From: Walz, Gregory S
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To: Taylor, Charles E
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Wellsite Checklists
Cementing Responsibilities

Wellsite Leader/Drilling Engineer

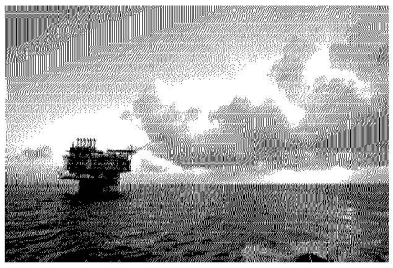
Cement Engineer

Drilling Contractor

Mud Engineer

Mud Logger

Wellsite Leader/Drilling Engineer
Cementing Responsibilities



Tick box

General

1	Supervise all Companies involved in the safe execution of the cement job.	☐
2	Verify that the final slurry recommendation meets the job requirements including DWOP and ETP compliance.	☐
3	The specifications given in the drilling programme should be checked against actual conditions in the well.	☐
4	For land wells ensure Service Company is advised of the time they are expected at location and any site specific requirements.	☐
5	Ensure that all Companies are contacted and informed in time to complete these preparations for the job.	☐
6	Approve all reports, worksheets and job tickets.	☐
7	In areas where the "Working Time Directive" applies ensure there are sufficient resources to prepare and execute the cement job.	☐
8	In areas where a chemical permit is required, ensure that all chemicals including contingencies are included in the permit.	☐

Tick box

Slurry Design

1. For an offshore location ensure all final slurry designs have been based on samples of materials taken at the rig site. For onshore wells, ensure tests are on actual field blend samples/materials. ☐

2. Confirm with the cement engineer that sufficient materials and contingency materials (normally 100% extra) are available at the rig site. ☐

3. Ensure the thickening time of the slurry is greater than the planned job time, including mixing time. ☐

   i. As a general guide, the thickening time to 50Bc at the bottom hole circulating temperature should exceed the time to mix, pump and displace by more than 2 hours. ☐

   ii. Review achievable mixing rate based on bulk supply and ensure this is factored into the pumping time estimate. ☐

4. Review strength development indicated by laboratory testing against timeline for subsequent operations (pressure testing, barrier removal, drill out) and discuss any WOC identified with Cement Company to assess possible mitigations. ☐

Tick box

Equipment

1	Confirm with Cement Engineer that all cement unit maintenance is current and all pressure retaining equipment (e.g. cement heads/ chiksans) have appropriate testing/certification.	☐
2	For land locations confirm location of the cement equipment with adequate supply of water, mud etc. Ensure Cement Company is aware of any location requirements (zoning etc). Confirm that acceptable wash up procedures and disposal plans have been made.	☐
3	Confirm float equipment was callipered, checked for debris and threads are OK. Also confirm operation of float equipment during casing running operation.	☐
4	If a stage collar is being used, confirm it has been checked for closed position, it is clear of debris and the threads are not damaged. Check plugs and baffles are correctly installed.	☐
5	For a sub sea plug or liner system, confirm plugs are correctly assembled, swivel is OK and plugs are compatible with launch balls/darts and landing collar. Drift drill pipe and x overs in landing/running string. Check the launch balls/darts have been correctly loaded in the dropping head. Ensure there are no bevelled profiles inside any of the equipment that restrict the travel of a plug or dart.	☐

		Tick box
6	For surface cement heads, confirm o-rings, valves and manifold are OK and that the pipe seals and indicator system are functioning.	☐
7	Confirm the liquid additive system (LAS) calibration is correct (particularly verify accuracy of automatic LAS) and all data recording devices are functioning correctly.	☐
8	Confirm correct centralisers are available and suitable stop collars have been supplied. Confirm installation is according to design and review any necessary changes with the Cement Company engineer.	☐
9	Where a computer based LAS is used, the Wellsite Leader will verify that the correct information has been loaded.	☐
10	Ensure exclusion of non essential personnel during pressure testing operations and ensure an announcement is made.	☐
11	Confirm that all temporary pipework connections and ratings are compatible.	☐
12	Confirm that the Drilling Contractor has prepared the bulk system and pits	☐

