

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
*754	101M&TS	BOONE	95	50
STA. _____		TO STA. _____		
FED. ROAD DIST. NO. _____		ILLINOIS FED. AID PROJECT		

SHAFT ANALYSIS

BROM'S OVERTURNING & TORSION SHAFT ANALYSIS

I.D.O.T. BBS CENTRAL GEOTECHNICAL UNIT Modified on 9/1/2005

55 foot mast arm

TOTAL MOMENT APPLIED AT TOP OF SHAFT = KIP-FT (POSITIVE BEING CLOCKWISE)
 TOTAL SHEAR APPLIED AT TOP OF SHAFT = KIPS (POSITIVE TO THE RIGHT)
 TOTAL TORQUE APPLIED AT TOP OF SHAFT = FT-KIPS
 DIAMETER OF FOUNDATION SHAFT = FT. (WHICH IS A 36 IN. DIAMETER)
 DEPTH BELOW SURFACE TO WATERTABLE = FT. (MUST BE PLACED BETWEEN SOIL LAYERS)
 DEPTH OF FROST/DISTURBED SOIL BELOW SURFACE = FT. (MUST BE PLACED BETWEEN SOIL LAYERS) (FOR TORQUE ANALYSIS)
 DEPTH OF NEGLECTED SOIL PRESSURE (1.5xDIA) = FT. (PLACE BETWEEN LAYERS) (FOR COHESIVE LAYERS/MOMENT ANALYSIS)
 CRITICAL SURFACE CROSS SLOPE IN A 15' RADIUS = DEG. (WHICH IS A 3.01: 1' SLOPE)
 FACTOR OF SAFETY FOR OVERTURNING = F.S. (REDUCES SOIL SHEAR STRENGTH BY 69.0%)
 FACTOR OF SAFETY FOR TWISTING = F.S. (REDUCES SKIN FRICTION RESISTING TORQUE BY 11.3%)

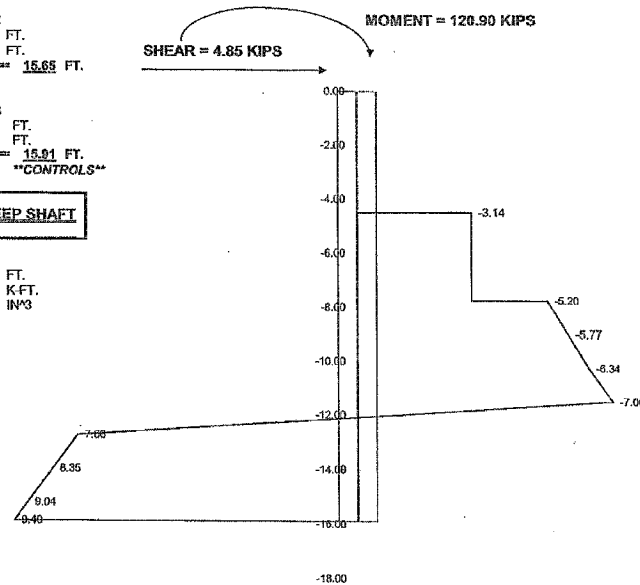
LAYER THICK (FT.)	COHES. INTER. (KSF)	S.P.T. BLOWS (N)	FRICTION ANGLE (DEG)	UNIT WEIGHT (PCF)	BOUYANT UNIT WT. (PCF)	SOIL PRESSURE (KFT) AT TOP / AT BOT. OF EACH LAYER	SUM SHEAR (KIPS) AT TOP / AT BOT. OF EACH LAYER	SUM MOMENT (KIP-FT) AT TOP / AT BOT. OF EACH LAYER	SUM TORQUE (FT-K) AT TOP / AT BOT. OF EACH LAYER
1	3.00		0.0	115.7	115.7	0.000 0.000	4.850 4.850	120.900 135.450	105.100 105.100
2	1.50		0.0	121.5	59.1	0.000 0.000	4.850 4.850	135.450 142.725	105.100 96.827
3			0.0	115.7	53.3	-3.144 -3.144	4.850 2.492	142.725 145.478	96.827 94.242
4			0.0	115.7	53.3	-3.144 -3.144	2.492 -1.437	145.478 146.138	94.242 89.933
5			0.0	115.7	53.3	-3.144 -3.144	-1.437 -5.367	146.138 141.885	89.933 85.824
6			28.1	115.7	53.3	-5.201 -5.770	-5.367 -12.224	141.885 130.964	85.824 74.459
7			28.1	115.7	53.3	-5.770 -6.339	-12.224 -19.785	130.964 111.053	74.459 62.461
8			31.6	124.2	61.8	-6.339 -6.998	-19.785 -28.120	111.053 81.198	62.461 49.555
9			31.6	124.2	61.8	-6.998 7.558	-28.120 -26.929	81.198 43.917	49.555 35.707
10			32.9	126.9	64.5	7.558 8.346	-26.929 -16.926	43.917 16.417	35.707 20.932
11			32.9	126.9	64.5	8.346 9.035	-16.926 -0.063	16.417 1.660	20.932 5.246
12			33.5	128.0	65.6	9.035 9.404	-0.063 0.000	1.660 -0.047	5.246 -3.361
13			33.5	128.0	65.6				
14			33.5	128.0	65.6				
15			33.8	128.5	66.1				
16			33.8	128.5	66.1				
17			33.2	127.5	65.1				
18			33.2	127.5	65.1				

LAYER OF ZERO TORQUE = 12
 DISTANCE THRU LAYER = 0.40 FT.
 SUM OF LAYERS ABOVE = 15.25 FT.
 LENGTH TO RESIST "TORQUE" WITH F.S. = 15.65 FT.

LAYER OF ZERO MOMENT = 13
 DISTANCE THRU LAYER = 0.00 FT.
 SUM OF LAYERS ABOVE = 15.91 FT.
 LENGTH TO RESIST "MOMENT" WITH F.S. = 15.91 FT.
 "CONTROLS"

USE 36.0 IN. DIAMETER, 15.91 FT. DEEP SHAFT

SHAFT ROTATION DEPTH = 12.056 FT.
 MAXIMUM MOMENT = 146.47 K-FT.
 MIN. REQ'D SECT. MODULUS = 88.77 IN³



SHAFT SOIL PRESSURE DIAGRAM

4/19/2006

BROMS SHAFT FOUNDATION ANALYSIS

Broms Overturning Torsion Shaft.xls

PLOT DATE = Thu, Dec 07, 13:47:06, 2006
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