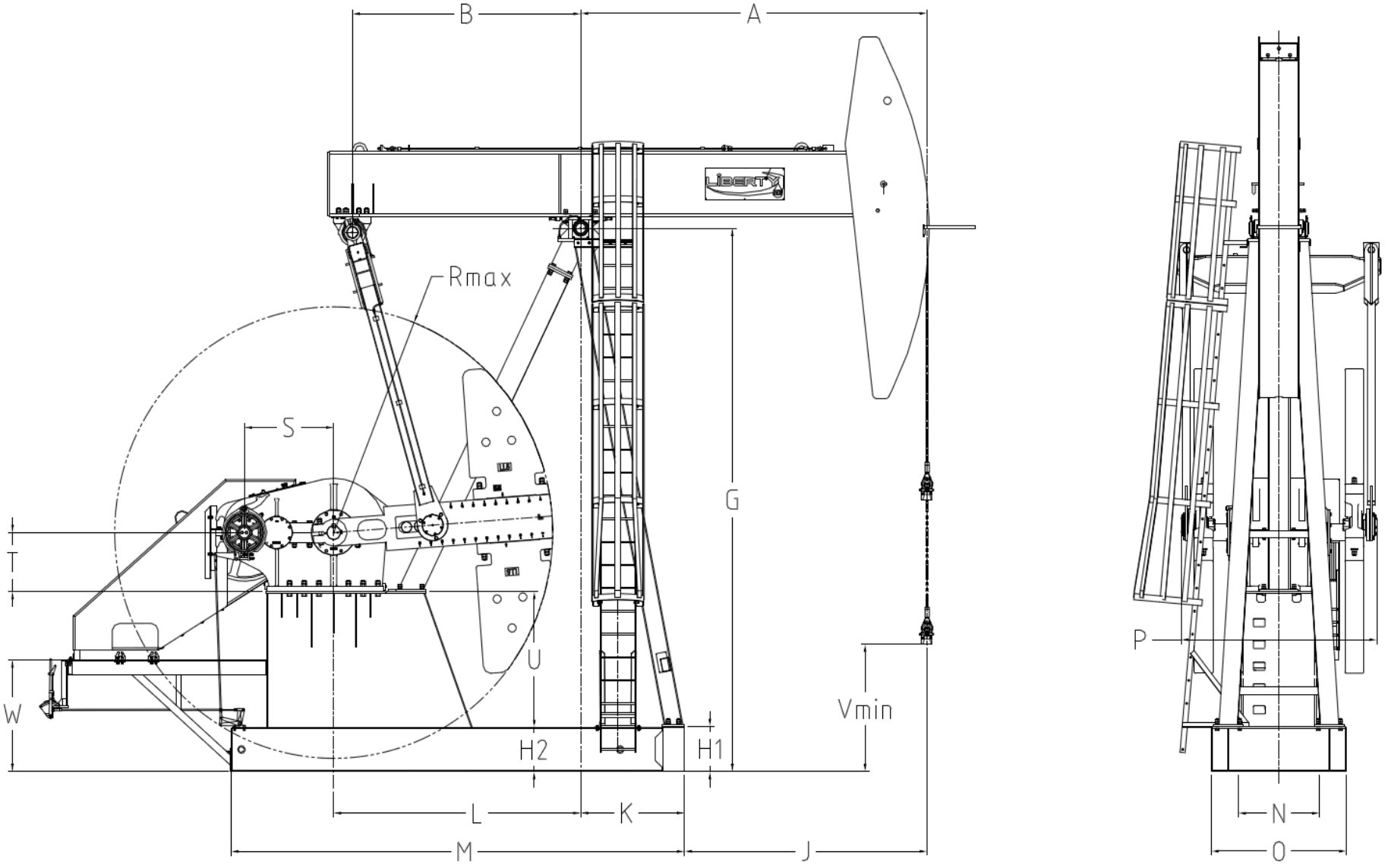
LIBERTY LIFT HE PUMPING UNIT



UNIT	A	B	G	H1	H2	J	K	L	M	N	O	P	R	S	T	U	Vmin	W
912-365-168	15'-5 1/8"	10'-2"	23'-5 5/8"	23 1/8"	23 5/8"	10'-9 5/8"	4'-7 1/2"	11'-0"	20'-2 1/4"	3'-3 3/8"	6'-0 1/4"	8'-8 5/8"	117"	47.768"	30.512"	5'-9 3/4"	5'-3 5/8"	4'-9 7/8"

