



PowerDrive Orbit & X6 BHA Design Guide

Revision 1.1
10 March 2020

BHA design requirements:

Stabilization

All PowerDrive BHAs should have at least 2 stabilizers. **The first stabilizer must be located on the PowerDrive Control Collar or the first component directly behind it.** The 2nd stabilizer should be 30-40 feet back from the first stabilizer. Proper stabilizer placement ensures optimal steering response and minimizes shock and vibration damage. Depending on the BHA design, a 3rd stabilizer may be added another 30-40 feet behind the 2nd stabilizer. This may aid in shock and vibration on the MWD but will have minimal effect on steering.

The first stabilizer should be 1/8" under-gauge from the hole size. The additional stabilizers may be 1/8" or 1/4" under-gauge.

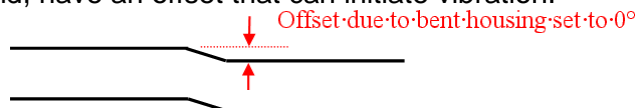
Stabilizers should have spiral wrap, short gauge and long tapers. A good rule of thumb is to aim for a gauge length that is 50% of the hole-size and 60-degree taper. This design optimizes steerability while preventing the stabilizers from hanging up. The picture below is an example of a PowerDrive Control Collar stabilizer:



Roller Reamers may be used in place of stabilizers to reduce torque and stick-slip. Do not use eccentric reamers or hole openers in place of stabilizers.

Motor Selection

Bearing sections must be fixed-straight, not adjustable dialed to zero. Adjustable motors, even when dialed to zero bend, have an offset that can initiate vibration.



Consider the PowerDrive RPM specifications (220 for X6, 350 for Orbit) when choosing rev/gallon or the power section. Exceeding the RPM specification will lead to reduced dogleg and tool damage.

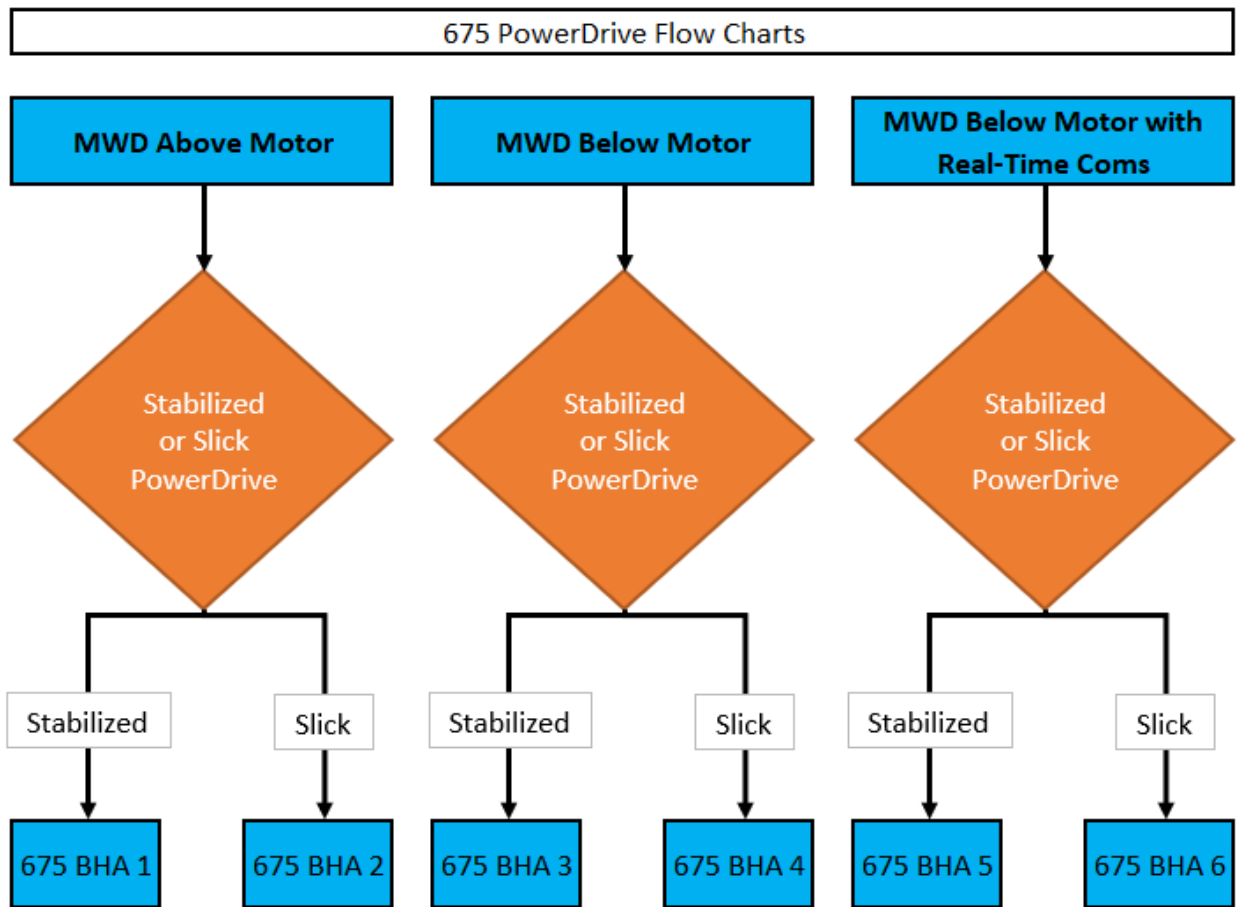
Additional Considerations

Flex Ponies and Collars should generally be avoided, especially in tangents or horizontals, as they increase the odds of shock and vibration damage. A short Flex Pony directly on top of the PD tool will increase the maximum dogleg by 1-2 degrees but should only be used if truly necessary.

