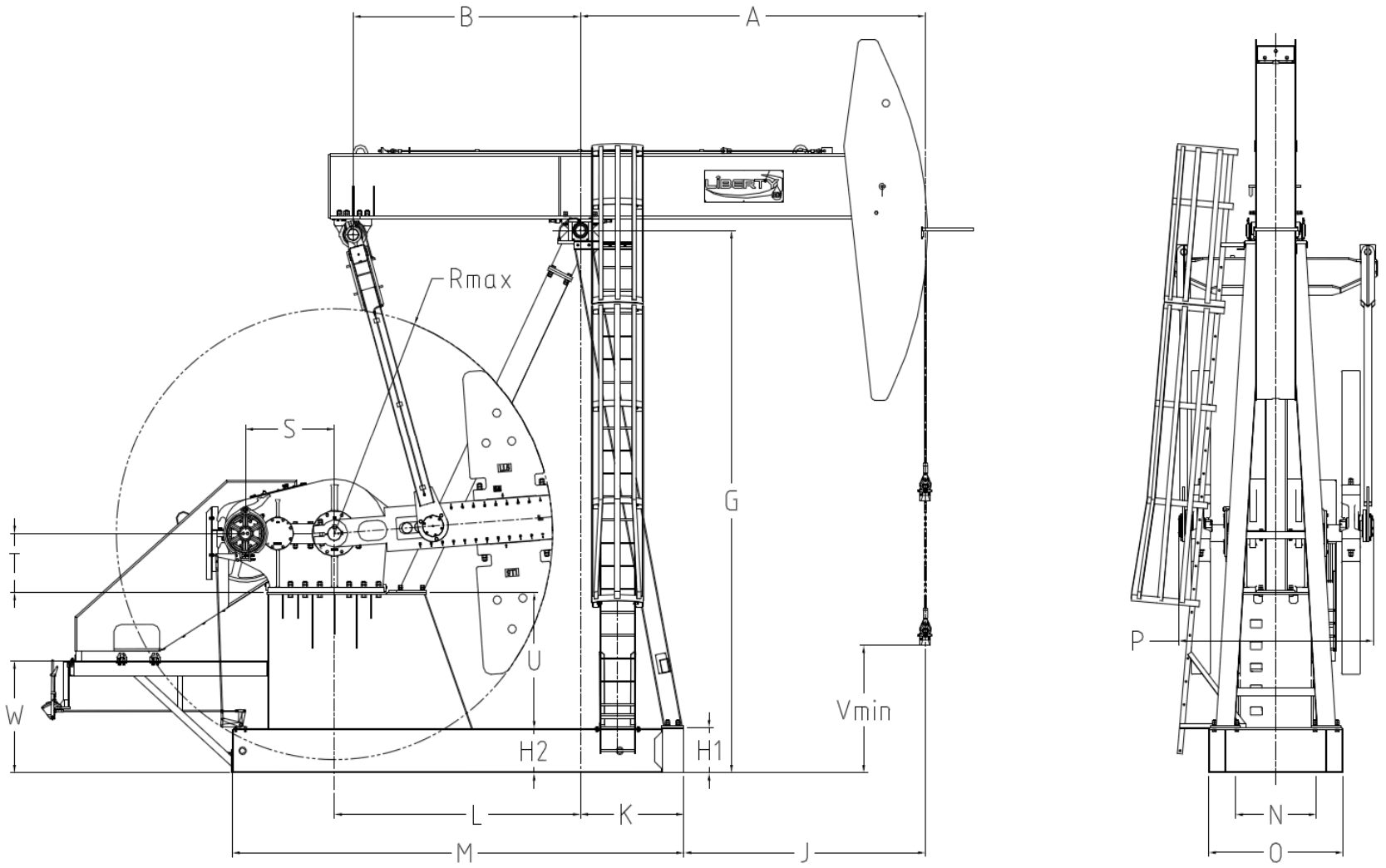
LIBERTY LIFT HE PUMPING UNIT



UNIT	A	B	G	H1	H2	J	K	L	M	N	O	P	R	S	T	U	V	W
912-365-192	17'-7 3/8"	10'-2"	25'-11"	23 3/8"	22 7/8"	13'-0"	4'-7 1/2"	11'-0"	20'-2 3/8"	3'-7 1/4"	6'-0 1/4"	8'-8 5/8"	117"	47.768"	30.512"	5'-5 5/8"	6'-6 5/8"	4'-9 7/8"

