentonite for well grouting/sealing or well/borehole plugging activities:

1. Dry poured bentonite seals should only be used if the depth to the bottom of the borehole or annular space is less than 50 feet, and the height of standing water in the borehole or annular space is less than 25 feet at the time of bentonite seal placement.
 - a. Seals placed below the water table can use sodium bentonite chips or pellets as defined in item 3 below.
 - b. Seals placed above the water table can use #6 to #8 mesh sodium bentonite granules, placed in lifts, tamped and hydrated as described in item 8 below.
2. All drilling fluid and drill cuttings shall be removed from the borehole prior to placing the seal. The only fluid that should be in the borehole/annular space at the time of grouting/sealing is formation water or potable water.
3. To reduce the potential for bridging, use the proper sized chips or pellets for the annular space available. The size of the bentonite chips or pellets shall not be any larger than one-fifth of the width of the annular space or borehole into which they are being placed. For example, sealing a 2 inch well in a 5.25 inch borehole requires chips no larger than 3/8 inch. Plugging an uncased 4 inch borehole can use 1/2 to 3/4 inch chips.
4. Calculate the borehole or annular space volume prior to grouting to determine the amount of material required to fill the borehole or annular space. Record calculated and actual volumes used on the boring and well construction log(s) or the plugging record.
5. Bentonite chips and pellets shall be screened before or during placement in the borehole/annular space to ensure that all fine bentonite particles are removed.
6. Use a pour rate of 3 minutes or slower per 50-pound sack. Ensure that the pour rate is consistent and slow.
7. Run a sounding or tamping bar in the borehole or annular space during pouring to sound/measure the fill rate of the annular space and break up potential grout bridges or bentonite cakes.
8. Above the water table, install bentonite granules in individual poured lifts of up to 2 feet in thickness. Tamp each lift in-place and then hydrate with potable water prior to placement of subsequent lifts. The hydration water shall be poured through a tremie pipe to reduce wetting of the well casing or borehole. Wetting of the well casing or borehole may cause a bentonite cake to form, restrict the annular working space, increase the potential for bridging of the sealing products, and cause an ineffective seal. If low moisture soils are present in the borehole profile, the bentonite granules may be

placed in unhydrated form using tamped lifts of up to 2 feet in thickness and then hydrating the lift.

Justification

The DNR believes that this decision provides equivalent or superior performance to existing well completion methods.

The DNR intends to revise solid waste rules in the future with language to expand the methods acceptable for monitoring well construction to allow the use of dry bentonite for well/borehole grouting, sealing and plugging.

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Date