PowerDrive 675

The BHAs detailed below are a proven starting point for typical PowerDrive operations based on best practices and extensive experience with PowerDrive in North America. However, BHAs will always have room for specific optimization and these guidelines are not intended to be a replacement for good engineering design. BHAs can be further optimized for particular performance concerns in discussion with your Extreme Coordinator.

The following flow charts are used to assist in BHA design. **Click on the “675 BHA X” at the bottom that matches the desired BHA and it will navigate you directly to the BHA example.**

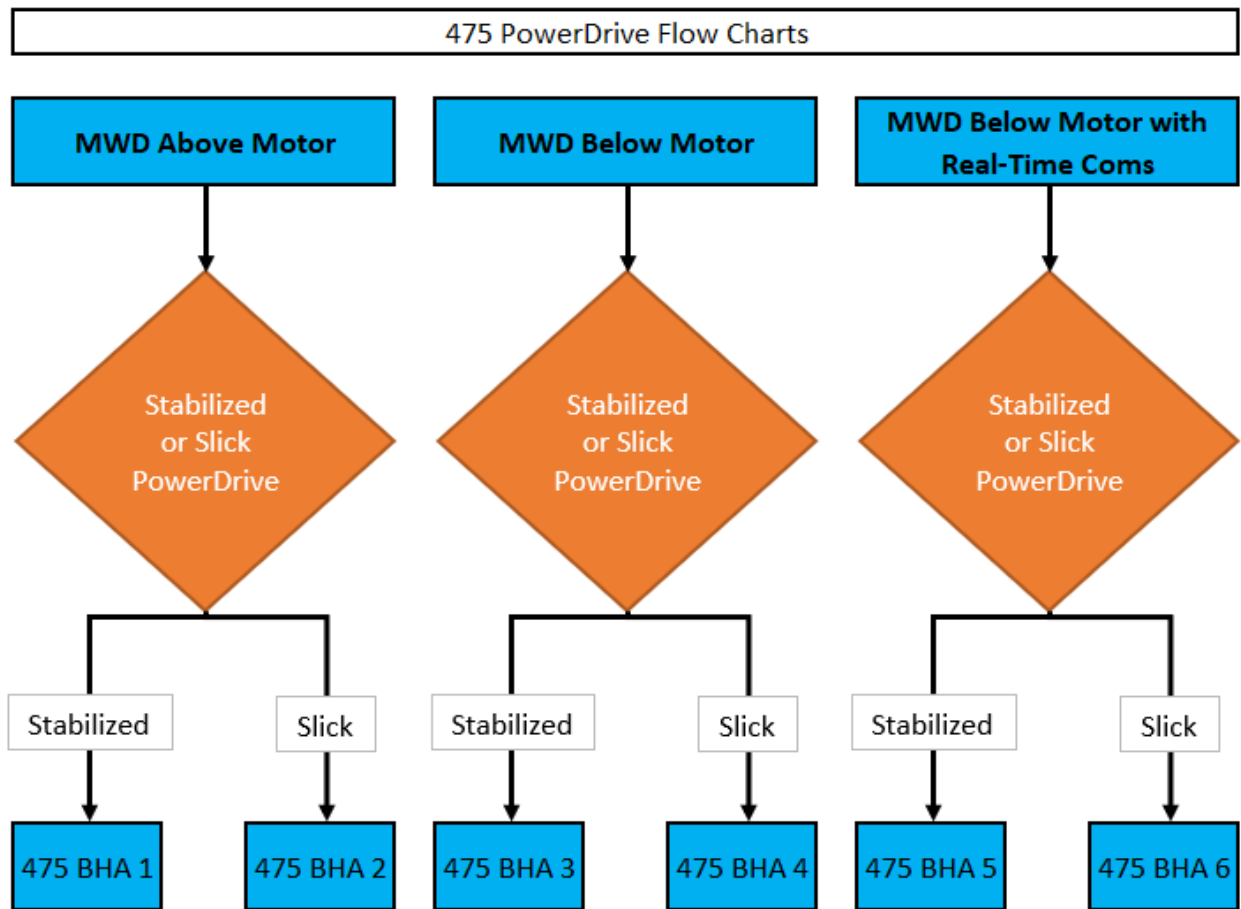


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PowerDrive 475

The BHAs detailed below are a proven starting point for typical PowerDrive operations based on best practices and extensive experience with PowerDrive in North America. However, BHAs will always have room for specific optimization and these guidelines are not intended to be a replacement for good engineering design. BHAs can be further optimized for particular performance concerns in discussion with your Extreme Coordinator.

The following flow charts are used to assist in BHA design. **Click on the “475 BHA X” at the bottom that matches the desired BHA and it will navigate you directly to the BHA example.**