Job Planning

		Tick box
1	Review job simulation from the Cement Company and ECD predictions at relevant depths. Review/agree proposed pumping schedule with Cement Engineer and Drilling Contractor.	☐
2	Confirm planned slurry excess with Cement Engineer and whether this is on calliper or theoretical OH diameter. Assess the potential for TOC to impact APB mitigations or the BOP.	☐
3	Review field spacer properties against planned design; confirm it has been amended to deal with any changes in mud properties required during the drilling phase. Ensure a biocide is added to any spacer left behind pipe.	☐
4	Ensure any departures from the plan are discussed with Cementing Company to ensure their impact is fully assessed. Where appropriate, the "Management of Change" process should be followed.	☐
5	Agree plug launching sequence and verify plug launches via indicators on cement head.	☐
6	Review casing pressure testing requirements, timing and contingencies.	☐
7	Review and communicate plans for mud and hole conditioning, equipment clean-up and disposal of contaminated returns.	☐

Tick box

Execution

1 Co-ordinate the execution of the cement job. Ensure that all relevant personnel are issued with a detailed programme of the cement job, highlighting individual responsibilities. The detailed programme must include volumes, pressures and pump rates for the cementing and displacing operations. Contingency plans must also be drawn up. Procedures must be written to cover alternative mix water supply, rig pump failure, and what to do if predicted pressures are exceeded or return volumes are insufficient to maintain displacement with mud. ☐

i. Ensure Drilling Contractor, Cementer, Mud Engineer and Mud Logger have reviewed their responsibilities for supporting the cementing operation and confirm they have met all requirements in their appropriate checklists. ☐

ii. Hold pre-job meeting with all involved in the cementing and pressure testing operations. Confirm PPE is available and MSDS reviewed before handling chemicals. ☐

iii. Clarify with the Cement Contractor if job involves any new technology at this location. ☐

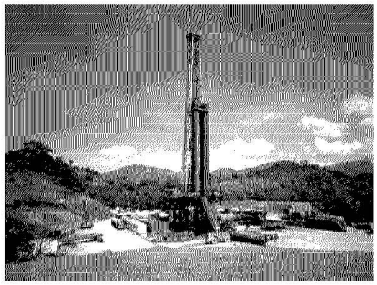
		Tick box
	iv. If new technology is involved, verify competence and experience of Cement Company Personnel.	
	v. Clarify lines of communication and use of PA or radios in noisy areas.	
2	Where a pill has been spotted in the rathole to prevent cement slumping, ensure circulation has occurred at casing setting depth.	☐
3	Carry out independent calculations for the cement job and reconcile results.	☐
4	Determine the displacement volume, pump strokes and time at which the displacement rate should be reduced prior to bumping the plugs. Displace cement at maximum rate allowable by pressure limitations, unless advised otherwise. Confirm mud compressibility with Mud Engineer and ensure this is factored into the displacement calculation. Review pre-job circulation and mud conditioning requirements with Cementer and Mud Engineer and agree plan. Where mud properties are different from those used in simulations by Cement Company, request modelling of pressures and displacement to be updated.	☐

		Tick box
5	Displacement should be from a separate pit than the returns, so that displacement volumes can be accurately monitored. The pump stroke counters will not be relied on as the only means of calculating the volume of displacement pumped, (this may not be possible with large displacement volumes).	☐
6	Agree in advance the additional displacement volume that can be pumped to bump the plug and the pressure which must be held after bump and the duration of the test.	☐
7	Unless rig pump efficiency is very well understood, use the cement unit to displace cement plugs, liner jobs and for all cementing through drill pipe. Volumes should be cross checked from mud pit measurements as well as the cement unit displacement tanks.	☐
8	Inform the Mudloggers and Driller of:	
	a. Which mud pits are being used for mix water preparation.	☐
	b. The volume of each type of mixwater to be used for both lead and tail cement jobs.	☐
	c. The expected gain, per barrel of mixwater blended with cement, for both lead and tail slurries.	☐

