

Walker Ridge Block 08 1
QUICK LOOK CASING DESIGN WORKSHEET

I. Conductor Pipe		<u>22" 224.2 ppf X-80 S-90 MT</u>	Collapse	Burst	Tension
		Ratings:	3873	6364	2120M
A. Burst	$= [0.052 \times \text{FG} \times \text{TVD}(\text{shoe})] - [\text{Gas Gradient} \times \text{TVD}(\text{BML})] - [\text{WD} \times 8.6 \times 0.052]$ $= [0.052 \text{ psi/ft} \times 12.758 \text{ ppg} \times 8250 \text{ ft}] - [0.1 \text{ psi/ft} \times 2353 \text{ ft}] - [5815 \text{ ft} \times 8.6 \text{ ppg} \times 0.052 \text{ psi/ft}]$ $= \underline{2637 \text{ psi}}$				
	$\text{Safety Factor} = \text{Rating} / \text{Burst} = \underline{6364.0 \text{ psi}} / \underline{2,637 \text{ psi}} = \underline{2.41}$				
B. Collapse	$= [0.052 \times \text{MW} \times \text{TVD}(\text{shoe})] - [0.052 \times 8.6 \times \text{TVD}(\text{shoe}) \times 50 \text{ \%}]$ $= [0.052 \times 9 \text{ ppg} \times 8250 \text{ ft}] - [0.052 \times 8.6 \text{ ppg} \times 8250 \text{ ft} \times 50 \text{ \%}]$ $= \underline{2016 \text{ psi}}$				
	$\text{Safety Factor} = \text{Rating} / \text{Collapse} = \underline{3873.0 \text{ psi}} / \underline{2,016 \text{ psi}} = \underline{1.92}$				
C. Tension	$= \text{Weight} \times \text{MD} \times [1 - (\text{MW} / 65.5)]$ $= 224.2 \text{ lbs/ft} \times 2353 \text{ ft} \times [1 - (9 \text{ ppg} / 65.5 \text{ ppg})]$ $= \underline{455056 \text{ lbs}}$				
	$\text{Safety Factor} = \text{Rating} / \text{Tension} = \underline{2120000 \text{ lbs}} / \underline{455056 \text{ lbs}} = \underline{4.66}$				

***Collapse' designed with 50 % evacuation and 50 % fill-up with seawater.

I. Conductor Liner		<u>17.875" 93.5 ppf HCP-110 HYD 521</u>	Collapse	Burst	Tension
		Ratings:	1160	6364	2157M
A. Burst	$= [0.052 \times \text{FG} \times \text{TVD}(\text{shoe})] - [\text{Gas Gradient} \times \text{TVD}(\text{BML}) \times 50 \text{ \%}] - [0.052 \times \text{MW} \times \text{TVD}(\text{BML}) \times 50 \text{ \%}] - [\text{WD} \times 8.6 \times 0.052]$ $= [0.052 \times 14.582 \text{ ppg} \times 12600 \text{ ft}] - [0.1 \text{ psi/ft} \times 6703 \text{ ft} \times 50 \text{ \%}] - [0.052 \times 12.2 \text{ ppg} \times 6703 \text{ ft} \times 50 \text{ \%}] - [5815 \text{ ft} \times 8.6 \text{ ppg} \times 0.052]$ $= \underline{4492 \text{ psi}}$				
	$\text{Safety Factor} = \text{Rating} / \text{Burst} = \underline{6,364 \text{ psi}} / \underline{4,492 \text{ psi}} = \underline{1.42}$				
B. Collapse	$= [0.052 \times \text{MW} \times \text{TVD}] - [0.052 \times 10.5 \times \text{TVD} \times 100 \text{ \%}]$ $= [0.052 \times 12.2 \text{ ppg} \times 12600 \text{ ft}] - [0.052 \times 10.5 \text{ ppg} \times 12600 \text{ ft} \times 100 \text{ \%}]$ $= \underline{1,114 \text{ psi}}$				
	$\text{Safety Factor} = \text{Rating} / \text{Collapse} = \underline{1,160 \text{ psi}} / \underline{1,114 \text{ psi}} = \underline{1.04}$				
C. Tension	$= \text{Weight} \times \text{MD} \times [1 - (\text{MW} / 65.5)]$ $= 93.5 \text{ lbs/ft} \times 4850 \text{ ft} \times [1 - (12.2 \text{ ppg} / 65.5 \text{ ppg})]$ $= \underline{369011 \text{ lbs}}$				
	$\text{Safety Factor} = \text{Rating} / \text{Tension} = \underline{2157000 \text{ lbs}} / \underline{369011 \text{ lbs}} = \underline{5.85}$				

* Burst designed with gas kick volume equivalent to 50 % of cased hole TVD.