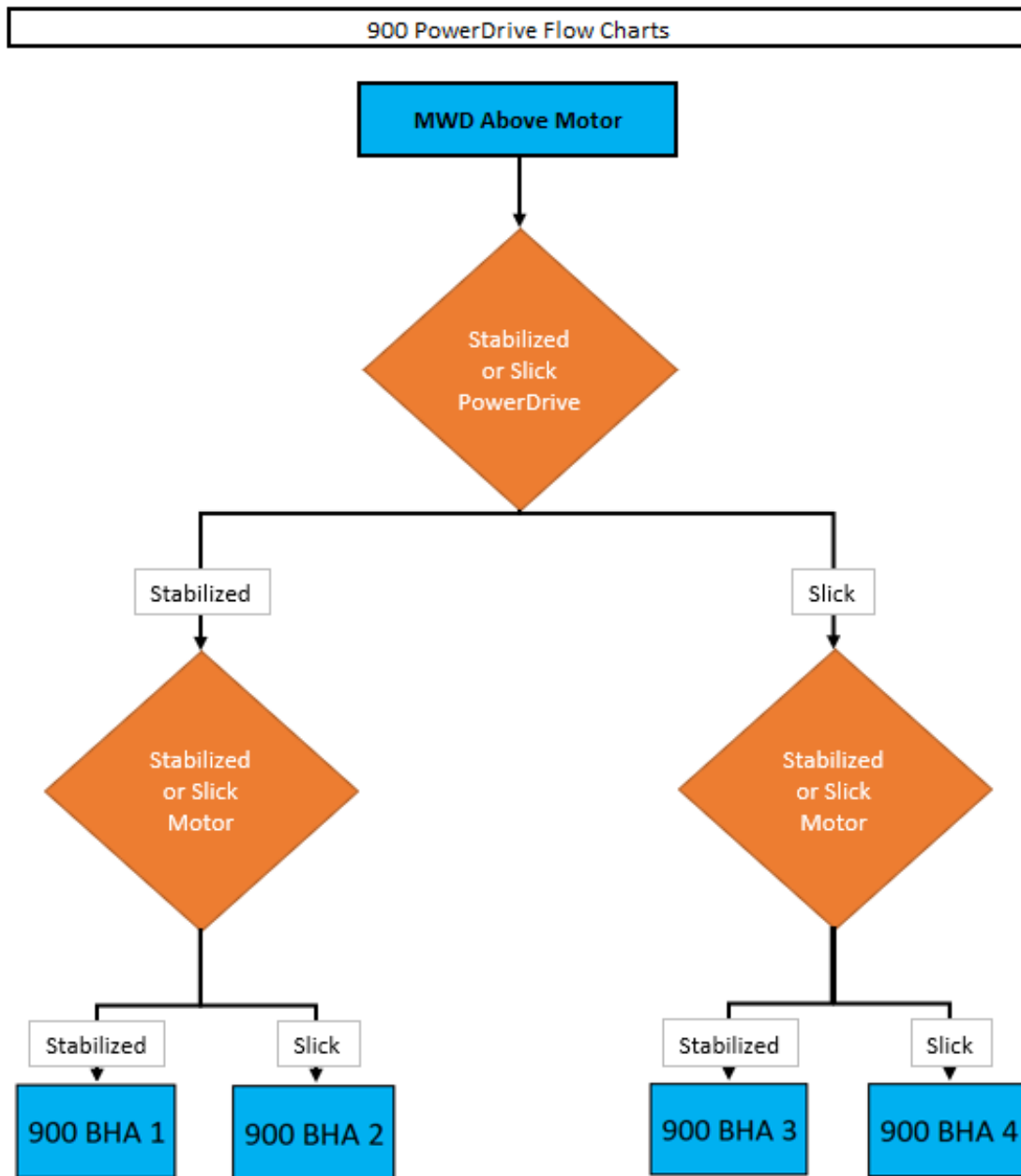
Schlumberger-Private

Note: The standard connection for 475 PowerDrive is 3 ½ IF. However, upon request the top connection can be XT39. **If running an XT39 PowerDrive then all connections in the BHA should also be XT39 (UBHO, Stabilizer, motor ect...).**

PowerDrive 900

The BHAs detailed below are a proven starting point for typical PowerDrive operations based on best practices and extensive experience with PowerDrive in North America. However, BHAs will always have room for specific optimization and these guidelines are not intended to be a replacement for good engineering design. BHAs can be further optimized for particular performance concerns in discussion with your Extreme Coordinator.

The following flow charts are used to assist in BHA design. **Click on the “900 BHA X” at the bottom that matches the desired BHA and it will navigate you directly to the BHA example.**



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675 BHA 1: Stabilized PowerDrive, MWD Above the Motor

	Desc.	OD (in)	Max OD (in)	Bot Type	Bot Gender	Length (ft)	Cum. Length (ft)	Cum. Weight (1000 lbm)
		ID (in)		Top Type	Top Gender			
		5.750						
1	8.5" PDC	2.250	8.500	4-1/2 REG	Pin	1.00	1.00	0.1
		6.750		4-1/2 REG	Box			
2	PD 675 Orbit 1/8"ug Stabilized CC	4.200	8.375	4 1/2 IF	Box	13.53	14.53	1.5
		6.750		4 1/2 IF	Pin			
3	6.75" Filter Sub	3.250	6.750	4 1/2 IF	Box	6.00	20.53	2.1
		6.750		4 1/2 IF	Pin			
4	Motor 675 7/8 5.7 Slick Pin Down	5.012	7.500	4 1/2 IF	Box	30.00	50.53	4.6
		6.750		4 1/2 IF	Pin			
5	6.75" Float Sub	2.813	6.750	4 1/2 IF	Box	3.00	53.53	4.9
		6.750		4 1/2 IF	Pin			
6	8.25" NM Stabilizer (1/4"ug)	2.813	8.250	4 1/2 IF	Box	5.00	58.53	5.4
		6.750		4 1/2 IF	Pin			
7	UBHO	3.250	6.750	4 1/2 IF	Box	4.00	62.53	5.8
		6.875		4 1/2 IF	Pin			
8	MWD	3.500	6.875	4 1/2 IF	Box	30.00	92.53	8.7
		6.750		4 1/2 IF	Pin			
9	6.75" NMDC	2.813	6.750	4 1/2 IF	Box	30.00	122.53	11.7
		5.000		4 1/2 IF	Pin			
10	Heavy Weight Drill Pipe (3 joints)	3.000	6.500	4 1/2 IF	Box	93.00	215.53	16.4
		4.928		4 1/2 IF	Pin			
11	5" 19.50 DPS, 10% Wear	4.276	6.625	4 1/2 IF	Box	32.81	248.34	17.2