		Tick box
	d. The expected total volume of returns during the cement job and the expected overall increase in pit volume.	☐
9	Ensure the pressurised mud balance has been calibrated and is used to confirm slurry density during cementing operation.	☐
10	Inform the Mudloggers and the Driller at the start of mixing cement.	☐
11	Inform the Mudloggers and Driller when changing from the lead to the tail cement slurry and at the end of pumping cement.	☐
12	Maintain plot of displacement versus top of cement and also the position of the top plug, identifying any pressure events during displacement with the volume pumped. Compare theoretical and actual pressures.	☐
13	Periodically advise Mudloggers of total cement slurry pumped.	☐
14	Record all mixing, displacing, bumping, opening/closing of DV collars, etc on pressure chart.	☐
15	After bumping top plug, release pressure, measure returns and check for backflow.	☐

		Tick box
16	If float equipment fails and/or pressure is held on the casing, a pressure gauge should be installed on the cement head so that the required pressure can be maintained and excessive pressure bled off periodically. In this case the pressure left on must not exceed the observed differential pressure between mud and cement.	☐

Cement Engineer
Cementing Responsibilities



		Tick box
1	Maintain and operate the cementing equipment and all associated equipment to the highest standards of reliability. Ensure that the equipment has valid certification (including certification for any densitometer with a radioactive source) and adequate spares.	☐
2	Review the cementing equipment pressure ratings with the anticipated pressures during the pumping or pressure testing operation. Where temporary pipework has been supplied, ensure all connections are of the same type and rating before assembly.	☐
3	Ensure all equipment required for the execution of the cement job is serviceable and ready. Check cement head and load plugs. Check float equipment prior to running casing.	☐
4	Obtain representative samples of cement and additives and forward these in good time for laboratory testing, properly packaged. Samples will be protected from deterioration using air tight containers. Where Cementer cannot himself physically obtain samples he must witness the sampling to ensure sampling is in compliance with API sampling procedures.	☐

		Tick box
5	Record stock levels of cement and additives, maintain quality control and physically check all stocks prior to the cementing operation. Ensure adequate stock is available to complete the cement job including contingency. Liquid additives should be checked by use of a hydrometer. Maintain a logbook of all materials used and delivered.	☐
6	Confirm with Drilling Contractor that no bulk has been transferred to the tank(s) after samples were taken and that sufficient tested cement is available to complete the job.	☐
7	Where necessary, confirm bulk tank sequence during the job with the Drilling Contractor.	☐
8	Review mud condition requirements with Mud Engineer and Wellsite Leader at least 24 hours before reaching section TD.	☐
9	Carry out independent cement calculations and verify calculations with the Wellsite Drilling Engineer and/or the Wellsite Leader.	☐
10	Where a chemical permit is required, ensure all chemicals (including contingencies) and correct quantities are included in the permit.	☐
11	Confirm that adequate power and air are available for the cementing equipment, based on predicted pressure requirements and job design.	☐
12	Confirm pop off settings are appropriate for the job planned.	☐

		Tick box
13	Provide temperature information from the well to Cement Company Design Engineer.	☐
14	Check the cement unit and equipment and ensure the following:	☐
	a. Unit and lines are pressure tested to minimum 1000psi above casing test pressure using a chart recorder.	☐
	b. Unit displacement tank barrel scale is accurate.	☐
	c. Displacement tank valves do not leak and are easily operable.	☐
	d. Low-pressure mixing system is flushed through.	☐
	e. Packing on mix pumps is effective.	☐
	f. Pressure on mix pumps is more than adequate for mixing.	☐
	g. Jets in mixer are correct.	☐
	h. Packings on high-pressure pumps are effective.	☐
	i. High-pressure mixing system is flushed through (if available).	☐
	j. Correct jets are available for high-pressure mixing.	☐
	k. Bypass valve on mix manifold is working.	☐
	l. Bypass on mixer is open (manually).	☐
	m. Engine oil and water are at correct levels.	☐

		Tick box
	n. Oil in pumps is at correct level.	☐
	o. Hoses are serviceable.	☐
	p. Hopper is serviceable.	☐
	q. Liquid additive system pumps, lines, gauging rates are sufficient to meet mixing require-ments. Trace lines on LAS and ensure correct additives are being added. Confirm that there are no shared lines where incompatible additives could mix.	☐
	r. Physically check that the volumes of liquid additives are sufficient to provide 100% in excess of job requirements.	☐
	s. Water supply rate to displacement tanks or batch tank exceeds maximum estimated requirement.	☐
	t. Batch mixer is operating correctly.	☐
	u. Cementer is to confirm all checks satisfactorily completed. If cementer doubts the high-pressure mixing discuss a trial mix with the Wellsite Leader.	☐
	v. Ensure data recording system is calibrated and functioning correctly.	☐
15	Ensure Mud Engineer checks drill water for chlorides and where mud pits are to be used for mixwater, that they have been adequately cleaned and the water transferred to the pits is tested.	☐
16	Review the equipment clean-up and waste management plan with the Wellsite Leader.	☐

