Run Parameter Specifications

The following is a chart intended to keep you informed of the specifications with which our tools should be run. Previous communications have mentioned the benefits of staying within optimal specification ranges and we hope by outlining these ranges in an easy-to-follow guide, we can perform the best service and keep additional costs to a minimum by reducing non-productive time and meeting run objectives.

Anything outside of these ranges may be classified as an Out of Specification (OoS) operation, which may result in premature tool failure, additional charges for tool usage and maintenance, extraordinary wear and tear, or replacement up to the Lost-in-Hole value.

This equipment has been designed using materials and design criteria that have been validated through testing and use. Direct evidence of use in excess of this design criteria (i.e. stress cracking, corrosion, or temperature) may be used as justification that the tool has exceeded its design intent.

	Parameters	Operating Specifications *(Enter range or values of specification limits in blank columns)*
	Flow Rate	*RSS:* *MWD:*
	Maximum Operating Temperature (302°F/150°C)	
	Maximum LCM size / Concentration / Type	*See LCM Guideline sheet (Appendix B)*
Stickslip Shocks	Maximum Time at Shock/Vibration Risk Level	*See Shock/Vibration sheet (Appendix A)*
	Maximum Time with Stick/Slip 100% above surface RPM	*> 30 min*
Rotary Steerable	Rotating without Circulation *Without approval from DD/MLWD*	*Automatic OoS*
	Maximum Doglog Severity (DLS) for BHA	
	Maximum RPM for Current Rotary Steerable (RSS) Setup *(Appendix C)*	*Vertical/Lateral:* *Curve:*
	Back Reaming in Curve	*Automatic OoS*
Mud	Maximum Sand Content	*< 1%*
	Maximum Low Gravity Solids	*< 8%*
	pH Range	*> 9.5 and <12.0*
	Maximum Dissolved Oxygen	*< 1% ppm (pH meters)*
	Jarring	*Automatic OoS*

Client:_____ Rig:_____ Well:_____

_____ _____ _____

Company Representative Extreme Tool Representative Date

These specifications are for Extreme ***Run*** _____ *until either the BHA changes significantly or you are otherwise notified.*

Appendix A

SHOCK/VIBRATION MATRIX

RISK	Tools	Tools Considered OoS if Shock/Vibration Level Experienced For						
		10 Minutes	30 Minutes	1 Hour	2 Hours	6 Hours	12 Hours	24+ Hours
MEDIUM	XEM/XDS1/xBolt							
	TelePacer (HDS1) cps Measurement							
	TelePacer (HDS1) G Measurement							
HIGH	XEM/XDS1/xBolt							
	TelePacer (HDS1) cps Measurement							
	TelePacer (HDS1) G Measurement							
SEVERE	XEM/XDS1/xBolt							
	TelePacer (HDS1) cps Measurement							
	TelePacer (HDS1) G Measurement							
CATASTROPHIC	XEM/XDS1/xBolt							
	TelePacer (HDS1) cps Measurement							
	TelePacer (HDS1) G Measurement							

*Any Shocks or Vibrations encountered that are not high enough to be within any shown Risk Level on the matrix should still be closely monitored.

**Shock/Vibration Mitigation should begin any time values are at or above the MEDIUM Risk Level.

RISK LEVELS

SHOCK/VIBRATION RISK LEVEL	XEM XDS1/xBolt	TelePacer (HDS1) (CPS Measurement)	TelePacer (HDS1) Triaxial (G Measurement)	TelePacer (HDS1) ABS (G Measurement)
LOW	Shock Risk 0 Axial: 0-15 G Lateral: 0-50 G	< 100 cps	< 3 G	< 5 G
MEDIUM	Shock Risk 1 Axial: 15-35 G Lateral: 50-100 G	100 - 150 cps	3 - 5 G	5 - 8 G
HIGH	Shock Risk 2 Axial: 35-50 G Lateral: 100-200 G	150 - 200 cps	5 - 8 G	8 - 11 G
SEVERE	Shock Risk 3 Axial: 50-100 G Lateral: 200-300 G	200 - 350 cps	8 - 11 G	11 - 15 G
CATASTROPHIC	Shock Risk 3 Axial: > 100 G Lateral: > 300 G	> 350 cps	> 11 G	> 15 G

Appendix B

LCM General Guidelines | *475 refers to 4.75" OD tools & 675+ refers to 6.75" OD tools and larger

LCM Type
Other Names \ Similar LCM
Concentration (lbs / bbl)
Tool Size
PowerDrive
TelePacer (HDS1)/XDS1/xBolt-L
xBolt-R

Fine Walnut							
< 15 lbs		15<lbs<35		35<lbs<50		> 50 lbs	
475	675+	475	675+	475	675+	475	675+

Medium Walnut							
< 15 lbs		15<lbs<35		35<lbs<50		> 50 lbs	
475	675+	475	675+	475	675+	475	675+