Schlumberger-Private

675 BHA 2: Slick PowerDrive, MWD Above the Motor

	Desc.	Serial Number	OD (in)	Max OD (in)	Bot Type	Bot Gender	Length (ft)	Cum. Length (ft)	Cum. Weight (1000 lbm)
			ID (in)		Top Type	Top Gender			
1	8 1/2" PDC		5.750 2.250	8.500	4 1/2 REG	Pin	1.00	1.00	0.1
2	PD 675 Orbit Slick CC		6.750 4.200	8.032	4 1/2 REG 4 1/2 IF	Box Box	13.53	14.53	1.5
3	8.375" NM Stabilizer (1/8"ug)		6.750 2.813	8.375	4 1/2 IF 4 1/2 IF	Pin Box	6.00	20.53	2.1
4	6.75" Filter Sub		6.750 3.250	6.750	4 1/2 IF 4 1/2 IF	Pin Box	6.00	26.53	2.7
5	Motor 675 7/8 5.7 Slick Pin Down		6.750 5.012	7.500	4 1/2 IF 4 1/2 IF	Pin Box	30.00	56.53	5.2
6	6.75" Float Sub		6.750 2.813	6.750	4 1/2 IF 4 1/2 IF	Pin Box	3.00	59.53	5.5
7	8.25" NM Stabilizer (1/4"ug)		6.750 2.813	8.250	4 1/2 IF 4 1/2 IF	Pin Box	5.00	64.53	6.0
8	UBHO		6.750 3.250	6.750	4 1/2 IF 4 1/2 IF	Pin Box	4.00	68.53	6.4
9	MWD		6.875 3.500	6.875	4 1/2 IF 4 1/2 IF	Pin Box	30.00	98.53	9.3
10	6.75" NMDC		6.750 2.813	6.750	4 1/2 IF 4 1/2 IF	Pin Box	30.00	128.53	12.3
11	Heavy Weight Drill Pipe (3 joints)		5.000 3.000	6.500	4 1/2 IF 4 1/2 IF	Pin Box	93.00	221.53	17.0
12	5" 19.50 DPS, 10% Wear		4.928 4.276	6.625	4 1/2 IF 4 1/2 IF	Pin Box	32.81	254.34	17.8

675 BHA 3: Stabilized PowerDrive, MWD Below the Motor

	Desc.	OD (in)	Max OD (in)	Bot Type	Bot Gender	Length (ft)	Cum. Length (ft)	Cum. Weight (1000 lbm)
		ID (in)		Top Type	Top Gender			
1	8.5" PDC	5.750	8.500	4 1/2 REG	Pin	1.00	1.00	0.1
		2.250						
2	PD 675 Orbit 1/8"ug Stabilized CC	6.750	8.375	4 1/2 REG	Box	13.53	14.53	1.5
		4.200						
3	UBHO	6.750	6.750	4 1/2 IF	Pin	4.00	18.53	1.9
				3.250				
4	MWD	6.875	6.875	4 1/2 IF	Pin	30.00	48.53	4.8
				3.500				
5	6.75" NM Filter Sub	6.750	6.750	4 1/2 IF	Pin	6.00	54.53	5.4
				3.250				
6	Motor 675 7/8 5.7 Pin Down Stabilized BH (1/4"ug)	6.875	7.500	4 1/2 IF	Pin	30.00	84.53	7.8
				5.012				
7	6.75" Float Sub	6.750	6.750	4 1/2 IF	Pin	3.00	87.53	8.1
				2.813				
8	8.25" Stabilizer (1/4"ug)	6.750	8.250	4 1/2 IF	Pin	5.00	92.53	8.6
				2.813				
9	Heavy Weight Drill Pipe (3 joints)	5.000	6.500	4 1/2 IF	Pin	93.00	185.53	13.3
				3.000				
10	5" 19.50 DPS, 10% Wear	4.928	6.625	4 1/2 IF	Pin	31.00	216.53	14.0
				4.276				

675 BHA 4: Slick PowerDrive, MWD Below the Motor

	Desc.	OD (in)	Max OD (in)	Bot Type	Bot Gender	Length (ft)	Cum. Length (ft)	Cum. Weight (1000 lbm)
		ID (in)		Top Type	Top Gender			
1	8.5" PDC	5.750						
		2.250	8.500	4 1/2 REG	Pin	1.00	1.00	0.1
2	PD 675 Orbit Slick CC	6.750		4 1/2 REG	Box			
		4.200	8.375	4 1/2 IF	Box	13.53	14.53	1.4
3	8.375" NM Stabilizer (1/8"ug)	6.750		4 1/2 IF	Pin			
		2.813	8.375	4 1/2 IF	Box	6.00	20.53	2.0
4	UBHO	6.750		4 1/2 IF	Pin			
		3.250	6.750	4 1/2 IF	Box	4.00	24.53	2.4
5	MWD	6.875		4 1/2 IF	Pin			
		3.500	6.875	4 1/2 IF	Box	30.00	54.53	5.3
6	6.75" NM Filter Sub	6.750		4 1/2 IF	Pin			
		3.250	6.750	4 1/2 IF	Box	6.00	60.53	5.9
7	Motor 675 7/8 5.7 Pin Down Stabilized BH (1/4"ug)	6.875		4 1/2 IF	Pin			
		5.012	7.500	4 1/2 IF	Box	30.00	90.53	8.4
8	6.75" Float Sub	6.750		4 1/2 IF	Pin			
		2.813	6.750	4 1/2 IF	Box	3.00	93.53	8.7
9	8.25" Stabilizer (1/4"ug)	6.750		4 1/2 IF	Pin			
		2.813	8.250	4 1/2 IF	Box	5.00	98.53	9.2
10	Heavy Weight Drill Pipe (3 joints)	5.000		4 1/2 IF	Pin			
		3.000	6.500	4 1/2 IF	Box	93.00	191.53	13.8
11	5" 19.50 DPS, 10% Wear	4.928		4 1/2 IF	Pin			
		4.276	6.625	4 1/2 IF	Box	31.00	222.53	14.6