LIBERTY LIFT SOLUTIONS

TORQUE FACTOR TABLE

UNIT DESIGNATION 912-365-192 High Efficiency

Cranks : CR002

Position of Crank	Polished Rod Position Length of Stroke, inches			Torque Factor Length of Stroke, inches		
degrees	192.143	164.718	138.321	192.143	164.718	138.321
0	0.0025	0.0019	0.0015	-10.793	-7.994	-5.810
15	0.0100	0.0107	0.0112	22.054	19.185	16.180
30	0.0621	0.0622	0.0620	53.852	45.123	36.955
45	0.1535	0.1512	0.1485	78.675	65.668	53.659
60	0.2715	0.2666	0.2612	92.596	78.031	64.332
75	0.4009	0.3948	0.3880	95.724	81.983	68.592
90	0.5288	0.5237	0.5174	91.059	79.303	67.393
105	0.6470	0.6446	0.6406	82.008	72.320	62.221
120	0.7514	0.7523	0.7513	70.910	62.844	54.388
135	0.8398	0.8436	0.8453	58.804	51.828	44.713
150	0.9112	0.9163	0.9196	45.695	39.470	33.523
165	0.9636	0.9682	0.9713	30.876	25.460	20.813
180	0.9940	0.9961	0.9974	13.271	9.317	6.509
195	0.9981	0.9966	0.9950	-7.886	-9.088	-9.189
210	0.9712	0.9664	0.9622	-31.848	-28.914	-25.499
225	0.9114	0.9050	0.8990	-55.616	-48.142	-41.025
240	0.8215	0.8150	0.8084	-75.341	-64.335	-54.155
255	0.7090	0.7030	0.6963	-88.713	-75.769	-63.621
270	0.5828	0.5771	0.5703	-95.408	-81.808	-68.745
285	0.4518	0.4458	0.4390	-95.966	-82.478	-69.307
300	0.3239	0.3176	0.3109	-90.828	-77.930	-65.285
315	0.2069	0.2008	0.1947	-80.009	-68.175	-56.695
330	0.1086	0.1037	0.0991	-63.163	-53.108	-43.607
345	0.0376	0.0348	0.0323	-39.952	-32.792	-26.342

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 = -1778

A =	211.417
C =	122.008
G =	119.016
H =	311.024
K =	233.009
I =	132.008
P =	191.545
R1 =	53.031
R2 =	46.023
R3 =	39.016

LIBERTY LIFT SOLUTIONS

EFFECTIVE COUNTERBALANCE TABLE

Unit Designation 912-365-192 High Efficiency

CRANK : CR002

Stroke Length, inches	192.143		164.718		138.321	
Cranks Only, pounds	3419		4189		5244	
Description	Max	Min	Max	Min	Max	Min
Cranks and 4 each LL3	16946	8961	19722	10553	23521	12733
Cranks w/2-LL3 & 2-LL4	18770	9979	21816	11722	25985	14108
Cranks and 4 each LL4	20593	10997	23910	12891	28449	15483
Cranks w/2-LL4 & 2-LL5	22057	11879	25591	13904	30427	16675
Cranks and 4 each LL5	23520	12761	27271	14916	32404	17866
Cranks w/2-LL5 & 2-LL6	25835	14651	29929	17087	35532	20420
Cranks and 4 each LL6	28150	16541	32587	19257	38660	22974
*Cranks w/2-LL6 & 2-LL7	29779	18227	34458	21192	40861	25251
*Cranks and 4 each LL7	31408	19912	36328	23127	43062	27528

