Cementing Contingencies

**Purpose**

To ensure minimal operational time with minimal exposure of risk to personnel and equipment.

If a cementing problems occur while cementing, the following “best practices” contingency procedures will be adhered to.

**Responsibilities**

It will be the responsibility of the Operators drilling representative to ensure that others with duties relating to these operations are aware of their responsibilities.

**Scope**

These procedures shall apply to all drilling personnel.

**Reference**

Stena, Service company and Operator’s Specific Procedures.
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**CONTINGENCY Squeeze Cementing**

**Shoe Squeeze Suggested Procedure**

After drilling out shoe perform leak off test at casing shoe and estimate volume of cement required based on the results of this test. Hold safety and job procedure meeting, perform calculations for reverse pressures etc.

1. Run in EZ Drill SV Squeeze Tool on workstring and set sufficiently high above the shoe such that all the slurry should be out of the stinger prior to the cement contacting the formation.

2. Pressure test surface lines.

3. Stay in hole with mechanical setting tool and pressure test casing with stinger stung out of packer.

4. Sting into EZ DRILL SV and re-establish injection into the formation with clean fluid, once injection test has been performed unsting from packer.

5. Pump Fresh water Spacer ahead of cement.


7. Hold back pressure to prevent cement freefall and sting into the EZSV stripping through Hydril. Sufficient weight should follow be set to prevent pump out of the stinger from the EZSV.
### Continuous Squeeze Method

- **a)** Squeeze cement at rate predetermined from injection test. Set a maximum squeeze pressure 80% of estimated (known) frac gradient.

- **b)** If a gradual pressure build-up is observed during squeeze, continue squeeze until the maximum pressure previously set is achieved.

- **c)** Slowly bleed off pressure and observe amount and rate of returns.

- **d)** If bleed off and returns are excessive then the pressure should be built back up to the maximum previously set and maintained. Periodically (every 15-20 mins) the pressure can be slowly bled off again and the returns observed. If necessary the pressure can be built up.

- **e)** Ensure that cement is not overdisplaced out of the shoe.
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Hesitation Squeeze Method

a) If after pumping half of the slurry volume (when following the continuos squeeze method) no appreciable increase in pressure is observed then a Hesitation type squeeze can be performed.

b) After pumping ½ the slurry volume shut down pumps. Observe final injection pressure, then bleed off pressure slowly observing returns and final pressure.

c) Leave slurry static for 10-20 mins.

d) Slowly inject 2-5 bbls of slurry. Shut down pumps. Observe final injection pressure, then bleed off pressure slowly observing returns and final pressure.

e) Leave slurry static 10-20 mins.

f) Repeat steps 3 and 4 as necessary until maximum pressure previously agreed upon is reached. Ensure that the slurry is not over displaced, i.e. 15 m remains in the shoe track.

8. Pull tubing 3 m off the packer and reverse circulate the tubing string.

9. POOH with work string, wait a minimum of 12 hours, if no squeeze pressure was seen during the cementing operations then sting back into the EZSV and pressure test, if pressure test is OK drill out EZSV and cement in shoe, otherwise repeat

Notes: Ensure that hesitation or continuous squeeze operations do not continue for a period that total time for the operations including reverse circulation of the tubing does not exceed the laboratory tested thickening time less a one hour safety factor.

If no squeeze pressure is seen during these operations over displace cement a minimum of 18 m below EZSV.

This recommendation is to be used as a guide only. Job conditions and field experience must dictate actual job procedures.
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CIRCULATION SQUEEZE REPAIR

PURPOSE OF SQUEEZE CEMENTING
Squeeze cement jobs are required for remedial repair of a primary cement job, to isolate specific intervals or to abandon specific reservoir sections.

CIRCULATION/SQUEEZE REPAIR
A circulation/squeeze repair may be required if the primary cement job does not reach part of the annulus and zonal isolation is inadequate. The casing is perforated and cement displaced up the annulus. If no circulation is possible behind the annulus due to a seal higher up then it may be possible to achieve circulation by additionally perforating higher up the casing and circulating cement around the two sets of perforations.

SETTING PROCEDURE
a) Identify the perforation interval required from the cement bond logs.

b) Run bit and scraper.

c) Set a drillable bridge plug or viscous pill below zone to be cemented.

d) Perforate if required.

e) Set a cement retainer 6m above the squeeze interval.

f) Stab into cement retainer and establish injectivity using water. Acidize if required.

g) Pump slurry using water spacers ahead and after the cement. Squeeze cement. Leave at least 15m of cement above the cement retainer.

h) Pull out of cement retainer and allow cement to equalise. Reverse circulate clean. If there are two sets of perforations pull to above the top set of perforations before reverse circulating clean. It may be necessary to squeeze the top perforations depending upon completion requirements.

i) The remedial cementation can be tested after drilling out the cement retainer.
STANDARD PRACTICES

1. Squeeze cementing is usually carried out through a drillable cement retainer, although in some cases a bradenhead squeeze may be an acceptable alternative.

2. A squeeze slurry should, ideally, have fluid loss less than 50 ml/30 min. This will help prevent premature hydration and provide better control in directing the placement of cement into channels or voids behind the casing.

3. A hesitation squeeze technique should be used to control the build up of cement solids against the formation. The slurry thickening time should be long enough to perform a hesitation squeeze.

4. Squeeze pressure should be carefully controlled so as not to exceed a maximum of 85% of fracture pressure.

5. Injection rate through perforations should be established using solids free fluid as opposed to mud.

6. Before a cement squeeze is undertaken the upward force generated by the pressure in the wellbore should be calculated to ensure that the string weight and annular closing pressure is sufficient to overcome these forces. At shallow depth, where the calculations show insufficient pipe weight, it will be necessary to lock the string in place with the pipe rams before applying pressure to the wellbore.

7. During squeeze cementing operations, the drill floor should be evacuated of non-essential personnel.

Notes
1. Provided the formation does not fracture, only cement filtrate, not whole cement enters pore spaces.
2. When the formation is fractured, cement slurry enters as a series of irregular wedges not as one distinct wedge.
3. Only a small interval of the perforations is likely to be receptive to fluid.
4. When a packer is used, ensure the bottom hole pressure does not exceed 85% of the collapse pressure of the casing. The packer may have to be repositioned or back pressure applied.
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REPORTING

1. Pressure and rate for injection test. State type and weight of fluid in use.

2. Volume of cement slurry mixed. Type of cement. Type and concentration of additives used. Slurry weight.

3. Displacement volume, pressures and rates. Spacer type and volume. (Also report bottom hole pressure vs volume pumped).

4. Total volume of cement squeezed/circulated behind casing.

5. Insert details on recorder chart.

6. Squeeze cement telex to be sent in after squeeze.

TESTING OF SQUEEZED OFF PERFORATIONS

The perforations should ideally be inflow tested to evaluate the quality of the shut off. The cement squeeze may be pressure tested, but a positive test is no guarantee of success.

Details of the inflow test draw down and time will be provided in the cementing programme.