

Directive 009

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Casing Cementing Minimum Requirements

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1 Introduction

1.1 Purpose of This Directive

This directive sets out casing cementing requirements in accordance with sections 6.080 and 6.090 of the [Oil and Gas Conservation Rules](#) and sections 24 and 28 of the [Geothermal Resource Development Rules](#).

This directive outlines

- the method for determining the required cement tops when cementing casing,
- cementing requirements for casing, and
- AER requirements for the use of special cements such as foam and thermal cements.

1.2 AER Requirements

Following AER requirements is mandatory for the responsible duty holder as specified in legislation (e.g., licensee, operator, company, applicant, approval holder, or permit holder). The term “must” indicates a requirement, while terms such as “should,” “recommends,” and “expects” indicate a recommended practice.

Each AER requirement is numbered.

Information on compliance and enforcement can be found on the AER website.

1.3 What’s New in This Edition

This directive now also applies to geothermal resource development. References to the *Geothermal Resource Development Rules* have been added to section 1.1 and section 2.

2 Cementing Requirements

The licensee is responsible for the satisfactory cementing of casing, as required by the *Oil and Gas Conservation Rules* and *Geothermal Resource Development Rules*. Set out below are the requirements for cementing casing.

2.1 Conductor Pipe (where required for well control)

- 1) The conductor pipe must be cemented full length by the circulation method.
- 2) If the cement job fails to retain its integrity, then drilling must be suspended and remedial action undertaken.
- 3) The hole diameter must be at least 100 mm larger than the diameter of the pipe.

2.2 Surface Casing

- 4) Surface casing must be cemented full length.
- 5) If cement returns are not obtained at surface or the cement level in the annulus drops, then the cement top must be determined and welloboperations@aer.ca contacted to discuss remedial action.
- 6) Fillers or additives that reduce the compressive strength must not be used in the cement.
- 7) Surface casing must be adequately centralized at the top and bottom and at 50-metre intervals.

2.3 Production, Intermediate, and Liner Casing

- 8) Cement must not be pumped down the annulus from surface unless approved by the AER.
- 9) The minimum cement top must be determined as outlined in section 4 of this directive.
- 10) The required cement volume must be based on hole-size measurements, taken from a caliper log, plus a minimum of 20 per cent excess. An exemption from the 20 per cent excess requirement may be granted upon application.
- 11) The use of fillers and/or additives to the cement system is acceptable only if the compressive strength of the mixture is at least 3500 kPa after curing for 48 hours at the temperature of the uppermost hydrocarbon-bearing zone.
- 12) The temperature of the zone referred to in item 11 must be calculated using a surface temperature of 4.4°C and a 2.7°C/100 m temperature gradient where the actual temperature is unknown.
- 13) Stage cementing programs, which will result in an open-hole (uncemented) interval behind casing, must be approved by the AER.
- 14) Liners must be cemented full length.
- 15) During the cementing operation, flow returns must be visually monitored. If cement returns are not obtained at surface when cementing full length, or if displaced drilling fluid returns indicate that the required cement top may not have been obtained, a cement-top locating log must be run. The log and a proposed remedial cementing program must be submitted to the AER within 60 days of rig release, or prior to commencement of completion operations.
- 16) Full details of the cementing operation must be recorded and submitted to the AER either on the tour reports or on a casing cement report.
- 17) The casing must be adequately centralized. On intermediate and production casing, centralizers must be placed at the top and bottom of all productive formations and at 50-metre intervals to the required cement top.

3 Use of Special Cements

In addition to the cementing requirements in the previous section, the AER requires the following when special cements are used.

3.1 Foam Cement

- 18) If circulation of foam cement to surface occurs, the rig's blowout preventers must be closed and circulation monitored through a bleed-off line equipped with an operational adjustable choke and pressure gauge until displacement is completed.
- 19) The pumping of cement down the annulus is not permitted unless prior approval has been obtained from the AER. This approval must be obtained from the AER well in advance of the job.
- 20) The compressive strength requirement of 3500 kPa in 48 hours is applicable to the foam cement column, but only up to the required cement top of 100 metres above the shallowest hydrocarbon-bearing zone.

3.2 Thermal Cement

- 21) The AER considers thermal cement to be a blend which does not exhibit a significant reduction in strength when subjected to temperatures greater than 360°C. As a minimum, the cement blends used in oil well cementing must be designed to withstand the operating conditions they will be subjected to; however, there is a need to ensure that the potential for enhanced recovery operations is not compromised.
- 22) All wells licensed for the purpose of the production of crude bitumen (primary, experimental, or commercial) will be required to cement casing with thermal cement. The well licence will be provisioned accordingly.
- 23) Conventional wells licensed in designated oil sands areas and that penetrate oil sands zones will be required to cement casing with thermal cement from 30 metres below the base of the deepest oil sands zone to 30 metres above the top of the shallowest oil sands zone.

4 Method of Determining Required Cement Top

In order to determine the required cement top in a given area, refer to figure 1 (a PDF version is available on the AER website) and follow the steps in the bulleted list below.

- 24) Where the required surface casing setting depth is less than 180 meters or the base of groundwater protection (BGWP) depth, the casing string next to the surface casing must be cemented full length. This requirement takes precedence over the required cement top in figure 1 or on the licence.

- Refer to figure 1 which identifies the required cement tops by township, range, and meridian. Using the example of Township 36, Range 24, West of the 4th Meridian, the required cement top is “100 metres above the top of the Viking and/or any shallower potential hydrocarbon-bearing zone.”
 - Should the township and range be blank, then send an email to welloperations@acr.ca after the well has been drilled and evaluated to obtain approval of the licensee’s proposed cement top.
 - The cement top requirements shown on figure 1 are subject to change, and priority will be given to requirements specified on the well licence or by an AER representative.
- 25) Requests for a relaxation or change in the required cement top will not normally be considered prior to the drilling and evaluation of a well; however, provided good offset data exists, requests will be evaluated, but may not be granted.
- All requests must be supported by log or sample interpretation, or other data from offset wells or the well being drilled. These requests should be directed to welloperations@acr.ca as far in advance of the cementing operation as possible.
- 26) If log evaluation indicates a shallower hydrocarbon-bearing zone than the required cement top, it must be covered and the AER notified accordingly.