LIBERTY LIFT SOLUTIONS

TORQUE FACTOR TABLE

UNIT DESIGNATION 912-365-168 High Efficiency

Cranks : CR011

Position of Crank	Polished Rod Position Length of Stroke, inches			Torque Factor Length of Stroke, inches		
degrees	169.089	144.659	121.337	169.089	144.659	121.337
0	0.0035	0.0027	0.0021	-11.420	-8.487	-6.183
15	0.0087	0.0095	0.0102	18.487	16.202	13.725
30	0.0605	0.0609	0.0607	47.970	40.067	32.691
45	0.1539	0.1515	0.1485	71.040	58.952	47.898
60	0.2749	0.2694	0.2632	83.372	69.898	57.341
75	0.4065	0.3995	0.3915	85.039	72.676	60.662
90	0.5345	0.5287	0.5213	79.427	69.288	58.946
105	0.6506	0.6482	0.6434	70.280	62.286	53.817
120	0.7516	0.7531	0.7521	60.023	53.565	46.655
135	0.8365	0.8416	0.8439	49.646	44.063	38.277
150	0.9052	0.9123	0.9166	39.125	33.934	28.957
165	0.9572	0.9638	0.9681	27.750	22.792	18.594
180	0.9901	0.9938	0.9959	14.316	9.975	6.935
195	0.9997	0.9985	0.9970	-2.520	-5.077	-6.127
210	0.9803	0.9741	0.9687	-23.149	-22.149	-20.184
225	0.9272	0.9181	0.9100	-45.378	-39.664	-34.112
240	0.8412	0.8318	0.8228	-64.850	-55.087	-46.329
255	0.7295	0.7213	0.7123	-78.303	-66.311	-55.429
270	0.6022	0.5949	0.5864	-85.141	-72.476	-60.609
285	0.4689	0.4620	0.4538	-86.090	-73.616	-61.616
300	0.3383	0.3313	0.3235	-81.822	-69.976	-58.449
315	0.2181	0.2115	0.2045	-72.503	-61.650	-51.149
330	0.1165	0.1111	0.1057	-57.849	-48.551	-39.769
345	0.0420	0.0387	0.0357	-37.447	-30.655	-24.539

1.) The position of the crank is the angular displacement measured clockwise from the 12 o'clock position View with the well head to the right.

2.) Position is expressed as a fraction of stroke above lowermost position

3.) Torque factor = T/P_R, where T = torque on pumping unit reducer due to polished rod load P_R.

Strctural Unbalance = -732

A =	185.091
C =	122.008
G =	123.898
H =	281.615
K =	205.671
I =	132.008
P =	157.650
R1 =	53.031
R2 =	46.023
R3 =	39.016

LIBERTY LIFT SOLUTIONS

EFFECTIVE COUNTERBALANCE TABLE

Unit Designation 912-365-168 High Efficiency

CRANK : CR011

Stroke Length, inches	169.089		144.659		121.337	
Cranks Only, pounds	4583		5361		6430	
Description	Max	Min	Max	Min	Max	Min
Cranks and 4 each LL2	14287	8141	16485	9440	19506	11224
Cranks w/2-LL2 & 2-LL3	17195	9539	19819	11043	23425	13108
Cranks and 4 each LL3	20103	10937	23153	12645	27343	14992
Cranks w/2-LL3 & 2-LL4	22196	12104	25552	13983	30163	16565
Cranks and 4 each LL4	24288	13271	27950	15321	32982	18137
Cranks w/2-LL4 & 2-LL5	25968	14282	29876	16480	35245	19500
Cranks and 4 each LL5	27647	15293	31801	17639	37508	20862
*Cranks w/2-LL5 & 2-LL6	30304	17460	34846	20123	41088	23782
*Cranks and 4 each LL6	32961	19627	37891	22607	44668	26702

