

Cementing Records Requirements in Direct Implementation Programs to Achieve Part II of Mechanical Integrity in Class II Injection Wells

National UIC Technical Workgroup Final Work Product #6

The Underground Injection Control regulations, specifically 40 CFR §146.8, maintains that an injection well has mechanical integrity if 1) there is no significant leak in the casing, tubing or packer (typically referred to as Part I) and 2) there is no significant fluid movement into Underground Sources of Drinking Water (USDWs) through vertical channels adjacent to the injection well bore (typically referred to as Part II). This paper addresses one of the methods an operator of a Class II injection well is permitted to use to demonstrate Part II of mechanical integrity. Specifically, 40 CFR §146.8(c)(2) allows the submission of cementing records to satisfy Part II of the mechanical integrity requirement.

What should be contained in an acceptable cementing record submission? This question has gone unanswered since the inception of the UIC program. It is important that the information being submitted allows the regulator to effectively evaluate whether the well has been constructed adequately to prevent fluid movement into USDWs. For EPA direct implementation (DI) programs, as well as for state primacy programs, it is important that the information used to evaluate the cementing record submission be similar so that a degree of consistency between programs is maintained. A well defined submission will not only provide regulators with an improved method of evaluating one of the more important environmental requirements of the UIC program, mechanical integrity, but, at the same time, will allow owners and operators of injection wells to provide regulators with documents that are universally accepted.

One point of clarification which this paper would like to bring to the readers attention, is the distinction made between the submission of cementing records for the demonstration of Part II of mechanical integrity and the requirements for Class II injection well construction. Section 146.22 of the regulations requires that all Class II wells be cased and cemented to prevent the movement of fluids into or between USDWs. Typically, most Class II wells are constructed such that surface casing is cemented from 50 feet below the identified lowermost USDW to the surface and then completed with cemented long string casing, tubing and packer. However, the UIC regulations do not specifically require a demonstration of Part I or Part II of mechanical integrity for the surface casing. Therefore the cementing records or completion reports submitted to verify that adequate cementing has been achieved for the surface casing may be different than the cementing records submitted to demonstrate Part II of mechanical integrity. Part 147 of the regulations provides a more definitive description on the construction requirements for Class II wells in each state.

The following portion of this paper summarizes the cementing record submission requirements for each Class II DI program. Tables 1 and 2 provide a condensed summary of the cementing record submission requirements. Although the cementing record submission requirements for DI programs may differ slightly, it is important to note that each program requires, at a minimum, each of the following items:

1. A cement ticket or cementing records from the operator or service company representative (or similar records from a state or other governmental jurisdiction);
2. A log typically a Cement Bond Log (CBL) to verify placement and location of cement (**Note: A CBL is not necessarily required by each DI program in an operators primary submission.**)

- However, if an operator is unable to provide the cementing record documentation the DI program requires, the CBL is requested as a substitution); and**
3. Documentation that minimum construction standards have been met.

At a minimum, these three items should provide the documentation necessary to effectively evaluate a cementing record submission. If further information regarding this paper is desired, please contact Stephen Platt at 215-814-5464 or another member of the UIC Technical Workgroup listed on attachment 1.

Summary of Cementing Record Submissions UIC Direct Implementation States

Region 2/New York

Region 2 requires that a cementing ticket from the operator or a service company representative be submitted for existing Class IIR wells as well as recompleted wells. Newly drilled Class IIR wells and Class IID wells require a cement ticket accompanied by a cement bond log (CBL). The CBL must document a good cement job for at least 100 feet above the confining zone. No squeeze jobs are permitted.

Region 3/Pennsylvania, Virginia

In an existing well, if the surface casing has not been cemented to the surface, the operator must install long string casing and cement it to the surface. A cementing ticket as well as the results of CBL or temperature log must also be submitted.

In a new injection well, the operator must document, through a cementing ticket, cement returns to the surface on the surface casing. A top of cement (density) log must be run if returns are not achieved. In addition, the submission of a cementing ticket as well as CBL or temperature log is required for the long string casing. A minimum of 100 feet of cement is required on the long string for both IIR and IID wells. Depending upon the depth of a IID well, it is recommended that the long string casing be cemented back into the next larger casing string.

Region 4/Kentucky, Tennessee

An operator may submit approved state oil and gas forms. A CBL is required to be run when an operator can't provide any cementing records. In addition, a CBL is required for new wells if cement returns to the surface are not documented by the cementing ticket on the long string casing.