Course Walnut							
< 15 lbs		15<lbs<35		35<lbs<50		> 50 lbs	
475	675+	475	675+	475	675+	475	675+

Baro Seal							
< 15 lbs		15<lbs<35		35<lbs<50		> 50 lbs	
475	675+	475	675+	475	675+	475	675+

LCM Type
Other Names \ Similar LCM
Concentration (lbs / bbl)
Tool Size
PowerDrive
TelePacer (HDS1)/XDS1/xBolt-L
xBolt-R

Baro Fiber							
< 15 lbs		15<lbs<35		35<lbs<50		> 50 lbs	
475	675+	475	675+	475	675+	475	675+

Steel Seal							
< 15 lbs		15<lbs<35		35<lbs<50		> 50 lbs	
475	675+	475	675+	475	675+	475	675+

Plug Git							
< 15 lbs		15<lbs<35		35<lbs<50		> 50 lbs	
475	675+	475	675+	475	675+	475	675+

Plug Git H							
< 15 lbs		15<lbs<35		35<lbs<50		> 50 lbs	
475	675+	475	675+	475	675+	475	675+

LCM Type
Other Names \ Similar LCM
Concentration (lbs / bbl)
Tool Size
PowerDrive
TelePacer (HDS1)/XDS1/xBolt-L
xBolt-R

Cotton Seed Hulls							
< 15 lbs		15<lbs<35		35<lbs<50		> 50 lbs	
475	675+	475	675+	475	675+	475	675+

Cedar Fiber							
< 15 lbs		15<lbs<35		35<lbs<50		> 50 lbs	
475	675+	475	675+	475	675+	475	675+

Pumping Practice		
	PowerDrive	Make sure that the LCM is evenly and thoroughly mixed or blended before pumping across the tool. Never "dump" LCM into the mud pits at the pump intake, always use a premix tank for mixing LCM. It is recommended to keep the PowerDrive control unit powered up while pumping the pills (ie above minimum telemetry flow rate), to ensure that the magnet housings are spinning. Staying above Mininum Drill Flow minimizes the chance of packing off the magnet housings, especially in high mud weight, but maintain as low a flow rate as possible to minimize the pressure differential across the bias unit pads.
	TelePacer (HDS1) xBolt-R xBolt-L XDS1	The maximum recommended mixture of LCM for all Extreme MLWD systems is one sack every 12 minutes. If pumping a pill, make sure the pill is circulated all the way though the BHA. Do not stop circulating when the pill reaches the pulser. Glass beads can impact effectiveness of the MLWD system. A concentration less than 5 ppb going in the hole is recommended. LCM does not affect data acquisition when the LWD service is run in a trip logging mode.

	=	**NOT RECOMMENDED**		=	**Consult Coordinator Before pumping**		=	**Safe to Pump**
	=	Significantly increases the probability of tool failure. Considered to be Out of Spec. Client assumes all risk.		=	LCM in this quantity can increase the probability of tool failure if not properly mixed.		=	LCM in this quantity is safe to run.

Appendix C

Rotary Steerable Operational Specifications

Extreme Tool	Collar Size	Hole Size (inch)	Flow Rate (gpm)	DLS Rotating (deg/100ft)	DLS Sliding (deg/100ft)	Max WOB (k lbs)	Rotary Rate (RPM)	LCM (ppb Medium Nut Plug)	Temp (Deg C)	Sand (%)	LGS (%)	pH	Dissolved Oxygen (ppm)	Pressure (psi)	Bit Box Make up Torque (ft lb)	Overpull (k lbf)
Rotary Steerable																
PowerDrive X6	4 3/4"	5 1/2 - 6 3/4	100-375	10	30	See Bit Specs	220	35	150	1	8	9.5 - 12.0	1	20,000	8,000	340
	6 3/4"	7 7/8 - 9 7/8	200-975	8	16	See Bit Specs	220	50	150	1	8	9.5 - 12.0	1	20,000	16,000	1,100
	8 1/4"	10 5/8 - 11 5/8	250-2000	6	12	See Bit Specs	220	50	150	1	8	9.5 - 12.0	1	20,000	16,000	1,100
	9"	12 - 14 3/4	250-2000	5	10	See Bit Specs	220	50	150	1	8	9.5 - 12.0	1	20,000	48,000	1,400
	11"	15 1/2 - 18 1/2	250-2000	2	4	See Bit Specs	220	50	150	1	8	9.5 - 12.0	1	20,000	48,000	1,400
	11"	20 - 28	250-2000	2	4	See Bit Specs	125	50	150	1	8	9.5 - 12.0	1	20,000	48,000	1,400
PowerDrive Orbit	4 3/4"	5 7/8 - 6 3/4	100-375	18	30	See Bit Specs	350	35	150	1	8	9.5 - 12.0	1	20,000	9,000	340
	6 3/4"	8 3/8 - 8 3/4	200-975	8	16	See Bit Specs	350	50	150	1	8	9.5 - 12.0	1	20,000	18,500	1,100