675 BHA 5: Stabilized PowerDrive, MWD Below Motor with Real-Time Coms

	Desc.	OD (in)	Max OD (in)	Bot Type	Bot Gender	Length (ft)	Cum. Length (ft)	Cum. Weight (1000 lbm)
		ID (in)		Top Type	Top Gender			
		5.750						
1	8.5" PDC	2.250	8.500	4 1/2 REG	Pin	1.00	1.00	0.1
	PD 675 Orbit 1/8"ug	6.750		4 1/2 REG	Box			
2	Stabilized CC	4.200	8.375	4 1/2 IF	Box	13.53	14.53	1.5
		6.875		4 1/2 IF	Pin			
3	6.75" HHOP	3.125	6.875	5-1/2 FH	Box	4.82	19.35	2.0
		6.875		5-1/2 FH	Pin			
4	HDS-1 MWD	3.500	6.875	5-1/2 FH	Box	32.30	51.65	5.1
		6.750		5-1/2 FH	Pin			
5	HDS-1 Top Crossover	3.250	6.750	4 1/2 IF	Box	3.00	54.65	5.4
		6.750		4 1/2 IF	Pin			
6	6.75" NM Filter Sub	3.250	6.750	4 1/2 IF	Box	6.00	60.65	6.0
		6.875		4 1/2 IF	Pin			
7	Motor 675 7/8 5.7 Pin Down Stabilized BH (1/4"ug)	5.012	7.500	4 1/2 IF	Box	30.00	90.65	8.5
		6.750		4 1/2 IF	Pin			
8	6.75" Float Sub	2.813	6.750	4 1/2 IF	Box	3.00	93.65	8.8
		6.750		4 1/2 IF	Pin			
9	8.25" Stabilizer (1/4"ug)	2.813	8.250	4 1/2 IF	Box	5.00	98.65	9.3
		5.000		4 1/2 IF	Pin			
10	Heavy Weight Drill Pipe (3 joints)	3.000	6.500	4 1/2 IF	Box	93.00	191.65	14.0
		4.928		4 1/2 IF	Pin			
11	5" 19.50 DPS, 10% Wear	4.276	6.625	4 1/2 IF	Box	31.00	222.65	14.7

675 BHA 6: Slick PowerDrive, MWD Below Motor with Real-Time Coms

	Desc.	OD (in)	Max OD (in)	Bot Type	Bot Gender	Length (ft)	Cum. Length (ft)	Cum. Weight (1000 lbm)
		ID (in)		Top Type	Top Gender			
1	8.5" PDC	5.750	8.500	4-1/2 REG	Pin	1.00	1.00	0.1
		2.250		4-1/2 REG	Box			
2	PD 675 Orbit Slick CC	6.750	8.032	4 1/2 IF	Box	13.53	14.53	1.5
		4.200		4 1/2 IF	Pin			
3	6.75" HHOP	6.875	6.875	5-1/2 FH	Box	4.82	19.35	2.0
		3.125		4 1/2 IF	Pin			
4	8.375" NM Stabilizer (1/8"ug)	6.750	8.375	4 1/2 IF	Box	6.00	25.35	2.6
		2.813		5-1/2 FH	Pin			
5	HDS-1 MWD	6.875	6.875	5-1/2 FH	Box	32.30	57.65	5.8
		3.500		5-1/2 FH	Pin			
6	HDS-1 Top Crossover	6.750	6.750	4 1/2 IF	Box	3.00	60.65	6.1
		3.250		4 1/2 IF	Pin			
7	6.75" NM Filter Sub	6.750	6.750	4 1/2 IF	Box	6.00	66.65	6.6
		3.250		4 1/2 IF	Pin			
8	Motor 675 7/8 5.7 Pin Down Stabilized BH (1/4"ug)	6.875	7.500	4 1/2 IF	Box	30.00	96.65	9.1
		5.012		4 1/2 IF	Pin			
9	6.75" NM Float Sub	6.750	6.750	4 1/2 IF	Box	3.00	99.65	9.4
		3.250		4 1/2 IF	Pin			
10	8.25" Stabilizer (1/4"ug)	6.750	8.250	4 1/2 IF	Box	5.00	104.65	9.5
		2.813		4 1/2 IF	Pin			
11	Heavy Weight Drill Pipe (3 joints)	5.000	6.500	4 1/2 IF	Box	93.00	197.65	14.6
		3.000		4 1/2 IF	Pin			
12	5" 19.50 DPS, 10% Wear	4.928	6.625	4 1/2 IF	Box	31.00	228.65	15.3
		4.276		4 1/2 IF	Pin			

Schlumberger-Private

475 BHA 1: Stabilized PowerDrive, MWD Above the Motor

	Desc.	OD (in)	Max OD (in)	Bot Type	Bot Gender	Length (ft)	Cum. Length (ft)	Cum. Weight (1000 lbm)
		ID (in)		Top Type	Top Gender			
1	6 3/4" Bit	4.500 1.500	6.750	3-1/2 REG	Pin	0.79	0.79	0.1
2	PD 475 Orbit 1/8"ug Stabilized CC	4.980 3.640	6.625	3-1/2 REG 3 1/2 IF	Box Box	13.50	14.29	0.7
3	4.75" Filter Sub	4.750 2.250	4.750	3 1/2 IF 3 1/2 IF	Pin Box	5.00	19.29	1.0
4	Motor 475 7/8 8.2 Slick Pin Down	4.750 3.810	5.500	3 1/2 IF 3 1/2 IF	Pin Box	30.00	49.29	2.4
5	4.75" Float Sub	4.750 2.250	4.750	3 1/2 IF 3 1/2 IF	Pin Box	3.00	52.29	2.5
6	6.5" Stabilizer (1/4"ug)	4.750 2.250	6.500	3 1/2 IF 3 1/2 IF	Pin Box	5.00	57.29	2.7
7	UBHO	4.750 2.250	4.750	3 1/2 IF 3 1/2 IF	Pin Box	3.00	60.29	2.9
8	MWD	4.750 2.750	5.875	3 1/2 IF 3 1/2 IF	Pin Box	31.00	91.29	4.3
9	4.75" NMDC	4.750 2.813	4.750	3 1/2 IF 3 1/2 IF	Pin Box	30.00	121.29	5.5
10	4.75" X/O	4.750 2.813	4.750	3 1/2 IF XT39	Pin Box	5.00	126.29	5.7
11	4" 14.00 DPS	4.000 3.340	5.125	XT39 XT39	Pin Box	32.81	159.10	6.2