** Collapse designed with 0 % evacuation and 100 % fill-up with 10.5 ppg fluid or equivalent head.

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III. Intermediate Casing	<u>13.625" 88.2 ppf HCQ-125 E HYD 523</u>	Collapse	Burst	Tension
	Ratings:	5930	10610	2464M
A. Burst = [0.052 x FG x TVD(shoe)] - [Gas Gradient x TVD(BML) x 50 %] - [0.052 x MW x TVD(BML) x 50 %] -[WD x 8.6 x 0.052]				
= [0.052 x 15.798 ppg x 19500 ft] - [0.1 psi/ft x 13603 ft x 50 %] - [0.052 x 14.2 ppg x 13603 ft x 50 %] - [5815 ft x 8.6 ppg x 0.052]				
= <u>7716 psi</u>				
Safety Factor = Rating / Burst = <u>10,610 psi</u> / <u>7,716 psi</u> = <u>1.38</u>				
B. Collapse = [0.052 x MW x TVD] - [0.052 x SW Gradient x TVD x 100 %]				
= [0.052 x 13.8 ppg x 19500 ft] - [0.052 x 8.6 ppg x 19500 ft x 100 %]				
= <u>5,273 psi</u>				
Safety Factor = Rating / Collapse = <u>5,930 psi</u> / <u>5,273 psi</u> = <u>1.12</u>				
C. Tension = Weight x MD x [1 - (MW / 65.5)]				
= 88.2 lbs/ft x 13603 ft x [1 - (13.8 ppg /65.5 ppg)]				
= <u>947006 lbs</u>				
Safety Factor = Rating / Tension = <u>2464000 lbs</u> / <u>947006 lbs</u> = <u>2.60</u>				

* Burst designed with gas kick volume equivalent to 50 % of cased hole TVD.

** Collapse designed with 0 % evacuation and 100 % fill-up with seawater.

V. Intermediate Liner	<u>11.875 71.8 ppf HCQ-125 HYD 513</u>	Collapse	Burst	Tension
	Ratings:	7190	10610	1723M
A. Burst = [0.052 x FG x TVD(shoe)] - [Gas Gradient x TVD(BML) x 50 %] - [0.052 x MW x TVD(BML) x 50 %] -[WD x 8.6 x 0.052]				
= [0.052 x 14.676 ppg x 26022 ft] - [0.1 psi/ft x 20125 ft x 50 %] - [0.052 x 14.2 ppg x 20125 ft x 50 %] - [5815 ft x 8.6 ppg x 0.052]				
= <u>8821 psi</u>				
Safety Factor = Rating / Burst = <u>10,610 psi</u> / <u>8,821 psi</u> = <u>1.20</u>				
B. Collapse = [0.052 x MW x TVD] - [0.052 x 9.0 Gradient x TVD x 100 %]				
= [0.052 x 14.2 ppg x 26022 ft] - [0.052 x 9 ppg x 26022 ft x 100 %]				
= <u>7,036 psi</u>				
Safety Factor = Rating / Collapse = <u>7,190 psi</u> / <u>7,036 psi</u> = <u>1.02</u>				
C. Tension = Weight x MD x [1 - (MW / 65.5)]				
= 71.8 lbs/ft x 6941 ft x [1 - (14.2 ppg /65.5 ppg)]				
= <u>390322 lbs</u>				
Safety Factor = Rating / Tension = <u>1723000 lbs</u> / <u>390322 lbs</u> = <u>4.41</u>				

* Burst designed with gas kick volume equivalent to 50 % of cased hole TVD.

** Collapse designed with 0 % evacuation and 100 % fill-up 9.0 ppg mud or equivalent head.

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V. Intermediate Liner		<u>9.375 39 ppg HCQ-125 HYD 513</u>	Collapse	Burst	Tension
		Ratings:	4850	10610	1547M
A. Burst	$= [0.052 \times FG \times TVD(shoe)] - [Gas\ Gradient \times TVD(BML) \times 30\%] - [0.052 \times MW \times TVD(BML) \times 70\%] - [WD \times 8.6 \times 0.052]$ $= [0.052 \times 14.987\ ppg \times 27600\ ft] - [0.1\ psi/ft \times 21703\ ft \times 30\%] - [0.052 \times 14.2\ ppg \times 21703\ ft \times 70\%] - [5815\ ft \times 8.6\ ppg \times 0.052]$ $= \underline{7041\ psi}$				
	$Safety\ Factor = Rating / Burst = \underline{10,610\ psi} / \underline{7,041\ psi} = \underline{1.51}$				
B. Collapse	$= [0.052 \times MW \times TVD] - [0.052 \times 14.2 \times TVD \times 77\%]$ $= [0.052 \times 14.2\ ppg \times 27600\ ft] - [0.052 \times 14.2\ ppg \times 27600\ ft \times 77\%]$ $= \underline{4,687\ psi}$				
	$Safety\ Factor = Rating / Collapse = \underline{4,850\ psi} / \underline{4,687\ psi} = \underline{1.03}$				
C. Tension	$= Weight \times MD \times [1 - (MW / 65.5)]$ $= 39\ lbs/ft \times 2016\ ft \times [1 - (14.2\ ppg / 65.5\ ppg)]$ $= \underline{61579\ lbs}$				
	$Safety\ Factor = Rating / Tension = \underline{1547000\ lbs} / \underline{61579\ lbs} = \underline{25.12}$				

* Burst designed with gas kick volume equivalent to 30 % of cased hole TVD.

** Collapse designed with 23 % evacuation and 77 % fill-up with 14.2 ppg fluid or equivalent head.