		Tick box
17	Review proposed work plan for pumping and pressure testing, assess crew availability and competence and advise Wellsite Leader of any concerns which may impact execution.	☐
18	Retain samples of all mixwaters prepared.	☐
19	Witness mixing and confirm all spacers provided by the Cement Company are as per design (spacer density checked with a pressurised mud balance and rheology measured after spacer preparation). Any discrepancies with designed properties to be discussed with the Wellsite Leader.	☐
20	Roll all liquid additives before any sampling and before commencing mixing operation.	☐
21	Collect samples (mix water, spacers, lead and tail slurries) during the cement job.	☐
22	Compute slurry volumes from calliper.	☐
23	Review pre-job circulation pressures with pressure predicted in pre-job simulations.	☐
24	Ensure contingency plans have been discussed (what happens if plug does not bump, losses, etc?)	☐
25	Perform the cement job as per the programme specified by the Company, including the use of liquid additive systems and data recording devices.	☐
26	Clean up location and dispose of waste in approved manner.	☐

		Tick box
27	Complete post job reporting and report any discrepancies from agreed plan to Wellsite Leader including problems (e.g. equipment failure, mixing problems and NPT).	☐

Drilling Contractor
Cementing Responsibilities

		Tick box
	The drilling contractor is responsible for maintaining permanently installed bulk supply and BP-owned mixing systems, providing personnel for loading and backloading supplies and equipment and assisting with sampling, prior to and during the cement job.	
	The following minimum checks and procedures are to be performed where the Drilling Contractor is responsible for bulk system:	
1	Review and comply with Cement Company requirements on tank aeration ("fluffing") whilst cement is stored on location and after each cement delivery.	☐
2	Ensure compliance with maintenance schedules on the bulk system including air driers/vents and any sampling devices.	☐
3	Air up all tanks the day before the cement job, check for leaks. Carry out repairs immediately	☐
4	Pressure test and physically check all air supply lines and valves in the bulk system.	☐
5	Start up and check compressors. Check alternative air supply is immediately available in case the primary system fails.	☐

		Tick box
6	Ensure surge tank is clean internally, with all valves and vents working.	☐
7	Blow through all lines. Ensure dry air is vented and lines are clear.	☐
8	Check that bulk tank load cells are correctly calibrated and the rock catchers are clear.	☐
9	For offshore wells, prior to filling the pods from the supply boat, ensure all lines from the boat to pods are blown through until dry air is vented. **Note:** If damp air is found venting, either from the supply boat or on the pre-cementing inspection, the cause must be established and corrective action taken.	☐
10	Time the surge tank filling rate. Compare with previous filling rates and normal mixing rates.	☐
11	Ensure air pressure can be adequately maintained.	☐
12	Pre-charge all silos to be used, including backup silos.	☐
13	Prior to filling any storage pods, open the pod and physically check it is clear of debris/rocks, etc.	☐
14	Confirm to Wellsite Leader that bulk system inspections have been completed.	☐

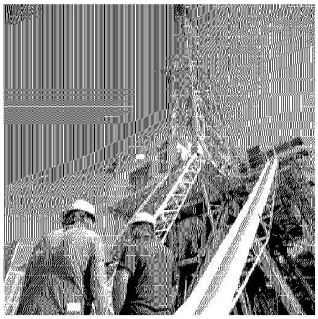
		Tick box
15	Purge all lines immediately upon completion of a cement job, until dry air is vented.	☐
16	After the mud pits have been prepared, no mud is to be transferred or dumped and no ballast control movements are to take place without prior permission from the Wellsite Leader.	☐
17	Where displacement with mud pumps is planned, ensure pumps have suction prior to commencing the cement job.	☐
18	Review the requirement for any pipe movement during cementing with Wellsite Leader.	☐
19	Review/agree displacement volume with Wellsite Leader and Cementer and when rig pumps are to be used, agree the pump efficiency factor to be employed.	☐
20	If more than one pit volume is required, equalise across two pits and pump the displacement. If that is not possible then displace a volume from one pit, stop the pumps, line up to the second pit and complete the displacement.	☐

