



Department of Primary Industries

15 March 2010
Our Ref: SP-E/PETOps (Montara Submission)

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Mr John Jepson
Executive Officer
Montara Commission of Inquiry
GPO Box 890
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Our Ref:

Dear Mr Jepson,

Montara Inquiry – Request for Information

I refer to your letter dated 5 March 2010 requesting information about drilling practices as described below. The following outlines how DPI views and undertakes assessment prior to approval of the examples requested by the Commission.

General Information

What would constitute International/Australian good oilfield practices in relation to the testing of a cemented casing shoe in circumstances where the casing shoe is in a hydrocarbon bearing zone and is to left as the primary barrier in the long-term suspension of the well?

The testing of casings is guided by industry best practice (good oilfield practice) as per recommended international agencies such as API. Australia does not have such a standard or recommended guide. The closest guidance is the now revoked Clause 504 of the PSLA 1967 Schedule of Specific Requirements. The clauses in the schedule are prescriptive and were revoked when the P(SL)(Management of Well Operations) Regulations came into force in 2004. Even though revoked, Clauses in the Schedule are used by DPI for guidance. Clause 504 is attached.

Testing of casing in reservoirs requires that the integrity of the casing and its cemented shoe track is acceptable at all times so that the casing is able to act as a first barrier to any invasion of formation fluids into the well bore or into the annular space between the casing and the open hole or another casing. Well integrity should be maintained at all time - whether the well is actively worked on or suspended temporary or temporary abandoned (long term suspension). That means that there must be well control in place at all times. In addition, other barriers should be placed inside the well bore and in the annular spaces above the last cemented casing shoe. The last cemented casing shoe must have adequate cement inside its shoe track and outside the casing so that the cement fills the inside of the casing shoe track as well as the annular space above the top of the reservoir. DPI uses Clause 504 as a guide which states that the top of cement should be at least 150 metres above the top of reservoir and bottom of cement (in shoe track) is at least 30 metres.



Particular circumstances regarding testing of the cemented casing shoe to prove its integrity as a primary barrier.

- 1. a casing pressure test conducted immediately following the pumping of cement and "bumping" of the shoe plugs but prior to the wait on cement (WOC); and/or**
- 2. any other test subsequent to WOC otherwise designed to test the integrity of the cementing job (including but not limited to further pressure tests, cement bond logging etc).**

If the plugs were bumped during cementing, it can be taken as the cementing process was done as per programmed. That means the volume of cement and the displacement fluids were as calculated or estimated. Testing of the casing could be conducted almost immediately with sufficient pressure to test both the casing and the plug integrity. However, larger casing (e.g. 340 mm) such as those used for surface or immediate depths, should not be tested immediately as testing creates a high tensional load (heavy load) on the casing. DPI considers it best to test the casing only after the cement has properly set or at least after WOC period. The casing pressure test is normally held at the calculated pressure (about equal to the maximum burst pressure as calculated, which is usually less than 85% of the internal yield pressure of the casing strings) for between 20 to 30 minutes. If the pressure test failed because the float failed (plug does not hold); the casing should be tested again after the cement has set or after the WOC period (based on samples collected during cementing). WOC could be at least 3 to 4 hours. However, it is better to test the second time after at least 12 to 24 hours to ensure that the cement has set completely. This is the most prudent thing to do and most, if not all, companies follow this principle or practice. The second test can be prior to drilling out the cement and casing shoe for drilling ahead into the production zone. This is normally after the BOP has been tested and installed which could take place for at least 24 hours. By then the cement is duly set. If the test fails again, then the casing and its cement need to be repaired by such methods as squeeze cement or a cement bond log (CBL) is run particularly to see the cementing of the annular space. While a CBL is useful in determining the amount of cement in the annular space, there are limitations and shortfalls with CBL. Appropriate analysis need to be conducted as compared to just casual qualitative examination of the logs. Australia does not have a prescriptive regulatory requirement for CBL to be run for every casing and cementing job but the DA can insist on CBL as a matter of "good oilfield practice". This has been done in a number of cases in the Victorian jurisdiction.

