

# PILE DRIVING CRITERIA

## (DURING INITIAL PILE DRIVING)

### GOALS :

1. ENSURE PILE CAPACITY
2. CONTROL OF PILE DAMAGE DURING PILE DRIVING (CONTROL DRIVING STRESS, COMPRESSION & TENSION)

### HOW :

FROM PILE DRIVING ANALYZER;

1. SELECT HAMMER WEIGHT
2. SELECT DROP HEIGHT
3. SELECT CUSION AT PILE HEAD



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## INDIANA STATE CODE FOR DRIVING STRESS

For the pile driving equipment to be acceptable, the driving stresses predicted by the wave equation analysis shall not exceed the values where pile damage impends. These limiting values shall be calculated as follows:

- a. The maximum compressive and tensile driving stresses for steel piles =  $0.9F_y$ .
- b. The maximum compressive driving stress for prestressed concrete piles =  $(0.85f'_c - f_{pe})$  where  $f_{pe}$  is the effective prestress value.
- c. The maximum tensile driving stress, psi (MPa),  
for prestressed concrete piles  
=  $3\sqrt{f'_c} + f_{pe}$ , where  $f'_c$  and  $f_{pe}$  are expressed in psi  
=  $0.25\sqrt{f'_c} + f_{pe}$ , where  $f'_c$  and  $f_{pe}$  are expressed in MPa.



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## SAMPLE OF PILE DRIVING CRITERIA

<b>Dia.600 mm</b>	Hammer Weight	7.0	Tons(see ref#4)
<b>PILE DRIVING CRITERIA</b>	Average Drop height	0.7	m.(see ref#4)
<b>DURING INITIAL TEST</b>	Average Settlement/blow	20.0	mm.(see ref#4)
Ultimate Load <b>228 Tons</b>	Settlement for last 10 blow<	20.0	cm.
Design Load <b>91 Tons</b>	Max.Transfered Energy	3.7	T-m.
F.S.= 2.5	Input Energy	4.9	T-m.
	Hammer Efficiency	74.9	%
	Measured Driving Stress	217.0	ksc.(OK not over Stress)
	Allow. Driving Stress	450.0	ksc.(see ref#3-03,Indiana State department of transportation)
	Measured Tensile Stress	7.0	ksc.(OK not over Stress)
	Allow. Tension Stress	66.1	ksc.(see ref#3-03,Indiana State department of transportation)



# PILE DRIVING CRITERIA

## SUMMARY OF PDA TEST FROM CAPWAP

File: TP#6 Test: 15-Jun-2012 14:33:  
 SPUN PILE 0.60 M.; Blow: 879 CAPWAP (R) 2006-3  
OP: NR

CAPWAP SUMMARY RESULTS								
Total CAPWAP Capacity:		164.5;	along Shaft	63.1	at Toe	101.4	tons	
Soil Sgmnt No.	Dist. Below Gages m	Depth Below Grade m	Ru tons	Force In Pile tons	Sum of Ru tons	Unit Resist. (Depth) tons/m	Unit Resist. (Area) tons/m <sup>2</sup>	Smith Damping Factor s/m
			SUM					
				164.5				
1	2.0	1.2	0.0	164.5	0.0	0.00	0.00	0.000
2	4.1	3.2	1.2	163.3	1.2	0.60	0.32	0.541
3	6.2	5.3	2.5	160.8	3.7	1.23	0.65	0.541
4	8.2	7.3	6.2	154.5	10.0	3.03	1.61	0.541
5	10.2	9.3	7.5	147.1	17.4	3.64	1.93	0.541
6	12.3	11.4	8.4	138.7	25.8	4.09	2.17	0.541
7	14.3	13.4	18.0	120.7	43.8	8.77	4.65	0.541
8	16.4	15.5	19.4	101.4	63.1	9.44	5.01	0.541
Avg. Shaft			7.9	Average/soil segment		4.0	2.16	0.541
Toe			101.4				645.20	0.758

Soil Model Parameters/Extensions		Shaft	Toe
Quake	(mm)	2.540	14.000
Case Damping Factor		0.200	0.450
Damping Type			Smith
Unloading Quake	(% of loading quake)	45	45
Reloading Level	(% of Ru)	100	100
Unloading Level	(% of Ru)	13	
Soil Plug Weight	(tons)		0.45

CAPWAP match quality = 6.59 (Wave Up Match) ; RSA = 0  
 Observed: final set = 10.000 mm; blow count = 100 b/m  
 Computed: final set = 6.204 mm; blow count = 161 b/m



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EXTREMA TABLE

File Sgmnt No.	Dist. Below Gages m	max. Force tons	min. Force tons	max. Comp. Stress tons/cm <sup>2</sup>	max. Tens. Stress tons/cm <sup>2</sup>	max. Trnsfd. Energy tonne-m	max. Veloc. m/s	max. Displ. mm
1	1.0	331.9	-10.5	0.211	-0.007	3.67	1.9	18.232
2	2.0	332.8	-10.5	0.212	-0.007	3.67	1.9	18.111
3	3.1	334.2	-10.5	0.213	-0.007	3.66	1.9	17.970
4	4.1	336.0	-10.6	0.214	-0.007	3.65	1.9	17.808
5	5.1	336.0	-10.4	0.214	-0.007	3.60	1.9	17.652
6	6.2	338.7	-10.4	0.216	-0.007	3.59	1.9	17.493
7	7.2	337.3	-10.0	0.215	-0.006	3.51	2.0	17.325
8	8.2	340.7	-10.1	0.217	-0.006	3.50	2.2	17.156
9	9.2	332.7	-9.1	0.212	-0.006	3.31	2.3	17.001
10	10.2	336.2	-9.2	0.214	-0.006	3.30	2.3	16.834
11	11.3	318.1	-8.0	0.202	-0.005	3.07	2.3	16.661
12	12.3	304.0	-8.0	0.194	-0.005	3.06	2.3	16.480
13	13.3	254.2	-6.7	0.162	-0.004	2.81	2.4	16.305
14	14.3	233.4	-6.7	0.149	-0.004	2.80	2.5	16.132
15	15.4	184.0	-4.1	0.117	-0.003	2.28	2.5	15.967
16	16.4	198.2	-4.1	0.126	-0.003	1.76	2.5	15.805
Absolute	8.2			0.217			(T =	24.7 ms)
	4.1				-0.007		(T =	182.9 ms)

