

Drillingsoftware BHA Design User Manual

The menu is your navigation point this will guide you around the program



- The main menu buttons
- Input BHA data
- Schematic
- Tool library
- BHA reference
- Critical BHA

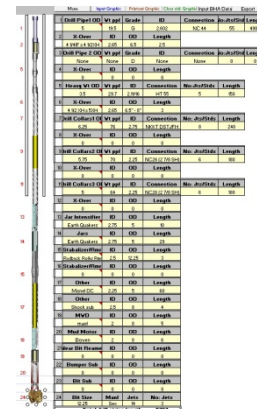
Get started by clicking the "Input BHA data" button
This will take you to the main worksheet everything is

related to this data apart from the various critical BHA calculations, which require dedicated inputs.

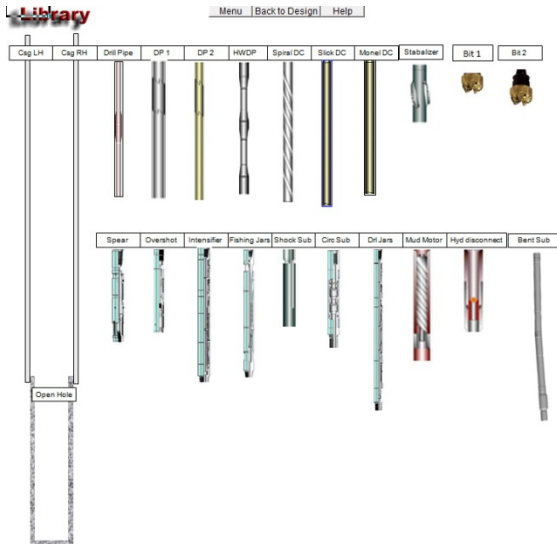
These will be shown later in this manual

All the inputs and selected drill string info is linked to the BHA schematic, All the yellow cells are linked to the main data so you should make sure

you do not overwrite these cells

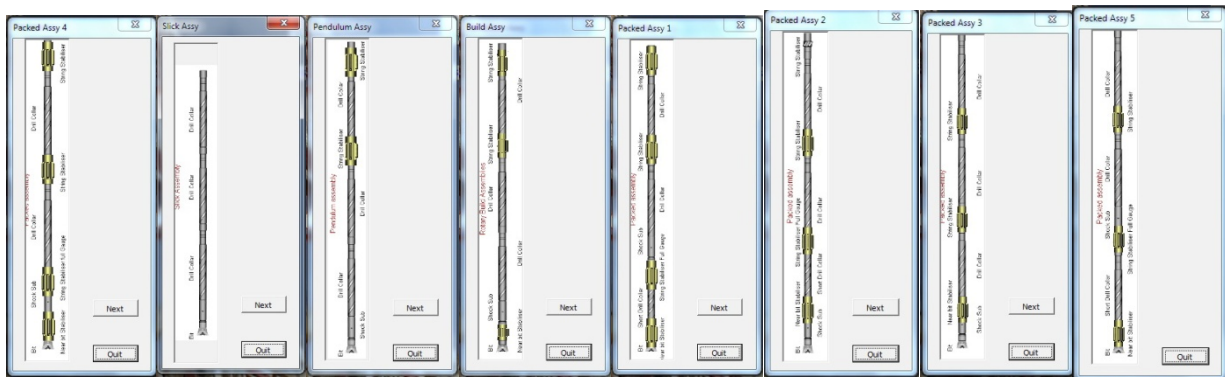


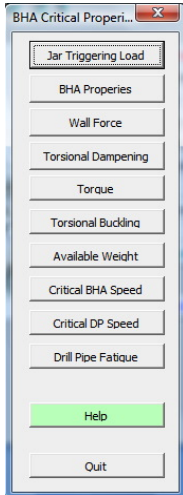
You have a library of tools to drop into your BHA schematic.



Tool selection is a simple click on the tool name found above each tool.

A complete reference to all the bottom hole assemblies for Build, Hold, Pendulum and Packed Assemblies.





Next click on the BHA design critical criteria,

- Jar triggering load.
- BHA properties.
- Wall force.
- Torsional dampening.
- Torque. Torsional buckling.
- Available bit weight.
- Critical BHA speed.
- Critical drill pipe speed.
- Drill pipe fatigue.

These buttons take you to additional worksheets for the critical calculations.