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475 BHA 2: Slick PowerDrive, MWD Above the Motor

	Desc.	OD (in)	Max OD (in)	Bot Type	Bot Gender	Length (ft)	Cum. Length (ft)	Cum. Weight (1000 lbm)
		ID (in)		Top Type	Top Gender			
1	6 3/4 " Bit	4.500						
		1.500	6.750	3-1/2 REG	Pin	0.79	0.79	0.1
2	PD 475 Orbit AA 6" Slick CC	4.980		3-1/2 REG	Box			
		3.640	5.753	3 1/2 IF	Box	13.50	14.29	0.7
3	6.625" NM Stabilizer (1/8"ug)	5.000		3 1/2 IF	Pin			
		2.750	6.625	3 1/2 IF	Box	6.00	20.29	1.0
4	4.75" Filter Sub	4.750		3 1/2 IF	Pin			
		2.250	4.750	3 1/2 IF	Box	5.00	25.29	1.2
5	Motor 475 7/8 8.2 Slick Pin Down	4.750		3 1/2 IF	Pin			
		3.810	5.500	3 1/2 IF	Box	30.00	55.29	2.7
6	4.75" Float Sub	4.750		3 1/2 IF	Pin			
		2.250	4.750	3 1/2 IF	Box	3.00	58.29	2.8
7	6.5" Stabilizer (1/4"ug)	4.750		3 1/2 IF	Pin			
		2.250	6.500	3 1/2 IF	Box	5.00	63.29	3.0
8	UBHO	4.750		3 1/2 IF	Pin			
		2.250	4.750	3 1/2 IF	Box	3.00	66.29	3.1
9	MWD	4.750		3 1/2 IF	Pin			
		2.750	5.875	3 1/2 IF	Box	31.00	97.29	4.6
10	4.75" NMDC	4.750		3 1/2 IF	Pin			
		2.813	4.750	3 1/2 IF	Box	30.00	127.29	5.8
11	4.75" X/O	4.750		3 1/2 IF	Pin			
		2.813	4.750	XT39	Box	5.00	132.29	5.9
12	4" 14.00 DPS	4.000		XT39	Pin			
		3.340	5.125	XT39	Box	32.81	165.10	6.5

475 BHA 3: Stabilized PowerDrive, MWD Below the Motor

	Desc.	OD (in)	Max OD (in)	Bot Type	Bot Gender	Length (ft)	Cum. Length (ft)	Cum. Weight (1000 lbm)
		ID (in)		Top Type	Top Gender			
		4.500						
1	6 3/4" Bit	1.500	6.750	3-1/2 REG	Pin	0.79	0.79	0.1
		4.980		3-1/2 REG	Box			
2	PD 475 Orbit 1/8"ug Stabilized CC	3.640	6.625	3 1/2 IF	Box	13.50	14.29	0.7
		4.750		3 1/2 IF	Pin			
3	UBHO	2.250	4.750	3 1/2 IF	Box	3.00	17.29	0.9
		4.750		3 1/2 IF	Pin			
4	MWD	2.750	5.875	3 1/2 IF	Box	31.00	48.29	2.3
		4.750		3 1/2 IF	Pin			
5	4.75" NM Filter Sub	2.250	4.750	3 1/2 IF	Box	5.00	53.29	2.6
		4.750		3 1/2 IF	Pin			
6	Motor 475 7/8 8.2 Pin Down with a BH (1/4"ug)	3.810	5.500	3 1/2 IF	Box	30.00	83.29	4.0
		4.750		3 1/2 IF	Pin			
7	4.75" Float Sub	2.250	4.750	3 1/2 IF	Box	3.00	86.29	4.1
		4.750		3 1/2 IF	Pin			
8	6.5" Stabilizer (1/4"ug)	2.250	6.500	3 1/2 IF	Box	5.00	91.29	4.3
		4.750		3 1/2 IF	Pin			
9	4.75" X/O	2.813	4.750	XT39	Box	5.00	96.29	4.5
		4.000		XT39	Pin			
10	4" 14.00 DPS	3.340	5.125	XT39	Box	32.81	129.10	5.1

475 BHA 4: Slick PowerDrive, MWD Below the Motor

	Desc.	OD (in)	Max OD (in)	Bot Type	Bot Gender	Length (ft)	Cum. Length (ft)	Cum. Weight (1000 lbm)
		ID (in)		Top Type	Top Gender			
1	6 3/4" Bit	4.500						
		1.500	6.750	3-1/2 REG	Pin	0.79	0.79	0.1
2	PD 475 Orbit Slick CC	4.980		3-1/2 REG	Box			
		3.640	5.753	3 1/2 IF	Box	13.50	14.29	0.7
3	6.625" NM Stabilizer (1/8"ug)	5.000		3 1/2 IF	Pin			
		2.750	6.625	3 1/2 IF	Box	6.00	20.29	1.0
4	UBHO	4.750		3 1/2 IF	Pin			
		2.250	4.750	3 1/2 IF	Box	3.00	23.29	1.2
5	MWD	4.750		3 1/2 IF	Pin			
		2.750	5.875	3 1/2 IF	Box	31.00	54.29	2.6
6	4.75" Filter Sub	4.750		3 1/2 IF	Pin			
		2.250	4.750	3 1/2 IF	Box	5.00	59.29	2.8
7	Motor 475 7/8 8.2 Pin Down with a BH (1/4"ug)	4.750		3 1/2 IF	Pin			
		3.810	5.500	3 1/2 IF	Box	30.00	89.29	4.3
8	4.75" Float Sub	4.750		3 1/2 IF	Pin			
		2.250	4.750	3 1/2 IF	Box	3.00	92.29	4.4
9	6.5" Stabilizer (1/4"ug)	4.750		3 1/2 IF	Pin			
		2.250	6.500	3 1/2 IF	Box	5.00	97.29	4.6
10	4.75" X/O	4.750		3 1/2 IF	Pin			
		2.813	4.750	XT39	Box	5.00	102.29	4.8
11	4" 14.00 DPS	4.000		XT39	Pin			
		3.340	5.125	XT39	Box	32.81	135.10	5.3