* Not Recommended

** Maximum recommended ECB for this unit is 29200 in maximum stroke position.

LIBERTY LIFT SOLUTIONS

COUNTERBALANCE MOMENT TABLE

Unit Designation 912-365-168 High Efficiency

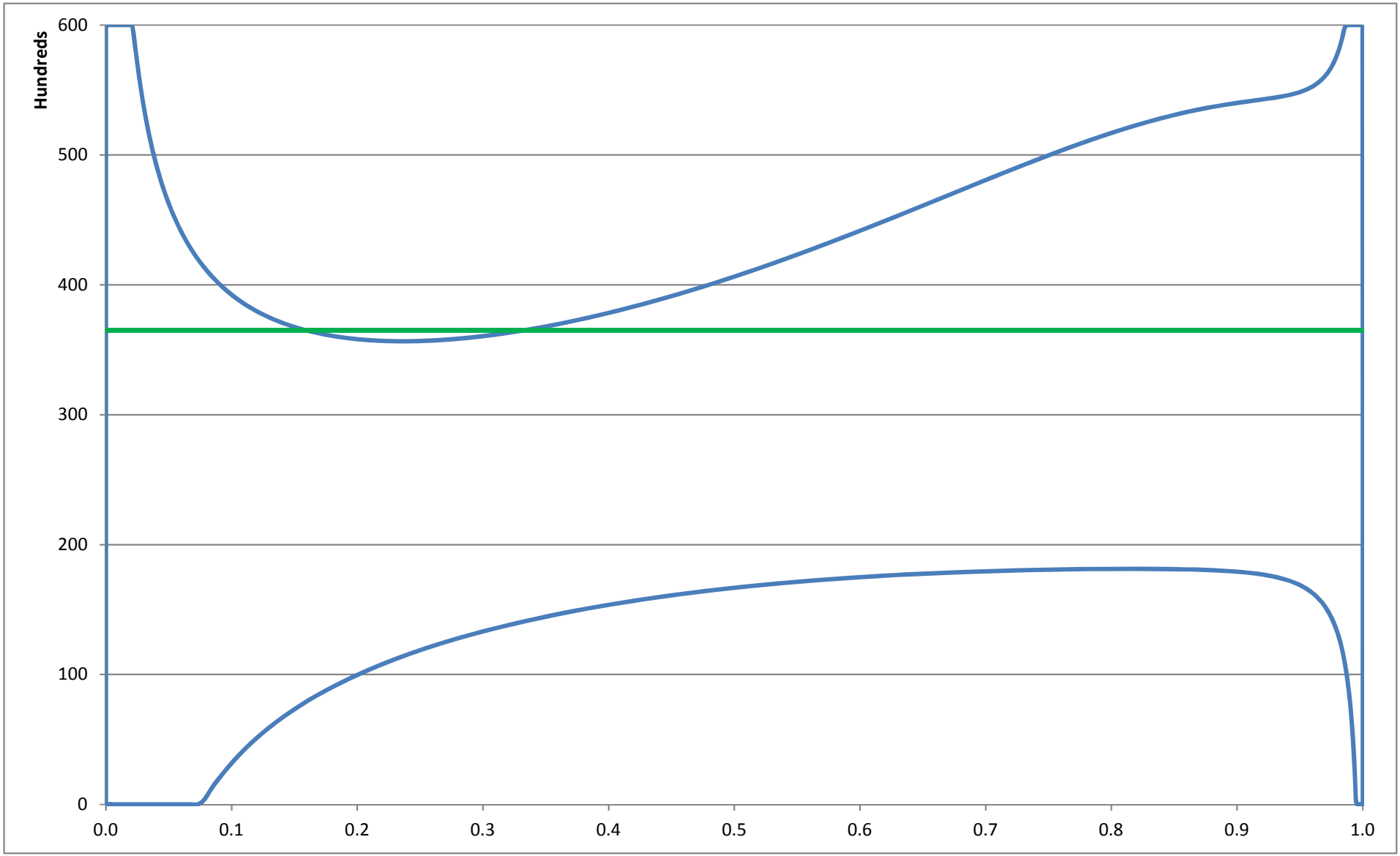
CRANK : CR011

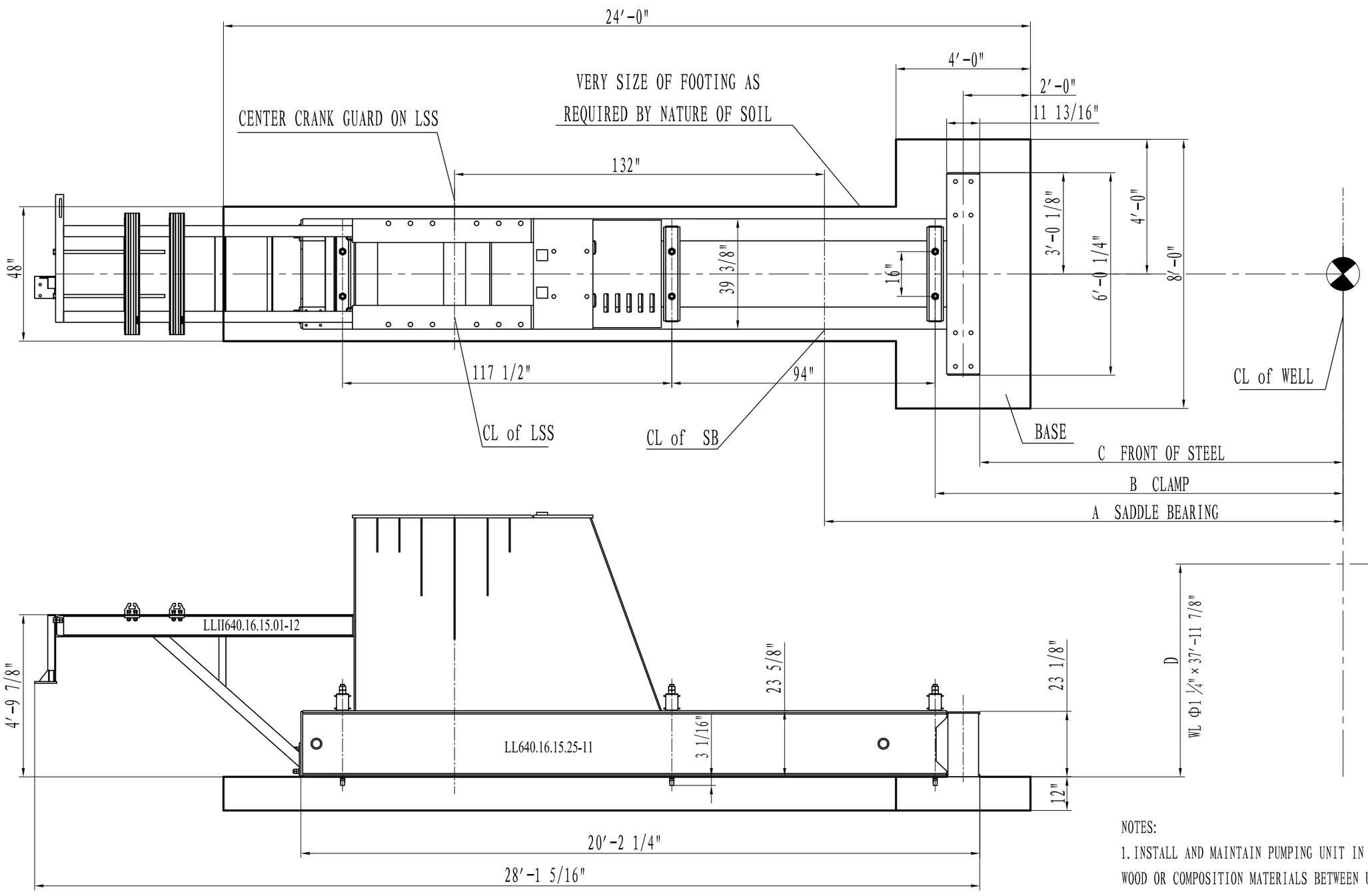
Cranks Only, inch pounds	422170	
Description	Max	Min
Cranks and 4 each LL2	1192979	704802
Cranks w/2-LL2 & 2-LL3	1423958	815857
Cranks and 4 each LL3	1654937	926912
Cranks w/2-LL3 & 2-LL4	1821141	1019603
Cranks and 4 each LL4	1987344	1112293
Cranks w/2-LL4 & 2-LL5	2120739	1192596
Cranks and 4 each LL5	2254133	1272898
*Cranks w/2-LL5 & 2-LL6	2465145	1445014
*Cranks and 4 each LL6	2676156	1617130

* Not Recommended

** Maximum recommended Moment for this unit is 2377412 inch pounds.

912-365-168 High Efficiency
Calculated Permissible Load with 2465145 in-lb Moment





640 B/G					
