

SKID ANALYSIS REPORT

Compressor Unit 17083 / 17084

LSD: 02-20-050-18 W5M

HUSKY OIL OPERATIONS Ltd.

ANSELL, ALBERTA

**RECIPROCATING COMPRESSOR PACKAGE
COOLER SHIPPED LOOSE**

Customer:

NGC Compression Solutions

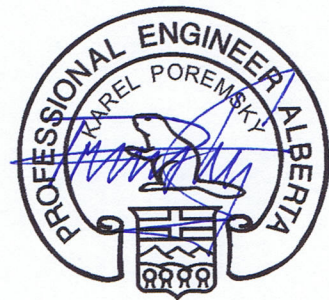
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***October 12, 2014
Calgary***

REPORT CONTENT:

1. Drawings supplied by NGC for job #17083/84 HUSKY
2. Calculation of skid as proposed by drawings
3. Conclusion
4. Design recommendations

Report provided by:



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1. Drawings supplied by NGC:

- 17083-GA, Rev. A General assembly, Sheet 1, 2, 3 and 4
- 17083-500, Rev.1 Skid structure, Sheet 1 to 9
- 17084-500, Rev.1 Skid structure, Sheet 1 to 9
- Weights of major components included on GA

2. See print-outs:

3. Conclusion

Proposed skid design analysis performed as drawn will meet industry standard deflection 1:360 for standard lifting of the compressor skid unit assembly with the self framing building. Analysis is based on using two full length main beams 30WF @ 132# / ft. HSS in wings not included in lifting deflection ratio. Actual calculated deflection ratio is equal to 1: 750. See calculations Section 2. Building weight calculated by program based on dimensions.

Weight ratio “concrete vs. driver & compressor” is 0.84 : 1. (recommended weight ratio is 1:1). Weight of concrete calculated by program based on dimensions.

4. Design recommendations:

Design of the structure skid is equivalent to standards included in CAN/CSA S16-09 Limit States Design of Structure Steel for deflection.

Welding shall be done as per structure steel standards of the CSA W59. Cut lengths are exact with tolerance +/- 1/8”.

COMPRESSOR SKID BENDING ANALYSIS

JOB No.: 17083/17084 HUSKY
DATE: 10-13-2014
THIS ANALYSIS EXECUTED BY: KAREL POREMSKY

***** DESIGN DATA & CONDITIONS *****

SKID WEIGHT (LBS.)..... = 38000
SKID LENGTH (FEET)..... = 34

LOAD #1 = SCRUBBERS 1 & 2
WEIGHT (LBS.)..... = 6500.001
LENGTH (FEET)..... = 4.255209
LOCATION (FEET)..... = 5.338542

LOAD #2 = COMPRESSOR/BOTTLES
WEIGHT (LBS.)..... = 25300
LENGTH (FEET)..... = 6.916667
LOCATION (FEET)..... = 11.75

LOAD #3 = ENGINE
WEIGHT (LBS.)..... = 21000
LENGTH (FEET)..... = 7.572917
LOCATION (FEET)..... = 20.02604

LOAD #4 = SCRUBBER 3
WEIGHT (LBS.)..... = 1500
LENGTH (FEET)..... = 2.375
LOCATION (FEET)..... = 31.625

MISCELLANEOUS EQUIPMENT
WEIGHT (LBS.)..... = 45000

COMPRESSOR BUILDING
LENGTH (FEET)..... = 34
WIDTH (FEET)..... = 22
EAVE HEIGHT (FEET)..... = 14
WEIGHT (LBS.)..... = 5322.82
LOCATION (FEET)..... = 5.208334E-03

CONCRETE CONTENT IN SKID
WEIGHT OF CONC. IN PIPE TRENCHES (LBS.) = 0
WEIGHT OF CONC. IN PEDESTALS (LBS.).... = 15127.21
WEIGHT OF CONC. IN CENTER SECTION (LBS.) = 18873.43
LENGTH OF CONC. IN CENTER SECTION (FEET) = 14.97396
LOCATION OF CENTER SECTION (FEET)..... = 11.28125
TOTAL WEIGHT OF CONCRETE (LBS.)..... = 34000.64

***** TOTAL WEIGHT (LBS.) *****.. = 176623.4

BEAM DATA FOR LOAD RESISTANCE
TOTAL MOMENT OF INERTIA (Ix)..... = 11540
TOTAL SECTION MODULUS (Sx)..... = 762

***** CALCULATION RESULTS *****

1. LIFTING REACTION @ DATUM END (LBS.). = 88182.41
LIFTING REACTION @ OTHER END (LBS.). = 88441.03
2. LOCATION OF ZERO SHEAR/MAX. BENDING,
FORM DATUM END OF SKID (FEET)..... = 16.7581
3. MAX. BENDING MOMENT (FT. LBS.)..... = 867716.2
4. BENDING STRESS @ POINT OF MAX. BENDING
B.S. = B.M. / S_x (PSI)..... = 13664.82
5. SAFETY FACTOR RATIO..... = 2.634502 : 1
6. ***** SKID DEFLECTION *****
EQUIVALENT LOAD IS GIVEN BY: $W \times L / 8 = 10412.6$
 $W = 204.1685$
7. DEFLECTION IS GIVEN BY:
 $DF = 5 \times W \times (L^3) / (384 \times 29 \times 10^6 \times I_x)$
MAX. DEFLECTION (INCHES)..... = .5395159

WEIGHT RATIO OF CONCRETE vs DRIVER+COMP.= .8395219 : 1