Directive 009: Casing Cementing Minimum Requirements

July 1990

Effective June 17, 2013, the Energy Resources Conservation Board (ERCB) has been succeeded by the Alberta Energy Regulator (AER).

As part of this succession, the title pages of all existing ERCB directives now carry the new AER logo. However, no other changes have been made to the directives, and they continue to have references to the ERCB. As new editions of the directives are issued, these references will be changed.

Some phone numbers in the directives may no longer be valid. Contact AER Inquiries at 1-855-297-8311 or inquiries@aer.ca.
Casing Cementing Minimum Requirements

July 1990
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1  INTRODUCTION

The purpose of this guide is to outline casing cementing requirements in accordance with sections 6.080 and 6.090 of the [Oil and Gas Conservation Regulations].

This guide:

- quotes the relevant sections of the regulations;
- outlines the method for determining the required cement tops when cementing casing;
- outlines cementing requirements for casing;
- outlines Board requirements for the use of special cements such as foam and thermal cements.
2 THE REGULATIONS

The regulations governing the cementing of casing for wells in Alberta are the "Oil and Gas Conservation Regulations", sections 6.080(4) and (6) and 6.090, as quoted below.

2.1 Section 6.080

"(4) Where the required surface casing setting depth is less than
(a) 180 metres, or
(b) 25 metres below any aquifer which is a source of useable water

the casing string next to the surface casing shall be cemented full length."

NOTE: The intent of section 6.080(4) above is to ensure the protection of useable groundwater by the adequate cementing of production and/or intermediate casing in lieu of the requirement to set deeper surface casing.

"(6) The licensee shall ensure that surface casing is cemented full length from the depth prescribed by the Board before any drilling is commenced more than 10 metres beyond the prescribed setting depth."

2.2 Section 6.090

"The Licensee shall cement casing as prescribed by the Board's Guide G-9, Casing Cementing - Minimum Requirements, as amended from time to time, unless the Board,

(a) exempts the Licensee from the requirements, or
(b) prescribes another method for cementing the casing for a particular well or area."
3 CEMENTING REQUIREMENTS

The licensee is responsible for the satisfactory cementing of casing, as required by the Oil and Gas Conservation Regulations. These requirements are summarized below:

3.1 Conductor Pipe (where required for well control)

(a) The conductor pipe shall be cemented full length by the circulation method.

(b) If the cement job fails to retain its integrity, then drilling shall be suspended and remedial action undertaken.

(c) The hole diameter shall be at least 100 mm larger than the diameter of the pipe.

3.2 Surface Casing

(a) Surface casing shall be cemented full length.

(b) If cement returns are not obtained at surface or the cement level in the annulus drops, then the cement top shall be determined and the appropriate ERCB Area Office contacted to discuss remedial action.

(c) Fillers or additives that reduce the compressive strength shall not be used in the cement.

(d) Surface casing shall be adequately centralized at the top and bottom and at 50-metre intervals.

3.3 Production, Intermediate, and Liner Casing

(a) Cement shall not be pumped down the annulus from surface unless approved by a Board representative.

(b) The minimum cement top shall be determined as outlined in Section 5 of this guide.

(c) The required cement volume shall 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.
(d) 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.

(e) The temperature of the zone referred to in item (d) should 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.

(f) Stage cementing programs, which will result in an open-hole (uncemented) interval behind casing, shall be approved by a Board representative.

(g) Liners shall be cemented full length.

(h) During the cementing operation, flow returns shall 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 shall be run. The log and a proposed remedial cementing program shall be submitted to the Board within 60 days of rig release, or prior to commencement of completion operations.

(i) Full details of the cementing operation shall be recorded and submitted to the Board either on the tour reports or on a casing cement report similar to the example in the Attachment 2.

(j) The casing shall be adequately centralized. On intermediate and production casing, centralizers shall be placed at the top and bottom of all productive formations and at 50-metre intervals to the required cement top.
4 USE OF SPECIAL CEMENTS

In addition to the foregoing Cementing Requirements (Section 3) the Board requires the following when special cements are used.