The use of cementing tables to calculate annular fill-up is required. Both Kentucky and Tennessee require cement to be circulated to surface on all casing strings. If returns are not achieved, a top of cement log, CBL or temperature log is run. When applicable, a one inch tremmie string is typically used to place cement down the backside of the casing if returns do not reach the surface. A minimum of 50 feet of cement is required across the confining zone for injection zone isolation.

Region 5/Michigan

It is strongly encouraged that cement be circulated to the surface on new wells. Minimally, there must be 250 feet of cement placed above the injection zone. For existing wells, if there is less than 250 feet of cement behind the longstring enough cement must be placed, either through a squeeze job or via a tremmie pipe, to achieve the 250 feet minimum. To verify this, the operator is required to submit either a state signed completion report providing the number of sacks of cement used or a cement job ticket from the well service company that performed the job.

If there is no information on the amount of cement used or if cementing records show less than 250 feet of cement, the operator must 1) perform a squeeze followed by a CBL or 2) run a noise, temperature or oxygen activation log to show no fluid movement. If the second option is followed, then the log is run prior to authorization to inject and every 5 years thereafter.

Region 5 has no specific criteria for what constitutes an acceptable CBL. Decisions regarding a good bond are based on site specific conditions including strength of cement, amount of bonded interval in the confining zone, etc. Typically, the Region accepts 250 feet of cement with at least 100 feet of well bonded cement extending into the confining zone.

Region 6/Osage and Other Indian Lands

The region accepts Bureau of Indian Affairs (BIA) or Bureau of Land Management (BLM) information and well schematics are reviewed to ensure consistency with the permit application. If there are differences, the BIA or BLM cementing records/reports are used or the operator is required to resolve the difference. The volume of cement required is calculated using casing size, hole size, and cementing tables. Variations in construction are permitted depending upon the year when construction took place.

Fluid movement is prevented by 1) surface or long string casing cemented from 50 feet below the base of the lowermost USDW to the surface, 2) an adequate confining zone between the injection zone and the USDW (500 feet total thickness or 100 feet cumulative shale) and 3) 100 feet of cement above the injection zone. To confirm adequate cement and no fluid movement, a radioactive tracer survey or temperature logs are sometimes run. More frequent mechanical integrity testing is sometimes required if total footage of cement is not adequate.

Region 8/Numerous Indian Lands

The Region requires the submission of a CBL or Cement Evaluation Log (CEL) as a means to verify that there is adequate cement above the injection zone. The amount of cement footage is based on casing size and 80% bonding. If this criteria is not met, the operator is required to run a radioactive tracer survey to show the absence of fluid movement. Any records the operator has related to cementing (e.g., cement tickets, original drilling and completion reports) must also be submitted.

Region 9/Arizona, Navajo Nation

Casing and cementing records are required for all Class II injection wells, including records of cemented surface and intermediate strings of casing. Existing rule authorized wells and newly converted wells require casing and cementing records only, unless those records fail to provide adequate assurance that fluid movement into USDWs can not occur. Casing and cement records will consist of the driller's report,

cement tickets, and/or an improved Bureau of Land Management or State completion report. Additional evidence is required if cementing records are judged to be inadequate for making a determination of no potential for fluid movement into or between USDWs. In that case, an external MIT will be required to make that determination. A CBL may be acceptable as evidence of external integrity, or a temperature log may be required if cementing records and the CBL are inconclusive.

Newly drilled wells require cementing records and a CBL, and may require a temperature survey to assess flow behind pipe if cement is not circulated to the surface and USDWs are exposed to potential inflow of annular fluids.

MINIMUM CEMENT RECORDS REQUIRED AS MECHANICAL INTEGRITY DEMONSTRATION FOR EXISTING CLASS II WELLS IN DIRECT IMPLEMENTATION PROGRAMS						
REGION	RECORD TYPES				MINIMUM CEMENT	
	Cement Records	State/BLM Form	TOC log	CBL	Surface Casing	Production Casing
2	IIR				information unavail.	information unavail.
3	IIR			IIR(a)	circulate to surface	circulate to surface(a)
4	IID, IIR(b)	IID, IIR(b)		IID, IIR(c)	information unavail.	information unavail.
5	IID, IIR(b)	IID, IIR(b)			no requirement	top inj. zone +250'
6		IID, IIR(d)		(f)	circulate to surface	100' above inj. zone
8	IID,IIR			IID, IIR	circulate to surface	must show isolation
9	IID, IIR	IID,IIR		IID, IIR(e)	information unavail.	information unavail.

1. if returns on surface casing are not achieved
2. either/or
3. if cement records can not be provided
4. or Bureau of Indian Affairs
5. if cement records inconclusive
6. radioactive tracer or temperature logs sometimes run to confirm adequate cement and no fluid movement