Schlumberger-Private

475 BHA 5: Stabilized PowerDrive, MWD Below Motor with Real-Time Coms

	Desc.	OD (in)	Max OD (in)	Bot Type	Bot Gender	Length (ft)	Cum. Length (ft)	Cum. Weight (1000 lbm)
		ID (in)		Top Type	Top Gender			
1	6 3/4" Bit	4.500						
		1.500	6.750	3-1/2 REG	Pin	0.79	0.79	0.1
2	PD 475 Orbit 1/8"ug Stabilized CC	4.980		3-1/2 REG	Box			
		3.640	6.625	3-1/2 IF	Box	13.50	14.29	0.7
3	HHop	4.750		3-1/2 IF	Pin			
		2.250	4.750	3-1/2 IF	Pin	5.50	19.79	1.0
4	HDS-1 4.75" MWD	4.750		3-1/2 IF	Box			
		2.810	4.750	3-1/2 IF	Box	30.65	50.44	2.4
5	4.75" NM Filter Sub	4.750		3-1/2 IF	Pin			
		2.250	4.750	3-1/2 IF	Box	5.00	55.44	2.7
6	Motor 475 7/8 8.2 Pin Down with a BH (1/4"ug)	4.750		3-1/2 IF	Pin			
		3.810	5.500	3-1/2 IF	Box	30.00	85.44	4.1
7	4.75" Float Sub	4.750		3 1/2 IF	Pin			
		2.250	4.750	3 1/2 IF	Box	3.00	88.44	4.2
8	6.5" Stabilizer (1/4"ug)	4.750		3-1/2 IF	Pin			
		2.250	6.500	3-1/2 IF	Box	5.00	93.44	4.4
9	4.75" X/O	4.750		3-1/2 IF	Pin			
		2.813	4.750	XT39	Box	5.00	98.44	4.6
10	4" 14.00 DPS	4.000		XT39	Pin			
		3.340	5.125	XT39	Box	32.81	131.25	5.2

475 BHA 6: Slick PowerDrive, MWD Below Motor with Real-Time Coms

	Desc.	OD (in)	Max OD (in)	Bot Type	Bot Gender	Length (ft)	Cum. Length (ft)	Cum. Weight (1000 lbm)
		ID (in)		Top Type	Top Gender			
1	6 3/4" Bit	4.500						
		1.500	6.750	3-1/2 REG	Pin	0.79	0.79	0.1
2	PD 475 Orbit Slick CC	4.980		3-1/2 REG	Box			
		3.640	6.625	3-1/2 IF	Box	13.50	14.29	0.7
3	HHop	4.750		3-1/2 IF	Pin			
		2.250	4.750	3-1/2 IF	Pin	5.50	19.79	1.0
4	6.625" NM Stabilizer (1/8"ug)	5.000		3-1/2 IF	Pin			
		2.750	6.625	3-1/2 IF	Box	6.00	25.79	1.3
5	HDS-1 4.75" MWD	4.750		3-1/2 IF	Box			
		2.810	4.750	3-1/2 IF	Box	30.65	56.44	2.7
6	4.75" Filter Sub	4.750		3-1/2 IF	Pin			
		2.250	4.750	3-1/2 IF	Box	5.00	61.44	3.0
7	Motor 475 7/8 8.2 Pin Down with a BH (1/4" ug)	4.750		3-1/2 IF	Pin			
		3.810	5.500	3-1/2 IF	Box	30.00	91.44	4.4
8	4.75" Float Sub	4.750		3-1/2 IF	Pin			
		2.250	4.750	3-1/2 IF	Box	3.00	94.44	4.5
9	6.5" Stabilizer (1/4"ug)	4.750		3-1/2 IF	Pin			
		2.250	6.500	3-1/2 IF	Box	5.00	99.44	4.7
10	4.75" X/O	4.750		3-1/2 IF	Pin			
		2.813	4.750	XT39	Box	5.00	104.44	4.9
11	4" 14.00 DPS	4.000		XT39	Pin			
		3.340	5.125	XT39	Box	32.81	137.25	5.5

Schlumberger-Private

900 BHA 1: Stabilized PowerDrive, MWD Above the Motor, Stabilized Motor

	Desc.	OD (in)	Max OD (in)	Bot Type	Bot Gender	Length (ft)	Cum. Length (ft)	Cum. Weight (1000 lbm)
		ID (in)		Top Type	Top Gender			
1	12.25" PDC Bit	8.000	12.250	6-5/8 REG	Pin	1.44	1.44	0.4
		3.250						
2	PD 900 Orbit 1/8"ug Stabilized CC	9.000	12.125	6-5/8 REG	Box	14.02	15.46	2.9
		5.125						
3	8" Filter Sub	8.000	8.000	6-5/8 REG	Pin	5.00	20.46	3.7
		2.813						
4	8" Motor 7/8 4.0 Pin Down Stabilized Stator can 1/4"ug	8.250	9.250	6-5/8 REG	Pin	30.00	50.46	8.1
		6.250						
5	8" Float Sub	8.000	8.000	6-5/8 REG	Pin	5.00	55.46	8.8
		2.813						
6	UBHO	8.000	8.000	6-5/8 REG	Pin	5.00	60.46	9.5
		2.813						
7	MWD	8.250	8.410	6-5/8 REG	Pin	31.00	91.46	13.6
		5.000						
8	8" NM Collar	8.000	8.000	6-5/8 REG	Pin	30.00	121.46	18.0
		3.000						