All the critical calculations for your BHA design are set out in separate worksheets

Jar triggering load calculations

Jar Triggering Load	
Length of Pipe	4900 ft
Pipe OD	5 in
Pipe ID	4.276 in
Grade of Pipe (D,E,G,N,S,X)	E API
Weight of Pipe	19.5 ppf
% Wear of Pipe	5 %
Length of Collars	519 ft
Collar OD	6 1/4 in
Collar ID	2 3/4 in
Mud Weight	9.2 ppf
Seal Area of Jar	15 in ²
Assistance Pressure for Jars	1000 psi

75000	psi	API Unit Yield Strength of the Pipe
84.11	ppf	Weight of Drill Collars
295954	lbs	Working Tensile Strength
119634	lbs	Bouyed Weight of the String Above the Jars
176321	lbs	Maximum Triggering Load
15000	lbs	Pump Extending Force
295954	lbs	Maximum Load WITHOUT Hydraulic Assistance
280954	lbs	Maximum Load WITH Hydraulic Assistance

Drill pipe fatigue

Drill Pipe Fatigue	
Pipe OD	5 Ins
Pipe ID	4.276 Ins
Weight of Pipe	19.5 Ins
Length of Pipe	4900 Ft
Grade of Pipe (D,E,G,N,S,X)	E
Distance Between Joints	30 Ft
Collar OD	6 1/4 Ins
Collar ID	2 3/4 Ins
Are the Collars Square or Round	Round
Length of Collars	279 Ft
Length of Tools In Hole	42 Ft
Modulus Of Elasticity	30000000
Mud Weight - Outside	11.3 ppg
Mud Weight - Inside	11.3 ppg
Dogleg Severity	0.25 %/100'
Depth Of Dogleg	500 Ft
Maximum Lateral Tooljoint Force	2000 lbs

75000 psi	API Unit Yield Strength of the Pipe
5.27 in ²	Cross Sectional Area Of Drillpipe
84.11 ppf	Weight per Foot of Drill Collars
0.827326	Bouyancy Factor
132298 lbs	Weight Of String Below Dogleg
109453 lbs	Bouyed Weight Of String Below Dogleg
20751 psi	Bouyant Tensile Stress In The Drillpipe [Teff]
14.27 in ⁴	Cross-Sectional Moment Of Inertia Of Drillpipe
0.01599 K	
16185.59 psi	Maximum Permissible Bending Stress [Grade E & S]
5.122312 °/100'	Maximum Permissible Dogleg Severity [Fatigue]
-3.4921 °/100'	Maximum Permissible Dogleg Severity [Wear]

Critical drill pipe speed

Critical Rotary Speed of Drill Pipe	
Pipe OD	5 Ins
Pipe ID	4.276 Ins
Weight of Pipe	19.5 ppf
Length of Pipe	4900 Ft
Length Between Tool Joint	30 Ft

242 R.P.M	Critical Nodal Rotary Speed
53 R.P.M	Critical Longitudinal Rotary Speed

Critical BHA speed

Critical Rotary Speed of BHA		
Collar OD	6 1/4	Ins
Collar ID	2 3/4	Ins
Are the Collars Square or Round	Round	
Length of Collars	279	Ft
Rotary Speed	100	R.P.M.
Order of Harmonic (1,3,5...)	3	
Is The Bit A Tri-Cone ?	N	
Is There A Shock Sub On The B.H.A. ?	N	
Weight per Foot of Drill Collars	84.11	ppf
Weight of Drill Collars	23465	Lbs
Longitudinal Frequency	15.10	Hz
Critical Longitudinal Rotary Speed	2717	R.P.M
Torsional Frequency	9.54	Hz
Critical Torsional Rotary Speed	1718	R.P.M.
Frequency Of Bit	5.00	Hz

Available bit weight

Available Bit Weight	
Hole Diameter	8 1/2 Ins
Pipe OD	5 Ins
Pipe ID	4.276 Ins
Weight of Pipe	19.5 ppg
Length of Pipe	4900 Ft
Collar OD	6 1/4 Ins
Collar ID	2 3/4 Ins
Are the Collars Square or Round	Round
Length of Collars	279 Ft
Number of Stabilizers (Same Size as Collars)	5
Length of Each Stabilizer	5.35 Ft
Mud Weight - Outside	9.1 ppg
Mud Weight - Inside	9.2 ppg
Hole Inclination	0.25 e