DN#	LLII640.16.15.01-14				
PN#	LL14070				
LLII640.16.15.01-14 (70.5"-81.4")					
RDCR SHEAVE		PM SHEAVE	OVERALL RATIO	SPM @1160	V-BELT
50	8C	7	210.6	5.5	C255
	6C	18	81.9	14.2	C255
44	8C	7	185.4	6.3	C240
	6C	16	81.1	14.3	C240
40	8C	8	147.5	7.9	C240
	6C	14	84.3	13.8	C240
36	8C	7	151.7	7.6	C225
	6C	13	81.7	14.2	C225

912 B/G					
DN#	LLII912.16.15.01-14				
PN#	LL14117				
LLII912.16.15.01-14 (71.9"-81.2")					
RDCR SHEAVE		PM SHEAVE	OVERALL RATIO	SPM @1160	V-BELT
50 8C		7.5	197.7	5.9	C255
		18	82.4	14.1	C255
44 8C		7	186.4	6.2	C240
		16	81.6	14.2	C240
40 8C		8	148.3	7.8	C240
		14	84.7	13.7	C240
36 8C		7	152.5	7.6	C225
		13	82.1	14.1	C225

NOTES:

1. INSTALL AND MAINTAIN PUMPING UNIT IN ACCORDANCE WITH API RP 11G. DO NOT USE WOOD OR COMPOSITION MATERIALS BETWEEN UNIT FRAME AND CONCRETE FOUNDATION.
2. USE WITH FOUNDATION CLAMP DN# LLII640.16.15.01-16A01, PN# LL16035.