900 BHA 2: Stabilized PowerDrive, MWD Above the Motor, Slick Motor

	Desc.	OD (in)	Max OD (in)	Bot Type	Bot Gender	Length (ft)	Cum. Length (ft)	Cum. Weight (1000 lbm)
		ID (in)		Top Type	Top Gender			
1	12.25" PDC Bit	8.000 3.250	12.250	6-5/8 REG	Pin	1.44	1.44	0.4
2	PD 900 Orbit 1/8"ug Stabilized CC	9.000 5.125	12.125	6-5/8 REG	Box	14.02	15.46	2.9
3	8" Filter Sub	8.000 2.813	8.000	6-5/8 REG	Pin Box	5.00	20.46	3.7
4	8" Motor 7/8 4.0 Pin Down Slick Bearing Housing	8.250 6.250	9.250	6-5/8 REG	Pin Box	30.00	50.46	8.1
5	8" Float Sub	8.000 2.813	8.000	6-5/8 REG	Pin Box	5.00	55.46	8.8
6	12" NM Stabilizer (1/4"ug)	8.250 2.500	12.000	6-5/8 REG	Pin Box	6.00	61.46	9.8
7	UBHO	8.000 2.813	8.000	6-5/8 REG	Pin Box	5.00	66.46	10.5
8	MWD	8.250 5.000	8.410	6-5/8 REG	Pin Box	31.00	97.46	14.6
9	8" NM Collar	8.000 3.000	8.000	6-5/8 REG	Pin Box	30.00	127.46	19.0

900 BHA 3: Slick PowerDrive, MWD Above the Motor, Stabilized Motor

	Desc.	OD (in)	Max OD (in)	Bot Type	Bot Gender	Length (ft)	Cum. Length (ft)	Cum. Weight (1000 lbm)
		ID (in)		Top Type	Top Gender			
1	12.25" PDC Bit	8.000	12.250			1.44	1.44	0.4
		3.250		6-5/8 REG	Pin			
2	PD 900 Orbit AA 12.25" Slick CC	9.000	11.822	6-5/8 REG	Box	14.02	15.46	2.9
		5.125		6-5/8 REG	Box			
3	8" Filter Sub	8.000	8.000	6-5/8 REG	Pin	5.00	20.46	3.7
		2.813		6-5/8 REG	Box			
4	8" Motor 7/8 4.0 Pin Down Stabilized Bearing Housing (1/8"ug)	8.250	12.125	6-5/8 REG	Pin	30.00	50.46	8.1
		6.250		6-5/8 REG	Box			
5	8" Float Sub	8.000	8.000	6-5/8 REG	Pin	5.00	55.46	8.8
		2.813		6-5/8 REG	Box			
6	12" NM Stabilizer (1/4"ug)	8.250	12.000	6-5/8 REG	Pin	6.00	61.46	9.8
		2.500		6-5/8 REG	Box			
7	UBHO	8.000	8.000	6-5/8 REG	Pin	5.00	66.46	10.5
		2.813		6-5/8 REG	Box			
8	MWD	8.250	8.410	6-5/8 REG	Pin	31.00	97.46	14.6
		5.000		6-5/8 REG	Box			
9	8" NM Collar	8.000	8.000	6-5/8 REG	Pin	30.00	127.46	19.0
		3.000		6-5/8 REG	Box			

900 BHA 4: Slick PowerDrive, MWD Above the Motor, Slick Motor

	Desc.	OD (in)	Max OD (in)	Bot Type	Bot Gender	Length (ft)	Cum. Length (ft)	Cum. Weight (1000 lbm)
		ID (in)		Top Type	Top Gender			
		8.000						
1	12.25" PDC Bit	3.250	12.250	6-5/8 REG	Pin	1.44	1.44	0.4
		9.000		6-5/8 REG	Box			
2	PD 900 Orbit AA 12.25" Slick CC	5.125	11.822	6-5/8 REG	Box	14.02	15.46	2.9
		8.250		6-5/8 REG	Pin			
3	12.125" NM Stabilizer (1/8"ug)	2.500	12.125	6-5/8 REG	Box	6.00	21.46	3.9
		8.000		6-5/8 REG	Pin			
4	8" Filter Sub	2.813	8.000	6-5/8 REG	Box	5.00	26.46	4.7
		8.250		6-5/8 REG	Pin			
5	8" Motor 7/8 4.0 Pin Down Slick Bearing Housing	6.250	9.250	6-5/8 REG	Box	30.00	56.46	9.1
		8.000		6-5/8 REG	Pin			
6	8" Float Sub	2.813	8.000	6-5/8 REG	Box	5.00	61.46	9.8
		8.250		6-5/8 REG	Pin			
7	12" NM Stabilizer (1/4"ug)	2.500	12.000	6-5/8 REG	Box	6.00	67.46	10.8
		8.000		6-5/8 REG	Pin			
8	UBHO	2.813	8.000	6-5/8 REG	Box	5.00	72.46	11.5
		8.250		6-5/8 REG	Pin			
9	MWD	5.000	8.410	6-5/8 REG	Box	31.00	103.46	15.6
		8.000		6-5/8 REG	Pin			
10	8" NM Collar	3.000	8.000	6-5/8 REG	Box	30.00	133.46	20.0