84.11	ppf	Weight per Foot of Drill Collars
23465.3	lbs	Weight of Drill Collars
0.861311		Bouyancy Factor
72.44	ppf	Bouyed Weight per Foot of Drill Collars
20210.91	lbs	Bouyed Weight of Drill Collars
1937.78	lbs	Bouyed Weight of Stabilizers
22148.48	lbs	Available Weight from Collars & Stabilizers
2341.14	lbs	Available Weight from the Drillpipe
24489.62	lbs	Total Weight Available

Torsional buckling

Torsional Buckling		
Pipe OD	5	ins
Pipe ID	4.276	ins
Length of Pipe	4900	ft
Weight of Pipe	19.5	ppf
Collar OD	6 1/4	ins
Collar ID	2 3/4	ins
Are the Collars Square ?	Round	
Length of Collars	279	ft
Current Rotary Speed	100	rpm
Axial Load On Pipe (- = Compression)	0	lbs
Axial Load On Collars (- = Compression)	-40000	lbs
	14.27	in ⁴ Resistance to Axial Bending (Pipe)
	28.54	in ⁴ Resistance to Torsion (Pipe)
	84.11	ppf Weight per Foot of Drill Collars
	23465.30	lbs Weight of Drill Collars
	72.09	in ⁴ Resistance to Axial Bending (Collars)
	144.19	in ⁴ Resistance to Torsion (Collars)
	3811.89	lbs-ft Buckling Torque of the Pipe
	UNDEFINED	lbs-ft Buckling Torque of the Collars
	-1.22	lbs Value of Axial Load on Pipe for Zero B.T.
	-1904.36	lbs Value of Axial Load on Collars for Zero B.T.
	3787.88	lbs-ft Torque Placed On Drillpipe By Collars

Torque

Torque of a spinning BHA		
Collar OD	6 1/4	ins
Collar ID	2 3/4	ins
Are the Collars Square ?	Round	
Length of Collars	279	Ft
Current Rotary Speed	100	rpm
	144	in ⁴ Resistance to Torsion (Polar Moment of Inertia)
	11463	lbs-ft Torque Transmitted To The Bit
	0.053265	sec Acting Time Period

Torsional dampening

Torsional Dampening

Collars Currently In The Hole

Collar OD

Collar ID

Drill Collar Type

Length of Collars

Current Rotary Speed

147.29 in⁴ Resistance to Torsion (Polar Moment of Inertia)

51.98 Dampening Variable [DV]

Collars To Be Added To The Hole

Collar OD

Collar ID

Drill Collar Type

Length of Collars

New Rotary Speed

10.80 in⁴ Resistance to Torsion (Polar Moment of Inertia)

3.50 Dampening Variable [DV]

55.47 Total Dampening

BHA properties

BHA Properties		DC1	DC2	DC3
Weight per Foot of Drill Collars	ppf	84.11	74.76	53.23
Weight of Drill Collars	lbs	20185.20	13456.80	9581.96
Bouyed Weight per Foot of Drill Collars	ppf	68.55	60.94	43.39
Bouyed Weight of Drill Collars	lbs	16452.98	10968.65	7810.27
		DC1	DC2	DC3
Resistance to Axial Bending	in ⁴	72.09	52.40	29.42
Resistance to Torsion	in ⁴	144.19	104.80	58.84
Sag (Resistance to Sag)	in	2902.88	1123.27	1424.52
Drop (Resistance to Drop)	°	739.21	381.38	483.67

Wall force in dog legs & inclined holes

Wall Force in Dog Legs		
Dp OD	5	ins
Dp ID	4.276	ins
Dc Weight	19.5	ppf
Average Jt Length	30	Ft
Dc OD	6 1/4	ins
Dc ID	2 1/4	ins
Dc Length	279	Ft
Drilling Depth	5600	Ft
Mud Weight	9.1	ppg
Dog Leg Severity	0.25	°/100'
Depth of Dog Leg	4000	Ft
Depth of Interest	5600	Ft
WOB	17000	Lbs
Weight of Collars	90.78	ppf
Tension in the Drill Pipe	122	lbs
Drill Pipe Property	TENSION	
Wall Force	0.16	lbs

Wall Force in Inclined Holes		
Hole angle	0.45	°
Mud Weight inside	9.2	ppg
Mud Weight Outside	9.1	ppg
Bouyed Weight of Pipe	16.90	ppf
Wall Force per Foot	0.13	lbs
Wall Force per Joint of Pipe	3.98	lbs

Centrifugal Force		
Rotary Speed	130	rpm
Hole Diameter	8.5	ins
Wall Force per Foot	48.98	ppf