Mud Engineer
Cementing Responsibilities

		Tick box
1	Check the mixwater for contamination.	☐
2	Ensure that a sufficient volume of mud is available on the surface prior to commencement of the cement job.	☐
3	With the Driller, prepare pits and flowlines for the expected total returns.	☐
	a. Unless impossible due to volumes, take all returns (= bbls of slurry and spacers to be pumped) into one pit.	☐
	b. Circulation system, including the sandtrap, should be complete and full of mud.	☐
4	Ascertain that the correct pit(s) have been lined up to the mudpumps.	☐
5	Make up water/flush/spacer according to the requirements of the Cementing Company.	☐
6	Provide a plan for conditioning the mud and hole to the required specification prior to section TD.	☐
7	Measure spacer density and rheology after preparation at the rig site.	☐

		Tick box
8	Monitor returns during cementing checking for spacer and/or cement returns.	☐
9	Record pit volumes before cement job, after pumping cement and after displacing.	☐
10	Prepare a plan for dealing with cement returns at surface if applicable.	☐
11	Check for cement returns at flowline. Have mud balance, cups, pH indicators, etc, ready.	☐

Mud Logger
Cementing Responsibilities



		Tick box
1	From the Wellsite Leader, get the details on planned pit usage, including the volumes of each type of fluid to be pumped and returned.	☐
2	With the Driller, record the volumes in each individual pit and the total volume before the start of cementing.	☐
3	Monitor pit volumes throughout the cement job.	☐
4	The active pit gain is to be monitored continuously during cementing. Expect additional return volumes during mixing and reduced return rates during initial displacing. Ensure losses are noted. Request U-tubing predictions from the Cement Company. Monitoring mud volumes is easier if returns go to just one pit and the transfer of mud between pits is minimised.	☐
5	Record the total volume in the pits and inform the Wellsite Leader/DE of the volume gained (or lost) during the entire cement job. The report should be given with losses before cement enters open hole and after cement enters open hole.	☐

		Tick box
6	If displacement is done using mud pumps, record flow rate, cumulative volume and pressures (also density if recorded). Provide the information to Cement Company in hard copy and electronic format. Cross check pit volumes to ensure the actual volume pumped corresponds to the strokes pumped.	☐

Signed

Position

Date

Document Produced Natively

CEMENTING DESIGN INPUT SHEET - PTA CEMENTING

Data Entry Revision No. & Date		WELL NAME/NUMBER XX Plug/Squeeze				
STATE HERE THE PRIMARY OBJECTIVES OF THE JOB	Units	PLUG 1	PLUG 2	PLUG 3	PLUG 4	PLUG 5
Conditions - CEMENT PLUG						
Plug type/purpose						
To be tagged/press tested						
Planned WOC time before tagg/P test						
Balanced Plug or Pump & Pull method						
Plug in open hole, casing or mixed?						
Plug bottom depth MD/TVD RKB						
Plug length						
Open hole gauge size						
Calliper or realistic estimate hole size						
If applicable -Casing size OD/ID						
If applicable -Shoe Depth MD/TVD RKB						
Base foundation for plug						
Cement Volume excess	%					
Lowest FG & where (gradient @ depth MD)						
Max Pore Press & where(gradient @ depthMD)						
BHST @ plug depth (deg__)						
BHST Certainty Error (+/-deg__)						
BHCT method						
BHCT (deg__) for Cement Plug						
Heatup time for Thickening Time test						
Pressure for Thickening Time test						
UCA test temperature/heat-up time						
Pressure for UCA test						
Mud/Wellfluid						
Density (gradient)						
Type						
Test Temp for rheology data						
PV , or raw Fann data						
YP , or raw Fann data						
10sec/10min gels (lb/100ft2)						
Temp for gels (deg__)						
Hardware						
Centralization						
DP/Workstring size OD/ID						
Tailpipe size OD/ID						
Tailpipe length						
Diverter tool						
BJ Parabow (umbrella support)						
Hallibuton CST (umbrella support)						
Specify other downhole tools eg. ball or dart catcher, etc						
Balls or darts						
Foam/sponge cleaning balls and/or scouring pill						
Cement Head						
IDs for string tools, crossovers, etc						
Hydraulic Simulation						
Simulation Required (yes/no)						
Displacement Efficiency (yes/no)						
Spacer Ahead & Behind						
Density (gradient)						
Type						
Design rheology for friction pressure hierarchy in annulus, yes/no (ie cement>spacer>mud).						
Fresh, sea or other mixwater						
Volume (bbl)						
Lab Tests Required (yes/no)						
Spacer rheology						
Mud Compatibility-rheology						
Cement Compatibility -rheology						
Mud removal - surfactant optimisation						
Water wetting - surfactant optimisation						
Static (surface or downhole) stability						
Dynamic (downhole) stability						
Other cement-spacer property tests						
Cement Slurry						
Density (gradient)						
Cement Type (neat G, blend, etc)						
Water - Fresh/Drill/Sea						
Gas tight design (yes/no)						
Field Mix method						
Use Liquid Additive System (yes/no)						
Silica Flour no/yes(%)						
Lab Test Requirement (yes/no/value)						
Rheology & Gels						
Fluid-Loss Control (cc API) Squeeze Cement Slurries						
Fluid-Loss Control (cc API) Plug Cement Slurries						
High Temp FL if BHCT>190F						
Thickening Time (hr:min)						
Surface Batch mix simulation						
API operating Free Water %						
BP Settling test						