* Not Recommended

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

LIBERTY LIFT SOLUTIONS,LLC GEAR REDUCER DATA SHEET

MANFACTURED BY: Dwang Jinai DATE SUBMITTED : August 28, 2014

NOMINAL API REDUCER SIZE : 912

CALCULATED VALUES

PITTING RESISTANCE TORQUE

First reduction 1,378,463 in-lb

Second reduction 1,328,722 in-lb

STATIC TORQUE

First reduction :

Gear 1,595,258 in-lb Pinion 2,083,148 in-lb

Second reduction :

Gear 1,331,170 in-lb Pinion 1,628,437 in-lb

BENDING STRENGTH TORQUE

First reduction :

Gear 1,884,846 in-lb Pinion 2,225,015 in-lb

Second reduction :

Gear 1,457,483 in-lb Pinion 1,620,663 in-lb

Notes:

1. First reduction is high-speed reduction.
2. Seond reduction is the slow-speed reduction.

CONSTRUCTION FEATURES

TYPE OF REDUCER : Double Reduction, Double Helical, Involute gearing

TEETH

Number of teeth and normal diametral pitch or transverse diametral pitch:

First reduction, Np = 18 Ng = 95 Pnd = 3.6286 Pd = 3.2616

Second reduction, Np = 21 Ng = 118 Pnd = 2.5400 Pd = 2.2828

Center distance ans net face width :

First reduction, CD = 17.323 in F = 8.661 in

Second reduction, CD = 30.445 in F = 14.906 in

Helix angle and normal pressure angle or transverse pressure angle.

First reduction, HA = 25.99 deg NPA = 20 deg

Second reduction, HA = 26.01 deg NPA = 20 deg

Geometry factors I and J for the pinion and gear.

First reduction, I = .2535 Jp = .5476 Jg = .5141

Second reduction, I = .2539 Jp = .5544 Jg = .5476

Manufacturing methods

Teeth generated by hobbing process. Teeth finished by hobbing process.

Tooth hardening method through hardened.

