

3745-9-06 **Well construction, specific geologic conditions.**

- (A) In addition to the requirements of rule 3745-9-05 of the Administrative Code, a well completed in specific geologic conditions shall be constructed according to the following procedures:
- (1) Where consolidated formations are encountered within twenty-five feet of the ground surface, an oversized borehole shall be drilled and the annular space shall be filled with grout by pressure grouting.
  - (2) A well completed where multiple aquifers are present shall have the casing extend through aquifers that are not contributing to the water supply of the well. The annular space contiguous to aquifers that are not contributing to the water supply of the well shall be filled with grout by pressure grouting.
  - (3) A well completed in confined aquifers shall have the casing extend through the confining layer to the top of the aquifer. The annular space contiguous to the confining formation shall be filled with grout by pressure grouting. Filter packs and formation stabilizers shall not extend significantly into a confining formation or allow interconnection of two separate aquifers along the annular space.
  - (4) A well completed in aquifers with hydrostatic heads greater than the land surface elevation shall have casing and grout installed to protect the aquifer, prevent erosion of the overlying geologic materials and confine the flow to within the casing, and shall be constructed according to the following procedures:
    - (a) If the anticipated flow at the ground surface is not excessive, after the borehole is drilled, and the casing set, the water in the casing may be pumped to lower the water level in the casing and the annular space. The annular space shall then be filled with cement grout by pressure grouting. The density of cement grout shall be sufficient to control flow in the annular space, but no less than that required by rule 3745-9-07 of the Administrative Code.
    - (b) If the water flow at the ground surface is anticipated to exceed five gallons per minute, an upper enlarged borehole shall be drilled partially into the confining formation. The upper enlarged borehole shall be at least four inches in diameter larger than the nominal diameter of the outer well casing. The annular space between the upper enlarged borehole and outer well casing shall be filled with cement grout by pressure grouting. The outer casing may be left as permanent casing once the well is completed, or it may be removed. Where outer casing is not removed, the casing shall be withdrawn at least five feet to ensure grout contact with the formation.
    - (i) If the confined aquifer is consolidated, a smaller diameter borehole shall be drilled through the upper enlarged borehole, the inner casing shall be firmly seated into the bedrock, and the remaining annular space shall be filled with cement grout by pressure grouting. The density of cement grout shall be sufficient to control flow in the annular space, but no less than that required by rule 3745-9-07 of the Administrative Code.

- (ii) If the confined aquifer is unconsolidated, a smaller diameter borehole shall be drilled through the upper enlarged borehole, with casing and a screen installed into the confined aquifer. The well shall be double-cased, and the remaining annular space filled with cement grout by pressure grouting. The density of cement grout shall be sufficient to control flow in the annular space, but no less than that required by rule 3745-9-07 of the Administrative Code.
- (5) A well completed in a cavernous formation or mine shall be constructed according to the following:
  - (a) A cavernous formation or mine that is not being used as a source of water shall have casing installed through the formation or mine, as follows:
    - (i) If a cavernous formation or mine is greater than twenty-five feet below ground surface, then the formation or mine shall be filled with cuttings, clean gravel or grout. Packers or shale traps shall be installed at the top and bottom of the formation or mine. The annular space shall then be filled with grout by pressure grouting.
    - (ii) If a cavernous formation or mine is less than twenty-five feet below ground surface, casing shall be installed in an enlarged borehole and the annular space shall be filled with a cement grout containing additives that promote bridging of the cavernous formation or mine by pressure grouting to a depth of at least five feet beyond the formation or mine.
  - (b) If a cavernous formation or mine will be the source of water supply, then a packer or shale trap shall be installed at the top of the formation or mine and the annular space shall be filled by pressure grouting with grout.
- (6) A well encountering brine producing formations shall be constructed according to these procedures. Brine producing formations that are encountered during drilling shall have casing installed throughout the entire formation. The annular space contiguous to the brine producing formation shall be filled with grout by pressure grouting, or the well shall be sealed to an elevation higher than the top of the brine producing formation. Grout that is not adversely affected by the brine water shall be used for sealing the well or annular space.
- (7) Except when a well is completed in the upper-most weathered portion of a consolidated formation, a well completed in a consolidated formation shall have the casing extend into the formation so that the well casing will not settle or shift, and will have a proper annular seal.

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