Compressive Strength (UCA)						
UCA pre-condition to BHCT, 20 mins at BHCT or Actual placement						
Static Gel Strength (Zero Gel Time & Transition Time) at downhole temperature and pressure						
Static period Thickening Time (hr:min)						
SENSITIVITY TESTING						
Temperature-Thick. Time +/- x deg						
Retarder -Thick.Time +/- x %						
Field Mix Density +/- "X" gradient						
Silica Flour, 25 to 45 %						
Thick.Time w/Pump shutdown, x min						
Displacement & Pump Times						
Spacer behind cement (type & SG)						
Displacement Fluid (type & SG)						
Displacement Volume approx						
Under-displacement						
Est rate mix lead/tail/ displace (bpm)						
Est job time from start cmnt downhole to POOH >70m above TOC, and (if applicable) circulate out excess cement.						

Guidance Notes

1. This pre-job cementing design check sheet is intended to be completed with both the bp enginer and cement contractor engineer present. It aims to promote discussion and ensure that both patries jointly agree the cement
2. It is recommended that the discussions are held face to face, to avoid time consuming efforts e-mailing the sheet back and forth between the two parties.
3. For a multi well programme it may be necessary to only fill in the sheet once for each type of cement job. In such cases it is important to check that none of the assumptions made for earlier
4. The guidance notes can be tailored to be region or field specific, based upon local practices and lessons learnt.

wells have changed

C.1 Problems requiring squeeze cementing

The following problems can be repaired squeeze cementing operations:

- Losses
- Repair of leaking shoe or liner lap
- Casing leaks
- Perforation shut off
- Annulus repair to eliminate cross flow or SCP

C.2 Squeeze cementing classifications

C.2.1 High pressure squeeze

Uses squeeze pressure exceeding formation fracture pressure, in these cases cement is able to displace trapped fluids, primary application is shoe squeezes / block squeezes and liner lap repair / bullhead treatment down an annulus. It maybe difficult to obtain squeeze pressure back flow possible when completed without a retainer. The technique has little control over placement due to formation breakdown.

C.2.2 Low pressure squeeze

Squeeze pressures are maintained below formation fracture pressure, in these cases the technique is best suited where formation damage may impact production, filling large caves / uncemented sections. It increases the chance of establishing squeeze pressure but risks not injecting sufficient cement to establish repair where small flow paths exist.

C.3 Basic techniques

Either technique can be used in conjunction with above squeeze classification

C.3.1 Running Squeeze

In this case fluid is injected until the predetermined squeeze pressure is achieved. May require large slurry volume but is simple and is unlikely to require fluid loss control. Technique is prone to the impact of contamination and mixing and when coupled with a low pressure squeeze technique may result in small volumes being injected.

