



PROCEDURE FOR CONDUCTING THE TEMPERATURE LOG FOR EVALUATING EXTERNAL MECHANICAL INTEGRITY OF A CLASS I WASTE DISPOSAL WELL

Procedure #: UICI-9
(4/11)

Narrative:

The purpose of this test is to evaluate the external mechanical integrity of the well. A well has external mechanical integrity if there is no fluid movement behind the casing through vertical channels adjacent to the wellbore. One method of checking external mechanical integrity is to conduct a series of temperature logs following the procedures listed in this document.

A plan for this test shall be submitted to KDHE for review and approval prior to conducting the test. In order to provide KDHE opportunity to witness the test, the schedule for conducting the test shall be mutually agreed upon. Plan approval shall be obtained from KDHE before commencing the test. The plan shall include a schematic of the well configuration for the test, a prognosis and a schedule for conducting the test. The procedure listed is general in nature. When developing a test procedure for an individual well; the well configuration, geology, hydrology, and operating conditions must be considered. K.A.R. 28-46-33 establishes mechanical integrity requirements.

Procedure:

1. Clear the wellbore of any material that would be corrosive to the logging tools and ensure that there are no obstructions that will prevent the passage of the temperature tool.
2. The temperature log must be conducted through the injection tubing to obtain "real condition" data and to be protective of human health and the environment.
3. An appropriate scale for the temperature log must be selected. Frequent shifts in the log will be required if the scale selected is too small which makes the log difficult to interpret. If the scale is too large, the log is again difficult to interpret because temperature changes and gradients are difficult to discern. A scale range of 4°F/inch to 10°F/inch is generally the best.
4. The temperature log shall be conducted in tandem with a collar locator log and a gamma-ray log. A differential temperature curve shall be included.
5. The temperature tool shall be sensitive to temperature changes of at least 0.1°F.
6. The temperature log shall be run going into the well. The logging speed should be between 20-35 feet per minute. The logging speed shall be kept constant for all sequential passes. Stopping the tool during a log run should be avoided.
7. The well shall be shut-in for a minimum of 24 hours to allow the well to reach "static" conditions prior to running the base log.

8. Record the beginning and ending clock time on each log pass.
9. Run the base log from surface to total depth after the 24-hour shut-in period.
10. Record the temperature of the liquid to be injected just prior to injection and then periodically during injection, record the temperature of the liquid injected. Provide this information with the final report.
11. Inject the greater of either three well volumes or one barrel of fluid per each foot of disposal interval. The well volume is to be calculated using the volume of the longstring casing plus the open hole interval, if applicable. The best results are obtained when the difference between the injected fluid temperature and the wellbore temperature at the zone of interest is at least 35° F, especially if the temperature log is conducted through the tubing. In no case shall the temperature difference be less than 10°F. Even minor variations in the temperature of the injection water can adversely influence the results; thus, a source of water with a uniform temperature should be used. The injection rate used should be at a normal operational injection rate and, if feasible, the maximum permitted injection rate.
12. Cease injection and place the logging tool at a depth 300 feet above the disposal zone. Make three passes from 300 feet above the disposal zone to total depth at the one-hour, two-hour and the four-hour interval after stopping injection.
13. Pull the temperature log to surface. Run the final base temperature log from surface to total depth.
14. Submit the temperature logs to KDHE with the following information on each log:
 - a. time log was run
 - b. well conditions, shut-in, injecting
 - c. scales
 - d. logging speed
 - e. depth and size of various casings, depth and size of tubing, packer seat depth

A report shall accompany the logs describing the procedure, volume of fluid injected, well construction data, rate at which fluid was injected, and the injection pressure. The report shall also include an interpretation of the logs and a description of the temperature log results by a person with the technical expertise to evaluate the logs.

15. If the well is determined to be lacking external mechanical integrity, injection shall cease immediately and the permittee shall submit the following to KDHE for review and approval: 1) an evaluation of the impact to the environment which may require additional testing approved by KDHE, 2) an environmental remediation plan and implementation schedule, and 3) a repair plan and implementation schedule for the well. No work is to commence until plan and schedule approval has been obtained from KDHE.