Gear and pinion materials and hardness

First reduction,

Gear material Normalized Ductile Iron Hardness BHN 245 - 285

Pinion material Q and T AISI4145 Hardness BHN 285 - 325

Second reduction,

Gear material Normalized Ductile Iron Hardness BHN 260 - 300

Pinion material Q and T AISI4145 Hardness BHN 300 - 340

Other components

Crankshaft material Q and T AISI4140 Hardness BHN 300 - 330

Housing material Cast Iron

Housing type Split Type

Bearing Sizes

High speed pinion NU2324

Intermediate speed pinion NU2328

Low speed shaft NJ2244

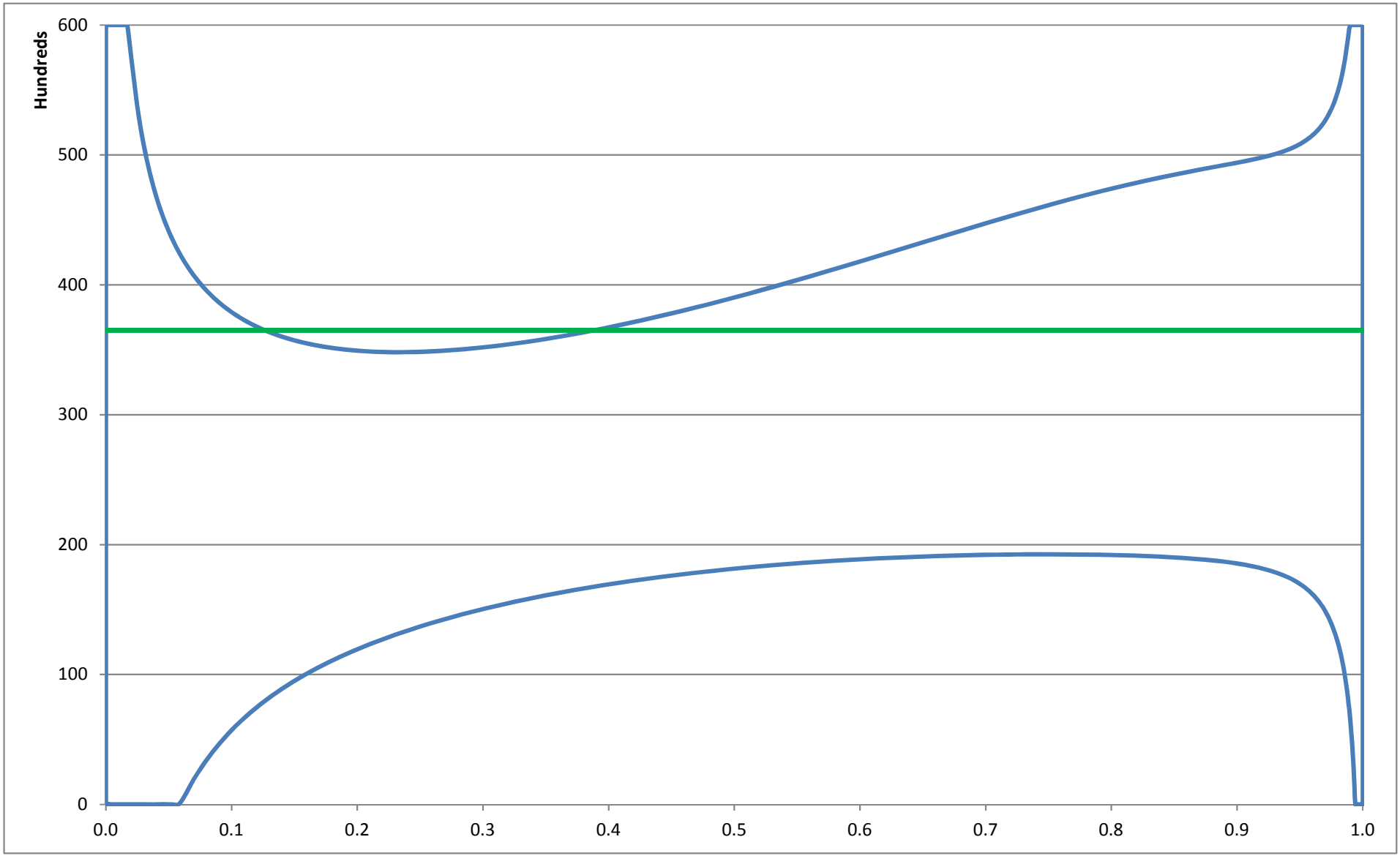
Bearing Life, L10

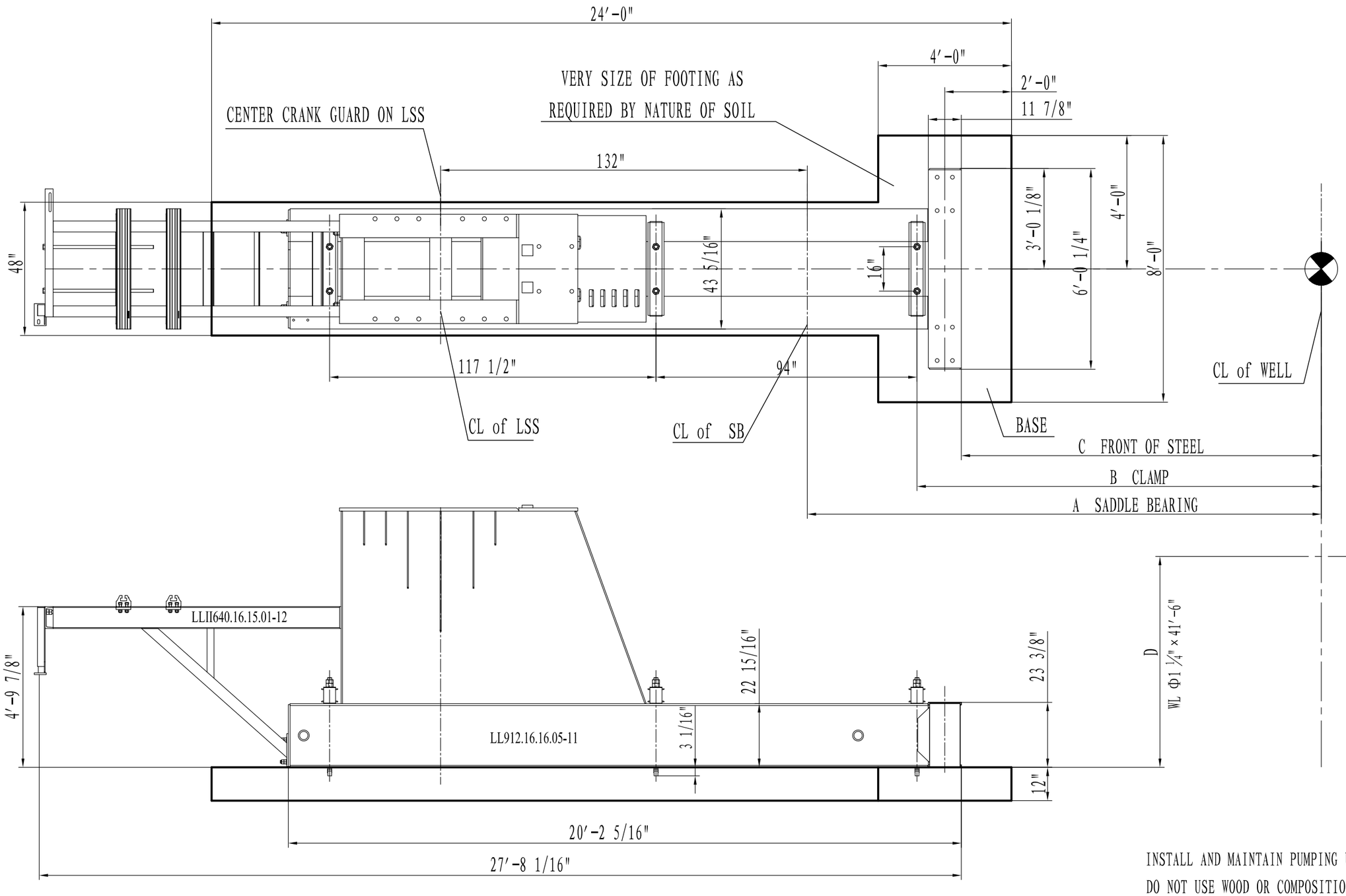
High speed pinion >135,000 hours

Intermediate speed pinion >135,000 hours

Low speed shaft >120,000 hours

912-365-192 High Efficiency
Calculated Permissible Load with 2873335 in-lb Moment





912 B/G				
DN#	LL912.16.16.05-14			
PN#	LL14260			
LL912.16.16.05-14 (74.7"-81.4")				
RDCR SHEAVE	PM SHEAVE	OVERALL RATIO	SPM @1160	V-BELT
50 8C	7	211.8	5.5	C255
50 6C	11	134.8	8.6	C255
44 8C	7	186.4	6.2	C240
44 6C	10.5	124.3	9.3	C240

UNIT	A	B	C	D	E	F	CRANK
912-365-192	17'-7 3/8"	14'-3 7/8"	155.94"	6'-6 5/8"			CR002

INSTALL AND MAINTAIN PUMPING UNIT IN ACCORDANCE WITH API RP 11G. DO NOT USE WOOD OR COMPOSITION MATERIALS BETWEEN UNIT FRAME AND CONCRETE FOUNDATION.

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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	LL50023	DRAWING NUMBER US	REV
TITLE	FOUNDATION, HE3, HP	WEIGHT	
MATERIAL	ASSEMBLY	SCALE	1:36
DRAWING NUMBER CHINA	LLB1.13	REV	0