

**Construction requirements for class I wells.**

- (A) All class I wells shall be sited in such a fashion that they inject into a formation which is beneath the lowermost formation containing, within one-quarter mile of the well bore, an underground source of drinking water.
- (B) All class I wells shall be cased and cemented to prevent the movement of fluids into or between underground sources of drinking water. The casing and cement used in the construction of each newly drilled well shall be designed for the life expectancy of the well. In determining and specifying casing and cementing requirements, the following factors shall be considered:
- (1) Depth to the injection zone;
  - (2) Injection pressure, external pressure, internal pressure, and axial loading;
  - (3) Hole size;
  - (4) Size and grade of all casing strings (wall thickness, diameter, nominal weight, length, joint specification, and construction material);
  - (5) Corrosiveness of injected fluid, formation fluids, and temperatures;
  - (6) Lithology of injection and confining intervals; and
  - (7) Type or grade of cement.
- (C) All class I injection wells, except those municipal wells injecting non-corrosive wastes, shall inject fluids through tubing with a packer set immediately above the injection zone, or tubing with an approved fluid seal as an alternative. The tubing, packer, and fluid seal shall be designed for the expected service.
- (1) The use of other alternatives to a packer may be allowed with the written approval of the director. To obtain approval, the operator shall submit a written request to the director, which shall set forth the proposed alternative and all technical data supporting its use. The director shall approve the request if the alternative method will reliably provide a comparable level of protection to underground sources of drinking water. The director may approve an alternative method solely for an individual well or for general use.
  - (2) In determining and specifying requirements for tubing, packer, or alternatives, the following factors shall be considered:

- (a) Depth of setting;
  - (b) Characteristics of injection fluid (chemical content, corrosiveness, and density);
  - (c) Injection pressure;
  - (d) Annular pressure;
  - (e) Rate, temperature and volume of injected fluid; and
  - (f) Size of casing.
- (3) All areas of a well that may come into contact with corrosive wastes shall be constructed of corrosion-resistant materials.
- (D) Appropriate logs and other tests shall be conducted during the drilling and construction of new class I wells. A descriptive report interpreting the results of such logs and tests shall be prepared by a knowledgeable log analyst and submitted to the director. At a minimum, such logs and tests shall include:
- (1) Deviation checks on all holes constructed by first drilling a pilot hole, and then enlarging the pilot hole by reaming or another method. Such checks shall be at sufficiently frequent intervals to assure that vertical avenues for fluid migration in the form of diverging holes are not created during drilling.
  - (2) Such other logs and tests as may be needed after taking into account the availability of similar data in the area of the drilling site, the construction plan, and the need for additional information, that may arise from time to time as the construction of the well progresses. In determining which logs and tests shall be required, the following logs shall be considered for use in the following situations:
    - (a) For surface casing intended to protect underground sources of drinking water;
      - (i) Resistivity, spontaneous potential, and caliper logs before the casing is installed; and
      - (ii) A cement bond, temperature, or density log after the casing is set and cemented.
    - (b) For intermediate and long strings of casing intended to facilitate injection:

- (i) Resistivity, spontaneous potential, porosity, and gamma ray logs before the casing is installed;
  - (ii) Fracture finder logs; and
  - (iii) A cement bond, temperature, or density log after the casing is set and cemented.
- (E) At a minimum, the following information concerning the injection formation shall be determined or calculated for new class I wells:
  - (1) Fluid pressure;
  - (2) Temperature;
  - (3) Fracture pressure;
  - (4) Other physical and chemical characteristics of the injection matrix;
  - (5) Physical and chemical characteristics of the formation fluids; and
  - (6) Compatibility of injected fluids with formation fluids.

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