UNIT	A	B	C	D	E	F	CRANK
640-365-168	15'-5 1/8"	12'-1 1/2"	129.63"	5'-3 5/8"			CR011
640-305-168	15'-5 1/8"	12'-1 1/2"	129.63"	5'-3 5/8"			CR011
912-365-168	15'-5 1/8"	12'-1 1/2"	129.63"	5'-3 5/8"			CR011

THIS DRAWING IS PROPERTY OF LIBERTY LIFT SOLUTIONS, LLC, AND IS LOANED TO THE RECIPIENT FOR HIS CONFIDENTIAL USE ONLY IN CONSIDERATION OF THE LOAN OF THIS DRAWING.THE RECIPIENT PROMISES AND AGREES THAT IT SHALL NOT BE USED IN ANY WAY DETRIMENTAL TO THE INTEREST OF LIBERTY LIFT SOLUTIONS, LLC.THAT IT SHALL BE RETURNED UPON REQUEST.AND THAT IT SHALL NOT BE REPRODUCED, COPIED, LOANED OR OTHERWISE DISPOSED OF, DIRECTLY OR INDIRECTLY WITHOUT THE EXPRESS WRITTEN CONSENT OF LIBERTY LIFT SOLUTIONS, LLC.

LIBERTY LIFT
1250 Wood Branch Park Dr
Suite 250
Houston, TX 77079

TOLERANCES:
a. X.X: ±3
b. X.XX: ±1
c. X.XXX: ±0.25
d. ANGULAR: ±1°

SURFACE FINISH:
a. X.X: 25
b. X.XX: 6.3
c. X.XXX: 3.2

DRAWN		STANDARD	
CHECKED		APPROVAL	
DATE			

PART NUMBER CHINA	LL50083	DRAWING NUMBER US		REV
TITLE	FOUNDATION, HE, HP		WEIGHT	
MATERIAL	ASSEMBLY		SCALE	1:36
DRAWING NUMBER CHINA	LLB1.40		REV	0

RODSTAR INPUTS FOR USER DATABASE

Unit Code : G2C

Unit Description :	**HE 912-365-168 CR0011**
Manufacturer	Liberty Lift
API Designation	HE 912-365-168
Crank Rotation	See Note 1
Unit Type	Conventional
Required Crank Rotation	See Note 2
Gearbox Rating (M in-lbs)	912
Structural Rating (x 100 lbs)	365
Maximum Stroke length (in)	168
Articulating inertia (lb-ft^2)	971136
Number of Wrist Pin holes :	3
R1 (in)	53.031
R2 (in)	46.023
R3 (in)	39.016
A (in)	185.091
C (in)	122.008
I (in)	132.008
K (in)	205.671
P (in)	157.650
Structural Unbalance (lbs)	-740
Phase Angle (degrees)	0.0

Note 1 : For the data base input leave this field blank. You should be able to chose the direction of rotation when running the predictive.

Note 2 : For data base input for conventional unit leave this field blank. You should be able to choose the direction of rotation when running the predictive.

SROD Pumping Unit Input Data

Unit Code : G2C

Unit Description	HE 912-365-168 CR0011
Unit Type	Conventional
Counterbalance Phase Angle (degrees)	0.0
Number of Crank Holes (5 holes max)	3
Counterbalance Torque of Cranks (in-lb)	422170
API Dimension K (in)	205.671
API Dimension C (in)	122.008
API Dimension P (in)	157.650
API Dimension A (in)	185.091
API Dimension I (in)	132.008
API Dimension R 1st Crank Hole (in)	53.031
API Dimension R 2nd Crank Hole (in)	46.023
API Dimension R 3rd Crank Hole (in)	39.016
API Dimension R 4th Crank Hole (in)	
API Dimension R 5th Crank Hole (in)	
Reducer Speed Ratio	29.656
Crank Inertia (lb ft-ft)	242552
Slow Speed Gear Inertia (lb ft-ft)	8381
Total Reducer Inertia (lb ft-ft)	90675
Articulating Inertia (lb ft-ft)	971136
Structure Unbalance (lb)	-740
Reducer Rating (M in-lb)	912
Structure Rating (lb)	36500
Manufacturer Code	Liberty Lift

Note 1: Let SROD determine