If the plugs are not bumped then there is uncertainty in the cementing process - adequacy of the calculated volume of cement and displacement volume is uncertain. In such a case, testing of the casing and its cement should only be carried out after WOC or prior to drilling out the cement and casing shoe. Again, the BOP would be tested and installed by then. If the test failed, squeeze cementing is one of the methods to repair the cement job. In this case (scenario 2) it is the same as when the plugs are bumped but the immediate pressure test failed. Again, there is no prescriptive regulatory requirement to repair bad cementing or to conduct second casing test etc. However, these process are normally provided for in the accepted WOMP or the drilling and completion program

Any variation to the above practices will require closer examination of the company's proposal and risk assessment of the proposal and this is taken on a case by case basis. In all cases, this process or procedures should be described in the accepted WOMP or in the casing and cementing program (usually part of the drilling and completion program).

It must be noted that well integrity does not rely solely on the primary barrier. It is unwise to rely only on cemented casing as the only barrier for well integrity even if the above tests have been conducted and are accepted as confirming the calculated integrity of the cemented casing. There must be appropriate secondary barriers in place for the well at all times, particularly when the well is being worked on whether it is active (live) or been killed. Well integrity needs to be considered as "a whole well approach" in that the well must be controlled at all time. The petroleum industry practice in Australia is to have at least 2 barriers with appropriate high viscosity mud in its well bore if the well is suspended at the reservoir level or appropriate mechanical barriers such as completion valves and packers are in place. The well should be killed before suspension. Abandoned wells normally require at least 3 barriers and DPI would treat long term suspended wells as temporary abandoned wells requiring this number of plugs. Our earlier submission pointed to three different types of well suspensions practised in offshore Victorian waters. Any variation to the above would depend on the company's proposal, its risk assessment and would be treated on a case by case basis depending on the geology (reservoir/aquifer conditions etc) and how the well will be managed and monitored as contained in the company's standards or its standard operating procedures. These documents are usually listed in the accepted WOMP and can be easily audited by the DA.

Should you have any queries regarding the information supplied or any other associated matter please not hesitate to contact me on (03) 9658 4414 or email terry.mckinley@dpi.vic.gov.au

Yours sincerely



TERRY MCKINLEY
Manger Petroleum and Gethermal Operations
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Att:

Cementing 504
of casing
strings

- (1) Structural casing strings and conductor casing strings (other than those placed by jetting or driving) shall be cemented with sufficient cement to fill the annular space between the casing string and the wall of the hole or next outer casing string from the casing shoe of the structural or conductor casing string to the seabed if possible.
- (2) Surface casing strings shall be cemented with a volume of cement sufficient to fill the annular space between the casing string and the hole to a height of at least 450 metres above the shoe of the casing string or to the seabed if such casing string is less than 450 metres in length. Unless otherwise directed -
 - (a) any excess return cement slurry as a result of cementing the conductor pipe or surface casing may be discharged to the sea
 - (b) the column of cement slurry used for commissioning and acceptance testing of cementing equipment may be discharged to the sea.
- (3) Intermediate and production casing strings and liner strings shall be cemented with sufficient cement to fill the annular space between the casing string and the wall of the hole or next outer casing string as follows -
 - (a) from each cementing point (including the casing shoe) to a height of at least 150 m above the cementing point;
 - (b) to a height of at least 100 metres above any zone not previously cased containing fluid hydrocarbons;
 - (c) additionally, in case of a liner string which is used as an intermediate or production casing string, the overlap between the liner string and the next larger casing string previously set shall be cemented with sufficient cement to fill at least 30 metres measured length of the annular space between the liner string and the next larger casing string, unless provision is made for the overlap to be sealed in some other effective manner or unless otherwise approved.

- (4) All casing string cementations shall be carried out in accordance with good oilfield practice and the details of the cementing operations shall be recorded in the driller's log. If there is any reason to suspect a faulty cementing operation, the Director shall be notified.
- (5) After the cementing of casing strings, drilling shall not be commenced until a time lapse of -
 - (a) 24 hours; or
 - (b) 8 hours under pressure for the surface casing string and 10 hours under pressure for all other casing strings.
- (6) For the purpose of sub-clause (5)(b) the cement is considered to be under pressure if during the time lapse referred to in that sub-clause the cement after placing is restrained from movement by the use of float valves or other approved equipment.
- (7) If the cementing requirements of this clause have not been achieved by primary cementing operations, endeavours shall be made to meet those requirements by recementing or by remedial cementing, unless otherwise approved.