C.3.2 Hesitation squeeze

Relies on self diversion of cement buy bringing squeeze pressure to pre-determined level, permitting bled off then injecting more cement to achieve the desired squeeze pressure. When coupled with a high pressure squeeze achieving and holding squeeze pressure is a good indictor of success. Slurry design requirement and testing more complex and fluid loss additives are required (except when squeezing into shale). More requirement for rig to interprete pressure response from the well during squeeze operations.

C.4 Squeeze deployment procedure

C.4.1 Retrievable packer

Eliminates hardware to drill out and can be set and unset for multiple treatments. Backflow is difficult to prevent and reversing or circulating excess cement out not recommended. Retrievable packers can be prone to problems setting and unsettling adding a variable which is difficult to manage during squeeze cementing operations

C.4.2 Drillable Packer or retainer

Can be set via wireline (for accurate depth control) or drillpipe (high angle wells and where depth control not critical). Tools give back pressure control after the squeeze and permit circulating out of excess cement after achieving squeeze pressure. However tool not suitable for a mutltizone squeeze operation. Recommended option when attempting a circulation squeeze as it permits use of a spacer ahead of the cement.

C.4.3 Bradenhead or Packerless Squeeze

Simplest technique either by setting a balanced plug and pulling above to establish squeeze pressure tends to be associated with low pressure hesitation squeeze techniques. Possible issue with contamination of cement with fluid being displaced since it is not possible to inject spacer ahead. Applies squeeze pressure to entire casing contents which can be a disadvantage if there is a large volume of compressible fluid in the casing.

C.4.4 Bullhead squeezes

Essentially relies on bull heading squeeze treatment using the annular preventer, technique is simple and permits spacer to be injected ahead of cement in case of fluid incompatibility. Generally associated with high pressure running squeeze approach. Has disadvantage of the packerless squeeze in that limited ability to control back flow except by WOC. Technique often used to top fill an annulus with SCP or low TOC. Can carry significant risk when used to stem loss zones if location of losses unknown.

Document Produced Natively

All testing is required on rig samples and to be submitted to BP Wells Team 24 hours prior to cementing operations commence (unless otherwise agreed with Wells Team)

General Requirements (all slurries all job types)

- ***All slurries incorporating a Fluids Loss aid must have API fluid loss determined***

- ***Slurries placed for control of Shallow Flows (conductor or surface pipe) or where gas migration risk is high (predicted flow potential is high and/or static cement overbalance < 200psi against a permeable gas bearing formations) must have static gel strength transition time and zero gel time determined. In addition BP settlement test must be run in these situations***

Specific Requirements

Job Type	Slurry	Pump Time	Compressive Strength	Operating Free Water	API Fluid Loss	Rheology	BP Settlement Test
Conductor	Neat	**Note 1**	No	No	No	No	No
	Extended	Yes	Yes	Yes	No	Yes	No
Surface	Lead	Yes	**Note 2**	Yes	No	No	No
	Tail	Yes	Yes	Yes	No	No	No
Intermediate	Lead	Yes	No	Yes	No	Yes	No
	Tail	Yes	Yes	Yes	No	Yes	No
Production Casing and Drilling liners	Lead and Tail	Yes	Yes	Yes	No	Yes	**Note 3**
Production Liner		Yes	Yes	Yes	Yes	Yes	Yes
Plugs		Yes	Yes	Yes	No	Yes	**Note 3**

Note 1 Extended testing regime applies if temperature > 40°C or slurry not Class G/H + accelerator
Note 2 Where structural support or zonal isolation is required compressive strength must be determined. When purely a filler slurry it is unnecessary.
Note 3 When the hole angle exceeds 70° a BP settlement test is required.

Compatibility Testing

WBM and OBM

For liner jobs and where cement is pumped directly in contact with the drilling fluid a contaminated thickening time test is required using a 95/5 cement to mud contaminant.

For every well API mud /spacer compatibility test should be performed on intervals isolating hydrocarbon bearing formations and permeable overpressured brine or water bearing formations for each section (mud spacer combinations only need to be tested once per well).

Where a cement evaluation log is to be run compressive strength should be determined for a 95/5 cement/spacer combination.

OBM Only

Water wetting characteristics of the spacer to be confirmed on a metal coupon test with sample of field mud for once each well