4.1 Foam Cement

(a) If circulation of foam cement to surface occurs, the rig's blowout preventers shall be closed and circulation monitored through a bleed-off line equipped with an operational adjustable choke and pressure gauge until displacement is completed.

(b) The pumping of cement down the annulus is not permitted unless prior approval has been obtained from the Board. This approval shall be obtained from the appropriate ERCA Area Office or the Calgary Office well in advance of the job.

(c) 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.

4.2 Thermal Cement

(a) The Board considers thermal cement to be a blend which does not exhibit a significant reduction in strength when subjected to temperatures greater than 360°C.

It is expected that, as a minimum, the cement blends used in oil well cementing will 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.

(b) 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.

(c) 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.
5 METHOD OF DETERMINING REQUIRED CEMENT TOP

In order to determine the required cement top in a given area refer to the Map of Alberta (Attachment 1) and follow the steps outlined below.

(a) In all cases if less than 180 metres of surface casing has been run, or casing is not set more than 25 metres below any aquifer which contains usable water, the intermediate or production casing shall be cemented full length. This requirement will take precedence over the required cement top in the map (Attachment 1) or on the licence.

(b) Refer to the map, which identifies the required cement tops by township, range, and meridian.

(c) 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".

(d) Should the township and range be blank, then the appropriate ERCB Area Office shall be contacted after the well has been drilled and evaluated to obtain approval of the licensee's proposed cement top.

(e) The cement top requirements shown on the map are subject to change, and priority shall be given to requirements specified on the well licence, or by a Board representative.

(f) 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 the appropriate ERCB Area Office as far in advance of the cementing operation as possible.

(g) If log evaluation indicates a shallower hydrocarbon-bearing zone than the required cement top, it shall be covered and the Board notified accordingly.
## CASING AND CEMENTING REPORT

### WELL NAME (COMPLETE)
- **WELL**
- **WELL NAME (COMPLETE)**
- **UNIQUE I.D.**
- **LE**
- **LSD**
- **SEC**
- **TWP**
- **RGE**
- **W**
- **M**
- **LICENSEE / AGENT**
- **LICENSEE REP.**
- **CONTRACTOR AND RIG NO.**

### HOLE
- **HOLE**
- **BIT SIZE**
- **AVG HOLE SIZE (CALIPER)**
- **TOTAL DEPTH**
- **KELLY BUSHING**
- **CEMENT TOP REQUIREMENT**
- **REQUIRED CEMENT VOLUME**
- **MUD TYPE AND DENSITY**

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<th>SIZE (mm)</th>
<th>INTERVAL (m)</th>
<th>LINEAR DENSITY</th>
<th>CASING GRADE</th>
<th>CONNECTION TYPE</th>
<th>NUMBER OF JOINTS</th>
<th>COMMENTS (NEW? USED?)</th>
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### CASING
- **IS CASING AS PER LICENCE OR APPROVAL ?**
- **IF NOT, WHY ?**
- **FLOAT COLLAR MAKE**
- **SET AT**
- **SHOE MAKE**
- **SET AT**
- **CENTRALIZERS - NO. AND DEPTH SET AT**
- **SCRATCHERS - NO. AND DEPTH SET AT**
- **CASING RECIPROCATED ?**
- **ROTATED ?**

### CEMENTING COMPANY
- **CEMENTING**
- **OPERATOR**

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<th>TYPE</th>
<th>ADDITIVES</th>
<th>TONNES (t)</th>
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<th>DENSITY (kg/m³)</th>
<th>MO WATER (m³)</th>
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- **GOOD RETURNS THROUGHOUT JOB ?**
- **CEMENT RETURNS ?**
- **AMOUNT**
- **FALBACK**

### SAMPLES TAKEN
- **SAMPLES TAKEN ?**
- **SAMPLES SET UP ?**

### COMMENTS

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**ERCOB REP.**